

THE SHIFTED PARADIGM: FORENSIC SCIENCE'S OVERDUE EVOLUTION FROM MAGIC TO LAW

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PREFACE

When a federal magistrate judge recommended that the United States District Court for the Middle District of Pennsylvania exonerate Han Tak Lee for the murder by arson of his young daughter, he began his report this way:³ “Slow and painful has been man’s progress from magic to law.”⁴ Lee’s daughter, the court explained, had perished “in a tragic cabin fire at a religious retreat,” and the State’s evidence “was based, to a substantial degree, upon what was at the time undisputed scientific evidence concerning the source and origin of this fire, fire origin evidence which tended to show that the fire which consumed this cabin and took the life of . . . [the victim] was deliberately set by the defendant in a calculated fashion.”⁵ Lee had been wrongly imprisoned for twenty-five years, the

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³ Lee v. Tennis, No. 4:08-CV-1972, slip op. at 1 (M.D. Pa. June 13, 2014).

⁴ *Id.* at 2. As the court explained, “[t]his proverb, inscribed at the University of Pennsylvania Law School on the statue of Hsieh-Chai, a mythological Chinese beast who was endowed with the faculty of discerning the guilty.” *Id.* at 1.

⁵ *Id.* at 2.

State's conviction rested on the theory, elicited through expert testimony, that Lee "was especially cruel and calculating, dousing . . . [the] small cabin in Pennsylvania's Pocono Mountains with more than 60 gallons of gasoline and heating fuel and setting at least eight fires, ending at the front door to block any chance of escape."⁶

When the magistrate judge recommended that Lee be freed, however, he left no room for debate about either Lee's innocence or the character of the evidence that had claimed a quarter century of his life. "Today," the court wrote, "with the benefit of extraordinary progress in human knowledge regarding fire science over the past two decades it is now uncontested that this fire science evidence – which was a critical component in the quantum of proof that led to . . . [the] conviction – is invalid, and that much of what was presented to . . . [the] jury as science is now conceded to be little more than superstition."⁷

Han Tak Lee is an important case. This article argues that its primary importance rests not in its innocence narrative, which is now, unfortunately, a familiar one.⁸ Or even in the sub-narrative of its particular

⁶ Michael Rubinkam, *Arson Science Discredited*, COLUMBUS DISPATCH, June 23, 2014, http://www.dispatch.com/content/stories/national_world/2014/06/23/arson-science-discredited.html.

⁷ Lee v. Tennis, No. 4:08-CV-1972, slip op. at 1 (M.D. Pa. June 13, 2014).

⁸ See, e.g., Rachel Dioso-Villa, *Scientific and Legal Developments in Arson Investigation Expertise in Texas v. Willingham*, 14 MINN. J.L. SCI. & TECH. 817 (2013); see also David Grann, *Trial by Fire: Did Texas Execute an Innocent*

taxonomy: the set of wrongful convictions whose root cause is flawed forensic science.⁹ Instead, its significance derives from the court's bracing and ultimately dispositive critique of the forensic discipline that formed the core of the wrongful conviction – arson science – as well as of the false accord that has been granted over time to certain forensic disciplines in our criminal justice system, disciplines that despite widespread acceptance by criminal courts are, in final analysis, mere “superstition.”

The judicial critique, which elevated scientific proof above doctrinal dogma, was a long-time in coming and necessarily calls into question the force and legitimacy of precedent as basis to introduce purportedly scientific evidence. It has been a decade since an article in *Science Magazine* predicted what the authors termed the coming “paradigm shift”¹⁰ – forensic science’s evolution away from magic and toward law – the so-called “shot heard round the forensic science community.”¹¹ It is this narrative, based on a historical assessment of the jurisprudence underlying two forensic assays – bite mark identification and hair microscopy – their

Man?, THE NEW YORKER, Sept. 7, 2009.

⁹ Brandon Garrett & Peter Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1 (2009); Caitlin Plummer & Imran Syed, “Shifted Science” and Post-Conviction Relief, 8 STAN. J. CIV. RTS. & CIV. LIBERTIES 259 (2012).

¹⁰ Michael Saks & Jonathan Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (2005).

¹¹ KELLY M. PYREK, FORENSIC SCIENCE UNDER SIEGE: THE CHALLENGES OF FORENSIC LABORATORIES AND THE MEDICO-LEGAL INVESTIGATION SYSTEM 222, Elsevier Academic Press (2007).

underlying empirical evidence and data, that this article argues presents a parallel narrative: the failure of courts and litigants to distinguish between magic and science in the first instance, and the judicial system's continuing reflexive reliance on deeply flawed, scientifically invalid precedent to support the admissibility of false and misleading evidence.

Consider, for example, the relationship between the 1985 Wisconsin conviction of Robert Lee Stinson for the murder of his elderly neighbor and the 1992 Mississippi conviction of Levon Brooks for the sexual assault and murder of a three-year old girl. The only direct evidence against Stinson was the bite mark testimony of two board-certified "Diplomates" of the American Board of Forensic Odontology (ABFO). One expert concluded that bite marks on the victim "had to have been made by teeth identical"¹² to Stinson's, and that there was "no margin for error"¹³ in his conclusion; the other expert concurred, testifying the bite mark evidence was "high quality"¹⁴ and "overwhelming."¹⁵ In Brooks' case, the State also presented the testimony of a board-certified forensic odontologist, who, by utilizing a purportedly path-breaking new forensic technique, testified that the only

¹² State v. Stinson, 397 N.W.2d 136, 138 (Wisc. Ct. App. 1986).

¹³ Trial Transcript at 83, State v. Stinson, No. 86-0002-CR (Milwaukee Cnty. Cir. Ct. Nov. 3, 1984).

¹⁴ State v. Stinson, 397 N.W.2d 136, 138 (Wisc. Ct. App. 1986).

¹⁵ See, *id.* Stinson was exonerated in 2009. See *Robert Lee Stinson*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Robert_Lee_Stinson.php (last visited Dec. 11, 2014).

direct evidence linking Brooks to the crime was a series of bite marks on the victim that “matched” Brooks’ teeth in such a way that “it could be no one but Levon Brooks that bit this girl’s arm.”¹⁶ Stinson and Brooks were both exonerated after DNA testing proved that they were not the perpetrators – Stinson in 2009¹⁷ and Brooks in 2008.¹⁸

Apart from sharing the same type of inculpating forensic evidence, *Stinson* and *Brooks* would appear to have little in common: the convictions are separated by nearly a decade; the crimes occurred on opposite sides of the country in jurisdictions that applied different standards to evaluate and admit expert testimony from two different experts.¹⁹ But a comparison of the underlying data tells another story altogether: that the cases are actually strikingly similar, even co-dependent. In fact, each depended on the other

¹⁶ Trial Transcript at 730, *State v. Brooks*, No. 5937 (Noxubee Cnty Cir. Ct. Jan 15, 1992).

¹⁷ See *Robert Lee Stinson*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Robert_Lee_Stinson.php (last visited Dec. 11, 2014).

¹⁸ Levon Brooks, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Levon_Brooks.php

¹⁹ The governing standard for expert opinion admissibility in Stinson’s case was that “evidence given by a qualified expert is admissible irrespective of the underlying scientific theory . . . [as long as the] expert scientific testimony [is] relevant . . . and the expert [is] qualified [so that] scientific or specialized knowledge will assist the trier of fact to determine a fact in issue . . .” *State v. Stinson*, 397 N.W.2d 136, 140-41 (Wisc. Ct. App 1986). In *Brooks*, the Mississippi Supreme Court simply adopted a blanket admission of bite mark testimony, but noted that “it is certainly open to defense counsel to attack the qualifications of the expert, the methods and data used to compare the bite marks to persons other than the defendant, and the factual and logical bases of the expert’s opinions. Also, where such expert testimony is allowed by the trial court, it should be open to the defendant to present evidence challenging the reliability of bite-mark comparisons.” *Brooks v. State*, 748 So.2d 736, 739 (Miss. 1999).

for the failures of justice that occurred, both at trial and during the years-long, protracted struggle that Stinson and Brooks endured while seeking to prove their innocence.

In reviewing Brooks's conviction, specifically the propriety of admitting the bite mark evidence, the Mississippi Supreme Court relied upon the reasoning in *Stinson*,²⁰ along with other similar precedent, to find no error in the admission, affirm the conviction, and, in an effort to preclude further challenges, to issue a blanket pronouncement that "bite-mark identification is admissible in Mississippi."²¹ And, notwithstanding the fact that both Stinson and Brooks have since been exonerated – along with overwhelming proof that the bite mark evidence presented in *Brooks* was spurious²² – *State v. Brooks*, with *Stinson* in support, continues to stand as reliable authority for the wholesale admissibility of this branch of forensic science in Mississippi and Wisconsin state courts.

This kind of self-serving, court-facilitated pseudo-jurisprudence not only facilitates trial courts' wholesale admission of flawed evidence; it also insulates such decisions from appellate review, no matter how legally

²⁰ *Brooks v. State*, 748 So.2d 736, 746 (Miss. 1999) (Smith, J., concurring).

²¹ *Brooks v. State*, 748 So.2d 736, 739 (Miss. 1999).

²² In a companion case, Kennedy Brewer was also exonerated a few weeks before Brooks. Bite mark evidence testimony from the same State expert had also led to Brewer's conviction, and, like Brooks' exoneration, was debunked as a result. Post conviction DNA testing identified the true perpetrator, who had murdered the victims in each case. *See Kennedy Brewer*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Kennedy_Brewer.php(last visited Dec. 11, 2014).

indefensible and intellectually dishonest. Post-conviction courts, moreover, typically avoid any rigorous analysis of a discipline's validity or of the propriety of a trial court's admissibility decision by invoking procedural bars. In Han Tak Lee's case, for example, post-conviction courts' review was primarily focused not on substantive analysis – even cursory – of fire science, but, instead, but on procedural hurdles that Lee's request for post-conviction relief were required to overcome in state and federal *habeas corpus* litigation.²³ After a lower court declined to address the scientific legitimacy of the fire science,²⁴ Lee was denied review because his “claim of newly discovered evidence [that the fire evidence was not based on sound science] is not cognizable under § 2254 [state remedies in federal court]²⁵ because claims of actual innocence based on newly discovered evidence are never grounds for federal habeas relief absent an independent constitutional violation.”²⁶

²³ See, e.g., Commonwealth v. Lee, 911 A.2d 182 (Pa. Super. 2006); Lee v. Tennis, No. 4:08-CV-1972, slip op. at 1 (M.D. Pa. June 13, 2014); Willingham v. Johnson, 2001 WL 1677023 (N.D. Tex. Dec.31, 2001).

²⁴ Lee v. Tennis, No. 4:08-CV-1972, slip op. at 1 (M.D. Pa. June 13, 2014).

²⁵ 28 U.S.C.A. § 2254 (“State custody; remedies in Federal courts”).

²⁶ Lee v. Tennis, No. 4:08-CV-1972, slip op. at 1 (M.D. Pa. June 13, 2014).. The court cited *Herrera v. Collins*, 506 U.S. 390 (1993) for the proposition that “[c]laims of actual innocence based on newly discovered evidence have never been held to state a ground for federal habeas relief absent an independent constitutional violation occurring in the underlying state criminal proceeding This rule is grounded in the principle that federal habeas courts sit to ensure that individuals are not imprisoned in violation of the Constitution-not to correct errors of fact.” *Id.* at 400.

Lee, along with *Brooks* and *Stinson*, have been resolved.²⁷ But the scientifically invalid evidence and erroneous jurisprudence that led to their convictions continues to frustrate the truth-seeking mission of the criminal justice system, precluding the legitimate claims of innocence in dozens, perhaps hundreds, of other similarly situated cases, including capital convictions.²⁸ The jurisprudence connecting *Lee*, *Brooks* and *Stinson* to other, unresolved cases is not attenuated; it is direct, open and, as the evidence gathered here demonstrates, obvious. *State (Mississippi) v. Howard*,²⁹ is a timely example. *Howard* is a pending death penalty case where the conviction rests almost exclusively on bite mark evidence. The Mississippi Supreme Court, in affirming Howard's conviction and refusing to grant him relief thus far, has relied on *Brooks* and *Stinson* for substantive support for the discipline's validity, even though those cases are notorious incidents of wrongful convictions and even though the forensic expert who testified falsely in *Brooks* also testified in *Howard*.³⁰ Entirely absent from appellate review is any discussion of trial court's failure to conduct a

²⁷ Unfortunately, this claim may be overstated as it relates to *Willingham*. See, e.g., Maurice Possley, *New Evidence Revives Concerns That a Man Was Wrongly Put to Death in 2004*, WASHINGTON POST, Aug. 3, 2014, at national 1.

²⁸ With respect to death penalty cases alone, we have identified at least fifteen convictions where bitemark evidence not only played a key role in the prosecution, but also where, as in *Stinson* and *Brooks*, the cases rely mutually on each others' flawed acceptance of the pseudo-science to justify the conviction. See, Research Memo: *Death Penalty Convictions Supported by Bite Mark Evidence*, The Innocence Project, Strategic Litigation Unit, Sept. 25, 2014, on file with authors.

²⁹ *Howard v. State*, 701 So.2d 274 (Miss. 1997).

³⁰ *Howard v. State*, 701 So.2d 274 (Miss. 1997) (Smith, J., dissenting).

rigorous analysis of the discipline before allowing it to be proffered to a capital jury as scientific evidence of guilt, as required by relevant case law and evidentiary rules; nor is there, in its reliance on *Brooks* and *Stinson* for support, any recognition that those courts' analysis was similarly deficient. Instead, the State of Mississippi continues to elevate procedural rules over scientific reality, arguing that Howard's claims are "barred from consideration both by the successive petition bar"³¹ and are "*res judicata*."³² Thus far, the Mississippi Supreme Court has found those arguments persuasive.³³

INTRODUCTION

Against a backdrop of recent developments that reveal gross shortcomings of previously accepted forensic techniques, our empirical evidence and data, derived in large part from our litigation, both nationally³⁴ and in Mississippi,³⁵ reveal that certain forensic science disciplines are

³¹ State of Mississippi's Request for DNA Testing and Motion for Post-Conviction Relief at 25, *Howard v. State*, No. 2010-DR-01043-SCT (Miss. Aug. 2, 2010).

³² *Id.*

³³ 945 So.2d 326, 363 (Miss. 2006).

³⁴ The Innocence Project's Strategic Litigation Unit uses litigation to challenge judicial reliance on unreliable forensic science disciplines and reform the legal framework used to evaluate eyewitness identification evidence through multiple strategies: the filing of amicus briefs in appropriate cases; consulting and supporting trial attorneys across the country; direct litigation on behalf of individuals at all stages of litigation; training attorneys and judges; and effectuating change through legislation and policy.

³⁵ Mississippi has had an unusually high incidence of bite mark convictions – and post-conviction litigation around them – because state prosecutors used one of its most aggressive practitioners, Dr. Michael West – for two decades beginning in

significantly more problematic than previously thought. In fact, they are far more egregious than the 2009 National Research Council of the National Academy of Sciences report's ("NAS Report") characterization of them as "imprecise or exaggerated" and the cause of "erroneous or misleading evidence."³⁶ Although there exists scholarly critique of the generalized shortcomings of this so-called "first generation" forensic evidence,

the mid 1980s. See Radley Balko, *The Bite-Marks Men: Mississippi's Criminal Forensics Disaster*, SLATE, Feb. 20, 2008,8) at http://www.slate.com/articles/news_and_politics/jurisprudence/2008/02/the_bitemarks_men.html

³⁶ Keith A. Findley, *Process and Evidentiary Rules in the Age of Innocence*, 47 GEORGIA L. REV. 723 (2013); Craig M. Cooley & Gabrielle S. Oberfield, *Increasing Forensic Evidence's Reliability and Minimizing Wrongful Convictions: Applying Daubert Isn't the Only Problem*, 43 TULSA L. REV. 285 (2007), WILLIAM J. STUNTZ, *THE COLLAPSE OF AMERICAN CRIMINAL JUSTICE* (2011); Sandra Guerra Thompson, *Judicial Gatekeeping of Police-Generated Witness Testimony*, 102 J. CRIM. L. & CRIMINOLOGY 329 (2012). Scholars have now by in large turned their attention away from this type of evidence and toward a new type of evidence: so-called "second generation" evidence – database-driven techniques, like location tracking, biometrics and digital forensics, for example – to warn and argue that "the adversarial process, as currently conceived, is ill-suited to ensuring the integrity of high-tech evidence." Erin Murphy, *The Mismatch Between Twenty-First Century Forensic Evidence and Our Antiquated Criminal Justice System*, (forthcoming); see also, Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 CAL. L. REV. 721 (2007); Erin Murphy, *Inferences, Arguments, and Second Generation Forensic Evidence*, 59 HASTINGS L. J. 1047 (2008); Jennifer E. Laurin, *Remapping the Path Forward: Toward a Systemic Review of Forensic Science Reform and Oversight*, 91 TEX. L. REV. 1051 (2013); Munia Jabbar, *Overcoming Daubert's Shortcomings in Criminal Trials: Making the Error Rate the Primary Factor in Daubert's Validity Inquiry*, 85 N.Y.U. L. REV. 2024 (2010); Judge Donald E. Shelton, *Twenty-First Century Challenges for Trial Judges in Criminal Cases: Where the "Polybutadiene Meets the "Bitumen,"* 18 WIDENER L.J. 309 (2009); NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* 1 (2009), available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf [hereinafter NAS Report].

particularly hair microscopy and bite marks, which are the focus here,³⁷ our argument relies on empirical evidence, the historical record, and recent scientific and scholarly advancement.

More specifically, our thesis is situated on five bases: (1) the ever-increasing numbers of post-conviction exonerations, particularly those involving bite mark and hair microscopy evidence;³⁸ (2) the publication and widespread acceptance of the NAS Report, including recent federal legislative and policy initiatives directed realizing several of the Report's core recommendations; (3) the Federal Bureau of Investigation (FBI) and Department of Justice's (DOJ) unprecedented audit of thousands of hair comparison cases, stemming from its admission that FBI analysts routinely proffered scientifically invalid testimony in these cases; (4) state-level legislation amending habeas corpus statutes in order to provide avenues of post-conviction review for petitioners whose convictions rest on discredited

³⁷ See, e.g., Erica Beecher Monas, *Reality Bites: The Illusion of Science in Bite-Mark Evidence*, 30 CARDOZO L. REV. 1369 (2009); Michael J. Saks & Jonathan J. Koehler, *The Individualization Fallacy in Forensic Science Evidence*, 61 VAND. L. REV. (2008); D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?* 64 ALB. L. REV. 99 (2000). Attention has now also turned to the practicalities of dealing prospectively with certain types of this forensic evidence. See e.g., Keith Findley, *Judicial Gatekeeping of Suspect Evidence: Due Process and Evidentiary Rules in the Age of Innocence*, 47 GEORGIA L. REV. 723 (2013).

³⁸ The University of Michigan Law School and the Northwestern University School of Law together manage the National Registry of Exonerations, which lists more than 1,000 exonerations since 1989. See *National Registry of Exonerations*, UNIVERSITY OF MICHIGAN LAW SCHOOL, <http://www.law.umich.edu/special/exoneration/Pages/about.aspx>.

scientific evidence; and, (5) our own case data about bite mark identification and hair evidence that provides abundant empirical support concerning the ethical and legal obligations that should flow as a matter of course.

Several serious consequences logically and inevitably flow from the shifted paradigm thesis advanced here. Among these, each of which we address in turn, are what we argue is (a) the lack of scientific or evidentiary validity for certain types of pattern and identification techniques; (b) that as a result of our empirical findings, state, and to some extent federal, jurisprudence that stands for the proposition that this type of evidence is admissible is objectively erroneous and must be reevaluated and effectively rejected as valid precedent;³⁹ and, (c) that the long-overdue awakening to scientific reality presents a unique ethical challenge to the profession, one that current professional ethics fail to adequately capture, even though fundamental due process norms compel the conclusion that prosecutors, defense attorneys, and experts, and their respective governing bodies have an ethical, moral and legal duty to revisit convictions resting on discredited

³⁹ There has been some isolated and sporadic effort at the state level to address the problem we identify here. *See, e.g.*, State v. Henderson, 27 A.3d 872 (N.J. 2011) (revising the standards for evaluating eyewitness identification testimony so that they more closely track social science findings on reliability); State v. Lawson, 291 P.3d 673, 685 (Or. 2012) (finding that “the scientific knowledge and empirical research concerning eyewitness perception and memory has progressed sufficiently to warrant taking judicial notice of . . . [them] in determining the effectiveness of our existing test for the admission of eyewitness identification evidence.”).

scientific evidence and provide effective remedies.

Part I sets forth the broad, contextual bases of our argument. Briefly discussed is the predominant incidence of flawed forensic science as a leading cause of wrongful convictions, specifically those involving bite mark and hair microscopy evidence. The discussion of the NAS Report's findings in this Part centers on elements of the federal forensic reform agenda that are complementary to or, in certain instances, adoptive of suggestions contained in the Report. Also explored here are recent state efforts to address forensic malfeasance and discredited scientific evidence through legislation passed in direct response to post-conviction courts elevating procedural rules over the reality of scientific progress. In Parts II and III we introduce our own data – its contextual background within wrongful convictions generally and the specific disciplines of bite mark identification and hair microscopy science, as well as a diagnosis for its perniciousness, namely an embarrassingly lax and self-perpetuating approach to the admissibility of unvalidated and false forensic evidence. We conclude in Part IV with discussion of the unique set of ethical conundrums – and pressing obligations – that, left uncorrected, threaten the legitimacy of the justice system.

I. “THE SHIFTED PARADIGM”

Law and science are truth-seeking processes and therefore share a

critical, but sometimes anomalous, relationship: “Science helps the law understand the world in which legal policy must operate,”⁴⁰ whereas law values and relies on precedent to establish guarantees of trustworthiness. Scientific inquiry accepts precedent only as a baseline from which to seek a new way forward, sometimes quite rapidly.⁴¹ To the extent consistency and finality – component parts of precedent – are valued in science, it is only insofar as they remain scientifically valid. Put differently, falsified hypotheses are quickly discarded and, if referenced at all, it is typically to draw a line from what mankind once thought to be true to the current state of scientific knowledge. The law, on the other hand, has moved glacially to abandon techniques [admitted with little inquiry which] science has proven false, or revealed/exposed as baseless speculation.⁴² Exacerbating this problem is the adversarial system’s propensity to value zealous advocacy over sound science,⁴³ particularly when deployed against criminal

⁴⁰ Sarah Lucy Cooper, *The Collision of Law and Science: American Court Responses to Developments in Forensic Science*, 33 PACE L. REV. 234, 237 (2012).

⁴¹ *Id.* at 238.

⁴² *Id.* at 238 n. 16; *Id.* at 238 n. 17 (internal citations omitted). In contrast, however, stands some recent Fourth Amendment jurisprudence. Take, for example, *U.S. v. Jones*, 132 S.Ct. 945

(2011), which considered whether federal law enforcement’s attaching a GPS device to a drug suspect’s vehicle constituted a search under the Fourth Amendment. In holding that it did, the Court discussed one’s right to privacy, previously considered very limited when one was out in public, in an era of secret, electronic monitoring.

⁴³ Sarah Lucy Cooper, *The Collision of Law and Science: American Court Responses to Developments in Forensic Science*, 33 PACE L. REV. 234, 238 (2012) (internal citations omitted)

defendants.⁴⁴

The rapid development and introduction of cutting-edge science in our courtrooms has intensified the tension (both to emerging techniques and those with long, if undistinguished, histories). This is particularly true as it relates to traditional forensic individualization sciences. In their 2005 groundbreaking – and controversial⁴⁵ – article, *The Coming Paradigm Shift in Forensic Identification*,⁴⁶ Michael J. Saks and Jonathan J. Koehler, argued that “[l]egal and scientific forces are converging to drive an emerging skepticism about the claims of the traditional forensic individualization sciences. As a result, these sciences are moving toward a new scientific paradigm.”⁴⁷ Calls for reforming the way the criminal justice

⁴⁴ See, e.g., Radley Balko, *How the Courts Trap People Who Were Convicted by Bad Forensics*, Washington Post, Nov. 17, 2014, available at <http://www.washingtonpost.com/news/the-watch/wp/2014/11/17/how-the-courts-trap-people-who-were-convicted-by-bad-forensics/>.

⁴⁵ Norah Rudin & Keith Inman, *The Shifty Paradigm, Part I: Who Gets to Define the Practice of Forensic Science?*, CAC NEWS, October 2005 at 13, available at <http://www.forensicdna.com/assets/4thq05.pdf>.

⁴⁶ Michael Saks & Jonathan Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (2005).

⁴⁷ Michael Saks & Jonathan Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (2005). To make traditional forensic individualization sciences fit the new paradigm, and as a consequence achieve some level of otherwise lacking scientific rigor, Saks and Koehler argue that DNA typing be used as a model. First, they note, DNA typing technology was an application of knowledge derived from core scientific disciplines . . . [and] provided a stable structure for future empirical work Second, the courts and scientists scrutinized applications of the technology in individual cases. As a result, early, unscientific practices were rooted out. Third, DNA typing offered data-based, probabilistic assessments of the meaning of evidentiary ‘matches.’ This practice represented an advance over potentially misleading match/no-match claims associated with other forensic identification sciences.” *Id.* at 893. Saks’ and

system currently views and admits forensic evidence in court quickly followed suit.⁴⁸ Among the numerous examples, some of which are novel and progressive, are those that argue that because of the surfeit of documented forensic error,⁴⁹ “suspect evidentiary categories” which “are both recurring features of wrongful convictions and not otherwise susceptible to correction through traditional trial mechanisms . . . should be subjected to heightened scrutiny for reliability under the Due Process Clause.”⁵⁰ Or proposals that would subject all “police generated” evidence – namely “eyewitness identification testimony, police officer testimony regarding a defendant’s confession, and a police informant’s testimony regarding a defendant’s incriminating statements” – to a pre-trial reliability

Koehler’s suggestion is consistent with the NAS Report’s findings that “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. In terms of scientific basis, the analytically based disciplines generally hold a notable edge over disciplines based on expert interpretation.” NAS Report at S-5.

⁴⁸ The Saks and Koehler article was quite controversial. Norah Rudin and Keith Inman’s responsive article, *The Shifty Paradigm, Part I: Who Gets to Define the Practice of Forensic Science?*, while agreeing with Saks and Koehler that DNA science has raised the bar for other forensic disciplines, nonetheless argue that there are core differences between other types of forensic evidence and the access to source populations that make application of DNA typing models possible.

⁴⁹ See, e.g., Samuel R. Gross et al., *Exonerations in the United States 1989 Through 2003*, 95 J.

CRIM. L. & CRIMINOLOGY 523 (2005); D. Michael Risinger, *Innocents Convicted: An Empirically Justified Factual Wrongful Conviction Rate*, 97 J. CRIM. L. & CRIMINOLOGY 762 (2007).

⁵⁰ Keith Findley, *Judicial Gatekeeping of Suspect Evidence: Due Process and Evidentiary Rules in the Age of Innocence*, 47 GEORGIA L. REV. 723 (2013).

screening prior to being offered into evidence.⁵¹

Scholars are not the only proponents; courts, too, have recently, albeit belatedly, joined the effort. In 2012 two state supreme courts, New Jersey and Oregon, each issued opinions that redrew the landscape of those state courts' treatment of eyewitness identification evidence, a landscape created by the Supreme Court's near universally adopted, yet scientifically flawed, "balancing test" announced in *Manson v. Brathwaite*.⁵² In *State [New Jersey] v. Henderson*⁵³ the court assessed decades of social science research

⁵¹ Sandra Guerra Thompson, *Judicial Gatekeeping of Police-Generated Witness Testimony*, 102 J. CRIM. L. & CRIMINOLOGY 329, 330 (2012).

⁵² *Manson v. Brathwaite*, 432 U.S. 98, 110-14 (1977). From the Innocence Network, Karen Newirth": "The Manson Court held that "reliability is the linchpin in determining the admissibility of identification testimony," id. at 114, and that when confronted with evidence of unduly suggestive identification procedures, courts should weigh that suggestiveness against "reliability." The Court offered five factors for courts to consider, a list it intended to be non-exclusive: "the opportunity of the witness to view the criminal at the time of the crime, the witness' degree of attention, the accuracy of the witness' prior description of the criminal, the level of certainty demonstrated by the witness at the confrontation, and the length of time between the crime and the confrontation." *Neil v. Biggers*, 409 U.S. 188, 199-200 (1972) (cited in *Manson*, 432 U.S. at 114). The Manson "test, has been undermined by scientific research that courts have called a "near perfect scientific consensus" demonstrating that "eyewitness identifications are potentially unreliable in a variety of ways unknown to the average juror." *State v. Guilbert*, 49 A.3d 705, 720-21 (Conn. 2012); *State v. Lawson*, 291 P.3d 673, 690 n.5 (Or. 2012) (noting frequency of misidentification); *State v. Henderson*, 27 A. 3d 872, 878 (N.J. 2011) (same). See also National Academy of Sciences, *Identifying the Culprit: Assessing Eyewitness Identification*, at 65-66 (prepublication 2014), available at https://public.psych.iastate.edu/glwells/NAS_Eyewitness_ID_Report.pdf (noting that Manson "was not based on much of the research conducted by scientists on visual perception, memory, and eyewitness identification, and . . . fails to include important advances")."

