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Deceptively Simple: Framing, Intuition, and Judicial Gatekeeping of Forensic Feature-Comparison Methods Evidence

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Erratum

Law; Criminal Law; Evidence; Courts; Judges

DECEPTIVELY SIMPLE: FRAMING, INTUITION, AND JUDICIAL GATEKEEPING OF FORENSIC FEATURE-COMPARISON METHODS EVIDENCE

*Jane Campbell Moriarty**

> Without appropriate estimates of accuracy, an examiner's statement that two samples are similar—or even indistinguishable—is scientifically meaningless: it has no probative value, and considerable potential for prejudicial impact. Nothing—not training, personal experience nor professional practices—can substitute for adequate empirical demonstration of accuracy.[1]

INTRODUCTION

During the Symposium for the Judicial Conference Advisory Committee on Evidence Rules, held at Boston College on October 27, 2017, the scientists, statisticians, legal academics, and criminal defense lawyers presented a unified theme: the federal courts have not fulfilled their role as gatekeepers to exclude or limit potentially unreliable feature-comparison methods of forensic science evidence ("FCM evidence").[2] The only voiced

* Carol Los Mansmann Chair in Faculty Scholarship and Professor, Duquesne University School of Law. This Article was prepared for the *Symposium on Forensic Expert Testimony*, Daubert, *and Rule 702*, held on October 27, 2017, at Boston College School of Law. The Symposium took place under the sponsorship of the Judicial Conference Advisory Committee on Evidence Rules. For an overview of the Symposium, see Daniel J. Capra, *Foreword: Symposium on Forensic Expert Testimony*, Daubert, *and Rule 702*, 86 FORDHAM L. REV. 1459 (2018). Many thanks to Professor Capra for inviting me to speak at the Boston College Law School Symposium and to write for this *Fordham Law Review* Symposium. Additional thanks to the patient and thoughtful editors of the *Fordham Law Review*; to Richard Bielawa for his fine research assistance; and to Lauren Gailey for her kind recommendation and friendship. Finally, thanks to my colleague Bruce Ledewitz for our frequent chats that sharpen the questions and provide insights to the answers. I'm so grateful for the friendship and collegiality.

1. PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., EXEC. OFFICE OF THE PRESIDENT, FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 46 (2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf [https://perma.cc/R76Y-7VU] (emphasis omitted).

2. These types of forensic-science evidence, which compare a known and unknown sample, include handwriting, shoe print, microscopic hairs, fingerprint, and bite marks, among other forms of evidence. DNA is a type of FCM evidence but is methodologically distinct from these others forms and is not addressed in this Article. FCM evidence has frequently been referred to as "individualization evidence." *See, e.g.*, Simon A. Cole, *Individualization*

dissents came from the DOJ and FBI lawyers, who argued that the courts had been admitting such pattern-matching evidence properly and that the evidence was indeed reliable.[3]

For decades, scientists and legal academics have been highly critical of claims that FCM evidence has a reliable foundation and can reliably match a known and unknown sample.[4] Moreover, as Innocence Project data and analysis of such data establish, wrongful convictions often include erroneous FCM evidence.[5]

Two national committees have written reports about the shortcomings of forensic science: The National Research Council for the National Academy of Sciences report in 2009 ("NRC report") and the President's Council of Advisors on Science and Technology report in 2016 ("PCAST report").[6] The

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Is Dead, Long Live Individualization! Reforms of Reporting Practices for Fingerprint Analysis in the United States, 13 L. PROBABILITY & RISK 117, 119–22 (2014) (discussing the history of the term "individualization" and the problems it poses); Jane Campbell Moriarty, *Will History Be Servitude?: The NAS Report on Forensic Science and the Role of the Judiciary*, 2010 UTAH L. REV. 299, 300; *see also* David H. Kaye, *Identification, Individualization and Uniqueness: What's the Difference*, 8 L. PROBABILITY & RISK 85, 85–94 (2009).

3. See Symposium, *Forensic Evidence, Daubert, and Rule 702*, 86 FORDHAM L. REV. 1459 (2018).

4. *See generally* NAT'L RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 87 (2009), https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf [https://perma.cc/CLW3-Y6VQ]; PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., *supra* note 1; Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 J. CRIM. L. & CRIMINOLOGY 985 (2005); Itiel E. Dror & David Charlton, *Why Experts Make Errors*, 56 J. FORENSIC IDENTIFICATION 600 (2006); Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1 (2009); Paul C. Giannelli, *"Junk Science": The Criminal Cases*, 84 J. CRIM. L. & CRIMINOLOGY 150 (1993); Paul C. Giannelli, *Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs*, 86 N.C. L. REV. 163 (2007); Jennifer L. Mnookin, *Fingerprint Evidence in an Age of DNA Profiling*, 67 BROOK. L. REV. 13 (2001); Jennifer L. Mnookin, *Scripting Expertise: The History of Handwriting Identification Evidence and the Judicial Construction of Reliability*, 87 VA. L. REV. 1723 (2001); Jennifer L. Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725 (2011); Jane Campbell Moriarty, *"Misconvictions," Science and the Ministers of Justice*, 86 NEB. L. REV. 1 (2007); Jane Campbell Moriarty & Michael J. Saks, *Forensic Science: Grand Goals, Tragic Flaws, and Judicial Gatekeeping*, JUDGES' J., Fall 2005, at 16; Peter J. Neufeld, *The (Near) Irrelevance of* Daubert *to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH S107 (2005); D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?*, 64 ALB. L. REV. 99 (2000); D. Michael Risinger et al., *Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification 'Expertise,'* 137 U. PA. L. REV. 731 (1989); D. Michael Risinger with Michael J. Saks, *Science and Nonscience in the Courts:* Daubert *Meets Handwriting Identification Expertise*, 82 IOWA L. REV. 21 (1996); Michael J. Saks & David L. Faigman, *Failed Forensics: How Forensic Science Lost Its Way and How It Might Yet Find It*, 4 ANN. REV. L. & SOC. SCI. 149 (2008); Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (2005); Adam B. Shniderman, *Prosecutors Respond to Calls for Forensic Science Reform: More Sharks in Dirty Water*, 126 YALE L.J. FORUM 348 (2017).

5. Garrett & Neufeld, *supra* note 4, at 14 (explaining that 82 percent of the 137 exonerees' cases they reviewed involved "invalid forensic science testimony").

6. Other national bodies conduct research, collect data, and issue publications about various aspects of forensic science, such as the National Institute of Standards and Technology and the National Commission on Forensic Science. *See Forensic Science*, NIST,

NRC report concluded that, other than DNA analysis, "no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source."[7] The PCAST report was even more pointed in its critique, finding shortcomings in virtually all aspects of FCM evidence, from foundation through application.[8]

Despite the disturbing criticism of FCM evidence and its association with wrongful convictions, courts have been generally unwilling to exclude or even limit experts' conclusions about such evidence—a point made repeatedly by the speakers at the conference and in the NRC report.[9] Even more curiously, courts are much more willing to exclude scientific evidence in civil cases when such evidence is challenged under a reliability standard.[10] So what explains the intransigence of the judiciary refusing to take seriously the critiques of FCM evidence?

While there are many explanations for this persistent refusal to recognize the shortcomings of FCM evidence,[11] one idea I suggested in 2010 still resonates: courts do not appreciate the complexity of FCM evidence and, believing pattern matching is a straightforward and uncomplicated endeavor, admit the evidence under the assumption that cross-examination can reveal its problematic shortcomings.[12] FCM evidence is deceptive in its apparent simplicity—something courts do not recognize. In fact, rather than requiring the prosecution to meet the standard of reliability of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[13] and Federal Rule of Evidence 702,[14] courts have employed different ways of sidestepping a detailed reliability analysis, with some simply latching onto *Daubert*'s comment that "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the

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https://www.nist.gov/topics/forensic-science [https://perma.cc/5RHV-Q4YE] (last visited Feb. 14, 2018); *National Commission on Forensic Science*, NIST, https://www.nist.gov/topics/forensic-science/national-commission-forensic-science [https://perma.cc/32RK-QA4T] (last visited Feb. 14, 2018).

7. NAT'L RESEARCH COUNCIL, *supra* note 4, at 7.

8. *See infra* Part I.

9. NAT'L RESEARCH COUNCIL, *supra* note 4, at 11 ("[T]he vast majority of the *reported* opinions in criminal cases indicate that trial judges rarely exclude or restrict expert testimony offered by prosecutors: most *reported* opinions also indicate that the appellate courts routinely deny appeals contesting trial court decisions admitting forensic evidence against criminal defendants.").

10. *See* Moriarty, *supra* note 2, at 308–09.