⁵³ 27 A.3d 872 (N.J. 2011).

regarding the vagaries of eyewitness identification⁵⁴ and, as a result, revised the standards for the evidence's admissibility,⁵⁵ as well as instructions to juries about how to assess the evidence's purported value.⁵⁶ In *State [Oregon] v. Lawson*⁵⁷ the court's decision used many of the same factors as the *Henderson* court in reversing the conviction and establishing new evidentiary standard for the admission of such evidence,⁵⁸ but went further, shifting the burden of admissibility to the prosecution.⁵⁹ As progressive as these proposed remedies and substantive evidentiary changes are, they provide only prospective relief; they are not directed at the continuing failures of justice that the developments discussed below illustrate and that the data identify.

A. Forensic Evidence-Based Post-Conviction Exonerations

The phenomenon of post-conviction exonerations is now well-known and has been documented elsewhere.⁶⁰ For purposes of our argument, however, the frequency of flawed forensic evidence as a leading cause of wrongful conviction is worth reiterating briefly. A leading study of the first 200 post-conviction exonerations illustrated, 57% involved flawed

⁵⁴ *Id.* at 884–85.

⁵⁵ *Id.* at 919–24.

⁵⁶ *Id.* at 919.

⁵⁷ 291 P.3d 673 (Or. 2012).

⁵⁸ *Id.* at 690-97.

⁵⁹ *Id.* at 690-97.

⁶⁰ Since 1989 there have been more than 300 documented exonerations based on post-conviction DNA testing.

forensic evidence.⁶¹ That statistic is consistent with another: 60% of the forensic witnesses who testified in wrongful conviction cases provided inaccurate testimony.⁶² More specifically, “[f]orensic evidence was the second leading type of evidence supporting . . . [the first 200] erroneous convictions.”⁶³ Within that subset, serological analysis was the most commonly admitted, followed by hair evidence, bite mark evidence, and fiber comparison, respectively.⁶⁴ Correspondingly, and as our empirical evidence below supports, Garrett’s study indicates that these cases not only involved the “use of evidence with limited probative value, but the improper use of then-existing forensic science. To a surprising extent, the forensic testimony at trial was improper based on science at the time.”⁶⁵

Hair microscopy testimony, for example, comprised 22% of the first 200 exonerations.⁶⁶ Recent investigative reporting at *The Washington Post* revealed something else about this subset of cases, however: that for years

⁶¹ Brandon Garrett, *Judging Innocence*, 108 COLUMBIA L. REV. 55, 107 (2007).

⁶² Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Testimony and Wrongful*

Convictions, 95 VA. L. REV. 1 (2009).

⁶³ Brandon Garrett, *Judging Innocence*, 108 COLUMBIA L. REV. 55, 107 (2007).

⁶⁴ Brandon Garrett, *Judging Innocence*, 108 COLUMBIA L. REV. 55, 107 (2007).

⁶⁵ Brandon Garrett, *Judging Innocence*, 108 COLUMBIA L. REV. 55, 107 (2007). For example, Garrett reports “[a] preliminary review of serological testimony during these exonerees’ trials disclosed that more than half involved improper testimony by forensic examiners.”

⁶⁶ Brandon Garrett, *Judging Innocence*, 108 COLUMBIA L. REV. 55, 107 (2007).

DOJ officials who had reviewed work in these cases⁶⁷ and were aware that false or exaggerated testimony provided by its analysts had led to flawed convictions across the country, did not adequately inform defendants whose convictions were affected.⁶⁸ DOJ officials later took the position that the limited notification comported with their legal and constitutional obligations and they “were not required to inform defendants directly.”⁶⁹ Worse, the case review was limited, even though officials were aware that the potential problem was far broader, in large part because not only did the FBI make available its own experts, but also trained “about 600 examiners from outside the FBI between 1973 and 1987, as well as “an additional 450 examiners were trained over the next dozen years.”⁷⁰ The FBI-trained

⁶⁷ An appointed task force created during an inspector general’s investigation of misconduct at the FBI crime lab in the 1990s undertook the investigation. The inquiry took nine years and ended in 2004. Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

⁶⁸ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

⁶⁹ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

⁷⁰ Spencer S. Hsu, *Review of FBI Forensics Does Not Extend to Federally Trained State, Local Examiners*, WASHINGTON POST, Dec. 22, 2012. “The Washington Post worked with the nonprofit National Whistleblowers Center, which had obtained dozens of boxes of task force documents through a years-long Freedom of Information Act fight. Task force documents identifying the scientific reviews of problem cases generally did not contain the names of the defendants. Piecing together case numbers and other bits of information from more than 10,000 pages of documents, The Post found more than 250 cases in which a scientific review was completed. Available records did not allow the identification of defendants in roughly 100 of those cases. Records of an unknown number of other questioned cases handled by federal prosecutors have yet to be released by the government. Spencer S. Hsu, *Convicted Defendants Left Uninformed of*

experts were taught to provide the same testimony the FBI has conceded is scientifically invalid.⁷¹

Similarly, a 2013 investigation by the Associated Press (“AP”) revealed that at least twenty-four innocent men whose convictions and/or indictments were obtained through the use of bitemark evidence have been exonerated since 2000.⁷² Based on “decades of court records, archives, news reports” and interviews with “[t]wo dozen forensic scientists and other experts . . . including some who had never before spoken to a reporter about their work,” the AP investigation was the “most comprehensive” audit of bite mark case ever undertaken.⁷³ What is astounding about the number of wrongful convictions discovered thus far that were obtained at least in part through bite mark analysis, is that the technique is rarely used.

Forensic Flaws Found by Justice Department, WASHINGTON POST, April 16, 2012.

⁷¹ There is considerable evidence that the FBI trained all examiners as to how to testify and to exaggerate their findings beyond the limits of science. “A forensics expert who used to work in the federal lab, Max M. Houck, told [The New York Times] Retro Report that there was ‘absolutely a disconnect between what I could say as a scientist and what the prosecutors, or the defense attorneys, wanted me to say.’” Clyde Haberman, *DNA Analysis Exposes Flaws in an Inexact Forensic Science*, N.Y. TIMES, May 18, 2014. “[A]bout three dozen FBI agents trained 600 to 1,000 state and local examiners to apply the same standards that have proved problematic.” Spencer S. Hsu, *FBI Lab’s Woes Cast Growing Shadow – Doubts About State, Local Hair Matches – Federal training linked to suspect court testimony*, WASHINGTON POST, Dec. 22, 2012.

⁷² Amanda Lee Myers, *Once Key in Some Cases, Bite Mark Evidence Now Derided as Unreliable*, ASSOCIATED PRESS, June 17, 2013, available at http://www.denverpost.com/ci_23474835/once-key-some-cases-bite-mark-evidence-now.

⁷³ Amanda Lee Myers, *Men Wrongly Convicted or Arrested on Bite Evidence*, ASSOCIATED PRESS, June 16, 2013, available at <http://news.yahoo.com/men-wrongly-convicted-arrested-bite-evidence-150610286.html>.

B. National Academy of Sciences Report and Recent Complementary Forensic Developments

The NAS Report, even accepting its critiques,⁷⁴ has been widely cited as a “game-changing” document. Central to its concerns were findings associated with the use of flawed forensic science in criminal prosecutions, specifically the pronounced tendency “of giving undue weight to [forensic] evidence and testimony derived from imperfect testing and analysis . . .”⁷⁵ For too long, as the Report noted, forensic science has been largely advanced within a legal rather than scientific construct. Despite the dedicated work of forensic scientists, the disaggregated, uncoordinated nature of the system and its legal focus has prevented interested communities from “establishing strong links with a broad base of research universities and the national research community.”⁷⁶ Without the integration of the research community, the forensic science system was deprived of scientific research funding to meet the foundational and innovative needs, left absent of measurement and technical standards that guide practice, and isolated from other scientific communities that have improved many foundational issues (cognitive bias, root cause analyses, laboratory

⁷⁴ See, e.g., Paul C. Giannelli, *Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research*, 2011 U. ILL. L. REV. 53 (2011); David H. Kaye, *The Good, the Bad, and the Ugly: The NAS Report on Strengthening Forensic Science in America*, 50 SCI. & JUST. 8 (2010); Kenneth E. Melson, *Embracing the Path Forward: The Journey to Justice Continues*, 36 NEW ENG. J. ON CRIM. & CIV. CONFINEMENT 197 (2010).

⁷⁵ NAS Report at S-3.

⁷⁶ NAS Report at 78.

quality).⁷⁷ The Report went on to conclude that apart from nuclear DNA analyses,⁷⁸ claims about individualization – bite marks and hair microscopy, among others – are unsupported by the most basic foundational characteristics that would allow such claims to be characterized as sound science.⁷⁹

The scholarship and other reform that the Report has generated has been plentiful, much of it aimed at developing and refining solutions to the problems that the Report identified.⁸⁰ In addition, several practical suggestions that the NAS Report suggested have been implemented, primarily with federal government impetus and support. These developments have also raised the promise of a forensic science future that engages both the legal and scientific communities. Though this is a new endeavor for both communities, proper support will lead to a successful collaboration of researchers, forensic practitioners, and law enforcement and result in data-driven methods and practicable standard

⁷⁷ *Id.*

⁷⁸ See *infra* note and accompanying text.

⁷⁹ NAS Report at 1-6, S-6. This claim is consistent with the Saks and Koehler article.

⁸⁰ See e.g., Jennifer L. Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725, 749 (2011); *Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research*, 2011 U. ILL. L. REV. 53 (2011); William A. Tobin & Peter J. Blau, *Hypothesis Testing of the Critical Underlying Premise of Discernible Uniqueness in Firearms-Toolmarks Forensic Practice*, 53 JURIMETRICS J. 121, 142 (2013); Paul C. Giannelli, “*Ballsitics*” *Redux*, 28 CRIM. JUST. 47 (2013).

implementation.⁸¹

1. National Commission on Forensic Science

In 2013, the Department of Justice (DOJ) and the National Institute of Standards and Technology (NIST) signed a Memorandum of Understanding (MOU)⁸² outlining the framework for collaboration in strengthening the validity and reliability of forensic sciences. The MOU provides clear guidance on how DOJ and NIST will work together to enhance oversight and improve coordination across a broad range of forensic science disciplines. Among the enhancements is the creation of a new federal advisory committee, the National Commission on Forensic Science (NCFS),⁸³ and the creation of discipline-specific guidance groups

⁸¹ This portion of the article would not have been possible without the expertise of Sarah Chu, Senior Forensic Policy Advocacy at the Innocence Project, and her encyclopedic knowledge of the federal forensic science landscape.

⁸² See Press Release, Department of Justice, Department of Justice and National Institute of Standards and Technology Announce Launch of National Commission on Forensic Science (Feb. 15, 2013), available at <http://nist.gov/oles/doj-nist-forensic-science021513.cfm>.

⁸³ THE NCFS Charter provides:

The objectives and scope of activities of the Commission are to provide recommendations and advice to the Department of Justice (DOJ) concerning national methods and strategies for: strengthening the validity and reliability of the forensic sciences (including medico-legal death investigation); enhancing quality assurance and quality control in forensic science laboratories and units; identifying and recommending scientific guidance and protocols for evidence seizure, testing, analysis, and reporting by forensic science laboratories and units; and identifying and assessing other needs of the forensic science communities to strengthen their disciplines and meet the increasing demands generated by the criminal and civil justice systems at all levels of government. In accomplishing these objectives, the Commission may not develop or recommend guidance regarding digital evidence. See Eric Holder, *Charter*, DEPARTMENT OF JUSTICE (March 18, 2013), available at <http://www.justice.gov/ncfs/docs/ncfs-charter.pdf>

housed within NIST.

NCFS is charged with providing policy recommendations regarding forensic science to the Attorney General, specifically strengthening of the validity and reliability of the forensic sciences, enhancing quality assurance and quality control in forensic labs, and identifying protocols for evidence collection, analysis, and reporting. A central goal of NCFS is to advise the Attorney General on the intersection of science and the courtroom and to recommend standards and policies for implementation at federal law enforcement laboratories. At the first meeting of the NCFS on February 4 and 5, 2014, the Commission members – an impressive array of academic and research scientists, lawyers, judges, forensic science practitioners, and crime lab directors⁸⁴ – began their work by suggesting various subcommittees tasked to specific charges of the MOU.⁸⁵

2. Basic and Applied Research and Standards Development

Also as part of the MOU, NIST agreed to support the objectives of the Commission through a two-pronged effort: first, NIST will conduct basic foundational research on forensic techniques that, even in the absence of this research, have nevertheless long been accepted by criminal

⁸⁴ Press Release, Department of Justice, U.S. Departments of Justice and Commerce Name Experts to First-ever National Commission on Forensic Science (Jan. 10, 2014), <http://www.justice.gov/opa/pr/2014/January/14-at-029.html>

⁸⁵ See *Meeting Summary*, NATIONAL ASSOCIATION OF FORENSIC SCIENCE (Feb. 3-4, 2014), <http://www.justice.gov/ncfs/docs/meeting-sum.pdf>.

courts;⁸⁶ and, second, NIST will administer and coordinate the Organization of Scientific Area Committees (OSAC).⁸⁷ The foundational research prong will determine the reliability of forensic science methods, determine technical guidance for forensic science measurements, and perform validation studies for forensic science assays and techniques. Based on these foundations, NIST will independently develop measurement standards.

The second prong involves the creation of a sustainable infrastructure that will produce best practices, guidelines, and technical standards to improve the quality and consistency in forensic science disciplines. OSAC's technical standards will augment the measurement standards that are developed independently by NIST. OSAC will transition the currently independent Scientific Working Groups (SWGs)⁸⁸ into “subcommittees” that will consider their previous work product and engage in new standards setting activities.⁸⁹ The OSAC will be practice-focused but

⁸⁶ See *Meeting Summary*, NATIONAL ASSOCIATION OF FORENSIC SCIENCE (Feb. 3-4, 2014), <http://www.justice.gov/ncfs/docs/meeting-sum.pdf>.

⁸⁷ The OSAC was originally titled “guidance groups” in the MOU. *Summary of the NIST Proposed Plan for the Organization of Scientific Area Committees (OSAC)*, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, <http://nist.gov/forensics/upload/NIST-OSAC-Summary-1-31-14.pdf>.

⁸⁸ Scientific Working Groups (SWG) are a creation of national and international forensic practitioners and laboratories to facilitate collaboration in the forensic sciences. Previously, the FBI nominally supported SWGs.

⁸⁹ The question surrounding the composition of subcommittees and the level of incorporation of researchers and forensic scientists has elicited a range of responses in the Public Comments on the NIST Notice of Inquiry. The public

will not provide advice to the Attorney General or the NCFS directly. While NIST will administer the OSAC, its membership will be appointed by a NIST/DOJ leadership and membership selection committee. The NIST Forensic Science Program recently selected 402 experts to serve as members of the 23 subcommittees of the five Scientific Area Committees on Biology/DNA, Chemistry/Instrumental Analysis, Crime Scene/Death Investigation, Digital/Multimedia and Physics/Pattern Interpretation.⁹⁰

C. Federal Case Audit & State Legislation

The seismic pivot toward the use of validated science in criminal prosecutions discussed in the preceding sections is forward-looking reform. At least as pressing an issue emerging in this new era of scientific integrity is how the criminal justice system addresses convictions resting on discredited expert testimony. To that end, in what should be the beginning of a series of complementary efforts, the FBI and DOJ recently announced an unprecedented – both in mission and scope – audit of all of its all FBI Laboratory hair and fiber cases since the early 1980s.⁹¹ Questions about the validity of the FBI’s training of its forensic examiners, including the

comments may be found here: <http://www.nist.gov/forensics/upload/commentspdf-020714-small-3-2.pdf>.

⁹⁰ See *Meeting Summary*, National Association of Forensic Science (Feb. 3-4, 2014), <http://www.justice.gov/ncfs/docs/meeting-sum.pdf>; NIST, Press Release, *402 Members Named to Forensic Science Standards Organization*: http://www.nist.gov/forensics/osac_102914.cfm.

⁹¹ Spencer S. Hsu, *Justice Dept., FBI to Review Use of Forensic Evidence in Thousands of Cases*, WASHINGTON POST, July 10, 2012.

training it provided about how those examiners should testify about their purported findings, came under intense scrutiny after two cases in Washington, D.C. were the subject of post-conviction exonerations. In 1980, Santae Tribble was charged and convicted of the killing of a D.C. taxi driver.⁹² Tribble's conviction was based nearly entirely on an FBI agent's testimony that hair discovered in a stocking mask "matched in all microscopic characteristics" of Tribble's hair.⁹³ In December of 2012, after DNA testing excluded Tribble as the source of the hair; he was exonerated and released from prison.⁹⁴ Tribble's exoneration had been preceded by Kirk Odom's, another D.C. defendant, who had been convicted of a 1981 rape.⁹⁵ Odom served more than twenty years in prison.⁹⁶ At Odom's trial, an FBI analyst testified that a hair found on the victim's nightgown was "microscopically like" Odom's, and, according to the prosecution, the analyst had only "been able to distinguish between hair samples . . . 'eight or 10 times in the past 10 years, while performing thousands of

⁹² See Certificate of Actual Innocence, United States v. Tribble, No. 78 FEL 4160 (D.C. Dec. 14, 2012).

⁹³ See Certificate of Actual Innocence, United States v. Tribble, No. 78 FEL 4160 (D.C. Dec. 14, 2012).

⁹⁴ Spencer S. Hsu, *D.C. Judge Exonerates Santae Tribble in 1978 Murder, Cites Hair Evidence DNA Test Rejected*, WASHINGTON POST, Dec. 14, 2012.

⁹⁵ Spencer S. Hsu, *Kirk Odom, Who Served 20 Years for 1981 D.C. Rape, is Innocent, Prosecutors Say*, WASHINGTON POST, July 10, 2012.

⁹⁶ Spencer S. Hsu, *Kirk Odom, Who Served 20 Years for 1981 D.C. Rape, is Innocent, Prosecutors Say*, WASHINGTON POST, July 10, 2012.

analyses.”⁹⁷ The FBI and the DOJ have acknowledged that this type of testimony is scientifically invalid and has acknowledge two other varieties of scientifically invalid testimony FBI examiners routinely proffered to jurors in an effort to quantify the significance of an association between a questioned and known hair.⁹⁸

The Tribble and Odom cases were unique in their influence, but the scientifically invalid testimony used to secure their convictions was, as discussed below, routine and widespread. Aside from the false and misleading expert testimony and failures of justice that resulted, at least as worrisome is the initial response to the problem by the agencies responsible for it. As *The Washington Post* journalist, Spencer Hsu, documented in a series of articles, federal officials began reviewing these types of cases⁹⁹ in

⁹⁷ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Dept*, WASHINGTON POST, April 16, 2012.

⁹⁸ See discussion Part _____. More specifically, the errors have been identified as follows:

Error Type 1: “The examiner stated or implied that the evidentiary hair could be associated with a specific individual to the exclusion of all others.”

Error Type 2: “The examiner assigned to the positive association a statistical weight or probability or provided a likelihood that the questioned hair originated from a particular source, or an opinion as to the likelihood or rareness of the positive association that could lead the jury to believe that valid statistical weight can be assigned to a microscopic hair association.”

Error Type 3: “The examiner cites the number of cases or hair analyses worked in the lab and the number of samples from different individuals that could not be distinguished from one another as a predictive value to bolster the conclusion that a hair belongs to a specific individual.” FBI, Microscopic Hair Comparison Analysis Agreement, Nov. 9, 2012 (on file with authors).

⁹⁹ An appointed task force created during an inspector general’s investigation

the 1990s. But, instead of releasing the information to defendants whose convictions were affected – which demonstrated that the testimony and forensic work on which it was based was flawed – the federal task force made them available only to prosecutors.¹⁰⁰ Justice Department officials took the position that the limited notification comported with their legal and constitutional obligations and they “were not required to inform defendants directly.”¹⁰¹ Worse, the case review was narrowly circumscribed, even though officials were aware that the potential problem was far broader, in large part because not only did the FBI make available its own experts, but also trained “about 600 examiners from outside the FBI between 1973 and 1987, as well as “an additional 450 examiners were trained over the next dozen years.”¹⁰²

of misconduct at the FBI crime lab in the 1990s undertook the investigation. The inquiry took nine years and ended in 2004. Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Dept*, WASHINGTON POST, April 16, 2012.

¹⁰⁰ Spencer S. Hsu, *Convicted defendants left uninformed of forensic flaws found by Justice Dept*, WASHINGTON POST, April 16, 2012.

¹⁰¹ Spencer S. Hsu, *Convicted defendants left uninformed of forensic flaws found by Justice Dept*, WASHINGTON POST, April 16, 2012.

¹⁰² Spencer S. Hsu, *Review of FBI Forensics Does Not Extend to Federally Trained State, Local Examiners*, Dec. 22, 2012. “The Washington Post worked with the nonprofit National Whistleblowers Center, which had obtained dozens of boxes of task force documents through a years-long Freedom of Information Act fight. Task force documents identifying the scientific reviews of problem cases generally did not contain the names of the defendants. Piecing together case numbers and other bits of information from more than 10,000 pages of documents, The Post found more than 250 cases in which a scientific review was completed. Available records did not allow the identification of defendants in roughly 100 of those cases. Records of an unknown number of other questioned cases handled by federal prosecutors have yet to be released by the government. Spencer S. Hsu,

Nonetheless, the audit has already resulted in several firsts. Recently, the *Post* reported that no fewer than twenty-seven death penalty convictions from around the country are among the affected cases.¹⁰³ Among them is that of Willie Manning, who had been scheduled for execution in May, 2013 in Mississippi for the abduction and murder of two college students.¹⁰⁴ The Mississippi Supreme Court denied Manning's request for post-conviction DNA testing the week prior to his scheduled execution,¹⁰⁵ but in the days immediately preceding his execution date, the FBI and DOJ jointly wrote letters to Manning's counsel and Mississippi officials explaining that Manning's case had been included in the audit because an FBI analyst had testified that hair found at the crime scene implicated Manning, but that the testimony was "erroneous" and "exceeded the limits of the science" by claiming that the analysis could match the hair to an individual with "a relatively high degree of certainty."¹⁰⁶ Only hours

Convicted defendants left uninformed of forensic flaws found by Justice Dept.
WASHINGTON POST, April 16, 2012.

¹⁰³ Spencer S. Hsu, *U.S. Reviewing 27 death penalty convictions for FBI forensic testimony errors*, WASHINGTON POST, July 17, 2013. According to the article, "[t]he death row cases are among the first 120 convictions identified as potentially problematic among more than 21,700 FBI Laboratory files being examined." *Id.*

¹⁰⁴ For an excellent discussion of this case and appellate treatment of it, see Andrew Cohen, *A Ghost of Mississippi: The Willie Manning Capital Case*, THE ATLANTIC, May 2, 2013 at <http://www.theatlantic.com/national/archive/2013/05/a-ghost-of-mississippi-the-willie-manning-capital-case/275442/>.

¹⁰⁵ See Order, Manning v. State, No. 2013-DR-00491-SCT (Miss. Apr. 25, 2013), at <http://courts.ms.gov/Images/Opinions/183549.pdf>.

¹⁰⁶ Letter from John Crabb, Jr., Special Counsel, U.S. Department of Justice, to Deforest R. Allgood, Oktibbeha County Mississippi District Attorney, May 2,

before he was to die, the Court granted a stay that was presumably based on the audit's findings.¹⁰⁷ Later that summer the Court granted Manning leave to seek post-conviction DNA testing.¹⁰⁸

Similar retrospective efforts to identify and correct tainted convictions have gained ground in Texas and California. In the wake of appalling revelations about forensic malfeasance in criminal trials, executive meddling in efforts to right wrongs and indefensible¹⁰⁹ and

2013. More specifically, the letter stated that “[w]e have determined that the microscopic hair comparison analysis testimony or lab analysis report presented in this case included statements that exceeded the limits of science, and was, therefore, invalid. While this case did not involve a positive association of an evidentiary hair to an individual, the examiner stated or implied in a general explanation of microscopic hair comparison analysis that a questioned hair could be associated with a specific individual to the exclusion of all others – this type of testimony exceeded the limits of the science. The examiner also assigned a statistical weight or probability or provided a likelihood that, through microscopic hair comparison analysis, the examiner could determine that a questioned hair originated from a particular source, or an opinion as to the likelihood or rareness of a positive association that could lead the jury to believe that valid statistical weight can be assigned to a microscopic hair association – this type of testimony exceeded the limits of the science.” *Id.*

¹⁰⁷ See, Order, Manning v. State, No. 95-DP-00066-SCT (Miss. May 7, 2013).

¹⁰⁸ See, Order, Manning v. State, No. 2013-DR-00491-SCT (Miss. July 23, 2013).

¹⁰⁹ See, *In re Richards* 55 Cal. 4th 948 (2012), which California Lawyer Magazine determined was the worst state court decision of 2012 because it created a “distinction between the testimony of experts and the testimony of laypersons in applying the protections against false evidence in Penal Code section 1473(b)” and thus “creates a substantial obstacle to correcting what the California Commission on the Fair Administration of Justice identified as the second-most-common factor contributing to wrongful convictions: erroneous scientific evidence.” Gerald F. Uelmen, *New Balance at the California Supreme Court*, Cal. Lawyer, Aug. 2013, available at http://www.callawyer.com/Clstory.cfm?eid=930177&wteid=930177_New_Balance_at_the_California_Supreme_Court.

inconsistent¹¹⁰ legal rulings, both states enacted legislation aimed at correcting the wrongs. In 2005, Texas created its Forensic Science Commission¹¹¹ whose mission is to “investigate, in a timely manner, any allegation of professional negligence or misconduct that would substantially affect the integrity of the results of a forensic analysis conducted by an accredited laboratory, facility, or entity.”¹¹² In 2009, however, on the eve of the Commission’s report on Cameron Todd Willingham’s case¹¹³ – which was expected to find that the fire science used to secure Willingham’s conviction and death sentence was fundamentally flawed¹¹⁴ – Governor Rick Perry declined to re-appoint the Commission’s chairman and appointed three new commissioners.¹¹⁵ The Willingham report was

¹¹⁰ Compare *Ex parte Henderson*, 246 S.W.3d 690 (Tex. Crim. App. 2007)(granting state habeas relief to woman who was previously convicted of killing a baby in her care because biomechanical evidence showed that the death could have been the result of an accident rather than an intentional act) *with* *Ex Parte Robbins*, 360 S.W.3d 446 (Tex. Crim. App. 2011) (denying state habeas relief despite the testimony of several medical examiners, including the one who performed the original autopsy, which concluded that the cause of death was “undetermined” rather than “homicide.”)

¹¹¹ See H.B. 1068, 79th Leg., Reg. Sess. (Tex. 2005).

¹¹² TEX. CODE CRIM. PROC. ANN. art. 38.01, § 4(a)(3). The Commission has nine members, four of whom appointed by the Governor, three by the Lieutenant Governor and two by the Attorney General. TEX. CODE CRIM. PROC. ANN. art. 38.01 § 3(a).

¹¹³ David Grann, *Trial by Fire: Did Texas Execute an Innocent Man?* NEW YORKER, Sept. 7, 2009.

¹¹⁴ Maurice Possley, *Fresh Doubts Over a Texas Execution*, WASHINGTON POST, Aug. 2014.

¹¹⁵ Maurice Possley, *Fresh Doubts Over a Texas Execution*, WASHINGTON POST, Aug. 2014

delayed.¹¹⁶ In 2013 the Texas Legislature enacted several reforms, all aimed to one degree or another at the State's stunning incidence of wrongful convictions, many of them based on flawed science.¹¹⁷ Perhaps foremost among the efforts is Senate Bill 344 that allows challenges to convictions gained through now-discredited forensic techniques.¹¹⁸

¹¹⁶ Maurice Possley, *Fresh Doubts Over a Texas Execution*, WASHINGTON POST, Aug. 2014. Thereafter, the Texas Attorney General issued an opinion letter that limited the Commission's jurisdiction, including its investigation into the Willingham case, by prohibiting consideration of any cases where evidence was submitted before September 1, 2005. Willingham was executed in 2004. *See* Whether the Science Advisory Workgroup of the State Fire Marshal's Office Has Authority to Review Prior Arson Investigations, Op Att'y Gen. GA-1048 (Apr. 4, 2014), *available at* <https://www.texasattorneygeneral.gov/opinions/opinions/50abbott/op/2014/pdf/ga1048.pdf>.