11. *See, e.g.*, Stephanie L. Damon-Moore, *Trial Judges and the Forensic Science Problem*, 92 N.Y.U. L. REV. 1532, 1555–59 (2017) (discussing multiple reasons for judicial resistance to properly gatekeep forensic science); Shniderman, *supra* note 4, at 352–54 (listing various reasons, including a lack of scientific aptitude, a "systemic pro-prosecution bias on the bench," and the desire for reelection by proclaiming oneself tough on crime); *see also* United States v. Baines, 573 F.3d 979, 992 (10th Cir. 2009); United States v. Llera Plaza, 188 F. Supp. 2d 549, 572 (E.D. Pa. 2002) (recognizing the shortcomings of fingerprint comparison but allowing it into evidence because to do otherwise would "make the best the enemy of the good").

12. Moriarty, *supra* note 2, at 319 (suggesting that "[i]t may well be that fingerprint, handwriting, and microscopic hair comparisons seem to be 'simple' problems for judges").

13. 509 U.S. 579 (1993).

14. *See infra* Part II (discussing these standards).

burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."[15]

This Article explains how courts have skirted the reliability problem of FCM evidence and argues that judges perceive the question of FCM evidence to be a simple problem that cross-examination can solve. Relying on insights from cognitive science to help explain the resistance of the courts to FCM evidence challenges, the Article urges courts to recognize the complexity of FCM evidence and refocus on the danger such evidence poses for continued wrongful conviction. By framing the admissibility of FCM evidence as an "easy" question, courts are relying on heuristics—that is, shortcuts—to solve complex problems. As this Article explains, using heuristics can lead to more error-prone decisions, as such shortcuts are vulnerable to various cognitive biases and systemic fallacies. In both reasoning and language, courts exhibit biased-affected decision-making.

Part I of the Article briefly reviews the NRC report and the PCAST report while Part II discusses cases addressing FCM evidence. The cognitive science that may explain the courts' consistent approaches to the evidence is considered in Part III. Part III then applies these concepts to judicial decision-making related to FCM evidence—a complicated problem in need of greater analysis.

I. THE NRC AND PCAST REPORTS

Following a three-year congressionally mandated study of forensic science,[16] the National Academy of Sciences issued the groundbreaking NRC report.[17] The NRC report concluded that, except for DNA analysis, no forensic method "has been rigorously shown to have the capacity to consistently and with a high degree of certainty support conclusions about . . . 'matching' of an unknown item of evidence to a specific known source."[18] Strong words from a body as well regarded as the National Academy of Sciences, a nonpartisan organization that has addressed major science-related issues for more than 150 years.[19]

The NRC report described the use of forensic-science evidence in the courtroom, recognizing both the shortcomings of current methods and the need for improvement in the forensic sciences.[20] The NRC report found that the "existing legal regime," which included trial and appellate standards, judges, and lawyers who lacked scientific expertise, was "inadequate to the

15. *Daubert*, 509 U.S. at 596.

16. *See* PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., *supra* note 1, at 22 (describing the genesis of the NRC report).

17. *See generally* NAT'L RESEARCH COUNCIL, *supra* note 4.

18. *Id.* at 87.

19. For a fuller understanding of the significant role that the National Academies of Sciences, Engineering and Medicine have played in addressing pressing issues, see its website at *The National Academies: An Overview*, NAT'L ACADS. SCI. ENGINEERING & MED., http://www.nationalacademies.org/brochure/index.html [https://perma.cc/6ZU4-NZ5L] (last visited Feb. 14, 2018).

20. *See* NAT'L RESEARCH COUNCIL, *supra* note 4, at 85–86.

task of curing the documented ills of the forensic science disciplines."[21] In the chapter detailing the shortcomings of forensic science as courtroom evidence, the report addresses the courts' role in managing poor-quality forensic science:

> "[T]he undeniable reality is that the community of forensic science professionals has not done nearly as much as it reasonably could have done to establish either the validity of its approach or the accuracy of its practitioners' conclusions," and the courts have been "utterly ineffective" in addressing this problem.[22]

The report also found that courts were not successfully applying the *Daubert* reliability standard,[23] noting with irony that appellate courts were more willing to second-guess trial court decisions about expert evidence in civil cases than they were decisions in criminal matters.[24]

The initial reaction to the NRC report seemed encouraging, with the U.S. Supreme Court even commenting on it in a case involving the Sixth Amendment's Confrontation Clause. The Court mentioned the problems of subjectivity, bias, and the unreliability of feature-comparison evidence, specifically mentioning fingerprints, pattern-impression analysis, toolmarks, and firearms.[25] Law schools held conferences and published symposia articles about the perceived importance of the NRC report and its implications for courtroom evidence.[26] Many, including this author,[27] hoped that the NRC report would spur courts to reevaluate the way they were treating FCM evidence.[28]

However, despite the publication of the NRC report, "courts largely ignored the report's findings and continued to allow forensic scientists, particularly in the pattern-impression disciplines, to testify to individualization statements without a scientific basis for the statements."[29] A handful of courts limited the conclusions of the experts,[30] but most courts

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21. *Id.* at 85.

22. *Id.* at 108–09 (alteration in original) (first quoting Jennifer L. Mnookin, *The Validity of Latent Fingerprint Identification: Confessions of a Fingerprinting Moderate*, 7 L. PROBABILITY & RISK 127, 134 (2008); then quoting Neufeld, *supra* note 4, at S109).

23. *See infra* Part II (explaining this standard further).

24. NAT'L RESEARCH COUNCIL, *supra* note 4, at 11.

25. Melendez-Diaz v. Massachusetts, 557 U.S. 305, 321 (2009).

26. *See, e.g.*, Paul C. Giannelli, *The 2009 NAS Forensic Science Report: A Literature Review*, 48 CRIM. L. BULL. 380–81 nn.24–29 (2012) (listing the conferences, written symposia, and articles published at the time).

27. Moriarty, *supra* note 2, at 325–26 (suggesting that if the Supreme Court held lower courts accountable for forensic-science evidence gatekeeping, it would spur the judiciary to evaluate the testimony more accurately).

28. Giannelli, *supra* note 26, at 378 (collecting scholarly descriptions of the NRC report calling it "a 'blockbuster, a watershed, a scathing critique, a milestone, and pioneering'").

29. Jennifer Friedman & Jessica Brand, *It Is Now up to the Courts: "Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods,"* 57 SANTA CLARA L. REV. 367, 371–72 (2017).

30. *See, e.g.*, United States v. Willock, 696 F. Supp. 2d 536, 547 (D. Md. 2010) (limiting the degree of certainty that the expert could give about a match); United States v. Taylor, 663 F. Supp. 2d 1170, 1180 (D.N.M. 2009); United States v. Glynn, 578 F. Supp. 2d 567, 574–75 (S.D.N.Y. 2008) (holding that permitting the expert to testify to a "reasonable degree of

continued to admit the evidence as they always had. Some courts avoided the NRC report by suggesting that it was not intended for use in the courtroom.[31] Others have sidestepped the NRC report by discussing the long history of admitting such evidence.[32] Some courts proudly "remain[] faithful to their tradition" of admitting the evidence.[33] A number of courts categorize the evidence as not particularly scientific and therefore do not really employ *Daubert*'s reliability analysis,[34] and several judges have simply referenced the opinions of other courts that analyzed such evidence and found it sufficiently reliable.[35] Some decisions patently ignore the NRC report,

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ballistic certainty" would be seriously misleading and limiting the opinion of the expert to ballistics match testimony to a statement of "more likely than not"). Professor Imwinkelried sees a "definite judicial trend" to prohibit experts from testifying to overstated claims of certainty. Edward Imwinkelried, *The Importance of Forensic Metrology in Preventing Miscarriages of Justice: Intellectual Honesty About the Uncertainty of Measurement in Scientific Analysis*, 7 J. MARSHALL L.J. 333, 352 (2014).

31. *See, e.g.*, Commonwealth v. Gambora, 933 N.E.2d 50, 59 (Mass. 2010) ("The NAS Report does not conclude that fingerprint evidence is so unreliable that courts should no longer admit it."); *see also* Allen v. United States, No. 4:07CV00027 ERW, 2011 WL 13182909, at *3 (E.D. Mo. Aug. 29, 2011) ("The NAS Report, at most, calls into question whether the techniques used by ballistics and fingerprint experts to generate their conclusions can be counted on, in all circumstances, to produce totally reliable, unequivocal findings. It does *not* indicate that the conclusions of the experts in *this* case were wrong; the NAS Report does not suggest that the recovered bullets were not actually discharged from the firearm associated with Movant, or that the fingerprint matched to Movant was not actually Movant's."); United States v. Rose, 672 F. Supp. 2d 723, 725 (D. Md. 2009) (claiming, inaccurately, that the co-chair of the NRC report "made it clear that nothing in the [r]eport was intended to answer the 'question whether forensic evidence in a particular case is admissible under applicable law'"); Moriarty, *supra* note 2, at 322 (discussing this inaccuracy).