¹¹⁷ SB 1611, known as the "Michael Morton Act," broadens defendants' access to evidence that could prove innocence. SB 344 would allow a defendant to challenge a conviction that was gained through forensic techniques that have since been discredited by modern science. This bill, which awaits Perry's signature, responds to documented problems in old arson cases where junk science was used as evidence.

¹¹⁸ HOUSE RESEARCH ORGANIZATION, APPLICATION FOR A WRIT OF HABEAS CORPUS BASED ON SCIENTIFIC EVIDENCE, SB 344, 1st Sess. (2013), *available at* <http://www.hro.house.state.tx.us/pdf/ba83R/SB0344.pdf>. The statute is in part an answer to the Willingham case, but also the result of two inconsistent rulings. In *Ex parte Henderson*, 246 S.W.3d 690 (Tex. Crim. App. 2007), the Court of Criminal Appeals granted habeas relief to woman who was previously convicted of killing a baby in her care because biomechanical evidence showed that the death could have been the result of an accident rather than an intentional act. In *Ex Parte Robbins*, 360 S.W.3d 446 (Tex. Crim. App. 2011), the Court of Criminal Appeals denied habeas relief to a man who was convicted of killing a toddler in his care despite the testimony of several medical examiners, including the medical examiner who performed the original autopsy, which concluded that the cause of death was "undetermined" rather than "homicide." The Court of Criminal Appeals concluded that Robbins failed to show that the testimony given by the medical examiner during the trial was false. Moreover, an actual innocence claim required Robbins to show "by clear and convincing evidence that no reasonable juror would have convicted him in light of" the medical examiner's recantation, and Robbins failed to do so. The new statute lowers the burden from a

Motivated as well by forensic embarrassments – in this instance a 1997 murder conviction based on bite mark evidence and a State Supreme Court decision affirming the conviction that was voted the state’s worst appellate decision of the year – California recently passed Senate Bill 1058.¹¹⁹ The legislation allows habeas petitioners to seek relief on claims when a forensic expert repudiates his trial testimony or where that testimony is subsequent to trial undermined by scientific or technological advancements.¹²⁰

D. Empirical Data

Finally, we rest our argument on separate sets of data that deconstruct foundational legal doctrine and demonstrate empirically, viewed in context with the developments above, the various forensic discipline’s fallacies, as well as analysts’ willingness to tout and courts’ to embrace and admit such evidence in the absence of basic validation research. This phenomenon has been noted elsewhere, though its prevalence can now – after several years of exonerations involving bite mark and hair microscopy testimony – definitively illustrated. For example, in another leading article, data illustrates that courts “policed the introduction of

¹¹⁹ “clear and convincing” standard to a “preponderance of the evidence” standard. On November 26, 2014, Robbins was the first petitioner to be granted relief under the statute’s new terms. See *Ex Parte Robbins*, No. WR-73, 484-02 (Tex. Crim App. Nov 25, 2014).

¹²⁰ See S.B. 1058, 2013-2014 Sess. (Cal. 2014), available at http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1058

¹²⁰ *Id.*

forensic testimony in these trials in a highly deferential manner, typically trusting the jury to assess the expert testimony.”¹²¹ In part because defense attorneys failed to challenge the evidence in the first instance, combined with appellate courts’ failure to take the issues seriously either,¹²² many exonerees never challenged, or were otherwise procedurally barred from doing so, on appeal or post-conviction.¹²³ In those instances where exonerees did challenge the putative scientific evidence, appellate courts typically relied on decades, sometimes centuries, of precedent supporting the admissible of the technique at issue to brush aside requests for relief.

We have termed this phenomenon as the “Echo Chamber”: where

¹²¹ Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Testimony and Wrongful Convictions*, 95 VA. L REV. 1 (2009).

¹²² Of some of the more egregious, but emblematic, are these: in Gerard Richardson’s direct appeal to the Superior Court of New Jersey, his counsel, as well as Richardson himself in a *pro se* pleading, exhaustively briefed what they argued was the erroneous admission of bite mark evidence. The court’s analysis, in full: “We have carefully considered each of these contentions in light of the entire record and find them to be without sufficient merit to warrant a written opinion.” *State v. Richardson*, No. A-4235-95T4 (N.J. Jan. 22, 1998). In Eddie Lee Howard’s death penalty conviction, the Mississippi Supreme Court was confronted with a host of valid claims about Dr. Michael West’s, the forensic odontologist, malfeasance, including instances where Dr. West had misidentified bite marks in other cases. About the admission of his testimony in Howard’s case, though, the Court wrote: “In support of his post-conviction claim, Howard has offered numerous expert affidavits and other documents which attack Dr. West, his testimony, and bite mark evidence in general. These affidavits and other documents point out how many times Dr. West has been proven wrong and they discuss how unscientific his methods are. One affidavit even states that Dr. West made a misdiagnosis in Howard’s case, but, it does not go on and opine that Howard did not bite Kemp. Just because Dr. West has been wrong a lot, does not mean, without something more, that he was wrong here.” *Howard v. State*, 945 So.2d 326, 352 (Miss. 2006).

¹²³ Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Testimony and Wrongful Convictions*, 95 VA. L REV. 1 (2009).

courts fail to engage in meaningful review of the proffered evidence – usually a *Frye*¹²⁴ or *Daubert*¹²⁵ hearing – and, instead, cite “persuasive” authority from sister states admitting such evidence – usually established without a single *Frye* or *Daubert* hearing – even in cases of first impression – or admit the technique based on some other rationale, typically that analysts (often those testifying, who have a professional interest in the technique’s continued admissibility) agree that the evidence at issue is “generally accepted” within their own “scientific” community.” A third line of reasoning leading to the uncritical admission of invalid scientific evidence involves abdicating judicial gatekeeping responsibly entirely and allowing juries to evaluate competing opinions, or even the legitimacy of the discipline itself.¹²⁶

II. BITE-MARK EVIDENCE

A. *Introduction*

Perhaps no discredited forensic assay has benefited more from criminal courts’ abdication of gatekeeper responsibilities than bite mark analysis. The genesis of the flawed jurisprudence can be traced back to a

¹²⁴ *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923) (requiring the proponent of novel scientific evidence bear the burden of demonstrating that the evidence has “gained general acceptance in the particular field in which it belongs”).

¹²⁵ *Daubert v. Merrill Dow Pharmaceuticals*, 509 U.S. 579 (1993).

¹²⁶ Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 90 (2009) (“Once a witness has been permitted to testify as an expert under Rule 702, judges usually leave the task of correcting and explaining their instructional statements to the opposing parties and the expert witnesses they call.”) (internal citations omitted).

single case: *People v. Marx*,¹²⁷ the first reported case to consider the admissibility of bite mark comparison evidence in human flesh.¹²⁸ Although in *Marx* there was no pre-trial *Frye*¹²⁹ hearing – or any other evidence or rule-based admissibility hearing – to examine the validity and reliability of the new technique, over time *Marx* has proven to be a seminal decision. *Marx* turned an obscure, unvalidated sub-discipline of “forensic odontology”,¹³⁰ into mainstream, “generally accepted,” “scientific” evidence¹³¹ – without any basic or applied research to validate the technique’s two underlying hypotheses: first, that a properly trained bite mark expert can make an association between bite mark and suspect’s “dentition” (the biting surface of teeth); or, second, that a properly trained

¹²⁷ *People v. Marx*, 54 Cal. App. 3d 100 (Ct. App. 1975).

¹²⁸ *People v. Marx*, 54 Cal. App. 3d 100 (Ct. App. 1975)

¹²⁹ *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923) (requiring the proponent of novel scientific evidence bear the burden of demonstrating that the evidence has “gained general acceptance in the particular field in which it belongs”).

¹³⁰ Courts, including *Marx*, have conflated the identification of human remains through dental records with bite mark identification. The former is a well-established, relatively non-controversial technique; bite mark analysis is an entirely different discipline, relying on untested assumptions and the interpretation of injuries in human flesh. Nonetheless, courts have often treated the disciplines as essentially interchangeable, further insulating bite mark evidence from judicial scrutiny. *See, e.g.*, *People v. Marx*, 54 Cal. App. 3d 100 (Ct. App. 1975); *Handley v. State*, 515 So. 2d 121, 129 (Ala. Crim. App. 1987); *People v. Middleton*, 429 N.E.2d 100, 103 (N.Y. 1981); *People v. Milone*, 396 N.E.2d 1350 (Ill. 1976); *State v. Jones*, 259 S.E.2d 120, 124 (S.C. 1979).

¹³¹ D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?* 64 ALB. L. REV. 99, 138 (2000) (“*Marx* came to be read as a global warrant to admit bite mark identification evidence whenever a person displaying apparent credentials chose to testify to an identification.”).

expert can provide a scientifically valid estimate of the rareness or frequency of that association, i.e., how many other dentitions may also be associated with the putative bite mark.¹³² Despite criminal courts continued acceptance of bite mark analysis, no such validation research exists today.¹³³

That *Marx* was so influential demonstrates the disinclination of criminal courts to engage in a rigorous analysis of putative scientific evidence, at least in criminal cases,¹³⁴ or even to scrutinize carefully

¹³² Robust reporting of error rates in the field do not exist, and at least one commentator has suggested an affirmative reason for that. C. Michael Bowers, *Problem-Based Analysis of Bitemark Misidentifications: The Role of DNA*, 159 FORENSIC SCI. INT'L 104, 106-177 (2006) (“Bite mark experts have benefited from their ability . . . to do few proficiency studies and to keep secret the results of such proficiency studies.”); *see also*, D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?*, 64 ALA. L. REV. 99, 142 (2000). Even the results of controlled studies have been disturbing. A 1999 American Board of Forensic Odontology bite mark workshop “ABFO diplomats attempted to match four bitemarks to seven dental models [and] found 63.5% false positives.” A 2001 study of “bites made in pig skin, ‘widely accepted as an accurate analogue of human skin,’” resulted in 11.9 to 22.0 percent “false positive identifications . . . for various groups of forensic odontologists.” C. Michael Bowers, *Problem-Based Analysis of Bitemark Misidentifications: The Role of DNA*, 159 FORENSIC SCI. INT'L 104, 106-177 (2006).

¹³³ See NAS Report at 173-76 (assessing the current state of bite mark analysis).

¹³⁴ Take, for example, Mississippi appellate courts – the same courts that have thus far affirmed, among others, Levon Brooks’ and Eddie Lee Howard’s convictions, both of which were based on bite mark evidence. The Mississippi Supreme Court has spent considerable time discussing the merits, or lack thereof, of expert testimony concerning the following: the cause of plaintiff’s need for hip-replacement surgery where the expert lacked experience and training in orthopedics, *Bailey Lumber & Supply Co. v. Robinson*, 98 So.3d 986 (Miss. 2012) (“the expert opinion of a doctor as to causation must be expressed in terms of medical probabilities as opposed to possibilities”); *Univ. of Miss. Medical Center v. Lanier*, 97 So. 3d 1197 (Miss. 2012) (noting that (1) “when the reliability of an expert’s opinion is attacked with credible evidence that the opinion is not accepted

precedent when weighing the admission of such evidence. Indeed, the *Marx* court clearly recognized that basic tenets of science – generating a hypothesis, testing that hypothesis through laboratory and field experiments, publishing the results in peer reviewed journals, repeating the experiments, testing the results of those experiments under a wide variety of conditions – were entirely absent from the nascent field, writing that there was “no established science of identifying persons from bite marks,”¹³⁵ that “experts do not agree on the exact number of similarities necessary to make a positive identification,”¹³⁶ and that “there was no evidence of systematic,

within the scientific community, the proponent of the opinion under the attack should provide at least a minimal defense supporting the reliability of the opinion;” (2) an “offered opinion that has been contradicted by published and peer-reviewed data, however, must be supported by some evidence of support and acceptance in the scientific community”); *Patterson v. Tibbs*, 60 So. 3d 742 (Miss. 2011); (holding that because the opinions of plaintiffs’ three experts that exposure to lead paint caused plaintiff’s brain injury was not based on “any scientific authority that acute, asymptomatic ingestion of lead could lead to the alleged injuries, the plaintiff did not offer sufficient proof of causation” and that the testimony should have been excluded. The Court reminded trial judges that their gatekeeping duty under *Daubert* “includes making sure that the opinions themselves are based on sufficient facts or data and are the product of reliable principles and methods.”); *Sherwin Williams Co. v. Gaines*, 75 So.3d 41 (Miss. 2011) (holding as error the admission of expert testimony on the present value of the utility’s future cash flow where the expert acknowledged that his valuation was merely his opinion with no supporting methodology); *Dedeaux Util. Co., Inc. v. Gulfport*, 63 So. 3d 514 (Miss. 2011) (engaging in close scrutiny of, among other things, utility cash-flow and the relative valuation of storm windows, the trial court engaged in no such inquiry in Osborne’s case, which involved a life sentence, and the sum total of the analysis supporting the panel’s denial of relief is a generalized statement without any discussion whatsoever of the type that characterizes the Court’s serious consideration of these issues in its other cases); *McKee v. Bowers Window & Door Co., Inc.*, 926 So. 3d 926 (Miss. 2011).

¹³⁵ *Marx*, 54 Cal. App. 3d at 107.

¹³⁶ *Id.*

orderly experimentation in the area.”¹³⁷ Nonetheless, the *Marx* court found that “[l]eaving aside the question whether tooth bites made into human flesh are sufficiently common in forensic dentistry to expect that orderly experimentation will ever be possible”¹³⁸ the bite mark identification testimony was admissible. According to the court, the standard of “general acceptance”¹³⁹ by recognized experts (i.e., the *Frye* test) was *not* determinative of admissibility because “the basic data on which the experts based their conclusion was verifiable by the court.”¹⁴⁰ The court found that because it was able to observe with its own eyes – *Marx* was a bench trial – the “matching” of the defendant’s dentition with the bite mark at issue it need not “sacrifice its . . . common sense in evaluating it”¹⁴¹ and could independently verify the conclusions the experts were urging. “Indeed,” the court wrote, “it is evident that in most cases the expert himself must accept certain dogmas of his profession on faith. We doubt that the average criminologist could supply the data on which the reliability of fingerprint evidence is based.”¹⁴² Thus was laid the foundation for the admissibility of bite mark analysis. Over the past three decades it has served as the

¹³⁷ *Id.* at 109.

¹³⁸ *Id.* at 109-10.

¹³⁹ *Id.* at 110.

¹⁴⁰ *Id.* at 111.

¹⁴¹ *Id.*

¹⁴² *Id.* at n.14.

foundation of at least twenty-four wrongful convictions and indictments.¹⁴³

B. The Rise of Bite Mark Matching

Exacerbating the error is the fact that subsequent cases of *first impression* in other states relied on *Marx* for the proposition that a *Frye* hearing is unnecessary prior to the admission, in short, as precedent for the admissibility of bite mark evidence generally – as “scientific” evidence of everything from dog bites¹⁴⁴ to bites made in paper towels.¹⁴⁵ As the graphic below demonstrates, the overwhelming majority of these cases fail, like *Marx*, to examine the reliability of the technique prior to its admission at trial; unlike *Marx*, all but three decisions arbitrarily label the evidence as “scientific.”¹⁴⁶ For example, the next post-*Marx* California court to consider bite mark evidence, in citing to *Marx*,¹⁴⁷ noted the “superior trustworthiness

¹⁴³ Amanda Lee Myers, *Once Key in Some Cases, Bite Mark Evidence Now Derided as Unreliable*, ASSOC. PRESS, Jun. 17, 2013; Amanda Lee Myers, *Men Wrongly Convicted or Arrested on Bite Evidence*, ASSOC. PRESS, Jun. 16, 2013 (detailing twenty-four cases).

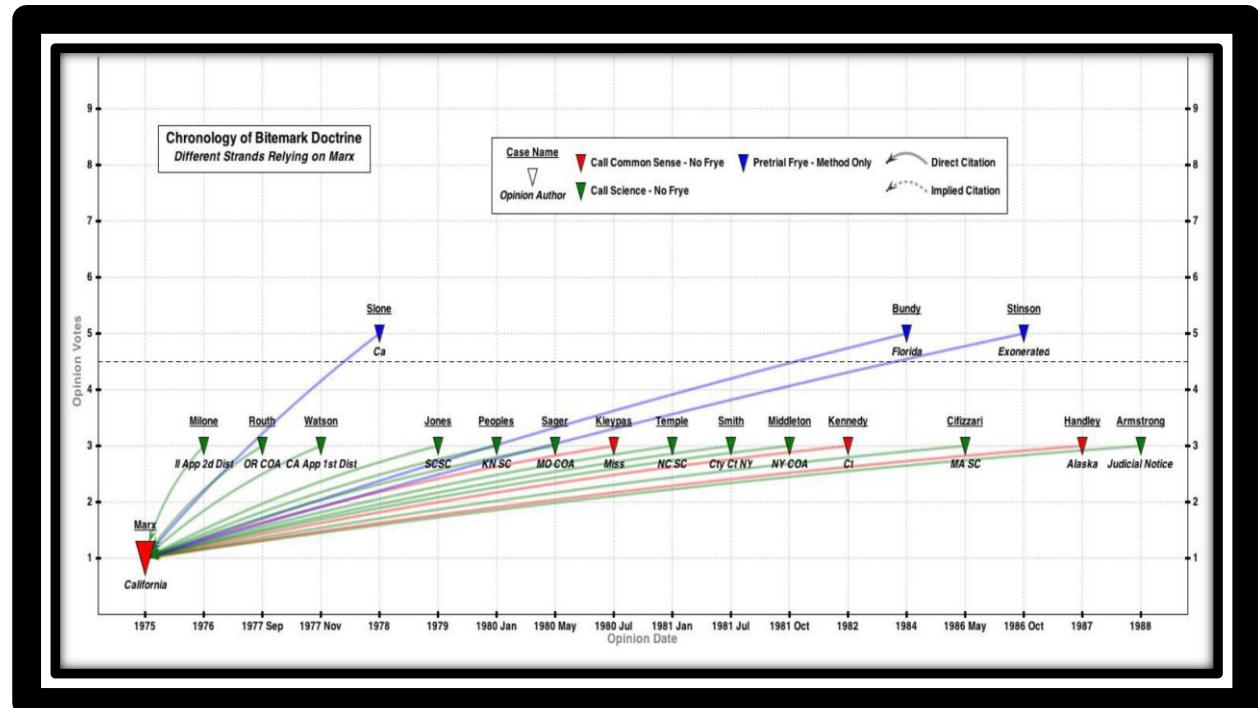
¹⁴⁴ *Davasher v. State*, 823 S.W.2d 863 (Ark. 1992) (“The State requested this evidence to prove by scientific testimony that a wound located on Davasher’s leg was a bite inflicted by the [victim’s] dog, Scooter. Dr. Richard Glass, a forensic odontologist, was allowed to testify that he could not rule Scooter out as the dog that bit Davasher.”).

¹⁴⁵ *State v. Armstrong*, 179 S.E.2d 870 (W. Va. 1988) (“[A]n examination of each tooth indicates an exact, perfect match between the appellant’s teeth and the bite-mark pattern on the paper towel, with no incompatibility. Dr. Sopher therefore concluded with a reasonable degree of dental certainty that ‘the bite-mark pattern in the towel is that of the teeth of Keith Armstrong, to the exclusion of all other individuals.’”)

¹⁴⁶ *State v. Kleypas*, 602 S.W.2d 863, 869 (Mo. Ct. App. 1980) (“[A] scientific principle . . . may or may not be involved in such a [bite mark] comparison.”); *Kennedy v. State*, 640 P.2d 971, 978 (Okla. 1982); *Handley*, 515 So. 2d at 129.

¹⁴⁷ *People v. Slone*, 76 Cal. App. 3d 611 (Ct. App. 1978).

of the scientific bite mark approach,¹⁴⁸ which compared favorably to “other scientific-test evidence,”¹⁴⁹ such as the “breathalyzer test.”¹⁵⁰



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This graph is a timeline of precedent-establishing cases that rely on *Marx* up until *Armstrong*, which in 1988 became the first court to take judicial notice of the “general acceptance” of bite mark evidence. The three cases placed above the dotted line, *Slone*, *Bundy* and *Stinson*, are the only reported cases to hold pre-trial *Frye* hearings. Every decision, apart from *Kleypas*, *Kennedy* and *Handley*, labeled bite mark evidence “scientific.”

The three reported cases of first impression in which trial courts

¹⁴⁸ *Id.* at 626.

¹⁴⁹ *Id.*
¹⁵⁰ *Id.* at 624.

¹⁵¹ The authors are indebted to University of Baltimore Law Professor Colin Starger, who created this graphic using software that he has developed for mapping Supreme Court precedent. See <http://law.ubalt.edu/faculty/scotus-mapping/>

actually held *Frye* hearings demonstrate another deep flaw running through the jurisprudence: the failure to distinguish between the methodology experts employ to collect data and the scientific basis for interpreting the data collected.¹⁵² The former is typically well established, non-controversial, and impressive to triers of fact; the latter is often entirely absent.

Bite mark experts refer to themselves as “forensic odontologists” and employ an imposing array of techniques and analytical instruments to collect and analyze data, teeth and the bite marks they purportedly leave.¹⁵³ For example, photographic techniques alone include infrared,¹⁵⁴ ultraviolet,¹⁵⁵ and trans-illumination,¹⁵⁶ that penetrates below the surface of the skin; to ensure photographs of bite marks are to scale, an “American

¹⁵² This phenomenon is true not only of bite mark evidence, but of many other forensic techniques, as well. *See, e.g.*, 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. 181, n. 84 (2014) (noting the National Research Council’s conclusions that available data does not support matching a bullet to a particular “box” of ammunition; that compositional analysis does not support definitive statements about the date of bullet manufacture; and, that detailed distribution of ammunition is such that probabilistic claims that a specific bullet came from a defendant should be avoided); NAT’L RESEARCH COUNCIL OF THE NAT’L ACADS, FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE 1 (2004), *available at* http://www.nap.edu/catalog.php?record_id=10924 (account required).

¹⁵³ *See, e.g.*, AMERICAN BOARD OF FORENSIC ODONTOLOGY, DIPLOMATES REFERENCE MANUAL (2013), *available at* <http://www.abfo.org/wp-content/uploads/2012/08/ABFO-Reference-Manual-1-22-2013-revision.pdf>.

¹⁵⁴ G.S. Golden, *Standards and Practices for Bite Mark Photography*, 29 J. FORENSIC ODONTOSTOMATOLOGY 2:27-39 (2011).

¹⁵⁵ *Id.*

¹⁵⁶ Robert B.J. Dorion, *Transillumination in Bite Mark Evidence*, J. FORENSIC SCI. May 1987.

Board of Forensic Odontology Number 2 Photomacrographic Scale”¹⁵⁷ (a right angled ruler) is placed on the same plane as the alleged bite mark; molds of suspect dentitions are created using a substance known as “polyvinylsiloxane;”¹⁵⁸ “digital overlays”¹⁵⁹ (outlines) of a exemplar “dentitions” (the biting surface of teeth) are generated through a digital software program and then used to superimpose the dentition to the photograph of the bite mark.¹⁶⁰ Forensic odontologists also make liberal use of scientific jargon and technical dentistry terms such as the “occlusal view” of teeth (closed mouth); “avulsive” bite marks (flesh tearing); “central ecchymosis” in the bite mark (bruising in the center of a bite mark); “subcutaneous hemorrhage” (bleeding beneath the skin); “temporomandibular joint function” (an individual’s biting mechanics); anterior and maxillary dentition (upper and lower teeth); and other esoteric terminology.

Courts considering admissibility challenges – and jurors weighing life and liberty issues – are impressed by the facility these experts have with the language of science and the supposed precision and complexity of the

¹⁵⁷ See, Angi M. Christensen, *et. al.*, *Forensic Anthropology: Current Methods and Practice* 81 (2014).

¹⁵⁸ Robert B.J. Dorion, *Bitemark Evidence: A Color Atlas and Text* 153 (2011).

¹⁵⁹ *Id.* at 112

¹⁶⁰ *Id.*

data collection process.¹⁶¹ However, although the terminology used by forensic odontologists is beyond the ken of a typical lay juror, the core methodology is easily understood. In essence, experts place outlines of suspects' teeth over photographs of bite marks and decide whether they "match." That the analysis of the data is entirely subjective and lacks any basis in science is typically lost on courts and factfinders. The few reported *Frye* hearings reflect this misunderstanding.¹⁶²

¹⁶¹ See, e.g., *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993) ("Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it."); *United States. v. Frazier*, 387 F.3d 1244, 1263 (11th Cir. 2004) ("Simply put, expert testimony may be assigned talismanic significance in the eyes of lay jurors, and, therefore, the district courts must take care to weigh the value of such evidence against its potential to mislead or confuse."); Neil Vidmar & Valerie P. Hans, *American Juries: The Verdict* 181-82 (2007)); William C. Thompson & Edward Schumann, *Interpretation of Statistical Evidence in Criminal Trials: The Prosecutor's Fallacy and Defense Attorney's Fallacy*, 11 LAW AND HUMAN BEHAVIOR 167 (1987); William C. Thompson, *Are Juries Competent to Evaluate Statistical Evidence?* 52 LAW & CONTEMPORARY PROBLEMS 9 (1989); David H. Kaye, et. al., *Statistics in the Jury Box: How Jurors Respond to Mitochondrial DNA Match Probabilities*, 4 JOURNAL OF EMPIRICAL LEGAL STUDIES 797-834 (2007); B. Michael Dann, et. al., *Can Jury Innovations Improve Juror Understanding of DNA Evidence?* 90 JUDICATURE 152 (2007).

¹⁶² *People v. Slone*, 76 Cal. App. 3d 611 (Ct. App. 1978) (explicitly rejecting appellant's contention that the expert's conclusion that it was "highly probably" appellant's teeth created the bite mark at issue was scientifically invalid); *Bundy*, 455 So. 2d at 349 ("The evidence in question is based on the examination of impressions made by human teeth and their comparison with models of known human teeth for the purpose of determining whether the impressions were or probably were or could have been made by a particular individual.... the basis for the comparison testimony—that the science of odontology makes such comparison possible due to the significant uniqueness of individual dental characteristics—has been adequately established."). See also *Kennedy v. State*, 640 P.2d 971, 978 (Okla.1982) ("The means and techniques for making the models for comparison are complex, but they are based on standardized procedures known to produce accurate measurements.").

Wisconsin's case of first impression, *State v. Stinson*,¹⁶³ is a paradigmatic example. *Stinson* is one of three cases in which a pre-trial admissibility hearing was held before *State v. Armstrong*¹⁶⁴ (West Virginia) became the first court to take judicial notice of the supposed "general acceptance" of bite mark evidence in the scientific community. Ruling that the trial court did not abuse its discretion in finding that "there are adequate standards and controls in the area of forensic odontology, specifically for the identification of an individual through bitemark [sic] evidence and that that area of science is an accepted area . . . of science,"¹⁶⁵ the Wisconsin Court of Appeals did not consider either of the two fundamental hypotheses: that a properly trained analyst can make an association; and that the analyst can provide a scientifically valid estimate of that association's evidentiary value. Instead, it focused on the impressive credentials of the experts and what appeared to be their sophisticated data collection and comparison techniques. The following excerpt from the opinion is worth quoting at length:

Dr. Lowell Thomas Johnson ... a practicing dentist and a clinical professor of pathology at Marquette University School of Dentistry, testified for the state. On November 3, 1984, Dr. Johnson was called by the medical examiner and

¹⁶³ *State v. Stinson*, 134 Wis. 2d 224 (Ct. App. 1986).

¹⁶⁴ *State v. Armstrong*, 369 S.E.2d 870 (1988).

¹⁶⁵ *Stinson*, 134 Wis. 2d at 232 (holding that the "standards and controls" at issue were of course for the collection of the data, not the interpretation of the data collected).

asked to examine the [63-year-old] victim's body. Upon examining Cychosz [the victim], Dr. Johnson discovered eight complete or partial bite marks. To preserve this evidence, Dr. Johnson had a photographer from the state crime laboratory photograph the bite marks. Dr. Johnson then made a rubber impression of the victim's right breast which (sic) contained the greatest number of three-dimensional indentations. According to Dr. Johnson, when the wounds are three-dimensional, or when there are any indentations present, they can be well preserved by taking an impression of them. This impression is then later used to produce a static replica of the bite marks which (sic) will not be subject to distortion.