32. *See, e.g.*, United States v. Baines, 573 F.3d 979, 990 (10th Cir. 2009) ("[W]hile we must agree . . . that this record does not show the technique has been subject to testing that would meet all of the standards of science, it would be unrealistic in the extreme for us to ignore the countervailing evidence. Fingerprint identification has been used extensively by law enforcement agencies all over the world for almost a century."); Meskimen v. Commonwealth, 435 S.W.3d 526, 535 (Ky. 2013) ("In this case, the Commonwealth offered evidence that has been admissible in the state of Kentucky for many years. Microscopic hair analysis is a scientifically reliable method, and we, therefore, do not require that a *Daubert* hearing be held with regard to the admittance of such evidence."); State v. Pigott, 325 P.3d 247, 250 (Wash. Ct. App. 2014) ("The reliability of fingerprint identification has been tested in our adversarial system for over a century and routinely subjected to peer review."); Moriarty, *supra* note 2, at 304 (discussing the "long history of use" fallacy in many cases).

33. *See, e.g.*, United States v. Casey, 928 F. Supp. 2d 397, 400 (D.P.R. 2013) (stating that "the Court . . . remains faithful to the long-standing tradition of allowing the unfettered testimony of qualified ballistics experts").

34. *See, e.g.*, *Gambora*, 933 N.E.2d at 60 (noting that the issues highlighted in the NRC report are "important and deserve consideration" but declining to take such consideration because of the "plausible" proposition that examiners can compare two prints and determine that they came from the same source); *see also* United States v. Willock, 696 F. Supp. 2d 636, 571 (D. Md. 2010) (noting that "it may be debatable" whether firearms-related toolmark identification evidence is "science" but that it is "clearly technical or specialized" with a "baseline level of credibility").

35. *See, e.g.*, United States v. Ashburn, 88 F. Supp. 3d 239, 245 (E.D.N.Y. 2015) ("This court too 'sees no need to duplicate the considerable efforts of those courts.'" (quoting United States v. Sebbern, No. 10 Cr. 87(SLT), 2012 WL 5989813, at *8 (E.D.N.Y. Nov. 30, 2012)); *id.* at 249 ("[G]iven the extensive record presented in other cases, the court joins in precluding this expert witness from testifying that he is 'certain' or '100%' sure of his conclusions that certain items match."); United States v. Sebbern, No. 10 Cr. 87(SLT), 2012 WL 5989813, at

despite it being raised in the case.[36] And some jurists use a combination of ways to avoid the implications of the NRC report. As Professor Paul Giannelli recently concluded when reviewing the cases, "[d]espite the [NRC] report, courts generally continued to admit the same evidence."[37]

Although the NRC report explained how the forensic science specialties lacked empirical data to support the claims that analysts made in court and provided recommendations for both developing protocols and pursuing research to improve the specialties, little progress was made to improve those specialties.[38] Given the courts' repeated willingness to look past the shortcomings of the evidence, there was little incentive to improve the quality of what was presented in court.

In April 2009, President Barack Obama announced the President's Council of Advisors on Science and Technology.[39] In 2015, the President tasked PCAST with determining "whether there are additional steps on the scientific side, beyond those already taken by the Administration in the aftermath of a highly critical [NRC Report] on the state of the forensic sciences, that could help ensure the validity of forensic evidence used in the Nation's legal system."[40]

Over the course of a year, PCAST compiled and reviewed voluminous material and studies, and in 2016 it issued the PCAST report.[41] The PCAST report focused on "defining the validity and reliability of one specific area within forensic science: forensic feature-comparison methods."[42] These methods fit within the field of "metrology—the science of measurement and its application."[43] The authors described the two different types of feature comparison methods, objective and subjective, discussed the scientific

*8 (E.D.N.Y. Nov. 30, 2012) ("This Court . . . sees no need to hold a separate *Daubert* hearing. This Court has reviewed [other] opinions . . . and is persuaded by those thorough and well-reasoned decisions that ballistics testimony of the sort proffered in this case is admissible under *Daubert*. This Court sees no need to duplicate the considerable efforts of those courts."); United States v. Stone, 848 F. Supp. 2d 714, 718 (E.D. Mich. 2012) ("[T]his Court finds no basis to expand on, or depart from, the holdings of numerous courts that latent fingerprint identification evidence is reliable under the five-factor test developed by the Supreme Court in *Daubert*.").

36. *See, e.g.*, Patterson v. State, 146 A.3d 496, 502–03 (Md. Ct. Spec. App. 2016) (ignoring the NRC report issue raised by the defendant but noting that toolmark identification is generally accepted within the scientific community), *cert. denied*, 155 A.3d 443 (Md. 2017).

37. Paul C. Giannelli, *Forensic Science:* Daubert*'s Failure*, 59 CASE W. RES. L. REV. (forthcoming 2018) (manuscript at 6), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3031227 [https://perma.cc/N32H-VL36].

38. Friedman & Brand, *supra* note 29, at 368.

39. *About PCAST*, WHITE HOUSE, https://obamawhitehouse.archives.gov/administration/eop/ostp/pcast/about [https://perma.cc/6RLC-X8D2] (last visited Feb. 14, 2018).

40. Eric Lander et al., *PCAST Releases Report on Forensic Science in Criminal Courts*, WHITE HOUSE (Sept. 20, 2016), https://obamawhitehouse.archives.gov/blog/2016/09/20/pcast-releases-report-forensic-science-criminal-courts [https://perma.cc/4GMJ-WHSQ].

41. *See generally* PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., *supra* note 1.

42. *Id.* at 44.

43. *Id.* Forensic feature-comparison methods involve a determination of whether "two sets of features agree within a given measurement tolerance." *Id.* at 44 n.93.

criteria for both foundational validity and validity as applied, and then addressed the views of the forensic-science community.[44]

The PCAST report is clear in its recommendation about what is necessary to establish validity of forensic feature-comparison methods:

> Scientific validity and reliability require that a method has been subjected to empirical testing, under conditions appropriate to its intended use, that provides valid estimates of how often the method reaches an incorrect conclusion. For subjective feature-comparison methods, appropriately designed black-box studies are required, in which many examiners render decisions about many independent tests (typically, involving "questioned" samples and one or more "known" samples) and the error rates are determined. Without appropriate estimates of accuracy, an examiner's statement that two samples are similar—or even indistinguishable—is scientifically meaningless: it has no probative value, and considerable potential for prejudicial impact. Nothing—not training, personal experience nor professional practices—can substitute for adequate empirical demonstration of accuracy.[45]

The PCAST report indicates that methods must be empirically tested in an appropriate fashion to make sure they are accurate: "Without an appropriate estimate of its accuracy [using appropriate empirical testing], a metrological method is useless—because one has no idea how to interpret its results."[46] The PCAST report also included a number of recommendations for various bodies, including one directed at the judiciary: "When deciding the admissibility of expert testimony, Federal judges should take into account the appropriate scientific criteria for assessing scientific validity."[47]

II. JUDICIAL DECISIONS ABOUT FCM EVIDENCE

Despite robust challenges to FCM evidence over the last three decades, courts have rebuffed nearly all claims under a *Daubert* reliability standard,[48]

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44. *Id.* at 44–66.

45. *Id.* at 46 (emphasis omitted). For further explanations of the PCAST report, see Friedman & Brand, *supra* note 29, at 374–81; Giannelli, *supra* note 37, at 51–53; David H. Kaye, *How* Daubert *and Its Progeny Have Failed Criminalistics Evidence and a Few Things the Judiciary Could Do About It*, 86 FORDHAM L. REV. 1639, 1651–58 (2018).

46. PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., *supra* note 1, at 48.

47. *Id.* at 145. For additional commentary on the PCAST report and its potential implications, see 4 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 29:11–29:15 (2017); 1 PAUL GIANNELLI ET AL., SCIENTIFIC EVIDENCE §§ 1.08(b), 13.04, 14.03 (Matthew Bender ed., 2017); 2 GIANNELLI ET AL., *supra*, § 16.01.