Dr. Johnson also testified that as part of established procedure, he preserved some of the tissue from the deeper bites. This was done by affixing an acrylic ring to the tissue surrounding the indentations and then removing that block of tissue for future study.

In addition to examining Cychosz, Dr. Johnson also did a complete forensic workup on Stinson. As part of the workup, a special camera was used to photograph the biting and facial surfaces of the teeth. A set of rubber impressions were then taken so a model of Stinson's teeth could be prepared. In addition, Dr. Johnson examined Stinson's teeth to observe the presence of defective or decayed teeth, or teeth which had been artificially restored.

Dr. Johnson also performed a similar dental workup on Robert Earl Stinson, the defendant's twin brother. Based on his comparison of the evidence taken from the victim with the models of Robert Earl's teeth, Dr. Johnson concluded that there were some gross discrepancies which would rule out Robert Earl Stinson as having

possibly made the bite marks.¹⁶⁶

Dr. Johnson next testified extensively on the comparisons he made using the dental impressions of Stinson's teeth and the bite marks found on the victim's body. He described and demonstrated the methods he used in making these comparisons. First, a comparison was made using the model of the bite marks and the model of Stinson's teeth. A comparison was also made by placing the model of Stinson's teeth over photos of the bite marks to see if the features were consistent. In addition, Dr. Johnson used an overlay technique, which he stated was another standard procedure in bite mark comparison. By taping a black and white negative of Stinson's teeth over a color transparency of the bite mark, Dr. Johnson was able to compare the patterns of the bite marks with the patterns of the teeth. Based on these comparisons, Dr. Johnson concluded that the bites he examined on Cychosz "had to have been made by teeth identical in all of these characteristics to those that I examined on Robert Lee [Stinson]"

The state also called Dr. Raymond Rawson, a forensic odontologist, who, as chairman of the Bite Mark Standards Committee of the American Board of Forensic Odontologists, participated in formulating the standards and procedures for evaluating bite mark evidence. Dr. Rawson was asked to conduct an independent evaluation of the bite mark evidence using Dr. Johnson's models and photos. Dr. Rawson testified that the evidence in the case was "high quality" and "overwhelming." He stated that this was an "exceptional" case because "[t]here were more ... pieces of evidence than you usually see in a bite

¹⁶⁶ Stinson's twin brother was not a suspect and there is no evidence that the dentitions of twins are any more or less alike than any other adult dentitions. *Id.* at 231.

mark case.”

After examining Dr. Johnson's workup, Dr. Rawson stated that the methods Dr. Johnson used in gathering the evidence complied with the standards of the American Board of Forensic Odontology. Dr. Rawson then analyzed the evidence and concluded, to a reasonable degree of scientific certainty, that Stinson had inflicted the bite marks found on [the victim's] body.

Dr. Rawson also reviewed the evidence produced from the examination of Stinson's twin brother. Dr. Rawson testified that after an extensive analysis of the similarities and differences between the two brothers' mouths, he found significant discrepancies in their dentition. Therefore, Dr. Rawson concluded, Robert Earl Stinson could not have inflicted the bite marks found on Cychosz's body.¹⁶⁷

...

Dr. Johnson stated that the availability of bite marks from different parts of the body eliminated the possibility that the impressions obtained may have been distorted. He also testified as to the methods used in preserving and comparing the bite mark evidence gathered.

A total of fourteen upper and lower jaw impressions were made from the bite marks found on Cychosz's body. Because of the opportunity to examine so many bites, and the fact that some of the bites were so deep as to be three-dimensional, Dr. Johnson testified he was able to detect a repetition of some particularly unique features in several of the bites.

Dr. Johnson later performed a forensic

¹⁶⁷ *Id.* at 229-233.

odontological examination of Stinson. Following the examination, Dr. Johnson noted the following unique features: one of the central incisors was fractured and decayed almost to the gum line; the lateral incisor in the upper jaw was set back from the other teeth; all of the upper front teeth were flared; the lower right lateral incisor was worn to a pointed edge; the right incisor was set out from the other teeth on the lower jaw. Dr. Johnson used these features along with the arch of the mouth and the spacing, width, and alignment of the teeth to make comparisons with the bite marks found on the victim. After an exhaustive examination of the photos, models and tissue samples taken from Stinson and the victim, Dr. Johnson concluded, to a reasonable degree of scientific certainty, that the bite marks on the victim were made by Stinson.

The jury also heard from Dr. Rawson who concluded, based on the workup Dr. Johnson performed on both the victim and Stinson, that Stinson had inflicted the bite marks on the victim. In Dr. Rawson's opinion the evidence in the case was overwhelming and he stated that "if we have four or five teeth that we are able to examine, then we can say that there is no other set of dentition like that." In this case, Dr. Johnson was able to identify seventy-five individual tooth marks in various combinations of between five and eleven teeth.

Based upon this evidence, we hold that a jury could reasonably conclude beyond a reasonable doubt that Stinson murdered Cychosz. *The reliability of the bite mark evidence in this case was sufficient to exclude to a moral certainty every reasonable hypothesis of innocence.*¹⁶⁸

¹⁶⁸ *Id.* at 238-240 (emphasis added).

Stinson was, of course, innocent.¹⁶⁹ Although the bite mark evidence was presented to the jury as “scientific” evidence, the *Stinson* court found that by the time Stinson’s appeal was heard the state had rejected the *Frye* test – only to have the test reemerge two years later¹⁷⁰ – and thus the court found that “evidence given by a qualified expert is admissible *irrespective of the underlying scientific theory.*”¹⁷¹ Borrowing the reasoning of *Marx*, the court found that bite mark evidence was a valuable aid to the jury because “[b]y looking directly at the physical evidence used, the models and the photos, the jury was able to judge for itself whether Stinson’s teeth did in fact match the bite marks found on the victim’s body.”¹⁷² As evidenced by the dozens of wrongful convictions,¹⁷³ jurors are not capable of determining whether bite marks “in fact” match a defendant’s dentition or, more generally but perhaps as more importantly, recognize that the prosecution is willing to proffer pseudo-science as evidence of culpability in lieu of careful and thorough law enforcement investigation.¹⁷⁴ Had

¹⁶⁹ See *supra* n. ____.

¹⁷⁰ Craig A. Kubiak, Comment, *Scientific Evidence in Wisconsin: Using Reliability to Regulate Expert Testimony*, 74 MARQ. L. REV. 261, 279-280 (1991).

¹⁷¹ *Stinson*, 134 Wisc. 2d at 241 (emphasis added).

¹⁷² *Id.* at 235.

¹⁷³ See N.J. Schweitzer & M.J. Saks, *The CSI Effect: Popular Fiction About Forensic Science Affects Public Expectations About Real Forensic Science*, 47 JURIMETRICS 357 (2007); Donald E. Shelton et al., *A Study of Juror Expectations and Demands Concerning Scientific Evidence: Does the ‘CSI Effect’ Exist?* 9 VAND. J. ENT. & TECH. L. 331 (2006); Max M. Houck, *CSI Reality*, SCIENTIFIC AMERICAN, at 85, (July 2006).

¹⁷⁴ See Tucker Carrington, *Mississippi Innocence: The Convictions and*

Stinson's jury relied on its own observations, Stinson may not have spent over two decades in prison. As the federal court adjudicating Stinson's civil suit against the experts who testified at his trial noted, the "eyeball test" showed that his dentition did not "match" the bite mark; he was missing a tooth where the perpetrator appeared to have had one, and there was no explanation as to "why a bite mark was on [the victim's] body where Stinson has a missing tooth."¹⁷⁵

Stinson's jury of course relied on the interpretation of the data urged by the "scientists," even though there was – and is – no evidence that bite mark experts are capable of reliably associating a dentition with a bite mark (experts are not required to and do not undergo proficiency testing),¹⁷⁶

Exonerations of Levon Brooks and Kennedy Brewer and the Failure of the American Promise, G'TOWN J. LEGAL ETHICS (forthcoming 2015).

¹⁷⁵ Stinson v. City of Milwaukee, No. 09-C-1033, 2013 WL 5447916 (E.D. Wis. Sept. 30, 2013) ("Stinson's tooth 8, which was broken at the root, could not create a mark on the victim's skin.").

¹⁷⁶ Scholars have noted that bite mark examiners often fail to actually match bite marks to the dentition that made those bite marks, even in the context of controlled studies. Thus, as one forensic dentist has noted, bite mark evidence is subject to a "disturbingly high false-positive error rate," as evidenced by:

- a 1975 study finding that bite mark examiners made "incorrect identification[s] of . . . bite" on pig skin 24% of the time when the bites were made "under ideal laboratory conditions" and 91% of the time when "the bites were photographed 24 h[ours] after the bites were made";
- a 1999 American Board of Forensic Odontology Bitemark Workshop "where ABFO diplomats attempted to match four bitemarks to seven dental models [and] found 63.5% false positives";

moreover, even if such associations could be made, there was – and is – no basis in science for concluding a suspect is the source of the bite mark to the exclusion of everyone else on the planet.¹⁷⁷ Put differently, since the two hypotheses underlying bite mark analysis have never been scientifically validated, conclusions offered by these experts are not helpful to a trier of fact because there is no evidence the technique is capable of providing probative evidence.

Jurisdictions that adopted the *Marx* “eyeball test” allowed proponents of bite mark analysis to have their cake and eat it too. Self-validating experts routinely proffered to juries “scientific” evidence of culpability, yet the empirical basis for the conclusions were not required to undergo *Frye* scrutiny,¹⁷⁸ or, later, challenges pursuant to *Daubert*¹⁷⁹ or

□ a 2001 study of “bites made in pig skin, ‘widely accepted as an accurate analogue of human skin’,” which resulted in 11.9-22.0% “false positive identifications . . . for various groups of forensic odontologists.”

C. Michael Bowers, *Problem-Based Analysis of Bitemark Misidentifications: The Role of DNA*, 159 FORENSIC SCI. INT'L 104, 107 (2006).

¹⁷⁷ See, e.g., H. David Sheets et al., *Dental Shape Match Rates in Selected and Orthodontically Treated Populations in New York State: A Two Dimensional Study*, J. FORENSIC SCI. (2011); NAS Report at 5-36.

¹⁷⁸ See *Handley v. State*, 515 So. 2d 121, 129 (Ala. Crim. App. 1987) (“Based upon our own precedent and the persuasiveness of other jurisdictions’ ruling, we, too, hold that the admissibility of the dental witness’s bite mark comparison does not depend on meeting the *Frye* standard. In the instant case, the jury itself was able to look at photographic overlays of the plastic models of the bite marks and of appellant’s teeth.”); *People v. Slone*, 76 Cal. App. 3d 611, 624 (Ct. App. 1978) (“The *Marx* court distinguished the bite mark evidentiary presentation from other scientific-test evidence . . . on the ground that there was a more trustworthy basis for admissibility of the bite-mark identification evidence . . . due to the fact that

the trier of fact could see for itself, by looking at the material-object exhibits that constituted the basis for comparison with a defendant's dentition."); *State v. Peoples*, 605 P.2d 135 (Kan. 1980) ("The superior trustworthiness of the scientific bite mark approach...is due to the fact that the trier of fact could see for itself ...what constituted the basis for comparison with a defendant's dentition."); *People v. Milone*, 356 N.E.2d 1350 (Ill. 1976) ("Another factor effecting the admissibility of scientific testimony involves the nature of the evidence being offered. In *Jennings*, the court refused to accept testimony based upon the workings of a machine (lie detector) which had not proved to be substantially reliable and the results of which were subject to various subjective interpretations. Bite mark comparison, on the other hand, involves only a visual comparison between the wound and the dentition of the defendant. The great care taken to preserve and gather the physical evidence in this case precludes any problems arising in regard to the quality of the exhibits being compared. For this reason, the testimony of the experts serves only to lend assistance to the trial court in interpreting physical evidence not within the ken of the average trial judge's knowledge."); *Commonwealth v. Cifizzari*, 492 N.E.2d 357, 372, n. 15 (Va. May 14, 1986) ("The admissibility of expert dental witnesses' testimony does not depend on meeting the *Frye* test. The experts' testimony merely aided the jury in comparing the photographs of the bite marks with the defendant's dental impressions. ... We are not denigrating from *Frye* because we recognize the importance of establishing scientific reliability of new theories. We simply rule that *Frye* is not here applicable."); *Kennedy v. State*, 640 P.2d 971, 977 (Okla. 1982) ("We cite with approval the leading California case on bite-mark identification [*Marx*]. There, the Court of Appeals emphasized that the bite-mark evidence was trustworthy because the basic data on which the experts based their conclusions were verifiable by the court. In *Marx*, as here, the trier of fact was shown models, photographs, and overlays of the victim's wounds and the accused teeth. The jury and the judge could see the extent to which the bite marks conformed to his teeth."); *State v. Jones*, 259 S.E.2d 120 (S.C. 1979) ("In this case, we think admissibility depends upon '...the degree to which the trier of fact must accept, on faith, scientific hypotheses not capable of proof or disproof in a court and not even generally accepted outside the courtroom.' *People v. Marx, supra*."); *Armstrong* 179 W.Va. at 441-442 ("Many of the courts have emphasized that the reliability of bite-mark evidence, unlike most scientific evidence, is, when presented properly in the particular case, readily apparent; it is a 'common sense' type of comparison of physical evidence which lends itself readily to verification and understanding. The judge and the jury can see the extent to which the bite mark conforms to the suspect's teeth."); *Bundy v. State*, 455 So. 2d 330 (Fla. 1984) ("With bite marks evidence, the jury is able to see the comparison for itself by looking directly at the physical evidence in the form of photographs and models . . . The technique is similar to hair comparison evidence, which is admissible even though it does not result in identifications of absolute certainty as fingerprints do.").

¹⁷⁹ *Daubert v. Merrill Dow Pharmaceuticals*, 509 U.S. 579 (1993). As discussed below, by the time the Supreme Court decided *Daubert* and, six years,

*Kumho Tire.*¹⁸⁰ Some states adopted the “eyeball test” specifically to exempt certain pattern-matching forensic techniques from judicial scrutiny, relying instead on lay jurors to distinguish between valid science and subjective speculation masquerading as scientific evidence.¹⁸¹

Connecticut jurisprudence in this area demonstrates how these pattern matching techniques were allowed into court through the backdoor *Marx* created for bite mark evidence.¹⁸² The Connecticut Supreme Court

later *Kumho Tire*, bitemark jurisprudence had been established; there exists not a single published decision applying *Daubert* analysis to bite mark evidence.

¹⁸⁰ *Kumho Tire Co. Ltd. v. Carmichael*, 526 U.S. 137, 148 (1999). It is important to note that the Supreme Court in *Kumho Tire* rejected the distinction between science and technical evidence for purposes of applying the *Daubert* test because such a distinction would be difficult to draw. The Court wrote: “[I]t would prove difficult, if not impossible, for judges to administer evidentiary rules under which a gatekeeping obligation depended upon a distinction between ‘scientific’ knowledge and ‘technical’ or ‘other specialized’ knowledge. There is no clear line that divides the one from the others.” *Id.* at 148. Indeed, philosophers of science disagree about the definition of “science.”

¹⁸¹ *Handley*, 515 So. 2d at 131 (“The jury and the judge could see the extent to which the bite marks conformed to [the defendant’s] teeth”); *Bundy*, 455 So. 2d at 349 (“The technique is similar to hair comparison evidence, which is admissible even though it does not result in identifications of absolute certainty as fingerprints do.”); *State v. Reid*, 757 A.2d 482, 487 (2000).

¹⁸² *Marx* cited no precedent, and there appears to have been none, for this “eyeball test” as it relates to bite mark evidence, though, as discussed *infra*, it has been used to admit hair comparison testimony. Instead, *Marx* cited *Frye* for the proposition that it applies only when “the trier of fact must accept, on faith, scientific hypotheses not capable of proof or disproof in court and not even generally accepted outside the courtroom.” *People v. Marx*, 54 Cal. App. 3d 100, 110 (Ct. App. 1975). The court reasoned that if there was no risk of overwhelming the trier of fact, then the court need not “sacrifice its independence in favor of deference to the expert.” *Id.* at 111. *Frye* however makes no such distinction. Rather, *Frye* applies “when the question involved does not lie within the range of common experience or common knowledge, but requires special experience or special knowledge.” *Frye v. United States*, (293 F. 1013, 1014 (App. D.C. 1923).

adopted *Daubert* for the admissibility of scientific evidence in 1997.¹⁸³ In doing so, the court emphasized the important role the trial court plays as a “gatekeeper,” responsible for determining the validity and reliability of scientific evidence because “a judge is in a much better position than a juror to assess accurately the fundamental validity of [scientific] evidence.”¹⁸⁴ The court acknowledged that a juror’s understanding of scientific evidence is “largely dependent on the presentations of the parties and their experts,”¹⁸⁵ that “expert presentations may often be misleading,”¹⁸⁶ and that “cross-examination may often be difficult and ineffective in bringing out flaws in the expert’s reasoning.”¹⁸⁷ Judges, on the other hand, “have the benefit of reviewing briefs and other documents”¹⁸⁸ and demanding “supplemental briefing on any issue that needs clarification,”¹⁸⁹ and “certain types of evidence, although ostensibly rooted in scientific principles and presented by expert witnesses with scientific training, are not ‘scientific’ for the purposes of [the] admissibility standard for scientific evidence.”¹⁹⁰ Such evidence “simply require[s] the

¹⁸³ State v. Porter, 698 A.2d 739, 746-48 (1997).

¹⁸⁴ *Id.* at 747-48.

¹⁸⁵ *Id.* at 748-49.

¹⁸⁶ *Id.*

¹⁸⁷ *Id.* at 747-48.

¹⁸⁸ *Id.* at 748.

¹⁸⁹ *Id.*

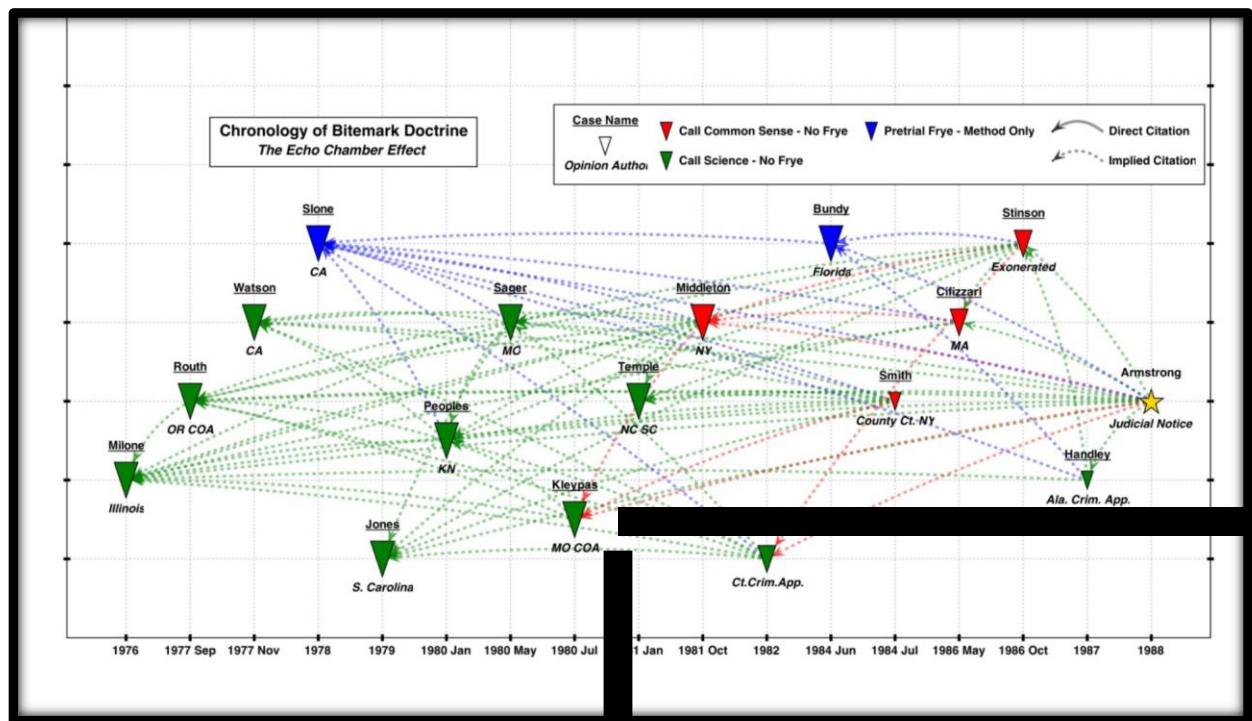
¹⁹⁰ State v. Reid, 757 A.2d 482, 487 (Conn. 2000).

jurors to use their own powers of observation and comparison,” and thus does not require a *Daubert* hearing.¹⁹¹

By the time the West Virginia Supreme Court became the first state high court to take judicial notice of the general acceptance of bite mark evidence, twenty-one states had already decided it was admissible, without a single dissenting opinion.¹⁹² Though the jurisprudence does not withstand contemporary scrutiny, it supported – and continues to support – the argument that every state that had considered the admissibility issue had decided that bite mark analysis passes evidentiary muster, however little muster was required. Subsequent cases of first impression became foregone conclusions. As the chart below demonstrates, courts began citing to one another as a matter of course, creating an echo chamber of ill-considered opinions.

¹⁹¹ *Id.*

¹⁹² *State v. Armstrong*, 369 S.E.2d 870, 876-77 (W. Va. 1988) (“This case presents a question of first impression for this Court, specifically, the admissibility of bite-mark evidence. *All* of the twenty-one jurisdictions which have specifically addressed this question in a reported opinion, where a qualified expert was involved, have held bite-mark evidence to be admissible for positive identification purposes, and the general reliability of bite-mark comparison techniques has been sufficiently established, such that a hearing in each case to establish the general reliability thereof is not necessary. The courts have rejected challenges to bite-mark evidence based upon constitutional, evidentiary and scientific arguments.”).



As noted, Marx looked to *Frye* to support the conclusion that bite mark analysis is exempt from *Frye* scrutiny.¹⁹³ This anomalous yet remarkably influential reasoning had another pernicious effect on trace evidence jurisprudence: allowing the experts themselves to define the “relevant scientific community.” In *Frye*, which involved a challenge to the admissibility of a lie detector test, the court precluded the evidence because it had not yet “gained such standing and scientific recognition among physiological and psychological authorities as would justify the courts in

¹⁹³ See *supra* note ____.

admitting expert testimony deduced from the discovery, development, and experiments thus far made.”¹⁹⁴

Precedent-establishing cases across the country uniformly defined the relevant scientific community as the forensic dentists themselves.¹⁹⁵ Those who “generally accepted” the discipline – many of whom practiced in the field and had a vested interest in its success – constituted the relevant community whose general acceptance was required for admissibility. The self-referential and self-interested community essentially resulted in the question of the field’s admissibility being a foregone conclusion. By time the NAS Committee, which was comprised of leading scientists in all

¹⁹⁴ Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).

¹⁹⁵ See, e.g., People v. Marx, 54 Cal. App. 3d 100, 110 (Ct. App. 1975) (giving credence to the testimony of the state’s experts who were optimistic that dental identification techniques could be used to identify bite marks, implying that the relevant scientific community was the experts themselves; People v. Watson, 75 Cal. App. 3d 384, 401-02 (Ct. App. 1977)(basing admission on *Marx*, and finding that once a new scientific technique has been accepted by the court it may not be disrupted without “evidence reflecting a change in the attitude of the scientific community,” presumably forensic odontologists as admission based on testimony of odontologist); People v. Smith, 63 N.Y.2d 41, 64, 468 N.E.2d 879 (1984) (basing admission on claim that the technique of comparing one photo of a bite mark to another was sufficiently reliable and had been “accepted by the scientific community,” comprised of prosecution and defense experts who together “acknowledged the reliability and acceptance of photographic comparisons.”); People v. Slone, 76 Cal. App. 3d 611, 624, 625 (Ct. App. 1978) (relying on testimony of three forensic odontologists which showed “bite-mark-identification technique had gained general acceptance in the scientific community of dentistry—the relevant scientific community involved”); People v. Middleton, 429 N.E.2d 100, 103 (1981) (admitting evidence by finding that “the test is not whether a particular procedure is unanimously indorsed by the scientific community, but whether it is generally acceptable as reliable. The techniques employed (photography, freezing of tissue specimens, the taking of dental molds, visual observation) are accepted and approved by the majority of the experts in the field.”).

relevant fields,¹⁹⁶ examined the validity and reliability of bite mark analysis and concluded in 2009 that the technique is inherently weak and lacks any basis in science, decades of state court precedent had reached exactly the opposite conclusion.¹⁹⁷

Finally, it is worth noting, albeit briefly for purposes of substantive discussion, that subsequent to the publication of the NAS Report and the attention the Report brought to the shortcomings of forensic odontology, a research team, led by Dr. Mary Bush, a tenured professor at the School of Dental Medicine, State University of New York at Buffalo and past president of the American Society of Forensic Odontology, began to develop studies in the field. Twelve studies that tested the foundational issues related to skin as a substrate to interpret data were ultimately conducted. Each used a cadaver model, and each was published in a peer-

¹⁹⁶ See NAS Report at iv-ix.

¹⁹⁷ The NAS Report noted that skin is simply not a suitable medium to record bite marks: “[B]ite marks on the skin will change over time and can be distorted by the elasticity of the skin, the unevenness of the surface bite, and swelling and healing.” *Id.* at 174. In addition, problems may also arise because of “distortions in photographs and changes over time in the dentition of suspects.” *Id.* The Report goes on to find that the first hypothesis underlying bite mark analysis, i.e., that an association can be made between a dentition and a bite mark, is flawed because, despite guidelines published by the American Board of Forensic Odontology, which provides for various methods of bite mark analysis, “[t]here is no science on the reproducibility of the different methods of analysis that lead to conclusions about the probability of a match.” *Id.* at 174. Indeed, “[e]ven when using the guidelines, different experts provide widely differing results and a high percentage of false positive matches of bite marks using controlled comparison studies.” *Id.* As to the second hypothesis, e.g. that a valid estimate of the probative value of a putative “match” can be stated, “there is no established science indicating what percentage of the population or subgroup of the population could also have produced the bite.” *Id.*

reviewed scientific journal.¹⁹⁸

Broadly speaking, the studies' research strongly suggests what is intuitive: even assuming the uniqueness of human dentition, human skin is not capable of capturing that uniqueness with sufficient fidelity to identify "the biter."¹⁹⁹ Moreover, bite marks created by the same dentition on the same individual appeared substantially different, depending on the angle of the body and whether the mark was made parallel or perpendicular to

¹⁹⁸ See Mary A. Bush et al., *A Study of Multiple Bitemarks Inflicted in Human Skin by a Single Dentition Using Geometric Morphometric Analysis* at 1-8; Mary A. Bush, et al., *Biomechanical Factors in Human Dermal Bitemarks in a Cadaver Model*, 54 J. FORENSIC SCI. 167, 167-176 (2009); H. David Sheets et al., *Dental Shape Match Rates in Selected and Orthodontically Treated Populations in New York State: A Two Dimensional Study*; Mary A. Bush et al., *Similarity and Match Rates of the Human Dentition In 3 Dimensions: Relevance to Bitemark Analysis*, 125 INT'L J. LEG. MED. 779 (2011); Mary A. Bush et al., *Statistical Evidence for the Similarity of the Human Dentition*, 56 J. FORENSIC SCI. 118 (2011); Mary A. Bush et al., *The Response of Skin to Applied Stress: Investigation of Bitemark Distortion in a Cadaver Model*, 55 J. FORENSIC SCI. 71 (2010); Raymond G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. FORENSIC SCI. 909 (2009); Mary A. Bush et al., *Inquiry into the Scientific Basis For Bitemark Profiling and Arbitrary Distortion Compensation*, 55 J. FORENSIC SCI. 976, 976-983 (2010); H. David Sheets & Mary A. Bush, *Mathematical Matching of a Dentition to Bitemarks: Use and Evaluation of Affine Methods*, 207 FORENSIC SCI. INT'L 111 (2011); H. David Sheets et al., *Bitemarks: Distortion and Covariation of the Maxillary and Mandibular Dentition as Impressed in Human Skin*, 223 FORENSIC SCI. INT'L 202, 202-207 (2012); H. David Sheets et al., *Patterns of Variation and Match Rates of the Anterior Biting Dentition: Characteristics of a Database of 3D Scanned Dentitions*, 58 J. FORENSIC SCI. 60 (2013).