48. *See generally* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993). The so-called *Daubert* trilogy, composed of the *Daubert* decision, *General Electric Co. v. Joiner*, 522 U.S. 136 (1997), and *Kumho Tire, Co. v. Carmichael*, 526 U.S. 137 (1999), collectively require that all expert testimony be reliable. Federal Rule of Evidence 702 has intentionally incorporated the requirements of those, and other, cases. *See* FED. R. EVID. 702 advisory committee's notes on 2000 amendments ("Rule 702 has been amended in response to *Daubert* . . . and to the many cases applying *Daubert* . . . ."). Rule 702 requires the expert to be qualified, the testimony to be both specialized and helpful, and proof that "the testimony is based on sufficient facts or data; . . . is the product of reliable principles and methods; and [that] the expert has reliably applied the principles and methods to the facts of the case." FED.

a *Frye* general-acceptance standard,[49] and under various other forms of challenges, such as newly discovered evidence[50] or a claim of constitutional infirmity.[51] Although the NRC report provided a scientific consensus about the shortcomings of FCM evidence, courts have nearly uniformly refused to address these shortcomings[52] and have found ways to minimize or sidestep the importance of the report.[53]

R. EVID. 702. Decisions involving interpretations of *Daubert* with respect to FCM evidence are discussed at length *infra*.

49. Frye v. United States, 293 F. 1013, 1013–14 (D.C. Cir. 1923). For cases upholding forensic science under a *Frye* general-acceptance standard, see People v. Luna, 989 N.E.2d 655, 679 (Ill. App. Ct. 2013) (concluding that a *Frye* hearing was not required for fingerprints, citing sister courts, and holding that "the trial court properly took judicial notice of the general acceptance of the ACE–V methodology within the relevant scientific community"); State v. Sheehan, 273 P.3d 417, 425 (Utah Ct. App. 2012) (holding no abuse of discretion for admitting the fingerprint expert's testimony without a hearing on general acceptance because of judicial precedent and the "longstanding reliance on fingerprint evidence"); State v. Lizarraga, 364 P.3d 810, 830 (Wash. Ct. App. 2015) (concluding that there was no error denying a *Frye* hearing and request for limits on expert testimony); State v. Pigott, 325 P.3d 247, 250 (Wash. Ct. App. 2014) ("[T]he reliability of fingerprint identification has been tested in our adversarial system for over a century and routinely subjected to peer review. The trial court considered all of this in reaching its conclusion that a *Frye* hearing was not needed. The trial court expressly found that the identification analysis is accepted in the relevant scientific community." (footnote omitted)).

50. *See* Sarah Lucy Cooper, *Judicial Responses to Shifting Scientific Opinion in Forensic Identification Evidence and Newly Discovered Evidence Claims in the United States: The Influence of Finality and Legal Process Theory*, 4 BRIT. J. AM. LEG. STUD. 649, 672 (2015) (reviewing cases in a variety of areas and discussing the consistent judicial resistance to the NRC report as a form of newly discovered evidence and finding that "there is a judicial resistance towards allowing claims that shifting scientific opinion about various forensic identification methods . . . qualify as newly discovered evidence").

51. *See, e.g.*, Allen v. United States, No. 4:07CV00027 ERW, 2011 WL 13182909, at *2–3 (E.D. Mo. Aug. 29, 2011) (holding that the NRC report did not suggest that all forensic science was of questionable reliability or materially inaccurate for purposes of conviction and sentencing, which was the required showing to prevail under the Fifth Amendment's Due Process Clause or the Eighth Amendment); *accord* United States v. Berry, 624 F.3d 1031, 1040–42 (9th Cir. 2010) (rejecting a due process claim about a conviction that rested in part on compositional analysis of bullet lead evidence that the FBI stopped using due its unreliability); Rice v. Gavin, No. 15-291, 2016 WL 3009392, at *11 (E.D. Pa. Feb. 18, 2016 (holding that the defendant's claim that the NRC report undermined the integrity of the bullet comparison evidence was meritless and did not constitute a due process violation).

52. *See, e.g.*, Simon A. 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. LEG. STUD. 585, 613 (2015) ("[B]y and large, [the NRC report] has not been received as a scientific statement requiring engagement, let alone deference or alignment, by most judges."); Kaye, *supra* note 45, at 1640 ("The years that followed [the publication of the NRC report] proved frustrating to those who had hoped that the courts would demand the scientific proof of validity and accuracy that the committee found absent in some areas as a condition for admissibility.").

53. *See, e.g.*, United States v. Johnson, No. 14–cr–00412–TEH, 2015 WL 5012949, at *3 (N.D. Cal. Aug. 24, 2015) (noting that the NRC report "has been considered and rejected as a basis for excluding ballistics evidence by numerous courts"); United States v. Otero, 849 F. Supp. 2d 425, 438 (D.N.J. 2012) (mentioning concerns raised by the NRC report but rejecting them as undermining the reliability of the evidence and stating that "the district court must conduct a flexible reliability analysis and leave questions about the strength of evidence to the jury"); Gee v. United States, 54 A.3d 1249, 1266–68 (D.C. 2012) (holding no abuse of discretion where the lower court concluded that the NRC report was not a "learned treatise" under FRE 803(18)); People v. Luna, 989 N.E.2d 655, 674–75 (Ill. App. Ct. 2013) (citing

Many opinions do not analyze the *Daubert* factors[54] in depth. In fact, the majority of opinions have avoided any serious analysis of the factors or have merely given lip service to the factors by concluding the test has been met, despite the Advisory Committee's admonishment that "testing" means an objective rather than a "subjective, conclusory approach that cannot be assessed for reliability."[55] As Professor David Kaye concludes, courts alter and misapply the factors and shy "away from scrutinizing criminalistics evidence of identity as *Daubert* originally seemed to require."[56] More typically, when the evidence—even with references to the NRC report—is challenged, the courts have cited prior case law,[57] looked to the decisions of sister courts,[58] focused on the experience of the experts, claimed the *Daubert* factors are meant to be helpful and not definitive,[59] or claimed any concerns about reliability were a matter for cross-examination.[60]

In 2015, ignoring the NRC report's critiques, the Eleventh Circuit in *United States v. Dale*[61] dismissed arguments that fingerprint and handwriting comparisons were potentially unreliable scientific evidence. The court

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cases from several jurisdictions and noting that the "the nuanced report, while critical of various aspects of the ACE-V methodology, does not in itself establish a lack of general acceptance among the relevant scientific community or otherwise undermine the uniform body of precedent rejecting admissibility challenges to print evidence"); Commonwealth v. Gambora, 933 N.E.2d 50, 59–60 (Mass. 2010) ("We recognize, however, that the issues highlighted in the [NRC] report are important, and deserve consideration. Nevertheless, we do not undertake such consideration in this case. The [NRC] Report accepts as 'plausible' the proposition that 'a careful comparison of two impressions can accurately discern whether or not they had a common source.'" (quoting NAT'L RESEARCH COUNCIL, *supra* note 4, at 142)).

54. As described by the Advisory Committee in the notes to the 2000 amendments, the factors include

> (1) whether the expert's technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability; (2) whether the technique or theory has been subject to peer review and publication; (3) the known or potential rate of error of the technique or theory when applied; (4) the existence and maintenance of standards and controls; and (5) whether the technique or theory has been generally accepted in the scientific community.

FED. R. EVID. 702 advisory committee's notes on 2000 amendments. Despite this interpretation of "tested" to require an objective, rather than subjective, conclusory approach, courts have not adopted this interpretation with respect to forensic-science evidence. The "subjectivity of a methodology is not fatal under Rule 702 and *Daubert*, as 'a court may admit well-founded testimony based on specialized training and experience.'" United States v. Ashburn, 88 F. Supp. 3d 239, 246 (E.D.N.Y. 2015) (quoting United States v. Montiero, 407 F. Supp. 2d 351, 371 (D. Mass. 2006)).

55. FED. R. EVID. 702 advisory committee's notes on 2000 amendments.

56. Kaye, *supra* note 45, at 1649.

57. *See, e.g.*, *Luna*, 989 N.E.2d at 667 (noting that courts may take judicial notice of general acceptance by looking to "unequivocal and undisputed prior judicial decisions" (quoting People v. McKown, 875 N.E.2d 1029, 1034 (Ill. 2007))).

58. *See, e.g.*, *id.* at 679.

59. United States v. Baines, 573 F.3d 979, 992 (10th Cir. 2009) (upholding the decision to admit fingerprints despite concerns whether the evidence met all of the *Daubert* requirements).

60. *See, e.g.*, United States v. Myshawn Bonds, No. 15 CR 573-2, 2017 WL 4511061, at *2 (N.D. Ill. Oct. 10, 2017).

61. 618 F. App'x 494 (11th Cir. 2015).

described the arguments as both meritless and foreclosed by 1999 and 2005 opinions—both of which predated the NRC and PCAST reports.[62] The court did not mention the *Daubert* factors or Rule 702's reliability requirements. Rather, without any explanation of why, the court asserted that the experts "used scientifically reliable methodology."[63] In *United States v. John*,[64] the Fifth Circuit noted that

> absent novel challenges, fingerprint evidence is sufficiently reliable to satisfy Rule 702 and *Daubert*. "Fingerprint identification has been admissible as reliable evidence in criminal trials in this country since at least 1911." In terms of specific *Daubert* factors, the reliability of the technique has been tested in the adversarial system for over a century and has been routinely subject to peer review.[65]

These three cases are not outliers but are the typical response of courts to reliability challenges to various forms of FCM evidence. Avoiding the pointed science-based critiques of FCM evidence or the complexity of matching feature-comparison methods of forensic science appears to be foundational in many judicial decisions on the subject. Rather than addressing the complexity head on and resolving it, courts tend to use a variety of analysis-avoiding methods in evaluating the reliability of FCM evidence, even after learning of its shortcomings in the NRC report. For example, in *Meskimen v. Commonwealth*,[66] the Supreme Court of Kentucky considered a challenge to the reliability of "microscopic hair comparison," where the defendant had argued, pretrial, that hair comparison was unreliable.[67] Not only did the trial court admit the evidence, but it took judicial notice that the hair comparison was scientifically reliable and declined to hold a *Daubert* hearing.[68] On appeal, the defendant brought to the court's attention the NRC report on the unreliability of microscopic hair comparison. The court rejected the defendant's concern, upholding the decision about judicial notice of reliability. In finding no error, the court noted that it has a "duty to ensure that method is supported by scientific findings, or at least not seriously questioned by recent reputable scientific findings, before taking judicial notice of its acceptability."[69] What the court failed to address, however, is noteworthy: the NRC report concluded there was "*no scientific support* for the use of hair comparisons for individualization in the absence of nuclear DNA."[70] Despite that conclusion, the court held that a *Daubert* hearing was not required as "[m]icroscopic hair

62. *Id.* at 497.
63. *Id.*
64. 597 F.3d 263 (5th Cir. 2010).
65. *Id.* at 274–75 (quoting United States v. Crisp, 324 F.3d 261, 266 (4th Cir. 2003)).
66. 435 S.W.3d 526 (Ky. 2013).
67. *Id.* at 530.
68. *Id.* at 535.
69. *Id.* at 535–36. The court cited the problem of bullet-lead analysis as an example of "junk science," noting the reversal of a conviction involving such evidence. *Id.* at 536 n.10 (citing Ragland v. Commonwealth, 191 S.W.3d 569 (Ky. 2006)).
70. NAT'L RESEARCH COUNCIL, *supra* note 4, at 161 (emphasis added).

analysis is a scientifically reliable method" that has been admissible in Kentucky for many years.[71]

Curiously, the court vaguely refers to the NRC report's critique of hair-comparison evidence in a footnote and states that "hair analysis has been called into question by several recent findings, including those of the Federal Bureau of Investigation."[72] But the court does not mention that the NRC report's conclusion regarding the lack of scientific support for hair comparison revealed that 90 percent of the trial transcripts reviewed contained erroneous statements about hair comparison—a finding corroborated the FBI and the Innocence Project.[73] It also failed to mention that twenty-six out of twenty-eight agents or analysts provided testimony or submitted laboratory reports with erroneous statements.[74]

In the first reported case to cite the PCAST report, the U.S. District Court for the Northern District of Illinois was not swayed by the concerns raised in the report and concluded that the shortcomings of fingerprint comparison were only questions of weight, not admissibility.[75] Any concerns, the court stated, could be addressed on cross-examination.[76] Likewise, and consistent with prior decisions,[77] the court declined to limit the expert from providing a conclusion about a match or otherwise limiting the opinion of the government's expert.[78] Finding that the PCAST report was simply "advisory,"[79] the court continued along the same, well-worn path.

III. MAKING DECISIONS

To address the problem of judicial resistance to seriously addressing the shortcomings of FCM evidence, insights from cognitive science may help to explain how judges think.

A. Thinking: Fast or Slow?

Renowned psychologists Daniel Kahneman and Amos Tversky met in 1969 and worked together on an almost-daily basis for the next decade and a

71. *Meskimen*, 435 S.W.3d at 535.

72. *Id.* at 535 n.9.

73. *See id.*; *see also* Press Release, FBI, FBI Testimony on Microscopic Hair Analysis Contained Errors in at Least 90 Percent of Cases in Ongoing Review (Apr. 20, 2015), https://www.fbi.gov/news/pressrel/press-releases/fbi-testimony-on-microscopic-hair-analysis-contained-errors-in-at-least-90-percent-of-cases-in-ongoing-review [https://perma.cc/MPT8-2NEP].

74. *See* Press Release, FBI, *supra* note 73.

75. United States v. Myshawn Bonds, No. 15 CR 573-2, 2017 WL 4511061, at *2 (N.D. Ill. Oct. 10, 2017).

76. *Id.*

77. *See, e.g.*, United States v. Herrera, 704 F.3d 480, 486 (7th Cir. 2013).

78. *Myshawn Bonds*, 2017 WL 4511061, at *3. The court also granted the government's request that the defendant not be allowed to cross-examine the analyst about the Brandon Mayfield case, in which the FBI wrongly identified Mayfield's fingerprints indicating his involvement in the Madrid train bombing case. *Id.* at *4.

79. *Id.* at *3 (stating that the court "agrees with the government that the PCAST report presents only advisory recommendations concerning validity").

half.[80] During that time, they "invented questions and jointly examined [their] intuitive answers."[81] Each day yielded multiple questions, and each question became a small experiment.[82] The goal was not to determine whether the intuition was correct but to assume that many intuitive thoughts were shared and to demonstrate the effect that these intuitive thoughts had on judgments.[83] From many decades of work, they developed an exceptionally influential theory of cognitive science, which reasons that humans have two systems for thinking—fast and slow, also described respectively as "intuitive and deliberate thought processes."[84] Kahneman was awarded the Nobel Prize for work that followed from their discoveries.[85]

"A defining property of intuitive thoughts," Kahneman wrote in his Nobel Prize lecture, "is that they come to mind spontaneously, like percepts."[86] These types of intuitive decisions, termed "System 1 decisions,"[87] are "fast, automatic, effortless, associative, and difficult to control or modify."[88] By comparison, the decision-making processes termed System II are "slower, serial, effortful, and deliberately controlled; they are also relatively flexible and potentially rule-governed."[89] Kahneman also explains that these different systems of decision-making have other defining attributes. For example, System I generates what he terms "*impressions* of the attributes of objects of perception and thought."[90] That is to say, these impressions are not voluntary and often not verbally explicit. By comparison, System II is involved in judgments, which are "explicit and intentional."[91]

We all use both systems of making decisions—although some claim these two systems are more of a continuum than a binary system.[92] The system used depends on the nature of the problem presented and possibly on the level of expertise the person has in resolving those types of problems.[93] But the

80. DANIEL KAHNEMAN, THINKING, FAST AND SLOW 6 (2011).
81. *Id.*
82. *Id.*
83. *Id.*
84. *See* Daniel Kahneman, Nobel Prize Lecture: Maps of Bounded Rationality: A Perspective on Intuitive Judgment and Choice 449 (Dec. 8, 2002), https://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2002/kahnemann-lecture.pdf [https://perma.cc/YE9Q-RV2R].
85. Amos Tversky had passed away before the Nobel Prize was awarded. *See id.*
86. *Id.* at 452.
87. Stanovich and West labeled the two systems Type I and Type II. *See* Keith E. Stanovich & Richard F. West, *Individual Differences in Reasoning: Implications for the Rationality Debate?*, 23 BEHAV. & BRAIN SCI. 645, 658–59 (2000).
88. Kahneman, *supra* note 84, at 450.
89. *Id.*
90. *Id.* at 451.
91. *Id.*
92. *See* Laura F. Mega et al., *Do Intuitive and Deliberate Judgments Rely on Two Distinct Neural Systems? A Case Study in Face Processing*, FRONTIERS HUM. NEUROSCIENCE, Aug. 25, 2015, at 1, 2 (noting that, in contrast to the binary system, the "unified approaches propose that intuitive and deliberate judgments rely on the same (or similar) rules, while differing only along a dimension of consciousness").
93. KAHNEMAN, *supra* note 80, at 33–35. "As you become skilled in a task, its demand for energy diminishes. . . . A general 'law of least effort' applies to cognitive as well as physical exertion." *Id.* at 35.