¹⁹⁹ See Mary A. Bush et al., *The Response of Skin to Applied Stress: Investigation of Bitemark Distortion in a Cadaver Model*, J. FORENSIC SCI. (2009) (finding no two bitemarks created by the same dentition were measurably identical; shorter teeth created indentations smaller than their actual width, some as much as 25% smaller); H. David Sheets & Mary A. Bush, *Mathematical Matching of a Dentition to Bitemarks: Use and Evaluation of Affine Methods*, 207 FORENSIC SCI. INT'L (2011) (finding that matching of dentition to the bitemarks created was not possible within limits of repeatable measurements).

“Langer lines.”²⁰⁰ Likewise, in a study conducted using orthodontically treated dentitions, i.e., teeth straightened through orthodontic work, Dr. Bush and her team found that bite marks created by treated dentitions could not be reliably distinguished from each other. More specifically, the research team found,

[a]s may be anticipated, orthodontic treatment had a very strong effect on dental shape similarity. The match rate in the known orthodontically treated set was 42.7% of individuals using the same threshold parameter in only 110 specimens. This confirmed that when orthodontically treated or naturally well-aligned, dentitions may be indistinguishable. This result is also a measure of how successful orthodontic treatment is at producing homologous dental arch shapes. The orthodontically treated human dentition is not unique,²⁰¹ as measured here with high accuracy and precision.

The Bush studies confirm the NAS Report’s observation that the “validity of forensic odontology” may be “severely limited” because it relies on interpreting data from a bite mark, which “will change over time

²⁰⁰ “Langer lines” is the term used to describe the direction within human skin along which the skin has the least flexibility. See *A Study of Multiple Bitemarks Inflicted in Human Skin by a Single Dentition Using Geometric Morphometric Analysis*, *supra* note, (a single dentition was used to create eighty-nine bitemarks; none of the bitemarks matched the measurable shape of the dentition; bitemarks were also compared to 411 other dentitions, showing the closest match to the bitemark was not always the teeth that created the mark); *Biomechanical Factors in Human Dermal Bitemarks in a Cadaver Model*, *supra* note _____, (of the twenty-three 23 bitemarks made for the experiment, none were visually or measurably identical); see also Iain A. Pretty, *Unresolved Issues in Bitemark Analysis*, in *BITEMARK EVIDENCE* at 549 (Robert B.J. Dorian ed., 2005) (noting that “skin is a poor registration material”).

²⁰¹ H. David Sheets et al., *Dental Shape Match Rates in Selected and Orthodontically Treated Populations in New York State: A Two Dimensional Study* J. FORENSIC SCI. (2011) at 621-26.

and can be distorted by the elasticity of the skin, the unevenness of the surface bite, and swelling and healing.”²⁰² It is for this same reason that there are no measurement processes or objective standards for bite mark analysis. The field simply has no methodology to account for the great variation in the size and shape of the bite marks created by the same dentition.²⁰³ Moreover, manipulating a mold of a suspect’s teeth on the victim’s decomposing body and declaring a “match” is plainly a scientifically invalid method, incapable even of associating a particular dentition with a bite mark, i.e., “consistent with,” to say nothing of the false individualization claims made in so many cases.²⁰⁴

²⁰² See NAS Report, at 174.

²⁰³ See *id.* at 175 (“[t]he effect of distortion on different comparison techniques is not fully understood and therefore has not been quantified.”).

²⁰⁴ The ABFO has since retreated from its claim that bitemark experts can identify the unique source of an alleged bitemark, a development discussed more fully in Part ___, Section ___, *infra*.

III. HAIR EVIDENCE: UNCHALLENGED AND UNVALIDATED

A. *Introduction*

Microscopic hair comparison attempts to link a known hair, typically from a suspect in a criminal case, and a questioned hair, typically a hair found at a crime scene.²⁰⁵ Like bite mark analysis – indeed all pattern and impression forensic assays²⁰⁶ – this technique rests on two hypotheses: (1) that a properly trained hair examiner can make an association between a questioned sample hair and sample hair from a suspect, and; (2) that a properly trained hair examiner can provide a scientifically valid estimate of the rareness or frequency of that association.²⁰⁷ As discussed *infra*, court-sanctioned, yet scientifically invalid conclusions concerning the second hypothesis have a long and ignoble history in the United States; no court has ever rejected the validity of the first hypothesis in a reported opinion. This, despite recent, highly-publicized research conducted by FBI hair

²⁰⁵ Cary T. Oien, *Forensic Hair Comparison: Background Information for Interpretation*, 11 FORENSIC SCIENCE COMMUNICATIONS 2 (2009), available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2009/review/2009_04_review02.htm.

²⁰⁶ For example, ballistics, latent print analysis, and bite mark evidence rest on the same hypotheses, i.e., that a properly trained expert can make an association between a mark at a crime and provide a statistical valid expression of the probative value of such an association.

²⁰⁷ Cary T. Oien, *Forensic Hair Comparison: Background Information for Interpretation*, 11 FORENSIC SCIENCE COMMUNICATIONS 2 (2009), available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2009/review/2009_04_review02.htm; *see also* Douglas W. Deedrick, *Part 1: Hair Evidence*, 2 FORENSIC SCIENCE COMMUNICATIONS 3 (2000), available at <http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/july2000/deedric1.htm>.

comparison experts demonstrating unacceptably high error rates in their own work and the staggering number of wrongful convictions obtained at least in part through the use of hair comparison evidence.²⁰⁸

Judicial acceptance of the first hypothesis's conclusions have humble origins, not as expert testimony, but as evidence introduced through lay witnesses using their own powers of observation to compare known and crime scene hairs. The first reported use of such evidence may be traced back to a murder investigation on a cotton plantation in Sunflower County, Mississippi, where, in 1855, John Browning and his son, Gaston Browning, were tried for the murder of John Neal, the overseer of the Hill and McNeill Plantation.²⁰⁹ Amongst other injuries, Neal's neck had been dislocated and

²⁰⁸ There is – and was – an abundance of evidence of the existence of error. In 2002, Bruce Budowle, the research director of the FBI DNA Laboratory and Max Houck, an expert in hair microscopy and director of the forensics program at West Virginia University, published a study that reviewed human hair examinations within the FBI laboratory that underwent both microscopical comparison and mtDNA analysis between 1996 and 2000. Max M. Houck & Bruce Budowle, *Correlation of Microscopic and Mitochondrial DNA Hair Comparisons*, 47 J. FORENSIC SCI. 964 (2002), available at <http://www.bioforensics.com/conference/mtDNA/HairHouck%26Budowle.pdf>. Of the eighty cases in which FBI hair examiners found a positive microscopic association, when the same hairs were subjected to mitochondrial DNA testing, nine of the eighty cases resulted in exclusions. *Id.* According to the NAS Report, the study “illustrates not only the imprecision of microscopic hair analyses, but also the problem with using imprecise reporting terminology such as ‘associated with,’ which is not clearly defined and which can be misunderstood to imply individualization.” NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 161 (2009), available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf [hereinafter NAS Report]

²⁰⁹ Browning v. State, 33 Miss. 47 (1857).

broken.²¹⁰ A search of the defendants' home revealed a noose with drops of blood, and “[o]n the rope near the noose were found several hairs, which upon comparison corresponded exactly in color and length with Neal's hair.”²¹¹ Despite this evidence, and not an insignificant amount of additional circumstantial evidence, one justice of the Mississippi Supreme Court found the evidence insufficient to sustain the capital conviction, and neither defendant was ever convicted of the crime.²¹²

Thirteen years later, the Supreme Judicial Court of Massachusetts in *Commonwealth v. Dorsey*²¹³ approved the introduction of hair comparison testimony by two lay witnesses, one of whom claimed that hairs found on a club alleged to have been the murder weapon appeared to be human hairs; the other witness claimed that the hairs “resembled the hair of the deceased.”²¹⁴ The *Dorsey* court found that observational evidence “gained through our senses” by lay witnesses was admissible and did not require expert testimony.²¹⁵ The court, in other words, articulated one of the earliest “eye ball” tests to admit lay opinion testimony of trace evidence. Lay testimony concerning handwriting, shoe impression, hair comparison, and evidence that a “fragment of a garment” originated from a particular source,

²¹⁰ *Browning v. State*, 33 Miss. 47, 56 (1857).

²¹¹ *Id.* at 58.

²¹² *Id.* at 84.

²¹³ 103 Mass. 412 (1869).

²¹⁴ *Id.* at 419.

²¹⁵ *Id.* at 420.

e.g., fiber analysis, was therefore admissible.²¹⁶ However, “[w]hen other tests than the senses are to be applied to these subjects in order to gain knowledge that cannot be gained by common observation, but must be acquired by the application of special skill or learning, the testimony of experts must be resorted to.”²¹⁷

Over the next century, trace evidence analysis, including hair comparison, became the province of experts as crime solvers began using increasingly sophisticated instruments to amplify observations of hairs.²¹⁸ Although the observations experts made using these instruments (the collection of the data) did indeed require special skill and training, the conclusions concerning “matches” between known and evidentiary hairs (the interpretation of the data, i.e., *the science*) is no more probative today than it was at the turn of the 19th Century,²¹⁹ nor have the core claims of the

²¹⁶ *Id.*

²¹⁷ *Id.*

²¹⁸ See, e.g., Michael J. Saks, *Banishing Ipse Dixit: The Impact Of Kumho Tire On Forensic Identification Science*, 57 WASH. & LEE L. REV. 879, 881 (2000). As noted by Professor Saks:

From the viewpoint of conventional science, the forensic identification sciences are contenders for being the shoddiest science offered to the courts. After being in business for nearly a century, they still have developed little that would be recognized as a scientific foundation and, consequently, have little basic science to apply to their operational activities. For much of the twentieth century, the courts readily admitted these fields, apparently because they were flying the banner of science and not because they presented sound data supporting their claims.

Id. at 879.

²¹⁹ *Id.*

experts changed since that time.²²⁰ However, like bite mark analysis, courtroom presentations became more robust, often featuring elaborate demonstrations accompanied by detailed visual demonstrations of microscopic images; experts referring to themselves as “scientists”,²²¹ and the employment of terms such “reasonable scientific certainty,”²²² without judicial inquiry into reliability²²³ to frame and support conclusions. The

²²⁰ John I. Thornton & Joseph L. Peterson, *The General Assumptions and Rationale of Forensic Identification*, in SCIENCE IN THE LAW: FORENSIC SCIENCE ISSUES 35 (D.L. Faigman et. al. eds. 2002).

²²¹ The label itself is problematic as it may accord to a discipline a level of gravitas that is underserved. *See, e.g.*, United States v. Starzecpyzel, 880 F. Supp. 1027, 1038 (S.D.N.Y. 1995) (noting that forensic document examination despite certification procedure and the like cannot after *Daubert* be regarded as scientific knowledge).

²²² This term has come under criticism recently because, among other things, it is itself, ambiguous and has different meanings for different analysts. *See, e.g.*, United State v. Glynn, 578 F. Supp 2d 567 (S.D.N.Y. 2008); United States v. Taylor, 663 F. Supp 2d 1170 (D.N.M. 2009).

²²³ State v. West, 877 A.2d 787, 807 (Conn. 2005) (finding that hair comparison evidence is rooted in science but is not subject to a threshold reliability hearing because it merely requires jurors to employ their own powers of observation and comparison.); State v. Reid, 757 A.2d 482, 487 (Conn. 1995) (finding that hair comparison evidence is based in science but is not subject to a threshold reliability hearing because it merely requires jurors to employ their own powers of observation and comparison.); Murray v. State, 3 So.3d 1108, 1117 (Fla. 2009) (finding visual and microscopic hair comparison does not require a Frye analysis because it is not based on new or novel scientific principles.), McDonald v. State, 952 So.2d 484, 498 (Fla. 2006) (finding visual and microscopic hair comparison does not require a Frye analysis because it is not based on new or novel scientific principles.); Jent v. State, 408 So. 2d 1024 (Fla. 1981) (finding that hair analysis evidence is not so unreliable and scientifically unacceptable that it is error to admit it.); Beam v. State, 463 S.E.2d 347, 349 (Ga. 1995) (finding that the crime lab expert’s hair analysis is admissible because O.C.G.A. § 24-9-67 states that “the opinions of experts on any question of science . . . or like questions shall always be admissible.”); People v. Harvey, 568 N.E.2d 381, 387 (Ill. App. 1991) (finding the trial court, following a *voir dire* hearing to determine the number of scientific areas of consistency between the hair samples, acted within its discretion in admitting the evidence despite the State’s failure to establish through

rationale for abdicating gatekeeping responsibilities has its roots in *Dorsey* and other early jurisprudence in this area.

An examination of these early opinions reveals a persistent line of

mathematical certainty that the hairs were identical), *McGrew v. State*, 682 N.E.2d 1289 (Ind. 1997); *Johnson v. Commonwealth*, 12 S.W.3d 258 (Ky. 1999) (concluding Kentucky trial courts may take judicial notice that hair comparison analysis is scientifically reliable); *Commonwealth v. Tarver*, 345 N.E.2d 671, 676-677 (Mass. 1975) (“It was sufficiently shown in the record that the use of microscopic examination has been generally accepted by the community of scientists involved.”), *People v. Browning*, 308 N.W.2d 264 (Mich. Ct. App. 1981); *People v. Collins*, 204 N.W.2d 290, 293-294 (Mich. Ct. App. 1972) (holding that when the defense objected to the State witness’s opinion based on “reasonable scientific certainty” that hairs shared a common origin because the “inability to identify hair samples by microscopic analysis is universally recognized; however, the court determined that affected the weight rather than the admissibility); *State v. Hudson*, 970 S.W.2d 855, 860 (Mo. Ct. App. 1998) (holding that when the defendant argued the hair analysis was inadmissible because the scientific principles were not generally accepted under *Frye*, but the court determined it was not appropriate for plain error review.); *State v. Millisor*, No. 3052-M, 1999 Ohio App. LEXIS 3542, *12-13 (Ohio App. 1999) (finding analyst’s statement that hair samples are consistent to a reasonable scientific certainty admissible.); *Williamson v. State*, 812 P.2d 384, 405 (Okla. Crim. App. 1991) (Appellant acknowledged that the court accepted hair comparison analysis but requested that the court reconsider because hair analysis “does not meet sufficient standards of scientific reliability.” Appellant cited four studies in support of his position. However, the court was not persuaded by Appellant’s argument or authorities and remained committed to its “position as expressed in *Driskell v. State*, 659 P.2d 343, 356 (Okl.Cr.1983), which sanctioned the use of hair comparison evidence and the determination that any question about the procedures and conclusions drawn therefrom should be raised on cross-examination”); *Commonwealth v. Chmiel*, 30 A.3d 1111, 1142 (Pa. 2011) (conceding that “ a once-viable science [hair analysis] may lose its wide acceptance in the scientific community and may be challenged pursuant to Rule 702.” However the science was widely accepted at the time of the appellant’s trial in 2002.); *State v. Fagundes*, 614 P.2d 198 (Wash. App. 1980) (finding it was in the discretion of the trial judge to admit hair analysis evidence following the analyst’s testimony regarding her testing methods and their general acceptability in the scientific community); *State v. Hicks*, 549 N.W.2d 435, 437 (Wis. 1996) (acknowledging that the “[Analyst] stated that to a reasonable degree of scientific certainty, the unknown Negro and Caucasian hair specimens “could have” come from Hicks and D.F.).

reasoning that mirrors *Marx*'s bite mark analysis: the judicial determination that a comparison of two items to determine whether they "match" – even when such analysis is performed by a "scientist" using sophisticated analytical instruments – is not subject to *Frye* scrutiny because conclusions drawn from a comparative examination are elemental and independently verifiable by the trier of fact, and the evidence is unlikely to mislead or confuse jurors.²²⁴ Put differently, the "eyeball test" articulated in *Dorsey* for the admissibility lay observations of trace evidence was eventually extended to shield expert testimony from judicial scrutiny as well.

It must be emphasized judicial labeling of this – or other pattern matching techniques – as "non-scientific" or "technical knowledge" based on the perception that the task at hand is a straightforward forensic assay, unlike, for example, DNA genotyping, is not a defensible position. The Supreme Court in *Kumho Tire* rejected the distinction between science and technical evidence for purposes of applying the Daubert test because such a distinction would be difficult to draw. The Court wrote: "[I]t would prove difficult, if not impossible, for judges to administer evidentiary rules under

²²⁴ McGrew v. State II, 682 N.E.2d 1289, 1292 (Ind. 1997) (hair comparison evidence is not subject to *Daubert* scrutiny because the technique relies on observations by persons with specialized knowledge than a matter of scientific principles); State v. Fukusaku, 946 P.2d 32, 44 (Haw. 1997) (affirming trial court's refusal to apply *Daubert* scrutiny to hair trace evidence because of its overwhelming acceptance by criminal court and because "the scientific principles and procedures underlying hair and fiber evidence are well-established and of proven reliability, the evidence in the present case can be treated as 'technical knowledge.'").

which a gatekeeping obligation depended upon a distinction between ‘scientific’ knowledge and ‘technical’ or ‘other specialized’ knowledge. There is no clear line that divides the one from the others.”²²⁵ Thus *Kumho Tire* eliminated arbitrary labels that effectively precluded inquiry into the foundational bases of expert testimony considered non-scientific for admissibility issues only.²²⁶ Virtually no state, however, has applied *Kumho Tire* to pattern matching techniques, even in jurisdictions that have generally adopted Daubert.²²⁷ Instead, courts have shielded these assays from Frye/Daubert scrutiny, while allowing experts to refer to themselves as scientists and to exploit the aura of “mythic infallibility” scientific evidence often holds over lay jurors.²²⁸

Furthermore the interpretation of or the conclusions drawn from an inquiry into whether two evidentiary items are indistinguishably similar, i.e., match, and how probative the association is the domain of science.²²⁹

²²⁵ *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 146 (1999).

²²⁶ Philosophers of science disagree about the definition of “science.” The Court quoted one definition in *Daubert*: “[T]he criterion of the scientific status of a theory is its falsifiability, or refutability, or testability.” *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579, 593 (1993) (quoting KARL POPPER, CONJECTURES AND REFUTATIONS: THE GROWTH OF SCIENTIFIC KNOWLEDGE 37 (5th ed. 1989)).

²²⁷ See e.g., *State v. Reid*, 757 A.2d 482 (Conn. 2000).

²²⁸ See N.J. Schweitzer & Michael J. Saks, *The Gatekeeper Effect: The Impact of Judges’ Admissibility Decisions on the Persuasiveness of Expert Testimony*, 15 PSYCHOL., PUB. POL’Y & L. 1 (2009); see also *United States v. Addison*, 498 F.2d 741, 744 (D.C. Cir. 1974) (holding that expert scientific evidence may “assume a posture of mythic infallibility in the eyes of a jury of laymen”).

²²⁹ Indeed, it is for this reason that the National Academy of Sciences had the authority to issue its comprehensive assessment of the state of forensic “science.”

More precisely, validating the accuracy of the expert's conclusion is an inherently scientific inquiry. For such an inquiry to result in a scientifically valid conclusion, the interpretation of the data must be drawn from a reliable foundation. Where conclusions by pattern matching experts are made without objective thresholds for declaring an association and without underlying statistical data to judge the relevance of the association,²³⁰ the conclusions are entirely subjective and therefore unscientific.²³¹ It does not

From the NAS Report:

The law's greatest dilemma in its heavy reliance on forensic evidence, however, concerns the question of whether—and to what extent—there is science in any given “forensic science” discipline. Two very important questions should underlie the law's admission of and reliance upon forensic evidence in criminal trials: (1) the extent to which a particular forensic discipline is founded on a reliable scientific methodology that gives it the capacity to accurately analyze evidence and report findings and (2) the extent to which practitioners in a particular forensic discipline rely on human interpretation that could be tainted by error, the threat of bias, or the absence of sound operational procedures and robust performance standards. These questions are significant. Thus, it matters a great deal whether an expert is qualified to testify about forensic evidence and whether the evidence is sufficiently reliable to merit a fact finder's reliance on the truth that it purports to support. Unfortunately, these important questions do not always produce satisfactory answers in judicial decisions pertaining to the admissibility of forensic science evidence proffered in criminal trials.

NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES,
STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD
87 (2009), *available at* http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf

²³⁰ The NIST research agenda discussed above should lead to developing a more scientific bases for these conclusions. That this basic research is only now being undertaken further demonstrates the inadequacy of the current state of scientific knowledge underlying these techniques.

²³¹ An example of this critique as it relates to ballistics and toolmarks can be

necessarily follow that analyses based on an expert's training and experience are without value,²³² but the limited value of conclusions drawn from experiential foundation must be plainly communicated to jurors and expert witnesses must be not permitted to claim the mantel of "science" in courtroom testimony, while at the same time avoid the judicial scrutiny scientific evidence is required to undergo before it is proffered as such to lay jurors.²³³

B. The Rise of Hair Microscopy

found in Itiel's Dror's piece,
How Can Francis Bacon Help Forensic Science? The Four Idols of Human Biases:

The subjective and unspecified identification criterion of sufficient agreement is an example of *idola fori*. Furthermore, the AFTE Theory of Identification stipulation that the determination of 'sufficient agreement is the product of the examiner's personal training, skills, and experience' also involves *idola specus*--the subjective individual's experience determines decisions, rather than scientifically measurable criteria based on objective, quantifiable measurement divorced from and independent of the specific incidental individual who is making the observations.

Itiel E. Dror,
How Can Francis Bacon Help Forensic Science? The Four Idols of Human Biases,
50 JURIMETRICS 93 (2009).

²³² NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 87 (2009), available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf ("[A]lthough some techniques may be too imprecise to permit accurate identification of a specific individual, they may still provide useful and accurate information about questions of classification.").

²³³ See also *infra* Part _____ (discussing the limiting language of hair comparison associations).

Apart from some notable early exceptions,²³⁴ the only consistent limits courts placed on hair evidence were conclusive individualization claims, i.e., explicit assertions that the defendant was the source of the questioned hair to exclusion of all other potential sources, and the use of statistics²³⁵ to suggest a defendant was the probable source of a crime scene hair.²³⁶ Although the establishment of the FBI crime lab in 1942

²³⁴ See e.g. *Knoll v. State*, 12 N.W. 369, 369-70 (1882) (“The opinion of the witness as to the fact that the hair came from the head of the same person was not admissible on the ground that the inquiry related to a scientific subject--one which required peculiar knowledge or previous study and experience to give information about. . . . The witness, then, could not testify to his opinion on the ground that the subject-matter of the inquiry related to a scientific subject, and was expert testimony.”).

²³⁵ Hair experts began using incorporating statistics into their conclusions largely based on a single 1974 study by Barry Gaudette, a former hair examiner with the Royal Canadian Mounted Police. B.D. Gaudette and E.S. Keeping, *An Attempt at Determining Probabilities in Human Scalp Hair Comparison*, 19 J. FORENSIC SCIENCES 599, 599-606 (1974). The use of this research to claim a statistical weight to hair examiners’ conclusions has been entirely discredited. See NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 23-24 (2009), available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

²³⁶ See e.g., *United States v. Massey*, 596 F.2d 676, 679-681 (8th Cir. 1979)(reversing and remanding for new trial because, in light of the importance of the hair comparison evidence, the use of statistical evidence from the Canadian study [Gaudette] that found there was a 1 in 4,500 possibility that the hair could have come from someone other than the defendant was not harmless error); *Williamson v. Reynolds*, 904 F. Supp. 1529 (E.D. Okla. 1995) (finding reversible error when expert cited Gaudette’s studies that estimated that the probability that two microscopically similar hairs came from two different sources at 1 in 4,500 and the probability for this kind of error in pubic hair analysis was 1 in 800 because the implication is that the hairs belonged to the petitioner); *People v. Cooper*, 809 P.2d 865, 878-879 (Cal. 1991) (“Unlike fingerprint comparison, an absolute match is not possible when comparing hairs.”); *Thompson v. State* 539 A.2d 1052, 1057 (Del. 1988) (finding that hair comparison evidence does not create probable cause to arrest a suspect because it is universally acknowledged that hair comparison evidence is not a form of positive identification, however, it

professionalized the technique,²³⁷ the result was not better science, but widespread exaggerated claims of the capabilities of hair evidence.²³⁸ As discussed earlier, there is evidence that the FBI understood the inherent limitations of hair microscopy evidence but deliberately obfuscated these limitations through testimony that either implicitly or explicitly argued that association between a suspect's hair and a crime scene hair was highly

may link a suspect to a crime); *Long v. State*, 689 So.2d 1055, 1058 (Fla. 1997) (reversing defendant's conviction for insufficient evidence because "[h]air comparisons cannot constitute a basis for positive personal identification because hairs from two different people may have precisely the same characteristics."); *Jackson v. State*, 511 So.2d 1047 (Fla. Dist. Ct. App. 1988) (reversing trial court's denial of defendant's motion for acquittal and vacating his conviction and sentence because the defendant's conviction hinged on hair comparison evidence which did not result in absolute identification.); *People v. Linscott* 566 N.E.2d 1355, 1360 (Ill. 1991) (finding the State's use of Gaudette statistics and its exper conclusively stating the hairs belonged to defendant constituted reversible error); *State v. Carlson* 267 N.W.2d 170, 176 (Minn. 1978) (holding that the Gaudette statistics were improperly received but cumulative and unprejudicial); *State v. Scarlett*, 426 A.2d 25, 28 (N.H. 1978) (finding harmless error, despite being erroneously admitted double- hearsay (at least), when witness cited study that suggested there was a forty-five to one chance that consistent hair had different origins); *State v. Bridges*, 421 S.E.2d 806, 808 (N.C. App. 1992) (finding no reversible error when witness testified to two studies on the probability of matching Caucasian hair coming from two different sources; the evidence is admissible but may not be used to positively identify a person.); *Crawford v. State* 840 P.2d 627, 636 (Okla. Crim. App. 1992) (finding witness properly testified as to the limits of hair comparison analysis when she stated that she could not conclude that a hair belonged to a particular individual beyond a reasonable doubt.); *Brown v. State* 751 P.2d 1078, 1080 (Okla. Crim. App. 1988) (finding harmless error in admitting the Gaudette statistics).

²³⁷ Kim Waggoner, *The FBI Laboratory: 75 Years of Forensic Science Service*, 9 FORENSIC SCIENCE COMMUNICATIONS 4 (2007), available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/oct2007/research/2007_10_research01_test2.htm/2007_10_research01_test1.htm.

²³⁸ See *supra* notes 223-227 and accompanying text.

probative evidence of the defendant's presence at the scene.²³⁹ Instead of a validated measurement process with objective thresholds for declaring a "match" (hypothesis one), experts began making claims that internal characteristics of hair observed though high-powered, side-by-side microscopic examination of questioned and known hairs revealed similarities of such minute quality that simply "matching" the two hairs was probative evidence of the source of the questioned hair.²⁴⁰ (This despite the

²³⁹ See *supra* notes and accompany234-35 and accompanying text.