use of System II demands more cognitive energy and is more taxing; and, in general, we tend to "gravitate to the least demanding course of action."[94] As Kahneman points out, based upon his research, "laziness is built deep into our nature."[95] Thus, we naturally resort to System I where we can conserve cognitive energy for when we need it (such as meeting deadlines when completing a law review article). System I runs automatically and generates suggestions for System II, such as "impressions, intuitions, intentions, and feelings."[96] As we generally believe our impressions and act on them, System II endorses our original sense and turns them into behaviors.[97] However, when there is a problem—as when System I does not offer a ready answer (as would occur with a complex math problem)—System II begins to take over and offers a surge of conscious attention.[98] Thus, when thinking about a more complicated problem than System I can manage, System II—which requires much greater cognition and focus—begins to operate.[99]

Kahneman provides examples of how much effort is required for some System II problems. For example, if you are asked to solve a complicated multiplication problem while walking, you will likely stop walking and turn your attention to the problem.[100] System II is "deliberate, effortful, and orderly."[101] When merging onto the highway, you generally stop talking or may even turn the radio down. System II is an energy-dependent process. While System II thinking engages in highly diverse forms of operations related to thought, it is also regulating self-control, another reason it is energy consumptive.[102] Notably, however, System II is able to "hold and compare two opposite arguments in the working memory," while System I does not even admit to the existence of an alternative.[103]

We generate intuitive ideas while taking a long drive on an uncrowded road, or when walking a few miles without any real effort: "a stroll," as Kahneman says.[104] We conjure up article ideas and book concepts easily, without much effort. These ideas present themselves to us effortlessly and spontaneously. Working through those ideas on the written page, however, is much more complicated and laborious, as anyone who writes knows. But those of us who write also know that some problems are simple to resolve in writing, while some are more akin to a mathematical proof.

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94. *Id.*
95. *Id.*
96. *Id.* at 24.
97. *Id.*
98. *Id.*
99. *Id.*
100. *Id.* at 39–40.
101. *Id.* at 20.
102. Diana Richards, When Judges Have a Hunch: Intuition (and Some Emotion) in Judicial Decision-Making 2 (2016) [hereinafter Richards, When Judges Have a Hunch] (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2009883 [https://perma.cc/M6FE-XPYF]. This manuscript was subsequently published. *See generally* Diana Richards, *When Judges Have a Hunch—Intuition and Experience in Judicial Decision-Making*, 102 ARCHIV FÜR RECHTS & SOZIALPHILOSPHIE 245 (2016).
103. Richards, When Judges Have a Hunch, *supra* note 102 (manuscript at 2).
104. KAHNEMAN, *supra* note 80, at 39–40.

When judges make legal decisions, are they using System I, System II, or both? If they are in the courtroom making snap decisions, we assume they will primarily be using System I. If they are writing opinions, we might assume it is always System II. And yet, there may be more complexity to the question in determining which system is at play.

Assume a lawyer asks a witness, "What did you say to the plaintiff at the scene of the accident?" The opposing lawyer stands up and says "objection, hearsay!" The judge—like all lawyers schooled in evidence—quickly and intuitively recognizes that an out-of-court statement offered for the truth of the matter asserted is hearsay.[105] Given that the judge has become an expert in matters of evidence due to longstanding practice with the subject,[106] this recognition is likely made nearly instantly and with little effort. It is, in short, a paradigmatic System I process—quick, intuitive, and effortless.

The more difficult question to answer here is what happens when the opposing lawyer provides a complex explanation for why the testimony should be admissible as a hearsay exception. For example, assume the lawyer argues the testimony is a prior consistent statement that occurred before a motive to fabricate arose and after the suggestion of fabrication had been leveled at the witness.[107] Now the judge will likely have to stop, look at the language of the rule, hear arguments from each side about when the statement occurred and when the alleged motive to fabricate arose, and then a careful judge will consult more authority to properly resolve the issue. The process has become more effortful, more likely a System II problem at this point. There is not an intuitive answer available, given the complexity of the hearsay exception at issue.

Judges make decisions all day and must categorize many issues as System I problems or they would simply not have the cognitive energy left to tackle all the questions they must resolve. System II decisions are energy draining.[108] President Obama noted this precise problem of decision fatigue

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105. *See* FED. R. EVID. 801(c) (defining hearsay as "a statement that: (1) the declarant does not make while testifying at the current trial or hearing; and (2) a party offers in evidence to prove the truth of the matter asserted in the statement").

106. Expertise in an area allows more complex thoughts to become more automatic, System I decisions. *See* KAHNEMAN, *supra* note 80, at 35.

107. *See* FED. R. EVID. 801(d). Rule 801(d) provides:

> Statements That Are Not Hearsay. A statement that meets the following conditions is not hearsay:
>
> (1) *A Declarant-Witness's Prior Statement*. The declarant testifies and is subject to cross-examination about a prior statement, and the statement:
>
> . . . .
>
> (B) is consistent with the declarant's testimony and is offered:
>
> (i) to rebut an express or implied charge that the declarant recently fabricated it or acted from a recent improper influence or motive in so testifying . . . [.]

Id. For proof of the complexity of applying Rule 801(d)(1)(B), see generally Laird C. Kirkpatrick & Christopher B. Mueller, *Prior Consistent Statements: The Dangers of Misinterpreting Recently Amended Federal Rule of Evidence 801(d)(1)(B)*, 84 GEO. WASH. L. REV. ARGUENDO 192 (2016).

108. *See* Richards, When Judges Have a Hunch, *supra* note 102 (manuscript at 2).

when he famously said that he wore only gray or blue suits to try to "pare down decisions" because he had too many other decisions to make.[109] "You need to focus your decision-making energy. You need to routinize yourself."[110]

Likewise, judges must apply System I thinking to avoid decision fatigue.[111] For example, in writing opinions, much of the rote citations to subjects such as standard of review, jurisdiction, and precedents on point, are likely to be System I decisions—automatic and effortless. Judges try not to reinvent the wheel on every summary judgment decision in which they explain the framework for making that decision. And for admissibility questions presented to the court that have been decided in a consistent way by that court and its sister courts, the pressure to consider the issue as an easy problem that can be answered safely by reference to those court decisions would likely be strong.

By comparison, *Daubert* hearings are notorious for being time and effort intensive. A typical *Daubert* hearing and opinion would seem to rest fully in System II thought, given the complexity of the subject and the need to "hold and compare two opposite arguments" in the working memory.[112] Unless, of course, the problem is perceived as simple, at which point System I might essentially hijack the cognitive process and the court might simply apply precedent or look to the decisions of sister courts.

The unconscious draw to rely on System I thinking to resolve FCM evidence issues without a deep explanation of the *Daubert* factors might be strong, particularly when there are troubling problems with the evidence that might result in an unpopular opinion to exclude or substantially limit its admissibility.[113] During the conference at Boston College Law School that

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109. Michael Lewis, *Obama's Way*, VANITY FAIR (Oct. 2012), https://www.vanityfair.com/news/2012/10/michael-lewis-profile-barack-obama [https://perma.cc/VG9A-N28U].

110. *Id.* In addition to making decisions about legal questions, judges have a great deal of case management responsibilities that incentivize them to find ways to clear their dockets, which creates additional pressures to decide matters expediently. *See* Jennifer K. Robbennolt et al., *Multiple Constraint Satisfaction in Judging*, *in* THE PSYCHOLOGY OF JUDICIAL DECISION MAKING 27, 31 (David E. Klein & Gregory Mitchell eds., 2010).

111. Whether judges employ System I or System II, of course, may depend on the level of effort they believe supports their needs, differentiating between easy cases and those that require more scrutiny. *See* Lawrence Baum, *Motivation and Judicial Behavior: Expanding the Scope of the Inquiry*, *in* THE PSYCHOLOGY OF JUDICIAL DECISION MAKING, *supra* note 110, at 3, 18–21 (discussing how intermediate courts use central staff law clerks to handle the perceived easier cases and how judges give "more limited scrutiny to cases that they characterize as easy").

112. *Id.*

113. The clearest example of an unpopular decision about forensic science is the original opinion in *United States v. Llera Plaza* (*Llera Plaza I*), 179 F. Supp. 2d 492 (E.D. Pa.), *vacated*, 188 F. Supp. 2d 549 (E.D. Pa. 2002). In *Llera Plaza I*, Judge Louis Pollak held that the government had failed to scientifically demonstrate that a latent fingerprint originated from a particular individual. *Id.* at 518. He concluded that the examiner would be permitted to testify only about points of similarity between the known and latent prints but could not give an opinion that the latent print came from a particular person. *Id.*; *see also* United States v. Llera Plaza (*Llera Plaza II*), 188 F. Supp. 2d 549, 552 (E.D. Pa. 2002) (describing the ruling in *Llera Plaza I*). After an outcry from the FBI and the DOJ, the court permitted a supplemental evidentiary hearing and changed its position and held that the testimony met the

gave rise to this symposium, one federal district court judge described the substantial time committed to both *Daubert* hearings and opinions in civil cases.[114] Other speakers—generally from the plaintiffs' bar—discussed how such *Daubert* hearings are incredibly time-intensive and expensive. According to the speakers, virtually every federal civil case involved a defense challenge to the plaintiff's expert testimony. Judges must make fairly quick decisions about what legal questions merit their deep attention and which questions can be handled quickly. Unfortunately but fairly clearly, judges have relegated FCM to the latter category.