²⁴⁰ United States v. Massey, 596 F.2d 676, 678 (8th Cir. 1979) ("Agent James Hilverda, an expert in microscopic analysis, testified that Carl Massey's hair was similar to three of the five hairs found in the blue ski mask in all categories of microscopic comparison."); United States v. Hickey, 596 F.2d 1082, 1084 (1st. Cir. 1979) ("An FBI agent testified that some hairs found on one of the ski masks, sweater, and in the hair brush were "microscopically identical" to the hairs of the defendant"); United States v. Holleman, 575 F.2d 139, 145 (7th Cir. 1978) ("An expert from the FBI laboratory testified that he had examined the human hairs found on those items and compared them to Taylor's hair. They matched in every one of the twenty microscopic, identifiable characteristics."); Pitts v. State, 617 S.W.2d 849, 851 (Ariz. 1981) ("The Negroid hair, when examined with a microscope, had 20 different characteristics. Sample specimens of Pitts's hair had exactly the same 20 characteristics."); Padilla v. People, 397 P.2d 741, 743 (Witness matched the victim's hairs to those found in the defendant's and stated "unequivocally that the hairs were from one and the same person."); Beam v. State, 463 S.E.2d 347, 348 (Ga. 1995) (discussing that crime lab expert found that hair recovered from a hat in a cab "microscopically matched" the defendant's hair); Paxton v. State, 282 S.E.2d 912, 916 (Ga. 1981) ("The expert found 15 matching characteristics in appellant's hair samples and those found on the victim's sheet and stocking."); People v. Jones, 528 N.E.2d 648, 653 (discussing that the expert found hairs found in defendant's and the victims' hairs had 13 characteristics in common.); People v. Columbo 455 N.E.2d 733, 791 (Ill. Ct. App. 1983) (Criminalist testified that if he found hairs to be 99.9% similar and .1% dissimilar, he would classify the hairs as dissimilar; however, he testified that "[e]very portion of this hair matched up exactly[.]"); Walters v. State, 234 A.2d 147 (Md. App. 1967) (finding that the expert testified that hairs found in victim's home were "identical" to the defendant's.); People v. Watkins, 259 N.W.2d 381, 385 (Mich. App. 1977) (finding that the expert witness testified that hair found on the victim's pants matched the defendant's in "fifteen points of comparison."); State v. Farrow,

fact that there is microscopic variability between hairs originating from the head of the *same individual*.)²⁴¹

The juxtaposed photos below illustrate the persuasive power of visual demonstrations of so-called “matches.” One photo depicts a hair from Jimmy Ray Bromgard; the other a hair recovered during the investigation of the sexual assault of an eight-year-old girl for which Bromgard stood

386 A.2d 808, 815 (N.H. 1976) (finding that expert witness could not positively identify the hair but found it was similar to defendant’s “in all fifteen recognized microscopic characteristics”); State v. Dickens, 180 S.E.2d 844, 847 (N.C. 1971) (FBI agent testified hairs were “microscopically identical.”); State v. Barber, 179 S.E.2d 404, 410 (N.C. 1971) (finding that FBI agent testified hairs were “microscopically identical in all identifying characteristics”); State v. Williams, 657 S.W.2d 405, 410 (Tenn. 1983) (finding that an FBI agent testified that hairs taken from defendant’s clothing and victim were “indistinguishable” and probably from a common source); State v. Melson 638 S.W.2d 342, 349 (Tenn. 1982) (finding that an FBI agent testified that hairs from the victim’s blouse “exactly matched” defendant’s hair); Ward v. State 427 S.W.2d 876, 880 (Tex. Crim. App. 1968) (finding that an expert witness testified that a pubic hair taken from the appellant was identical “in all characteristics” to those recovered from the victim’s body); State v. Golloday, 470 P.2d 191, 205 (Wash. 1970) (finding that the State’s expert testified that one of the hairs obtained from the victim was “microscopically identical” to defendant’s public hair; defense expert testified that the hair was not even a pubic hair).

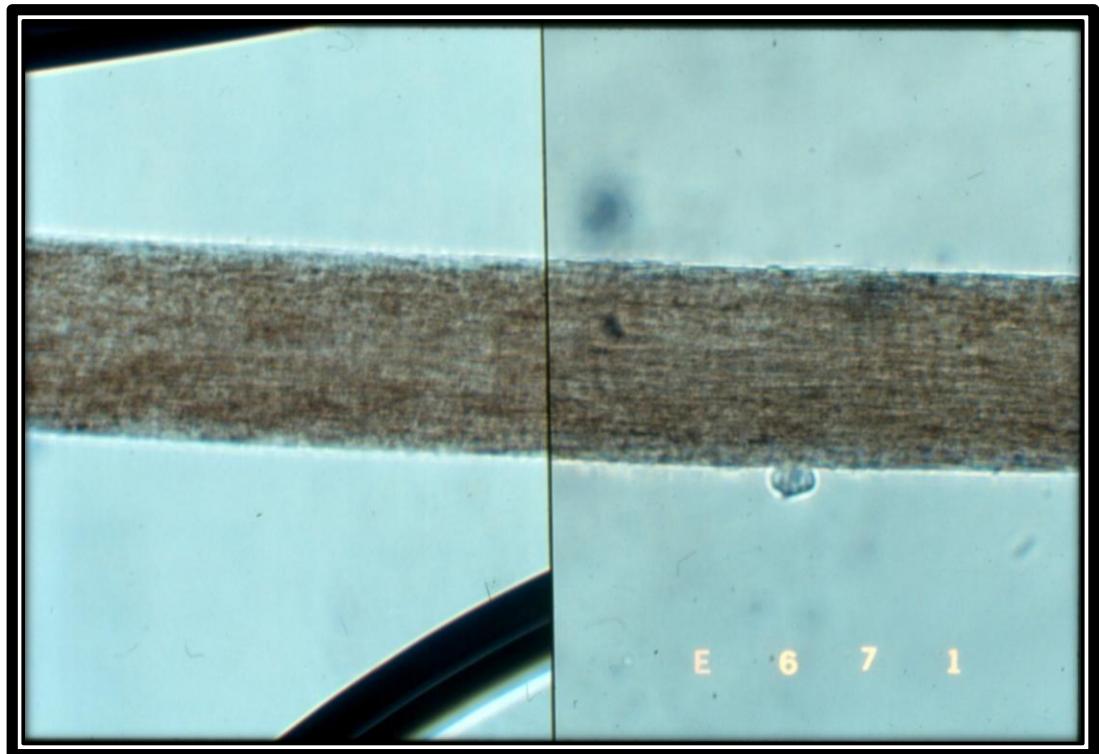
²⁴¹ See, e.g., Breen v. State, 349 So. 2d 113, 117 (Ala. Crim. App. 1977) (relating that the witness, the Supervisor of Scientific Investigation with the Birmingham Police Department, “testified that there was a great deal of variation in hair diameter, color, length and texture on a single head and for this reason hair could not be specifically identified as belonging to a particular individual”); People v. Allen, 41 Cal. App. 3d 196, 202 (Cal. App. 1974) (finding that the Criminologist “admitted on cross-examination that the present state of the art of testing hair presently made identification by hair samples inconclusive, as hair of any individual had a range of distinguishing characteristics”); NAT’L RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE 158 (1992) (“Although hair examiners can associate a hair with racial characteristics and body source (trunk, head, or pubic area) the variations among hairs on a given person make definitive association of a single hair with an individual problematic. The microscopic comparison of hairs is also subjective and of opinion among equally qualified experts.”).

accused. The FBI-trained hair comparison expert who testified in the prosecution of Bromgard claimed that his analysis revealed that the recovered hair belonged to Bromgard – specifically that the head and pubic hairs found on the sheets were indistinguishable from Bromgard's and that there was less than a one in ten thousand (1/10,000) chance that the hairs did not belong to him. The photo below was used to display the visual similarities.²⁴² Bromgard was convicted and spent nearly 15 years in prison.²⁴³ He was exonerated in 2002 after post-conviction DNA testing established that the hairs in the figure actually originated from different sources.²⁴⁴

²⁴² *Jimmy Ray Bromgard*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Jimmy_Ray_Bromgard.php (last visited Feb. 12, 2015).

²⁴³ *Id.*

²⁴⁴ *Id.*



These types of visual demonstrations of microscopic “matches” were supported by impressively credentialed “scientists,” who, like the bite mark experts discussed above, urged jurors to accept their conclusions as probative evidence of the defendant’s guilt.²⁴⁵ Yet instead of developing a statistical basis to provide scientifically valid conclusions concerning the probative value of an association between a known and a questioned hair (hypothesis two),²⁴⁶ FBI examiners used meaningless terms of art²⁴⁷ that

²⁴⁵ See *supra* note 239.

²⁴⁶ Though examples of the use of such statistics are as plentiful as they are invalid. *See, e.g.*, *People v. Linscott*, 566 N.E.2d 1355, 1360 (Ill. 1991) (finding the State’s use of Gaudette statistics and conclusively stating the hairs belonged to defendant constituted reversible error); *State v. Carlson*, 267 N.W.2d 170, 176 (Minn. 1978) (finding that the Gaudette statistics were improperly received but

masked the lack of population data while, at the same time, conveying to jurors that the defendant was the likely source of the questioned hair.²⁴⁸ To do so, agents from the FBI's hair and fiber unit proffered – and trained other analysts to proffer²⁴⁹ – scientifically false and misleading testimony. This invalid testimony fell into three broad categories. First, and most brazenly, experts baldly asserted and or implied that the defendant was the source of the questioned hair to exclusion of all other potential sources.²⁵⁰ Second, experts also used fictitious numbers to assign a statistical weight or probability that the questioned hair originated from a particular source.²⁵¹ Where experts refrained from using numbers, probabilistic opinions were expressed through language that led jurors to believe that valid statistical weight could be assigned to a microscopic hair association.²⁵² Finally,

cumulative and unprejudicial); *compare* State v. Bromgard, 862 P.2d 1140 (Mt. 1993) (finding that an expert testified that “in his experience the odds were one in one hundred that two people would have head hair *or* pubic hair so similar that they could not be distinguished by microscopic comparison and the odds of *both* head and pubic hair from two people being indistinguishable would be about one in ten thousand”); *with Jimmy Ray Bromgard*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Jimmy_Ray_Bromgard.php (last visited Feb. 12, 2015); State v. Bauer, 683 P.2d 946, 951 (Mont. 1984) (upholding conviction because, among other independent evidence, analyst estimated that “the chances of another person having the same type of pubic and head hair were one in ten thousand”); Brown v. State 751 P.2d 1078, 1080 (Okla. Crim. App. 1988) (finding harmless error in admitting the Gaudette statistics).

²⁴⁷ See *supra* note _____.

²⁴⁸ *Id.*

²⁴⁹ See *infra* Part _____.

²⁵⁰ The FBI has labeled such testimony as “Type 1 Errors”. See *supra* note 98.

²⁵¹ See *supra* notes 234-35.

²⁵² This variety of false and misleading testimony has been labeled “Type 2” errors by the FBI. See *supra* note 98.

analysts employed inappropriate substitutions of heuristically gained knowledge for a valid statistical basis in order to bolster the conclusion that a questioned hair belonged to the defendant.²⁵³ Such testimony, as in the Odom case discussed above, was expressed by citing the number of hair analyses the expert performed in the lab over the course of her career and the number of samples from different individuals that could not be distinguished from one another.²⁵⁴ This testimony was proffered to suggest without evidence that human hair was virtually unique and therefore the microscopic “match” between the known and questioned hair was highly probative evidence.²⁵⁵

These misleading statements, accompanied by impressive visual and oral explanations of points of microscopic comparison, allowed expert to argue that human hairs were “microscopically indistinguishable,” in other words, essentially unique, and, finally, to conclude that the questioned hair was therefore “consistent with” having originated from the defendant.²⁵⁶

²⁵³ The FBI has labeled such testimony as “Type 3 Errors”. *See supra* note 98.

²⁵⁴ *See* discussion of Odom exoneration Part X.

²⁵⁵ These errors have been classified as “Type 3” errors. *See supra* note 98.

²⁵⁶ For examples of courts’ assessments of “matching” used interchangeably with “consistent with,” *see* United States v. Barnes, 481 F. App’x 505 (11th Cir. 2012), United States v. Reddicks, 237 F. App’x 826 (4th Cir. 2007); Kogut v. County of Nassau, 894 F. Supp. 2d 230, 234 (E.D.N.Y. 2012); Bessaha v. Rock, No. 09-CV-3581 (JFB), 2012 WL 1458195 (E.D.N.Y. 2012); Williamson v. Reynolds, 904 F. Supp. 1529 (E.D. Okla. 1995), Hinson v. State, 199 P.3d 1166 (Ak. App. 2008); State v. Edgin, 520 P.2d 288 (Ariz. 1980); People v. Tully, 282 P.3d 173 (Cal. 2012); People v. Richardson, 183 P.3d 1146 (Cal. 2008); People v. Higgins, 131 P.3d 995 (Cal. 2006); People v. Pride, 833 P.2d 643 (Cal.

Affirming appellate courts, however, often pointed to the disclaimer and the term “consistent with” in finding the evidence, even if unreliable, was unlikely to have affected the outcome of trial because the expert qualified the conclusions.²⁵⁷

The prosecution of Timothy Scott Bridges in North Carolina is a useful illustration of the dissonance between what a jury was lead to believe was the probative value of hair evidence, as compared to how appellate courts characterized the evidence on appeal – characterizations that perpetuated decades of invalid precedent and gave license to hair examiners to continue to mislead juries. At Bridges’s 1990 trial for the beating and rape of an elderly woman, an FBI-trained hair expert testified that two head

1992); *People v. Cooper*, 809 P.2d 865 (Cal. 1991); *People v. Allen*, 41 Cal. App. 3d 196 (Cal. App. 1974); *Waterhouse v. State*, 82 So.3d 84 (Fla. 2012); *State v. Fukusaku*, 946 P.2d 32 (Haw. 1997); *State v. Liuafi*, 623 P.2d 1271 (Haw. App. 1981); *People v. Moore*, 171 Ill.2d 74 (Ill. 2000); *People v. Hall*, 194 Ill.2d 305 (Ill. 2000); *People v. Harvey*, 209 Ill. App.3d 733 (Ill. App. 1988); *Brown v. State*, 999 So.2d 853 (Miss. Ct. App. 2008); *State v. Dexter*, 954 S.W.2d 332 (Mo. 1997); *State v. Southern*, 980 P.2d 3 (Mont. 1999); *State v. McNicholas*, 360 S.E.2d 569 (N.C. 1988); *State v. Prevette*, 345 S.E.2d 159 (N.C. 1988); *State v. Head*, 338 S.E.2d 908 (N.C. 1986); *State v. Hannah*, 322 S.E.2d 148 (N.C. 1984); *State v. Pratt* 295 S.E.2d 462 (N.C. 1982); *State v. Green*, 290 S.E.2d 625 (N.C. 1982); *State v. Suddreth*, 412 S.E.2s 126 (N.C. App. 1992); *State v. Faircloth*, 394 S.E.2d 198 (N.C. Ct. App. 1990); *Bryan v. State* 935 P.2d 338 (Okla. Crim. App. 1997); *Harjo v. State*, 882 P.2d 1067 (Okla. Crim. App. 1994); *Salazar v. State*, 852 P.2d 729 (Okla Crim. App. 1993); *Crawford v. State*, 840 P.2d 627 (Okla Crim. App. 1992); *Williamson v. State*, 812 P.2d 384 (Okla. Crim. App. 1991); *Fox v. State*, 779 P.2d 562 (Okla. Crim. App. 1989); *Brown v. State*, 751 P.2d 1078 (Okla. Crim. App. 1988); *State v. Blair*, No. E2008-00073-CCA-R3-CD, 2009 WL 4878615 (Tenn. App. 2009); *Arciba v. State*, No. 10-08-00120-CR, 2009 WL 5155532 (Tex. App. 2009).

²⁵⁷ See *supra* note 255.

hairs found at a crime scene were “consistent with” Bridges.²⁵⁸ He explained “if an unknown hair is consistent with the standard source in all respects, then it is likely that the hair originated from the same source as the standard.”²⁵⁹ While acknowledging that no single characteristic in Bridges’s hair could be considered unique, the expert testified “all of those characteristics in combination is what makes it a strong identification.”²⁶⁰ The analyst invented statistical evidence to falsely claim that, based on his examination of 2,000 to 3,000 hairs, the “probability or likelihood conservative estimate would be approximately one in a thousand” that one would find two people from the general population with Caucasian head hairs whose hair would contain identical microscopic characteristics.²⁶¹ Finally, he testified that it was his opinion that “it is likely that [the two hairs] originated from Timothy Scott Bridges.”²⁶² The appellate court, relying the “disclaimer” and the court’s previous acceptance of *the same type of testimony from the same expert*, found that the statement that “it [the hair] is quite likely to have been from [the defendant],” was appropriate because the expert “did not rule out the possibility that the hair originated

²⁵⁸ Trial transcript at 823, State v. Bridges, 90-CRS-23102 (Mecklenburg Cnty. Superior Ct. Div. Jan. 22-29, 1991) (on file with authors).

²⁵⁹ *Id.* at 773.

²⁶⁰ *Id.* at 839.

²⁶¹ *Id.* at 803-04.

²⁶² *Id.* at 825.

from someone other than the defendant.”²⁶³ Although the “statistical illustration,” was error, it was harmless because it “was based on the expert's experience and expertise in the hair microscopy field and did not eliminate the possibility of sources of the hair other than defendant.”²⁶⁴ The error was the only physical evidence tying the Bridges to the crime, and the prosecutor argued that two hairs from the crime scene “matched” the defendant and that the expert, who “was qualified by the judge as an expert in this field of hair,” had assured the jury that “was likely to have come from the defendant.”²⁶⁵

Since Bridges's conviction, at least seventy-four defendants have been wrongfully convicted based at least in part on microscopic hair comparison.²⁶⁶ But while the DNA revolution that inspired Saks and Koehler's predicted paradigm shift has brought some level of additional scrutiny to the misleading claims of these and other trace evidence experts,²⁶⁷ a century of case law supported – and continues to support – the admissibility of false and misleading expert testimony in the field of hair

²⁶³ State v. Bridges, 421 S.E.2d 806, 809 (1992).

²⁶⁴ *Id.*

²⁶⁵ Trial transcript at 1000, *State v. Bridges*, 90-CRS-23102 (Mecklenburg Cnty. Superior Ct. Div. Jan. 22-29, 1991) (on file with authors).

²⁶⁶ See 51% of 300 DNA Exonerations Involved Use of Improper/Unvalidated Forensic Science: Breakdown by Discipline, INNOCENCE PROJECT, <http://www.innocenceproject.org/docs/FSBreakdownDiscipline.pdf> (last visited Feb. 12, 2015).

²⁶⁷ See e.g., Brandon Garrett & Peter Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1 (2009).

microscopy.²⁶⁸ The unanimity of case law proceeded apace even in jurisdictions with multiple DNA exonerations of wrongfully convicted defendants. *State v. Reid*,²⁶⁹ the first opportunity the Connecticut Supreme Court had to consider the admissibility of hair comparison evidence after that state adopted the *Daubert* test,²⁷⁰ is illustrative of how invalid precedent continues to frustrate due process. In response to a rare and strenuous objection to introduction of hair microscopy evidence, the trial court, in still a rarer occurrence, held a *Daubert* hearing prior to the introduction of the evidence.²⁷¹ In finding the evidence properly admitted because the “technique has been admitted in Connecticut courts for many years,”²⁷² the Connecticut high court went a step further, finding that, in any event, hair comparison evidence is not the type of evidence required to undergo *Daubert* scrutiny:

Although [the expert’s] training is based in science, he testified about a subject that simply required the jurors to use their own powers of observation and comparison. During his testimony, [the expert] displayed an enlarged photograph of

²⁶⁸ See e.g., *Johnson v. Commonwealth*, 12 S.W.3d 258, 262-63 (Ky. 1999) (“[T]he overwhelming acceptance of this evidence by other jurisdictions, as well as our own history of routine admission of this evidence at trial, trial courts in Kentucky can take judicial notice that this particular method or technique is deemed scientifically reliable.”).

²⁶⁹ *Reid*, supra, 254 Conn. 540.

²⁷⁰ See *State v. Porter*, 241 Conn. 57, 68 (1997)(adopting the *Daubert* test in Connecticut)

²⁷¹ Although such hearings are referred to as “Porter hearings” in Connecticut, we use the label “*Daubert* hearing” in states that have adopted the *Daubert* test for consistency.

²⁷² *State v. Reid*, 757 A.2d 482 (Conn. 2000).

one of [Mark Reid's] hairs and one of the hairs recovered from the victim's clothing as they appeared side-by-side under the comparison microscope. [The expert] explained to the jurors how the hairs were similar and what particular features of the hairs were visible. He also drew a diagram of a hair on a courtroom blackboard for the jurors. The jurors were free to make their own determinations as to the weight they would accord the expert's testimony in the light of the photograph and their own powers of observation and comparison. The jurors were not subject to confusing or obscure scientific evidence, but were able to use the testimony to guide them in their own determination of the similarity of the two hairs.²⁷³

Post-conviction DNA testing proved that Reid was innocent of the rape for which he was convicted.²⁷⁴ Apart from highly suspect eyewitness identification evidence,²⁷⁵ the only evidence introduced against him was hair comparison testimony from the lead criminologist at the Connecticut

²⁷³ *Id.* at 547-54. In an apparent effort to foreclose any future challenge to the admissibility of hair comparison evidence, the court found that, even if a Daubert/Porter was necessary, “microscopic hair analysis satisfied the Porter test because of its general acceptance in the scientific community.” *Id.* at n. 3. The court further found “that, in *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 141, 119 S.Ct. 1167, 143 L.Ed.2d 238 (1999), the United States Supreme Court held that a trial court has discretion to apply Daubert to all expert testimony, not just that which constitutes “scientific evidence.” We need not decide in this case whether to apply Kumho in our Porter analysis, however, because it would not alter our conclusion that the trial court properly admitted the evidence.” *Id.* at n.4.

²⁷⁴ *Mark Reid*, NAT'L REGISTRY OF EXONERATIONS, <https://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3569> (last visited Feb. 12, 2015); *Reid v. State*, No. CV020818, 8512003 WL 21235422 (Conn. May 14, 2003) (granting defendant's petition for new trial).

²⁷⁵ The victim had been forcibly raped in dark, wooded area at around 1 a.m.; she described the perpetrator as a black man, between 5' 6" and 7" with freckles across his nose and under his eyes. *Reid v. State*, No. CV020818, 8512003 WL 21235422, at *4 (Conn. May 14, 2003). Mr. Reid was six feet tall and had no freckles. *Id.* The victim had been drinking prior to the incident. *Id.* at *3-4. Based on the location of the incident and the description of the perpetrator, police suspected Mr. Reid. *Id.* at *6. His photo was placed in a photo array, the victim picked out his photo and ultimately identified him in court. *Id.* at * 3-4.

state police forensic laboratory.²⁷⁶ The expert testified “unequivocally” that three pubic hairs discovered on the victim’s panties, bra and sock were “were Negroid pubic hairs,”²⁷⁷ and concluded “‘to a ‘reasonable degree of scientific certainty,’ that the pubic hairs found on the victim’s clothing were microscopically similar to those pubic hair samples taken from Mark Reid.”²⁷⁸ DNA testing not only excluded Reid as the source, it also established that the pubic hairs originated from the (Caucasian) victim.²⁷⁹ Because it was a case of first impression, the *Reid* court looked to other jurisdictions for support “that a *Daubert* hearing is not required for admission of microscopic hair analysis,” including the Tenth Circuit’s opinion in *Williamson v. Ward*, a decision arising out of a habeas corpus petition by condemned Oklahoma prisoner Ronald Williamson,²⁸⁰ who, like Reid, was innocent but had been convicted on hair microscopy evidence. Indeed, Williamson was exonerated the year *before* the *Reid* decision.²⁸¹ In Reid’s case, the court mischaracterized *Williamson* as standing for proposition that hair microscopy is not the type of evidence required to

²⁷⁶ *Id.* At *3-4.

²⁷⁷ *Id.* at *n. 23

²⁷⁸ *Id.* at *5.

²⁷⁹ *Id.* at *12.

²⁸⁰ 110 F.3d 1508, 1522–23 (10th Cir. 1997).

²⁸¹ Williamson and his co-defendant Dennis Fritz were both innocent. *Ron Williamson*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Ron_Williamson.php (last visited Feb. 12, 2015).

undergo *Daubert* scrutiny.²⁸² The Tenth Circuit reversed the district court's decision, which found that hair microscopy failed *every element* of the *Daubert* test,²⁸³ because due process, not *Daubert*, was the controlling standard for federal habeas review of state court evidentiary rulings.²⁸⁴ The Tenth Circuit affirmed the district court's granting of relief on other grounds, but directed the trial court to conduct its own evidentiary hearing on the admissibility of the hair evidence.²⁸⁵

Before the case could be retried, though, Williamson was exonerated (along with another co-defendant Dennis Fritz, who had been tried separately) after post-conviction DNA testing revealed the identity of the true perpetrator (who had been a witness for the state) and that that the hair microscopy claims were misleading and false.²⁸⁶ State courts, including Oklahoma criminal courts, nevertheless took pains to point out the failed

²⁸² State v. Reid, 757 A.2d 482, 487 (Conn. 2000).

²⁸³ The district court was “unsuccessful in its attempts to locate any indication that expert hair comparison testimony meets any of the [*Daubert*] requirements.” Williamson v. Reynolds, 904 F. Supp. 1529, 1554 (E.D. Okla. 1995). The court further observed: “Although the hair expert may have followed procedures accepted in the community of hair experts, the human hair comparison results in this case were, nonetheless, scientifically unreliable.” *Id.*

²⁸⁴ *Id.*

²⁸⁵ *Id.*

²⁸⁶ See JOHN GRISHAM, THE INNOCENT MAN (2006). DNA testing revealed that none of the hairs that hair microscopy experts had labeled “matches” belonged to the defendants. In addition, a DNA profile developed from the semen evidence matched a third person, who had been one of the state’s witnesses at trial. Ron Williamson (and Dennis Fritz, also charged and convicted) were exonerated and released in April 1999. Williamson had, at one point, come within five days of execution. Together the two had spent eleven years imprisoned. *Id.*

Daubert test in *Williamson* was not controlling precedent and thereafter continued to admit hair comparison evidence.²⁸⁷ Oklahoma hair microscopy jurisprudence demonstrates the lethal dissonance between scientific reality and legal precedent. The rejection of the federal court's *Daubert* analysis occurred in 1997;²⁸⁸ between 1998 and 2012, eight defendants whose convictions were obtained at least in part through hair evidence were exonerated, including three people sentenced to death.²⁸⁹ Nonetheless there has never been a negative admissibility ruling concerning such evidence in Oklahoma, and, in the only documented challenge, the defendant lost.²⁹⁰

²⁸⁷ See *Bryon v. State*, 935 P.2d 338, 359 n.62 (Ok.1997) ("*Williamson* is not binding on this Court. *Bryon* offers no other reason to review this settled area of law."); *McGrew v. State I*, 673 N.E.2d 787, 800 (Ind. 1996)(same); *State v. Fukusaku*, 946 P.2d 32, n. 5 (Haw. 1997).

²⁸⁸ *Bryon v. State*, 935 P.2d 338, 359 n.62 (Ok. 1997).

²⁸⁹ *Robert Lee Miller*, NAT'L REGISTRY OF EXONERATIONS, <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3473> (last visited Feb. 12, 2015); *Dennis Fritz*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Dennis_Fritz.php; *Ronald Keith Williamson* (1999) (last visited Feb. 12, 2015) http://www.innocenceproject.org/Content/Ron_Williamson.php; *Jeffery Todd Pierce*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Jeffrey_Pierce.php (last visited Feb. 12, 2015); *David Bryson*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/David_Johns_Bryson.php (last visited Feb. 12, 2015); *Calvin Lee Scott*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Calvin_Lee_Scott.php (last visited Feb. 12, 2015); *Curtis McCarty*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Curtis_McCarty.php (last visited Feb. 12, 2015); *Sedrick Courtney*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Sedrick_Courtney.php (last visited Feb. 12, 2015).

²⁹⁰ See *McCarty v. State*, 904 P.2d 110, 129 (Okla.Crim.App.1995) ("[McCarty] acknowledges that hair comparison evidence is routinely used in criminal trials and this Court has previously found such testimony to be

The defendant in that case, Curtis McCarty, was innocent of the capital murder for which he was convicted.²⁹¹ He argued in a pretrial motion *in limine* to preclude hair evidence because “the reliability of forensic hair comparison evidence has not been adequately established.”²⁹² The court admitted the evidence and the appellate court, relying Oklahoma precedent, reaffirmed the admissibility of hair comparison evidence.²⁹³

Perhaps most interesting, and in some sense a disturbing inversion of trial and appellate courts’ reflexive embrace of precedent in the bite mark context, is courts’ treatment of the admissibility of hair evidence in those jurisdictions that featured precedent *excluding* the discipline. In New Hampshire, for example, as early as 1969, the state supreme court affirmed the trial court’s exclusion of the evidence based on the fact that “the evidence on hair-identification offered by the State would not be acceptable to scientists in the field” because, among other reasons, it did not meet the *Frye* standard that the “scientific principle involved ‘must be sufficiently established to have gained general acceptance in the particular field in

admissible.... However, he urges this Court to reconsider its position regarding the admissibility of hair analysis evidence, a request rejected by this Court in the past. [McCarty] has not persuaded this Court to now hold otherwise.”)(internal citations omitted).

²⁹¹ *Curtis McCarty*, INNOCENCE PROJECT, www.innocenceproject.org/Content/Curtis_McCarty.php (last visited Feb. 12, 2015).

²⁹² See *McCarty v. State*, 904 P.2d 110, 129 (Okla. Crim. App. 1995)

²⁹³ *Id.*

which it belongs.”²⁹⁴ Thereafter, in New Hampshire in three reported cases – in 1976, 1978 and 1981 – that were decided subsequent to *Coolidge* and that dealt with the admissibility of hair testimony, all three admitted the evidence.²⁹⁵ In *People v. Roff*, a 1979 New York case, the appellate court found the trial court erred “in receiving and refusing to strike the testimony of the chemist that the hair taken from the bathroom and found at the scene of the crime could have come from the same person and that there was some similarity between the two samples, and erred in receiving the physical evidence itself . . . because the evidence was inadequate to connect the hair samples with defendant's hair, it was inadmissible, because it did not ‘accurately portray a relevant and material element of the case.’”²⁹⁶ Thereafter, however, New York hair evidence jurisprudence stands in

²⁹⁴ *State v. Coolidge*, 260 A.2d 547, 559-60 (N.H. 1969) (quoting *Frye v. United States*, 56 F. 1013, 1014 (D.C. Cir. 1923)).

²⁹⁵ See *State v. Breest*, 367 A.2d 1320, 1331-33 (N.H. 1976) (rejecting due process challenge to an expert witness' hair comparison and identification testimony that there “exists a high degree of probability and reasonable ability that we have had contact between this [victim's] clothing and that [defendant's] car.”); *State v. Farrow*, 386 A.2d 808, 815 (N.H. 1978) (relying on *Breest* the court admitted evidence that although the expert witness “could not positively identify that the hair” belonged to defendant he could conclude that the hair was similar to his “in all fifteen recognized microscopic characteristics”); *State v. Scarlett*, 426 A.2d 25, 27-28 (N.H. 1981) (relying on *Farrow* and distinguishing *Coolidge*, the court determined that expert testimony that hair found on defendant's bed and the victim's hair were “morphologically similar” in “fifteen recognized microscopic characteristics” and that when hairs are “found to be consistent with respect to all these different microscopic characteristics . . . the chances of them having come from anyone else are forty-five to one” was admissible).

²⁹⁶ *State v. Roff*, 67 A.D.2d 805, 806-07 (N.Y. 1979).

opposition: for the discipline's admissibility.²⁹⁷

C. The FBI's Training of Hundreds of State Hair Examiners to Provide False and Misleading Testimony

The false hair comparison evidence that helped wrongfully convict Curtis McCarty and Jimmy Ray Bromgard was introduced through disgraced forensic analysts from state crime labs, Joyce Gilchrist and Arnold Melnikoff, respectively.²⁹⁸ Both analysts, like many hundreds of others, including the analyst in the Bridges case,²⁹⁹ were trained by the FBI in a two-week training course at the FBI Academy in Quantico, Virginia; and both later stated that they had been trained by the FBI to provide false and misleading testimony.³⁰⁰ Gilchrest's records showed that she was trained to use her experience to bolster the strength of her conclusion.

In her files, she kept a certificate of completion from her January 1981 class, including a session on 'Discussion of the significance of hair comparisons, testimony matters and pertinent literature.'

²⁹⁷ See, e.g., *People v. Allweiss*, 396 N.E.2d 736 (N.Y. Ct. App. 1979); *Barber v. Rubin*, 72 A.D.2d 347 (N.Y. App. 1980) ("[A]n expert in the field can conclude with a reasonable degree of certainty whether hair from an unknown source matches the hair from a known source; that hair samples microscopically alike or closely similar can be said with a high degree of probability to have originated from the same source.").

²⁹⁸ Spencer S. Hsu, *FBI Lab's Woes Cast Growing Shadow – Doubts About State, Local Hair Matches – Federal training linked to suspect court testimony*, WASH POST, December 22, 2012.

²⁹⁹ Trial transcript at 766, *State v. Bridges*, 90-CRS-23102 (Mecklenburg Cnty. Superior Ct. Div. Jan. 22-29, 1991) (on file with authors).

³⁰⁰ Spencer S. Hsu, *FBI Lab's Woes Cast Growing Shadow – Doubts About State, Local Hair Matches – Federal training linked to suspect court testimony*, WASH. POST, December 22, 2012

In her notes, she copied the FBI caveat that one cannot conclusively determine the source or origin of a hair. But, the notes also showed that instructors were teaching their students how to sidestep the limits of the science — by pointing out their experience.

‘Can conclude source — point out however in my experience, have rarely seen hairs from diff. people exhibiting the same microscopic characteristics,’ the notes say.³⁰¹

Other FBI-trained examiners made nearly identical assertions related to using bench experience as both a workaround for the lack of a valid statistical basis and to undermine the “disclaimer.”³⁰² As noted, there is evidence that, rather than massive failure by FBI scientists to appreciate fundamental scientific principles, the limitations of hair comparison evidence were understood and deliberately obfuscated to implicate defendants. For example, during the 1985 “International Symposium on Forensic Hair Comparisons” at the FBI Academy in Quantico, a revealing panel discussion took place concerning the lack of a statistical basis to support the claims of hair comparison expert.³⁰³ This panel included two participants from the FBI Laboratory, the Chief Scientist for the Hair and

³⁰¹ Spencer S. Hsu, *FBI Lab’s Woes Cast Growing Shadow – Doubts About State, Local Hair Matches – Federal training linked to suspect court testimony*, WASH. POST, December 22, 2012

³⁰² *Id.*

³⁰³ Symposium, *Proceedings on the International Symposium on Forensic Hair Comparisons*, DEPT. OF JUSTICE (June 25-27, 1987), available at <https://www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf> ([hereinafter “Symposium”]).

Fibers Section for the Royal Canadian Mounted Police, the Chief Scientific Officer for the Metropolitan Police Forensic Science Laboratory in London, the Scientific Director for the General Biology Section in Germany, and Dr. Peter De Forest, a Professor of Criminalistics at John Jay College.³⁰⁴ During the discussion, Dr. De Forest explained the limits to the “evidential value of hair” and some of the “defense expert’s perspectives on the hair question” that he had gleaned through his experience.³⁰⁵ He emphasized that “hair examination” is non-absolute associative evidence whose “power” is to “exclude hair.”³⁰⁶ Dr. De Forest also explained how experts are prone to overstating the value of hair comparison through inappropriate leveraging of bench experience:

I have a problem with the divergence from a laboratory report in which the conclusion is these hairs could have shared a common origin to the presentation of testimony in court when the expert says something to the effect that, ‘Yes, these hairs were found to be similar and in my experience I have examined thousands of hairs and I have never found two hairs from different sources that were alike.’ I think that is very misleading and it is not substantiated by any data.³⁰⁷

Dr. De Forest and other panelists emphasized that it was “clear more [had] to be done” concerning the training of hair microscopy “experts.”³⁰⁸ He noted that he was involved with an FBI-sponsored Committee of

³⁰⁴ *Id.* at 193.

³⁰⁵ *Id.* at 199.

³⁰⁶ *Id.*
³⁰⁷ *Id.* at 204.

³⁰⁸ *Id.*

Forensic Hair Comparison, which he felt “should be an ongoing committee” because they had “not solved all the problems by any means.”³⁰⁹ More recently, FBI Special Agent Michael Malone, a former supervisor in the FBI’s Hair and Fiber Unit, testified in a civil deposition that by the mid-1980s, FBI agents had had conversations “to the effect” of “[s]ince we didn’t have a database and we didn’t have, you know, real probabilities, scientifically valid probabilities, let’s try and use these numbers of the cases that we have looked at in lieu of real probabilities.”³¹⁰

Nevertheless, even as recently as 2009, the FBI published a report stating that, although hair microscopy is not a means of “positive identification,” it could provide “substantial information because of the variation in hair among individuals.”³¹¹ The FBI insisted that the significance of shared characteristics may be proffered to a jury “qualitatively or semi-qualitatively” and that the only “limitation on the science is that there is always the possibility of a coincidental match.”³¹²

³⁰⁹ *Id.*

³¹⁰ This deposition occurred on January 10, 2013 in *Gates v. District of Columbia*, 1:11-cv-00040 (D.D.C.), which involves a claim of wrongful conviction based on hair comparison testimony. The plaintiff was convicted of rape and murder, in part based on hair comparison testimony by an FBI examiner, and spent over twenty years in prison for those crimes. (Transcript on file with authors)

³¹¹ Cary T. Oien, *Forensic Hair Comparison: Background Information for Interpretation*, 11 FORENSIC SCIENCE COMMUNICATIONS 2 (2009), available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2009/review/2009_04_review02.htm/.

³¹² Cary T. Oien, *Forensic Hair Comparison: Background Information for Interpretation*, 11 FORENSIC SCIENCE COMMUNICATIONS 2 (2009), available at

D. The Fall of Hair Microscopy

The tide only began to turn against hair microscopy with the 2009 publication of the NAS Report.³¹³ The Report concluded that hair microscopy cannot uniquely identify one person as the source of a hair; instead, at best, a “match” between two hair samples “means only that the hair *could* have come from any person whose hair exhibited – within some levels of measurement uncertainties – the same microscopic characteristics.”³¹⁴ In addition, the NAS Report made clear that first hypothesis underlying the technique is invalid, noting that there is no consensus “on the number of features on which hairs must agree before an examiner may declare a ‘match.’”³¹⁵ the second hypothesis is likewise invalid because there are no statistics on the distribution of particular hair characteristics in the population.³¹⁵ The Report’s ultimate conclusion was “that testimony linking microscopic hair analysis with particular defendants is highly unreliable,” and that evidence of a match “must be confirmed using mtDNA analysis.”³¹⁶

[http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2009/review/2009_04_review02.htm/](http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2009/review/2009_04_review02.htm).

³¹³ NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 141-46 (2009), available at http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

³¹⁴ *Id.* at 156.

³¹⁵ *Id.* at 160.

³¹⁶ *Id.* at 161.

Following the NAS Report, a series of news articles in *The Washington Post* revealed that erroneous testimony by FBI hair examiners was “widespread and could affect potentially thousands of cases in federal, state and local courts.”³¹⁷ *The Post* reported that despite claims by FBI analysts that it was virtually impossible not to be able to distinguish between two human hairs from different sources, in one instance mitochondrial DNA testing revealed that two “FBI-trained analysts . . . could not even distinguish human hairs from canine hairs.”³¹⁸ “As a result, hundreds of defendants nationwide remain in prison or on parole for crimes that might merit exoneration, a retrial or a retesting of evidence using DNA because FBI hair and fiber experts may have misidentified them as suspects.”³¹⁹

The NAS Report, the numerous exonerations – particularly three men in the Washington, D.C. area who were exonerated after mitochondrial DNA contradicted hair microscopy testimony proffered by FBI examiners³²⁰ – and intense media scrutiny eventually persuaded the FBI to

³¹⁷ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

³¹⁸ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

³¹⁹ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, WASHINGTON POST, April 16, 2012.

³²⁰ See discussion *supra* Part X; see also Yamil Berard, *Forensic Science Commission to Review Convictions Based on Hair Samples*, STAR-TELEGRAM, Aug. 11, 2013, available at <http://www.forensicmag.com/news/2013/08/forensic-science-commission-review-convictions-based-hair-samples>.

reexamine the thousands of cases between 1980 and 2000 where its agents testified to a positive association between a defendant's hair and a questioned hair collected from a crime scene.³²¹ In doing so, the FBI essentially adopted the NAS Report's critique, acknowledging for the first time that hair microscopy is limited "in that the size of the pool of people who could be included as a possible source of a specific hair is unknown."³²² Therefore, an examiner may not apply "probabilities to a particular inclusion of someone as a source of a hair of unknown origin."³²³ Instead, the strongest conclusion one can draw is that the suspect could be included in a class of people of unknown size that could have been a possible source of the evidentiary hair.³²⁴

The FBI has acknowledged the three categories of errors discussed above,³²⁵ which were routinely proffered by its agents, and those they

³²¹ Norman L. Reimer, *The Hair Microscopy Review Project*, THE CHAMPION, July 2013, at 16. The review was announced in July 2013, and is being administered in conjunction with the Innocence Project and the National Association of Criminal Defense Lawyers. *See Innocence Project and NACDL Announce Historic Partnership with the FBI and Department of Justice on Microscopic Hair Analysis Cases*, INNOCENCE PROJECT (July 18, 2013), available at http://www.innocenceproject.org/Content/Innocence_Project_and_NACDL_Anounce_Historic_Partnership_with_the_FBI_and_Department_of_Justice_on_Microscopic_Hair_Analysis_Cases.php.

³²² FBI, Microscopic Hair Comparison Analysis Agreement, Nov. 9, 2012 (on file with authors)

³²³ FBI, Microscopic Hair Comparison Analysis Agreement, Nov. 9, 2012 (on file with authors)

³²⁴ FBI, Microscopic Hair Comparison Analysis Agreement, Nov. 9, 2012 (on file with authors)

³²⁵ *See supra* n. 98 (discussing error types).

trained, in thousands of cases. In the FBI’s ongoing review, the DOJ has agreed to waive any statute of limitations or procedural bars under 28 U.S.C. § 2255, in federal post-conviction cases where error is found, due to the manifest unfairness of punishing a criminal defendant for the FBI’s protracted campaign to advance the prosecution’s case without regard to the limitations of hair microscopy.

Even so, hair comparisons have been proffered to juries as “scientific” evidence and used to convict people (and to uphold wrongful convictions on direct appeal), sometimes with very little other corroborating or incriminating evidence.

IV. Attendant Obligations

The long-predicted and now manifest paradigm shift in forensic identification evidence is rooted in a systemic, century long failure by nearly all criminal justice stakeholders to comprehend, question, challenge and exclude as unreliable the false and misleading assertions made by forensic experts and exploited by advocates to persuade lay jurors. This fundamental breakdown in the adversarial process this Nation relies upon to discover the truth – illustrated most starkly by the empirical data – compel several prospective and retrospective ethical and professional obligations. Because the shift has occurred across disciplines and over time, the obligations extend not only to specific individuals in those disciplines, but

to distinct professional and governmental entities, as well.

What follows in this section are some broad suggestions for how our justice system might recover scientific integrity and how these solutions might be implemented, as well as some discrete proposals that we believe must be an aspect of whatever solution is implemented. Some of what is at stake is obvious, beginning with the reputation of the criminal justice system itself.³²⁶ It goes almost without mentioning that a failure to act will stymie the discovery, if past history is any indication, of numerous instances of wrongful conviction. Apart from that, though, as former Attorney General Janet Reno once noted at a conference to address the wrongful conviction phenomenon, “[i]f the public’s confidence in the results of the criminal justice system erode, then the public will not accept the criminal justice system’s findings and results, [a]nd what we do with the criminal justice system, which is the hallmark of the legal system for so many Americans looking in from the outside, will make a profound difference for this century.”³²⁷

The ethical and professional obligations that we argue apply are unprecedented. But so too are the circumstances that obligate their

³²⁶ See, Robert Aronson & Jacqueline McMurtrie, *The Use and Misuse of High-Tech Evidence by Prosecutors: Ethical and Evidentiary Issues*, 76 FORDHAM L. REV. 1453, n.235 (2007).

³²⁷ Conference Transcript, American Judicature Society, Conference on Preventing the Conviction of Innocent Persons at 5 (Jan. 17-19, 2003), https://www.ajs.org/files/7713/6500/2407/2003_conference_transcript.pdf.

imposition. And the system-wide problems that we have identified here will not self-correct.³²⁸ Additionally, traditional sources of authority for corrective direction – the Model Rules, governing bodies' ethical guidelines – are almost exclusively prospectively focused and, more importantly simply do not address these kinds of systemic failures. While there have certainly been instances where courts have attempted to correct episodes of systemic forensic fraud, those instances were less about the shortcomings of a discipline but instead about the malfeasance of specific individuals involved in them.³²⁹ Here, the fault lies at the core of the disciplines themselves and layers of invalid legal precedent. There is no rule or ethical obligation that contemplates these problems, much less addresses them. To the extent that individuals are involved, it is not discrete outliers but line prosecutors and defense attorneys, who acted without correction for decades – and who were aided and abetted by forensic witnesses who operated within unvalidated disciplines, exaggerated findings, or both, and by courts that shamelessly facilitated all of it, abdicating gatekeeping responsibilities and instead relying on lay jurors to separate science from subjective speculation convincingly masquerading a science, while, at the same time, allowing courtroom advocates to further exploit invalid expert opinions in

³²⁸ Indeed, hair microscopy and bite mark analysis still enjoy near universal admissibility.

³²⁹ For a good overview of several incidents of systemic forensic fraud, see Paul C. Giannelli, *Scientific Fraud*, 46 CRIMINAL LAW BULLETIN 1313 (2010).

opening and closing statements. Where DNA exonerations made it apparent that the claims these experts were making were grossly unreliable, courts failed to engage in any type of responsible analysis when asked to provide correction. The list of those held accountable for proffering unvalidated forensic testimony is short;³³⁰ for those individuals and entities responsible for the admission of bitemark testimony and hair microscopy evidence, the list is virtually non-existent.

For these reasons, then, we first argue, as it relates to individual prosecutors, that as a result of the information marshaled in this article, at least two positions typically proffered by prosecutors to deny petitioners post-conviction relief ought to be unethical to advance: (1) that a defendant-petitioner should have known at the time of trial that a forensic discipline

³³⁰ See, Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 FORDHAM L. REV. 1493 (2007). There are several documented incidents, each of which also reflects an acknowledgement of the damage to the system as a whole. The FBI, for example, which runs the nation's most recognized forensic lab, had one of its own analysts plead guilty to a charge of making false statements, the result of which, said the Justice Department's inspector general, "has damaged intangibly the credibility of the FBI laboratory" as a whole. Maurice Possley, Steve Mills, & Flynn McRoberts, *Scandal Touches Even Elite Labs*, CHICAGO TRIBUNE, Oct. 21, 2004. In addition, some courts have authorized administrative actions into incidences of gross forensic malfeasance. See, *In re Investigation of the W. Va. State Police Crime Lab.*, Serology Div., 438 S.E.2d 501 (W. Va. 1993) (discussing the fact that State Supreme Court appointed a special judge to investigate claims that Fred Zain, a serologist in the West Virginia State Police crime lab, gave false testimony), and sometimes offered comment about the effect of gross forensic malfeasance. Courts have also on occasion, often in dissent, offered criticism. See *Brooks v. State*, 748 So.2d 736, 750 (Miss. 2006) (McRae, J., dissenting) ("This Court's apparent willingness to allow West to testify to anything and everything so long as the defense is permitted to cross-examine him may be expedient for prosecutors but it is harmful to the criminal justice system.") (internal citations omitted).

was invalidated or false, particularly if its admission into evidence was achieved through improper processes, like the ones described earlier; and, (2) that whatever prejudice may have resulted from the admission of such evidence could have been cured through cross-examination and/or by the “disclaimers” described above.³³¹ Second, as it relates to defense counsel, we argue that it is *per se* ineffective assistance of counsel³³² to fail to

³³¹ Leaving aside the issue that arises from the admission of false evidence, there is a good deal of specific scholarship about the effectiveness of cross-examination regarding forensic evidence. See Jonathan Koehler, *If the Shoe Fits They Might Acquit: The Value of Forensic Science Testimony* 8 J. OF EMPIRICAL LEGAL STUDIES 21 (2011). Indeed, one experiment, which tested the reaction of potential jurors to flaws in microscopic hair examination, found that alerting jurors to problems had little impact on their decision-making. See Dawn McQuiston-Surrett and Michael J. Saks, *Communicating Opinion Evidence in the Forensic Identification Sciences: Accuracy and Impact*, 59 HASTINGS L.J. 1159,1167-69 (2008) (“Whether or not jurors were informed about the limitations of microscopic hair examination on cross-examination or by the judge had little measurable or meaningful impact on their judgments about the likelihood that the defendant was the source of the crime-scene hair or their perceived understanding of the expert’s testimony”).

³³² For particularized support, see *Hinton v. Alabama*, 134 S.Ct. 1081 (2014) (holding that where the only evidence linking defendant to crime was ballistic evidence, counsel ineffective for failing to seek additional funds, which he wrongly believed were not available, to hire a better qualified expert to rebut prosecution’s expert).

The following is a non-exhaustive list of authority finding counsel ineffective for various failures in responding to scientific evidence or expert testimony: *Dugas v. Coplan*, 428 F.3d 317 (1st Cir. 2005) (holding that counsel ineffective in failing to pursue a “not arson” defense where state’s strongest evidence was expert testimony on arson); *United States v. Tarricone*, 996 F.2d 1414 (2nd Cir. 1993) (holding that defense attorney was ineffective in failing to consult a handwriting expert who might have proven that the defendant never signed agreement at issue in case); *Bell v. Miller*, 500 F.3d 149 (2nd Cir. 2007) (holding that counsel was ineffective for failing to consult medical expert regarding reliability of shooting victim’s identification); *Elmore v. Ozmint*, 661 F.3d 783 (4th Cir. 2011) (holding that failure of petitioner’s lawyers to investigate state’s forensic evidence -- including hair and serology evidence -- constituted ineffective assistance of counsel); *Soffar v. Dretke*, 368 F.3d 441 (5th Cir. 2004)

(holding that defense counsel's failure to pursue and develop expert ballistics testimony that would have presented the jury with conflicting evidence bearing on the defendant's role in the crime was ineffective); *Draughon v. Dretke*, 427 F.3d 286, 296 (5th Cir. 2005) (holding that counsel was ineffective in failing to offer expert ballistics evidence in defense where government's prosecution was based on testimony from ballistics expert); *Williams v. Thaler*, 684 F.3d 597 (5th Cir. 2012) (holding that trial counsel was ineffective in his failure "to obtain any independent ballistics or forensics experts, and was therefore unable to offer any meaningful challenge to the findings and conclusions of the state's experts, many of which proved to be incorrect"); *Sturgeon v. Quarterman*, 615 F. Supp. 2d 546, 572 (S.D. Tex. 2009) (finding ineffective assistance of counsel in failure to prepare expert witness to testify about unreliability of eyewitness identification); *Sims v. Livesay*, 970 F.2d 1575 (6th Cir. 1992) (holding that counsel was ineffective for not hiring expert to analyze the bullet holes and powder patterns on a quilt a homicide victim held in her hands at the time of her shooting); *Ege v. Yukins*, 485 F.3d 364 (6th Cir. 2007) (holding that counsel's failure to object to admission of bite mark testimony constituted deficient performance, as required for petitioner to meet "cause" prong of cause-and-prejudice standard for review of defaulted habeas claim, where bite mark was only physical evidence connecting her to crime scene); *Richey v. Bradshaw*, 498 F.3d 344 (6th Cir. 2007) (holding that defendant's counsel provided ineffective assistance in arson trial where counsel failed to properly cross-examine the state's experts or to present competing scientific evidence); *Duncan v. Ornoski*, 528 F.3d 1222, 1235 (9th Cir. 2008) ("[W]hen the prosecutor's expert witness testifies about pivotal evidence or directly contradicts the defense theory, defense counsel's failure to present expert testimony on that matter may constitute deficient performance."); *State v. Smith*, 85 So.3d 1063, 1083 (Ala. Crim. App. 2010) (finding ineffectiveness supported by lack of expert testimony relating to police procedures); *State v. Fitzpatrick*, 118 So.3d 737 (Fla. 2013) (holding that counsel ineffective for failing to adequately investigate and obtain expert assistance to rebut state's forensic expert testimony); *Com. v. Bussell*, 226 S.W.3d 96, 105 (Ky. 2007) (holding that counsel was ineffective for failing to adequately investigate and obtain expert assistance to rebut state's forensic expert testimony); *Cravens v. State*, 50 S.W.3d 290, 295 (Mo. App. 2001) (holding that counsel was ineffective in failing to locate and present expert witnesses on forensic pathology and bullet analysis); *Wolfe v. State*, 96 S.W.3d 90 (Mo. 2003) (finding that counsel was ineffective for failing to test hair samples found in victim's car); *Wilhoit v. State*, 816 P.2d 545 (Okla. 1991) (holding that counsel's failure to investigate bite-mark evidence constituted ineffective assistance of counsel); *Ard v. Catoe*, 372 S.C. 318 (S.C. 2007) (finding that counsel was ineffective for failing to adequately develop and present gunshot residue evidence in response to government's expert testimony); *but see, e.g., United States v. Higgs*, 663 F.3d 726, 738 (4th Cir. 2011) (finding no *Strickland* violation where "counsel conducted a thorough and effective cross-examination . . . demonstrating that [he was] well acquainted with the criticisms" of forensic discipline at issue); *United States v. Davis*, 406 F.3d 505, 509 (8th Cir. 2005)

challenge these unvalidated disciplines going forward. Third, as it relates to courts: (1) because science is not static, taking judicial notice of the admissibility of putative scientific evidence is inappropriate;³³³ (2) decisions regarding admissibility of trace evidence should be treated as cases of first impression, without any reliance on flawed precedent; and, (3) similarly, following the DOJ’s lead in waiving procedural objections, reviewing courts should not invoke procedural bars to deny relief to defendant-petitioners if the rationale supporting denial of relief is that defendant-petitioners knew or should have known of the disciplines’ flaws. Lastly, again following the FBI/DOJ’s lead, we argue that there now exists affirmative ethical and professional obligations³³⁴ on a host of entities to

(“Davis’s trial counsel cannot be said to be ineffective for failing to challenge the FBI’s methodology on a basis that was not advanced by the scientific community at the time of trial.”); *Wyatt v. State*, 71 So.3d 86 (Fla. 2011) (finding no ineffective assistance of counsel where the flaws in the forensic discipline were not known until well after defendant’s trial); *Robertson v. State*, No. M2007-01378-CCA-R3-PC, 2009 WL 277073, at *17 (Tenn. Crim. App. 2009) (finding no ineffective assistance of counsel where, at time of trial, counsel “did not have the benefit of the FBI’s retraction”); *Libby v. McDaniel*, No. 3:04-CV-0038-LRH-RAM, 2011 WL 1301537 (D. Nev. 2011) (finding no ineffective assistance of counsel where defendant “offered no evidence that, as of 1990, the research or expertise necessary to successfully challenge forensic evidence was reasonably available to trial counsel”).

³³³ See *Cornell v. 360 West 51st St. Realty*, 22 N.Y.3d 762, 900 (2014) (“[S]cientific understanding, unlike a trial record, is not by its nature static; the scientific consensus prevailing at the time of the Frye hearing in a particular case may or may not endure.”). See also Parts X (cases taking judicial notice of hair and bitemark evidence)

³³⁴ Our argument is in accord with the American Society of Crime Lab Directors/Laboratory Accreditation Board, which in response to the joint FBI/DOJ hair microscopy case audit issued the following statement: “We have an ethical obligation to “take appropriate action if there is potential for, or there has been, a

identify and review case files for convictions based in whole or in part on unvalidated forensic science; to make substantive contact with affected defendant-petitioners, as well as the final prosecuting body, defense counsel of record, and the tribunals where jurisdiction lies for those cases.

A. Unique Nature of Ethical & Professional Obligations

In contemplating how best to implement these professional and ethical obligations, it is worth discussing briefly why currently available remedies are inadequate. The scholarship on the ethical implications surrounding questionable forensic evidence is prolific,³³⁵ especially as it concerns prosecutors' duties.³³⁶ There is even specific scholarship and

misdemeanor of justice due to circumstances that have come to light, incompetent practice or malpractice. It is not ASCLD/LAB's intent to direct that such reviews be conducted by any laboratory or judicial system but it is our recommendation that each laboratory, in consultation with the appropriate legal authorities, consider whether there may be past cases, specifically involving convictions, in which it would be appropriate to evaluate the potential impact of the reported conclusions and/or related testimony on the conviction." Press Release, American Society of Crime Laboratory Directors / Laboratory Accreditation Board, Notification from the ASCLD/LAB Board of Directors to Interested Parties Concerning Potential Issues with Hair Comparison Testimony (Apr. 21, 2013), *available at* <http://www.asclab.org/notification-from-the-asclab-board-of-directors-to-interested-parties-concerning-potential-issues-with-hair-comparison-testimony/>.

³³⁵ See, e.g., ABA Resolution 111B (August 2004) ("[Counsel should] have competence in the relevant area or consult with those who do where forensic evidence is essential in a case."); ABA, *Criminal Justice Section's Ad Hoc Innocence Comm. to Ensure the Integrity of the Criminal Process, Achieving Justice: Freeing the Innocent, Convicting the Guilty*

(Paul Giannelli & Myrna Raeder eds., 2006).

³³⁶ *Id.* at 99; Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 FORDHAM L. REV. 1493 (2007); Robert Aronson & Jacqueline McMurtrie, *The Use and Misuse of High-Tech Evidence by Prosecutors: Ethical and Evidentiary Issues*, 76 FORDHAM L. REV. 1453, n.235 (2007).

guidance directed at the use of hair microscopy evidence³³⁷ and bite mark evidence.³³⁸ But these discussions do not address the problems that we have illustrated for at least two significant reasons. First is a temporal problem. Model Rule of Professional Responsibility 3.3, *Candor Toward the Tribunal*, requires a lawyer not to “offer evidence that the lawyer knows to be false”³³⁹ and, “[i]f a lawyer . . . comes to know of . . . [the evidence’s] falsity, the lawyer shall take reasonable remedial measures, including, if necessary, disclosure to the tribunal.”³⁴⁰ But the obligation to take remedial measures extends only until “the conclusion of the proceeding,”³⁴¹ which the comment to the rule defines as “when a final judgment in the proceeding

³³⁷ See, *Memorandum of Potential Post-Conviction Arguments and Authority Based on Discredited Hair Microscopy Analysis*, INNOCENCE PROJECT, [http://www.americanbar.org/content/dam/aba/events/criminal_justice/Forensics_U
pdate_Post_Conviction_Discredited_Science.authcheckdam.pdf](http://www.americanbar.org/content/dam/aba/events/criminal_justice/Forensics_Update_Post_Conviction_Discredited_Science.authcheckdam.pdf) (last visited Feb. 12, 2015).