B. Framing the Issue: Gains or Losses; Simple or Complex?

Decisions about which types of issues are effort-intensive and which are less complex may follow from how the court, or the parties, frame the issue. As cognitive scientists explain, how we frame an issue affects the choices we make—known as "framing effects."[115] Framing has been described as "the tendency to treat gains differently from losses."[116] In their 1981 article, "The Framing of Decisions and the Psychology of Choice," Tversky and Kahneman explain the term "decision frame" as one that refers to "the decision-maker's conception of the acts, outcomes, and contingencies associated with a particular choice."[117] This chosen frame is partly guided by the problem itself and partly by the "norms, habits, and personal characteristics of the decision-maker."[118] In addition, even small and seemingly unimportant changes in the formulation of the problem can cause significant shifts of preference.[119]

Since Tversky and Kahneman's paper was published, studies have proven that how a problem is framed can significantly influence the choices people make when evaluating risk.[120] For example, assume a hypothetical criminal case with critical microscopic hair-comparison evidence framed in two ways. In the first way, fact finders are told that 97 percent of all hair comparisons performed using a comparison microscope are accurate for a 100-day period in which roughly twenty comparisons a day are performed. Fact finders would likely determine that the hair comparison in the instant case is accurate—focusing on the 97 percent accuracy rate. By comparison, if fact finders are told that in this same 100-day period, sixty faulty comparisons

Daubert requirements. *Llera Plaza II*, 188 F. Supp. 2d at 522, 576; *see also* D.H. Kaye, *The Nonscience of Fingerprinting:* United States v. Llera-Plaza, 21 QUINNIPIAC L. REV. 1073, 1073 (2003) (discussing the reaction to the *Llera Plaza I* decision).

114. This point was made by the Honorable Patti B. Saris, Chief Judge of the U.S. District Court for the District of Massachusetts. *Symposium on Forensic Expert Testimony*, Daubert, *and Rule 702*, 86 FORDHAM L. REV. 1463, 1535 (2018) (statement of Hon. Patti B. Saris).

115. *See generally* CHOICES, VALUES, AND FRAMES (Daniel Kahneman & Amos Tversky eds., 2000).

116. Jeffrey J. Rachlinski, *Heuristics and Biases in the Courts: Ignorance or Adaptation?*, 79 OR. L. REV. 61, 98 (2000).

117. Amos Tversky & Daniel Kahneman, *The Framing of Decisions and the Psychology of Choice*, 211 SCIENCE 453, 453 (1981).

118. *Id.*

119. *Id.* at 457.

120. KAHNEMAN, *supra* note 80, at 368–69.

occurred—approximately one error every three days—the fact finders might well find the error rate more meaningful in evaluating the facts of the case. The data, of course, are the same, but the framing of the problem influences how fact finders would evaluate the risk of error in the given case.

Additionally, how the litigants present the evidence might well affect how the court ultimately frames the issue. If prosecutors tell the court that "this evidence has been admitted in virtually all courts for decades and has properly formed the basis of many convictions," a judge may immediately frame the admissibility of the evidence as an easy problem in which many other courts have found no reason to exclude it. An example of the lure of System I thinking can be found in the language of *John*, in which the Fifth Circuit declined to even hold a *Daubert* hearing, instead invoking history and disregarding the concerns about the reliability of the evidence: "Fingerprint identification has been admissible as reliable evidence . . . since at least 1911."[121] Courts frame the FCM evidence question as a historical problem and one that many others judges have already solved. Thus, the choice to part from history and the decisions of sister courts would seem to be the far riskier decisions and the one to be avoided. As humans treat potential gains differently from loss, the safer decision is to admit the evidence.

Additional research explains how framing a problem as simple or complex affects whether we employ System I or II decision-making and the concomitant likelihood of error. In the classic bat-and-ball problem,[122] subjects are told that a bat and ball together cost $1.10 and that the bat costs $1.00 more than the ball and finally are asked how much the ball costs. Most people immediately answer "ten cents." The answer seems obvious but, after doing the math, it is clearly wrong. The ball costs five cents and the bat costs one dollar more: $1.05. But for most people, the "ten cent" answer *felt* correct. It had an intuitive, quick appeal to it that many smart people assumed was correct—but it was wrong. By framing the problem as simple, the decision-maker determined the answer quickly, intuitively, and incorrectly.

Most people assume they would not be fooled by what appears to be the correct answer but, indeed, they are fooled. Studies at a variety of institutions show that most people make the error and are unable to suppress the intuitive answer that comes to mind.[123] Some have wondered whether judges are also subject to making errors by relying on intuitive answers. One could hypothesize that judges, who make multiple serious decisions on a daily

121. United States v. John, 597 F.3d 263, 274–75 (5th Cir. 2010).

122. *See* Shane Frederick, *Cognitive Reflection and Decision Making*, J. ECON. PERSP., Fall 2005, at 25, 26–27. Discussions about this test abound in legal, popular, and scientific literature. *See, e.g.*, Chris Guthrie et al., *Blinking on the Bench: How Judges Decide Cases*, 93 CORNELL L. REV. 1, 10 n.51 (2007) (using the problem and citing popular media descriptions); Jonah Lehrer, *Why Smart People Are Stupid*, NEW YORKER (June 12, 2012), https://www.newyorker.com/tech/frontal-cortex/why-smart-people-are-stupid [https://perma.cc/6H9W-28CQ].

123. *See* Guthrie et al., *supra* note 122, at 11.

basis, are not so prey to the shortcomings of intuition, given that they are "experts" at decision-making.[124]

C. Judges Making Decisions

How judges make decisions and what factors affect those processes have been the subject of much literature over the last several decades.[125] More recently, many scholars have focused on the role that psychological factors may have on judicial decision-making.[126] Professors Chris Guthrie, Jeffrey J. Rachlinski, and Andrew J. Wistrich have conducted empirical examinations designed to determine how judges make decisions.[127] In one study, they tested intuitive versus deliberative decision-making, employing the bat-and-ball problem as well as two other cognitive-reflection tests (CRTs), to see if judges made decisions in a fashion that differed from others.[128] When answering the bat-and-ball problem,[129] approximately 28 percent answered the question correctly.[130] As the questions progressed and became more difficult, the accuracy percentage of the answers improved to between 44 percent and 50 percent.[131] These numbers, the authors note, are consistent with test-taking students from universities where the original CRTs were run; slightly better than those at the University of Michigan, and

124. On the issue of expertise in judicial decision-making, see Fredrick Schauer, *Is There a Psychology of Judging?*, *in* THE PSYCHOLOGY OF JUDICIAL DECISION MAKING, *supra* note 110, at 103, 113–14; Barbara A. Spellman, *Judges, Expertise, and Analogy*, *in* THE PSYCHOLOGY OF JUDICIAL DECISION MAKING, *supra* note 110, at 149, 152.

125. *See* Moriarty, *supra* note 2, at 317 n.118 (collecting citations from scholars on judicial decision-making). *See generally* Richard A. Posner, *The Role of the Judge in the Twenty-First Century*, 86 B.U. L. REV. 1049 (2006) (addressing multiple approaches judges employ to decide cases). One interesting strand of the literature has focused on whether judges decide cases by "hunch." *See* Joseph C. Hutcheson, Jr., *The Judgment Intuitive: The Function of the "Hunch" in Judicial Decision*, 14 CORNELL L.Q. 274, 275–76 (1929). *See generally* Linda L. Berger, *A Revised View of the Judicial Hunch*, 10 LEGAL COMM. & RHETORIC 1 (2013); Mark C. Modak-Truran, *A Pragmatic Justification of the Judicial Hunch*, 35 U. RICH. L. REV. 55 (2001); R. George Wright, *The Role of Intuition in Judicial Decisionmaking*, 42 HOUS. L. REV. 1381 (2006); Richards, When Judges Have a Hunch, *supra* note 102. The issue whether a "hunch" is synonymous or different from an intuitive decision is one that Diana Richards addresses and is one worth discussing, but it is beyond the scope of this paper. *See generally* Richards, When Judges Have a Hunch, *supra* note 102.

126. *See generally* THE PSYCHOLOGY OF JUDICIAL DECISION MAKING, *supra* note 110; Terry A. Maroney, *Emotional Regulation and Judicial Behavior*, 99 CALIF. L. REV. 1485 (2011); Moriarty, *supra* note 2; Nicole E. Negowetti, *Judicial Decisionmaking, Empathy, and the Limits of Perception*, 47 AKRON L. REV. 693 (2014); Dan Simon, *A Psychological Model of Judicial Decision Making*, 30 RUTGERS L.J. 1 (1998); Dan Simon, *A Third View of the Black Box: Cognitive Coherence in Legal Decision Making*, 71 U. CHI. L. REV. 511 (2004).

127. *See generally* Guthrie et al., *supra* note 122; Chris Guthrie et al., *Inside the Judicial Mind*, 86 CORNELL L. REV. 777 (2001); Chris Guthrie et al., *The "Hidden Judiciary": An Empirical Examination of Executive Branch Justice*, 58 DUKE L.J. 1477 (2009); Andrew J. Wistrich et al., *Heart Versus Head: Do Judges Follow the Law or Follow Their Feelings?*, 93 TEX. L. REV. 855 (2015); Andrew J. Wistrich et al., *Can Judges Ignore Inadmissible Information? The Difficulty of Deliberately Disregarding*, 153 U. PA. L. REV. 1251 (2005).

128. Guthrie et al., *supra* note 122, at 13. In this study, approximately 181 judges answered the three questions of the CRT. *Id.*

129. *See supra* note 122 and accompanying text.

130. Guthrie et al., *supra* note 122, at 15.

131. *Id.*

slightly lower than those at Harvard.[132] When all three questions were combined and analyzed, there was no statistically significant difference between male and female, experienced and inexperienced, and Democrat and Republican judges.[133] Collectively, the authors note, although "roughly one-seventh of the judges answered all three [questions] deliberatively," many were able to answer at least one of the problems deliberatively.[134] As a group, however, judges leaned toward intuitive rather than deliberative problem-solving.[135] Of course, a three-question CRT is not the same as what judges do on the bench, a point noted by the authors.[136] But it does provide some insight into how judges think. And as it turns out, they think pretty much like everyone else: when judges perceive a problem to be simple, they revert to intuitive decision-making.[137]

As Kahneman and others have learned, there are serious concerns about intuitive decision-making that arise from the use of heuristics and the subsequent likelihood of cognitive biases. These problems are likely to affect judges making decisions.

When framing a problem as simple, one tends to unknowingly rely on intuitive decision-making, a form of thinking that is prone to using heuristics. Heuristics are cognitive shortcuts used to solve a problem, or what Kahneman defined as "a simple procedure that helps find adequate, though often imperfect, answers to difficult questions."[138] Reliance upon heuristics, however, can lead to systematic biases.[139] Cognitive biases, which are understood as consistent errors or fallacies, are ones to which we all fall prey, even when we try to guard against them.[140] There are multiple forms of cognitive bias with names that explain the nature of the bias: confirmation

132. *Id.* at 14.
133. *Id.* at 18.
134. *Id.*
135. *Id.* at 17.
136. *Id.* at 18–19.
137. It may be, of course, that when judges decide cases, they do so as experts and thus their decision-making would differ from how they make decisions about bat-and-ball problems. For more, see Spellman, *supra* note 124, at 152 (noting the differences between experts and novices in given domains of expertise).
138. KAHNEMAN, *supra* note 80, at 98.
139. *See* HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 731 (Thomas Gilovich et al. eds., 2002); DANIEL KAHNEMAN ET AL., JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 3–4 (1982); *see also* JONATHAN BARON, THINKING AND DECIDING 53 (4th ed. 2008) ("People develop heuristics exactly because they are often useful. But the use of these heuristics leads to biases.").
140. KAHNEMAN, *supra* note 80, at 430.

bias,[141] hindsight bias,[142] belief perseverance,[143] groupthink,[144] and the sunk-cost fallacy.[145] Many of these biases are relevant to judicial decisions about FCM evidence and may explain the judicial resistance to taking reliability concerns seriously.

Some of these biases are exhibited in the cases. As proof of confirmation bias, the courts continue to seek out information that confirms their existing beliefs that FCM evidence should be admissible: looking to prior cases (even ones that predate the NRC report or the *Daubert* and Rule 702 reliability requirements) and findings ways to avoid the serious concerns raised in the NRC report about the shortcomings of the evidence. At the same time, they avoid anything that would challenge their existing belief, such as the strong association between faulty forensics and wrongful conviction. For example, the court in *Meskimen* admitted microscopic hair testimony—noting its long history of admission—and omitted the concern of the NRC report that counsels against it due to overwhelming proof that such evidence is flawed.[146] The court looked at the NRC report but only saw what confirmed its own opinion.[147]

Likewise, the role that belief perseverance has in these decisions is also strong: the constant references to history and the repeated references to remaining faithful to tradition despite the serious concerns about reliability raised in the NRC report are all indicative of the "tendency to maintain existing beliefs in the face of evidence that ought to weaken or even totally reverse those beliefs."[148] The "groupthink" problem is also prevalent in the decisions where courts repeatedly refer to sister courts to confirm that all in the group are thinking alike.

All in all, the opinions admitting FCM evidence without limitation or concern seem to follow the same, worn formula of treating the problem of

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141. Confirmation bias refers to the seeking or the interpretation of evidence in a manner that supports one's existing beliefs or expectations. *See generally* Raymond S. Nickerson, *Confirmation Bias: A Ubiquitous Phenomenon in Many Guises*, 2 REV. GEN. PSYCHOL. 175 (1998).

142. Hindsight bias occurs when people believe that they knew something before they had information that would allow them to know it; for example, when students in class "knew" they were going to be called on. *See* BARON, *supra* note 139, at 157–58. For further discussion, see generally Neal J. Roese & Kathleen D. Vohs, *Hindsight Bias*, 7 PERSP. ON PSYCHOL. SCI. 411 (2012).

143. Belief perseverance is the "tendency to maintain existing beliefs in the face of evidence that ought to weaken or even totally reverse those beliefs." Philip E. Tetlock, *Accountability and the Perseverance of First Impressions*, 46 SOC. PSYCHOL. Q. 285, 285 (1983).

144. BARON, *supra* note 139, at 224–26 (describing groupthink and noting that, in some circumstances, an individual decision may seem more "right" because it is shared by others in the group).

145. "Sunk cost" refers to an individual's unwillingness to withdraw from an endeavor after investing money, time, or effort: the individual is simply too invested to change direction. *See* BARON, *supra* note 139, at 305–07. *See generally* Hal R. Arkes & Catherine Blumer, *The Psychology of Sunk Cost*, 35 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 124 (1985).

146. Meskimen v. Commonwealth, 435 S.W.3d 526, 535 (Ky. 2013).

147. *Id.* at 535 n.9.

148. Tetlock, *supra* note 143, at 285.

FCM evidence as an easy issue, which results in the use of heuristics with their attendant cognitive biases. The pressing concern is whether there is any hope for change.

CONCLUSION

Sadly, it seems unlikely that a sea change will occur in the way courts approach FCM evidence. In the decade following the NRC report, the cases suggest that courts are simply intractable in their approach to admitting the evidence. Prosecutors have continued to argue, both in court and to the media, that forensic science is reliable and that both the NRC report and PCAST report are irrelevant.[149] Convincing courts otherwise seems to be nearly impossible. Courts have categorized FCM evidence admissibility as a simple problem and have avoided addressing the serious questions about its reliability.

There is a potential for change, however, with a change to Rule 702 that requires the judiciary to pay closer attention to the requirements of reliability. The Federal Rules of Evidence Advisory Committee's notes, mentioned above, suggest a first step. The notes describe testing as "whether the expert's technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability."[150] If Rule 702 embraced that requirement of objective proof, rather than a "subjective, conclusory approach," it might help the courts to move toward a better method of gatekeeping with respect to FCM evidence. This potential for change, however, will not be realized until courts recognize that matching a known and an unknown sample is a very complicated endeavor.

149. *See* Spencer S. Hsu, *White House Science Advisers Urge Justice Dept., Judges, to Raise Forensic Standards*, WASH. POST (Sept. 20, 2016), http://wapo.st/2d02qi7?tid=ss_tw&utm_term=.e6a7d761cc37 [https://perma.cc/P296-3NC6] (discussing the PCAST report and including comments from federal and state prosecutors dismissing the report's claims).

150. FED. R. EVID. 702 advisory committee's notes on 2000 amendments.