³³⁸ See, Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 FORDHAM L. REV. 1493, n. 90 (2007); see also *Northern Mariana Islands v. Bowie*, 243 F.3d 1109, 1118 (9th Cir. 2001) (“[A prosecutor’s due process duty] requires a prosecutor to act when put on notice of the real possibility of false testimony. This duty is not discharged by attempting to finesse the problem by pressing ahead without a diligent and a good faith attempt to resolve it. A prosecutor cannot avoid this obligation by refusing to search for the truth and remaining willfully ignorant of the facts.”).

³³⁹ MODEL RULES OF PROF’L CONDUCT r. 3.3. Note, however, that the comments clarify the parameters of knowing presentation of false evidence by stating that “[t]he prohibition against offering false evidence only applies if the lawyer knows that the evidence is false. A lawyer’s reasonable belief that evidence is false does not preclude its presentation to the trier of fact.” MODEL RULES OF PROF’L CONDUCT r. 3.3 cmt.

³⁴⁰ MODEL RULES OF PROF’L CONDUCT r. 3.3.

³⁴¹ *Id.*

has been affirmed on appeal or the time for review has passed.”³⁴² In almost every instance the set of affected cases that is of concern here will fall far outside of the time-frame that would require a lawyer to take remedial measures.³⁴³ Similarly, other discussions – like those involving amending Rule 3.8,³⁴⁴ *Special Responsibilities of a Prosecutor*, to add a “gatekeeping role” for prosecutors, or invoking Rule 1.1’s requirement of “competence”³⁴⁵ to counter a claim that Rule 3.3’s, *Candor Toward the Tribunal*, “knowing” scienter and the elastic definition of what comprises “false” evidence for advocates prohibits the imposition of ethical sanctions – are likewise unhelpful. To begin with they are prospective solutions, and, as solutions, seem unlikely either to be pursued or seriously adjudicated.³⁴⁶

³⁴² *Id.*

³⁴³ There is no prohibition against offering such measures anyway, regardless of the passing of the time frame. The authors have not seen a case where in these circumstances any lawyer has taken such steps.

³⁴⁴ See e.g., Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 FORDHAM L. REV. 1493, 1535-36 (2007); David S. Caudill, *Lawyers Judging Experts: Oversimplifying Science and Undervaluing Advocacy to Construct an Ethical Duty?* 38 PEPP. L. REV. 675 (2011).

³⁴⁵ RULES OF PROF’L CONDUCT r. 1.1. The rule requires “competent representation to a client” defined as “the legal knowledge, skill, thoroughness and preparation reasonably necessary for the representation.” *Id.*

³⁴⁶ See, e.g., Kathleen M. Ridolfi & Maurice Possley, *Preventable Error: A Report on Prosecutorial Misconduct in California 1997-2009*, NORTHERN CALIFORNIA INNOCENCE PROJECT (Oct. 2010), available at http://veritasinitiative.scu.edu/downloads/ProsecutorialMisconduct_Exec_Sum.pdf; David Keenan, et al., *Prosecutorial Accountability After Connick v. Thompson: Why Existing Professional Responsibility Measures Cannot Protect Against Prosecutorial Misconduct*, FORUM (Oct. 2011), <http://www.yalelawjournal.org/forum/the-myth-of-prosecutorial-accountability-after-connick-v-thompson-why-existing-professional-responsibility-measures-cannot-protect-against-prosecutorial-misconduct>.

More specifically, arguments that suggest that those responsible for these failures of justice – or, maybe more importantly, those who would be most effective at addressing them – have not acted based on what are typically viewed as incentives to do so. For example, the doctrine of prosecutorial immunity, which had been at least limited somewhat so that aggrieved petitioners might be able to seek redress for the most abusive acts of prosecutorial malfeasance,³⁴⁷ has not made a difference in redressing these failures in any meaningful or measurable way. In fact, the Supreme Court has substantially broadened, not limited, the protection afforded prosecutors by the doctrine.³⁴⁸

³⁴⁷ See, e.g., *Imbler v. Pachtman*, 424 U.S. 409 (1976).

³⁴⁸ See *Connick v. Thompson*, 131 S. Ct. 1350 (2011) (holding that there can be no municipal liability for a district attorney's office's failure to train its prosecutors to turn over exculpatory (*Brady*) evidence on the basis of a single violation of that obligation); *Van de Kamp v. Goldstein*, 129 S. Ct. 855, 862 (2009) (holding that extended immunity to include the concededly administrative acts of a district attorney's office's supervisory prosecutors in the systemic "training, or the supervision, or information-system management"); *see also* Symposium, Ted Sampsell-Jones & Jenna Yauch, *Official and Municipal Liability for Constitutional and International Torts Today: Does the Roberts Court Have An Agenda?*, 80 FORDHAM L. REV. 623 (2011); *see also*, Barry Scheck, *Professional and Conviction Integrity programs: Why We Need them, Why They Will Work, and Models for Creating Them*, 31 CARDOZO L. REV. 2215, 2221 (2010) ("The absolute immunity doctrine is not the only reason federal civil rights claims against prosecutors are, as a practical matter, rare and difficult to pursue. The qualified immunity 'good faith' defense is a very substantial hurdle for a civil rights plaintiff as well. Though not a complete bar to liability, the Supreme Court has recognized that qualified immunity shields 'all but the plainly incompetent or those who knowingly violate the law.' After *Ashcroft v. Iqbal*, it is certainly more difficult for a plaintiff, without any discovery, to file a pleading that will survive a motion to dismiss on qualified immunity grounds. Denials of the qualified immunity defense are also subject to interlocutory appeal, thereby making these lawsuits longer and more costly to litigate than ordinary cases. And even when the plaintiff prevails,

State bar discipline, also held out as an incentive, is likewise an unsatisfactory solution.³⁴⁹ Available data is replete with the systemic failure of state bar disciplinary entities to hold prosecutors (or defense attorneys, for that matter) accountable for misconduct.³⁵⁰ Judges, too, who are arguably best-suited to observe and consider misconduct in the trials over which they preside fare no better. In a 2008 study in California, data showed that of in cases involving findings of prosecutorial misconduct between 1997 to 2006 – of which there were 444 – fifty-four were reversed, which triggered a *per se* legal duty to report.³⁵¹ Yet there was not a single referral.³⁵²

Also unlikely to be helpful, at least in the near future, are forensic science organizations themselves. They have shown little to no inclination to address seriously the problems for which they are directly responsible,

there are serious problems collecting substantial damages awards.”) (internal citations omitted).

³⁴⁹ Interestingly, the doctrine of prosecutorial immunity and state bar discipline are connected. Amicus briefs filed by district attorneys and attorneys general groups urging extension of prosecutorial immunity have claimed that the specter of such sanctions is sufficient check. *See*, Barry Scheck, *Professional and Conviction Integrity programs: Why We Need them, Why They Will Work, and Models for Creating Them*, 31 CARDOZO L. REV. 2215, 2222 n.27 (2010).

³⁵⁰ *See*, Barry Scheck, *Professional and Conviction Integrity programs: Why We Need them, Why They Will Work, and Models for Creating Them*, 31 CARDOZO L. REV. 2215, 2222 (2010).

³⁵¹ Barry Scheck, *Professional and Conviction Integrity programs: Why We Need them, Why They Will Work, and Models for Creating Them*, 31 Cardozo L. Rev. 2215, 2223-24 (2010).

³⁵² Barry Scheck, *Professional and Conviction Integrity programs: Why We Need them, Why They Will Work, and Models for Creating Them*, 31 CARDOZO L. REV. 2215, 2223-24 (2010).

particularly issues related to fundamental scientific weaknesses. In addition to the sweeping critique of the substance of many traditional forensic science disciplines, the NAS Report also noted that few forensic science organizations have existing codes of ethics,³⁵³ and those that do “vary in content”³⁵⁴ and there is no “consistent mechanisms for enforcing”³⁵⁵ them. Further, “[m]any jurisdictions do not require certification in the same way that, for example, states require lawyers to be licensed. Therefore, few forensic science practitioners face the threat of official sanctions or loss of certification for serious ethical violations. And it is unclear whether and to what extent forensic science practitioners are required to adhere to ethics standards as a condition of employment.”³⁵⁶

The NAS’s concern is borne out by anecdotal evidence. With respect to forensic hair analysis, for example, as Spencer Hsu of *The Washington Post* reports, even though “Justice Department officials . . . [knew] for years that flawed forensic work might have led to the

³⁵³ NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 19 (2009), *available at* http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

³⁵⁴ NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 26 (2009), *available at* http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

³⁵⁵ NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 141-46 (2009), *available at* http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

³⁵⁶ See NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 141-46 (2009), *available at* http://ag.ca.gov/meetings/tf/pdf/2009_NAS_report.pdf.

convictions of potentially innocent people . . . prosecutors failed to notify defendants or their attorneys even in many cases they knew were troubled.”³⁵⁷ According to a July 2014 DOJ Office of Inspector General report, there were several “serious deficiencies” with an FBI Criminal Division Task Force’s internal review of “cases involving the use of scientifically unsupportable analysis and overstated testimony by FBI Lab examiners in criminal prosecutions.”³⁵⁸ First among the deficiencies was the failure to prioritize capital cases in its review. It took the Task Force almost five years to identify affected death penalty cases thus depriving “state authorities” the bases “to consider delaying scheduled executions.”³⁵⁹ As a result, Texas executed Benjamin H. Boyle³⁶⁰ before his case was reviewed by the Task Force even though “[t]he prosecutor deemed the [FBI] Lab analysis and testimony . . . material to the defendant’s conviction”³⁶¹ and death sentence.³⁶² In addition, the OIG report found that the affected

³⁵⁷ SPENCER S. HSU, *CONVICTED DEFENDANTS LEFT UNINFORMED OF FORENSIC FLAWS FOUND BY JUSTICE DEPT.*, THE WASHINGTON POST, APRIL 1, 2012.

For a listing of affected cases, see *Convictions Linked to FBI Lab’s Suspect Forensics*, THE WASHINGTON POST, <http://www.washingtonpost.com/wp-srv/special/local/fbi-crime-lab-case-reviews/> (last visited Feb. 12, 2015).

³⁵⁸ DEPT. OF JUSTICE, *AN ASSESSMENT OF THE 1996 DEPARTMENT OF JUSTICE TASK FORCE REVIEW OF THE FBI LABORATORY* i (2014).

³⁵⁹ *Id.*

³⁶⁰ *Id.*

³⁶¹ *Id.* at ii. According to the report, an “independent scientist who later reviewed the case found the FBI Lab analysis to be scientifically unsupportable and the testimony overstated and incorrect.” *Id.*

³⁶² Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Dept.*, THE WASHINGTON POST, April 1, 2012. According to Hsu, “In one Texas case, Benjamin Herbert Boyle was executed in 1997, more

defendants were not provided with “appropriate and timely disclosures” . . . “particularly in case . . . [where] the analysis or testimony was material to the conviction and the report of the independent scientists established that such evidence was unreliable.”³⁶³

The response to conclusions of the NAS Report and the ever-increasing number of wrongful convictions from the insular, largely independent forensic odontology community demonstrates the urgent necessity of legislation to provide avenues of post-conviction relief for prisoners whose convictions rest on discredited scientific evidence. First, there has been no effort at all to address known problems in past cases, even though the empirical data that would support such a review is well-documented and mounts annually.³⁶⁴ Worse, efforts that have been made to

than a year after the Justice Department began its review. Boyle would not have been eligible for the death penalty without the FBI’s flawed work, according to a prosecutor’s memo.” *Id.* Two others were executed prior to their cases being reviewed (though there was no finding of materiality); another capital defendant died in prison of natural causes before his case was reviewed. DEPT. OF JUSTICE, AN ASSESSMENT OF THE 1996 DEPARTMENT OF JUSTICE TASK FORCE REVIEW OF THE FBI LABORATORY ii (2014).

³⁶³ *Id.* at iii. The report concluded that of the 402 cases reviewed for the report, only in 13 were disclosures made to defendants or their last counsel of record. *Id.*

³⁶⁴ A 2013 investigation by the Associated Press revealed that at least twenty-four innocent men whose convictions and/or indictments were obtained through the use of bitemark evidence have been exonerated since 2000. Amanda Lee Myers, *Once Key in Some Cases, Bite Mark Evidence Now Derided as Unreliable*, ASSOCIATED PRESS, June 17, 2013, available at http://www.denverpost.com/ci_23474835/once-key-some-cases-bite-mark-evidence-now. Based on “decades of court records, archives, news reports” and interviews with “[t]wo dozen forensic scientists and other experts . . . including some who had never before spoken to a reporter about their work,” the AP investigation was the “most comprehensive” audit of bitemark cases ever

rectify the discipline's shortcomings have been directed mainly at salvaging an increasingly maligned discipline. For example, in August 2013 in the wake of wrongful convictions and indictments, lawsuits against the dentists who proffered false and misleading testimony³⁶⁵ and the devastating conclusions of the NAS Report, the American Board of Forensic Odontology (ABFO) finally conceded that individualization claims are invalid in "open population" cases where the universe of potential suspects is unknown.³⁶⁶ This dramatic and unprecedented change in the guidelines is a long-overdue admission that such testimony is scientifically invalid. But the change was not made publically, and no effort was made by the ABFO, or any other entity, to identify those cases – and convictions – that were in

undertaken. Amanda Lee Myers, *Men Wrongly Convicted or Arrested on Bite Evidence*, ASSOCIATED PRESS, June 16, 2013, available at <http://news.yahoo.com/men-wrongly-convicted-arrested-bite-evidence-150610286.html>.

³⁶⁵ See e.g., Burke v. Town of Walpole, 405 F.3d 66, 73 (1st Cir. 2005); Stinson v. City of Milwaukee, No. 09-C-1033, 2013 WL 5447916 (E.D. Wis.) (Sept. 30, 2013).

³⁶⁶ "The Biter," i.e., the individual responsible for the bite mark at issue, is the highest level of certainty sanctioned by the ABFO. Such a conclusion was authorized until August of 2013, when the Reference Manual was updated. See AMERICAN BOARD OF FORENSIC ODONTOLOGY, INC. DIPLOMATES REFERENCE MANUAL, *ABFO Standards for Bite Mark Terminology*, 117 (2013) ("The ABFO does not support a conclusion of 'The Biter' in an open population case(s)"). (Additionally, current president-elect of the ABFO, Dr. Peter Loomis, stated in July of this year that bite mark evidence "shouldn't be used to identify a suspect," and that it should only be used to 'include or exclude' a suspect, rather than to individualize in open population cases"; Jack Nicas, *Flawed Evidence Under a Microscope: Disputed Forensic Techniques Draw Fresh Scrutiny; FBI Says It Is Reviewing Thousands of Convictions*, THE WALL ST. J., March 26, 2012.

whole or in part the result of this type of now-rejected methodology.³⁶⁷ In short, the development, such as it is, seems to affect only the argument for the continued legitimacy of the discipline itself.³⁶⁸

³⁶⁷ In a recent *New York Times* article about Eddie Lee Howard's case in Mississippi, the current president of the ABFO was quoted as saying that "actually naming an individual biter to a reasonable degree of certainty should be very limited." Erik Eckholm, *Mississippi Death Row Case Faults Bite-Mark Forensics*, N.Y. TIMES, Sept. 15, 2014, available at http://www.nytimes.com/2014/09/16/us/mississippi-death-row-appeal-highlights-shortcomings-of-bite-mark-identifications.html?_r=0. In Howard's death penalty case, the ABFO member who testified, Dr. Michael West, testified that "to a reasonable medical certainty" that Howard's teeth inflicted the bite mark on the victim and, "Do I have any doubt [Howard's] teeth made that bite on [the victim's] breast? I don't have any." See Transcript of Record at 561, 584, *State v. Howard*, 92-400-CR1 (Lowndes Cnty. Cir. Ct. May 22, 2000).

³⁶⁸ In fact, in a response to the *New York Times* article on Howard's case, the ABFO posted this on its website:

The New York Times printed an article on 9/16/2014 faulting "bite-mark forensics." It highlights an appeal recently filed by the Mississippi Innocence Project with the Mississippi Supreme Court, of 22 year old case in which bite mark testimony was provided by Dr. Michael West. Like every news article, there are misstatements and some erroneous information is given. In particular, the author parrots the flawed Innocence Project publicity that 17 people previously convicted based on 'expert bite matches' have been exonerated by DNA evidence. The IP often uses the number of 24 so it least the number is down a bit, but in actuality the number is 10, and of these, five of the opinions were not "match" as the article mentions but a lesser opinion. While any number of wrongful convictions is unacceptable and we are all cognizant of the fact that some terrible mistakes have been made in the past, we cannot ignore the fact that hundreds of positive outcomes have occurred throughout the country wherein bite mark evidence played a crucial role in the judicial process to assist the triers of fact. The ABFO continues to make changes to ensure accuracy of expert opinions. The ABFO has developed the Bitemark Analysis and Comparison Decision Tree, is continuing to develop a bitemark proficiency examination, has significantly raised the bitemark and other requirements for examination eligibility for new candidates, requires recertifying diplomates to take a recertification examination and has revised the standards, guidelines and terminology for bitemark analysis.

Even assuming, though, a best-case scenario in which actors act with appropriate humility and haste, there are a host of practical difficulties. Hair microscopy serves as a good example. A legitimate audit of cases involving unvalidated hair microscopy evidence would have to include not only cases in which FBI analysts testified – several thousand cases over a 25 year period – but also those in which state analysts testified, as well. As discussed, beginning in the late 1970's, the FBI lab implemented a two-week training program in hair and fiber analysis for state and local lab employees, and there is ample evidence state practitioners were taught to proffer misleading testimony to triers of fact.³⁶⁹ As more and more states began to rely on their local and state labs to provide hair examiner reports and testimony in their state investigations and prosecutions, particularly in the 1980's and 90's, the Bureau's two-week program trained in excess of 500 examiners over a period that spanned twenty-five years.³⁷⁰ In short, there are likely thousands of cases – some in which FBI examiners provided testimony and others in which FBI-trained state analysts provided testimony³⁷¹ – which not only need to be part of an audit,³⁷² but, to the

Peter Loomis, *Third Quarter Message*, AMERICAN BOARD OF ODONTOLOGY, <http://www.abfo.org/abfo/presidents-message/> (last visited Feb. 15, 2015).

³⁶⁹ See *supra* notes 234-35 and accompanying text.

³⁷⁰ *Id.*

³⁷¹ A review of transcripts from state hair comparison cases during this period revealed a pattern of similar, invalid testimony by state hair experts, many of whom, if not most, learned to provide such testimony at the FBI training course.: *Memorandum of Potential Post-Conviction Arguments and Authority Based on*

extent that errors are found, counsel and defendants in those cases must be appropriately notified. Many of the cases will be decades old, records difficult to locate, and in some instances counsel impossible to locate. For jurisdictions already strapped for resources to fund their criminal justice systems, finding the resources, monetary and otherwise, may well turn out to be impossible.

B. Suggested Solutions

Conviction Integrity Programs (CIPs)³⁷³ have been used with success throughout a number of prosecutors' offices around the country,

Discredited Hair Microscopy Analysis, INNOCENCE PROJECT, [http://www.americanbar.org/content/dam/aba/events/criminal_justice/Forensics_U
pdate_Post_Conviction_Discredited_Science.authcheckdam.pdf](http://www.americanbar.org/content/dam/aba/events/criminal_justice/Forensics_Update_Post_Conviction_Discredited_Science.authcheckdam.pdf) (last visited Feb. 12, 2015) (“Among other things, this affidavit discusses the FBI’s training; in it, Mr. Howard states: —I was taught at the FBI class that the best basis for testimony was our own experience through case-work. The affidavit relates to improper hair comparison testimony provided by one time chief of the Montana State Crime Laboratory Arnold Melnikoff in Jimmy Bromgard’s trial for raping a young girl. After nearly 15 years in prison, Mr. Bromgard was exonerated through post-conviction DNA testing.”) (internal citations omitted).

³⁷² The American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) recognized the need for possible state reviews, as well. ASCLD/LAB recommended “each laboratory, in consultation with the appropriate legal authorities, consider whether there may be past cases, specifically involving convictions, in which it would be appropriate to evaluate the potential impact of the reported conclusions and/or related testimony on the conviction.” Press Release, American Society of Crime Laboratory Directors / Laboratory Accreditation Board, Notification from the ASCLD/LAB Board of Directors to Interested Parties Concerning Potential Issues with Hair Comparison Testimony (Apr. 21, 2013), *available at* <http://www.ascld-lab.org/notification-from-the-ascldlab-board-of-directors-to-interested-parties-concerning-potential-issues-with-hair-comparison-testimony/>.

³⁷³ See *Conviction Integrity Programs In Prosecutors’ Offices*, CENTER ON THE ADMINISTRATION OF CRIMINAL LAW’S CONVICTION INTEGRITY PROJECT, at http://www.law.nyu.edu/sites/default/files/upload_documents/Establishing_Conviction_Integrity_Programs_FinalReport_eclm_pro_073583.pdf (last visited Feb. 15, 2015).

and with certain modifications, may be the best administrative template for a successful remedy. Foremost among these programs' strengths is their practical approach to reviewing a discrete, identifiable set of cases for specific types of error. In essence, CIPs fill a gap that Rule 3.8 does not,³⁷⁴ and, in addition, they can stand as real, on-the-ground embodiments of aspirational standards that exist elsewhere.³⁷⁵ The units that we propose would, given the discrete focus on a certain subset of cases involving unreliable scientific evidence, be developed outside of, rather than within, prosecutors' offices and would thus function more like a neutral administrative agency rather than as a branch of an adversarial office.³⁷⁶ Like other successful CIPs their founding structure would incorporate best practices that among other things would grant them privileged access and cooperation – namely open file sharing, including work product, from both prosecutors' and defense attorneys' files, mutual investigative cooperation from all individuals and entities, including the forensic labs and analysts³⁷⁷

³⁷⁴ See Bruce A. Green & Ellen Yaroshefsky, *Prosecutorial Discretion and Post-Conviction Evidence of Innocence*, 6 OHIO ST. J. OF CRIM. L. 467, 511 (2009).

³⁷⁵ MODEL RULES OF PROF'L RESPONSIBILITY EC 7-13; *see also* ABA, American Bar Association Project on Standards for Criminal Justice, Prosecution and Defense Function §§ 3.9(c), 3.11 (Approved Draft 1971).

³⁷⁶ See Bruce A. Green & Ellen Yaroshefsky, *Prosecutorial Discretion and Post-Conviction Evidence of Innocence*, 6 OHIO ST. J. OF CRIM. L. 467, 506, n.96 (2009).

³⁷⁷ The cooperation of analysts may require that these individuals are accorded some limited immunity, when either requested or set forth as a reason for not participating in a review.

involved in identified cases.

1. Modification of procedural barriers

In addition to these modified conviction integrity models, procedural barriers cannot be erected to frustrate the very purpose of auditing these cases – to determine if false scientific evidence contributed to securing a conviction; thus, where such evidence was introduced, waivers of typical statute of limitations bars and other procedural default mechanisms must be granted as a matter of course. These suggestions are in accord with newly-developed post-conviction statutory modifications adopted in Texas and California, and, as importantly, coincide with the position that the DOJ has adopted with respect to affected cases identified in its hair microscopy audit. With respect to the FBI/DOJ audit, for example, letters notifying parties of the introduction of false evidence have stated “[i]n the event that the Defendant seeks post-conviction relief based on the Department’s disclosure that microscopic hair comparison reports or testimony used in this case contained statements that exceeded the limits of science, we provide the following information to make you aware of how we are handling such situations in federal cases. In such cases under 28 USC § 2255, in the interest of justice, the United States is waiving reliance on the statute of limitations under Section 2255(f) and any procedural default defense in order to permit the resolution of legal claims arising from

the erroneous presentation of microscopic hair examination laboratory reports or testimony.”³

In addition, most states’ post-conviction statutes require not simply that evidence – in this case errors affecting the admitted forensic evidence – is newly-discovered, but that its discovery would have affected the outcome of the trial.³⁷⁹ This standard, too, should be modified with respect to the cases that a CIP deems meritorious. Specifically, because so many of these

³⁷⁸ Letter, John Crabb Jr., U.S. Dept. of Justice, to Robert P. McCulloh, St. Louis County Prosecutor’s Office, Aug. 20, 2013, available at <http://www.law.ucla.edu/~media/Assets/Supreme%20Court%20Clinic/Documents/cert%20petition%20Ferguson%20v%20Steele.ashx>. There is ample precedent for this position. *See generally* Wilson v. Beard, 426 F.3d 653, 661 (3rd Cir. 2005) (holding that due diligence did not require prisoner to monitor local news twelve years after conviction when there was no reasonable basis to conclude that local news would provide information on prisoner’s case); Poole v. Woods, No. 08-cv-12955, 2011 WL 4502372, at *17 (E.D. Mich. Aug. 9, 2011) (holding that due process claim based on discovery of faulty bite mark evidence was timely under applicable limitations period of AEDPA and that reasonable diligence did not require the Petitioner to regularly scour the Detroit Free Press and Michigan Court Reporters more than a half-decade after his direct appeal was exhausted in the off-chance that something unforeseeable yet useful to his case would be found); United States v. Atchison, No. 09 C 2105, 2012 WL 581163, at *5 (N.D. Ill. Feb. 22, 2012) (holding that Due diligence does not require prisoners “to hunt through haystacks trying to figure out whether one of them might contain a needle”). In fact, most post-conviction petitioners have limited access (if any) to technical, scientific research. *See generally* In re Trapp, No. 65393-8-I, 2011 WL 5966266, at *5 (Wash. App. Div. 1 Nov. 28, 2011) (holding petition based on newly-discovered CBLA evidence not time-barred because, while “a report generally calling CBLA evidence into question may have been published in 2004, the extent of the FBI’s ‘misleading’ testimony in [the petitioner’s] case only became apparent after a detailed review of the trial record by specialists at the FBI laboratory sometime in 2009”).

³⁷⁹ *See, e.g.*, LA. CODE CRIM. PROC. § 930.3. Some States allow newly discovered evidence arguments only in support of an actual innocence claim. *See* MD. CODE ANN. § 8-301; CAL. PEN CODE § 1473.6 (newly discovered evidence must “point unerringly to his or her innocence”).

cases will be so old and information difficult to access and assess, the standard should be akin to a due process analysis of whether false evidence was admitted into the trial, and, if so, whether there is any reasonable likelihood the evidence affected the judgment of the jury.³⁸⁰ If so, relief should be warranted. Alternatively, the burden of proving that the trial was fundamentally fair notwithstanding the introduction of unvalidated forensic evidence should rest with the prosecution, which would be required to show that the constitutional error was harmless “beyond a reasonable doubt.” More specifically, where the court, the prosecutor and defense counsel all operated under the false assumption that the scientific evidence at issue was valid and reliable, there was no meaningful adversarial testing of the false evidence. Thus the introduction of the now discredited evidence, which was nevertheless proffered to the jury as infallible “scientific” evidence of guilt, was so unfair it resulted in a “breakdown in the adversarial process” in violation of petitioner’s due process rights.³⁸¹

³⁸⁰ See, e.g., *Giglio v. United States*, 405 U.S. 150, 154 (1972).

³⁸¹ See *Brecht v. Abrahamson*, 507 U.S. 619, 639 (1993) (Stevens, J., concurring) (“The Fourteenth Amendment prohibits the deprivation of liberty ‘without due process of law’; that guarantee is the source of the federal right to challenge state criminal convictions that result from fundamentally unfair trial proceedings.”); *Estelle v. McGuire*, 502 U.S. 62, 70 (1991) (“‘The Due Process Clause guarantees fundamental elements of fairness in a criminal trial’”); *Chambers v. Mississippi*, 410 U.S. 284, 294 (1973) (“The right of an accused in a criminal trial to due process is, in essence, the right to a fair opportunity to defend against the State’s accusations.”); *Spencer v. Texas*, 385 U.S. 554, 563–64, (1967) (“Cases in this Court have long proceeded on the premise that the Due Process Clause guarantees the fundamental elements of fairness in a criminal

CONCLUSION

On one hand, the extent of the problems that this article illustrates and the call that it makes for affirmative acts of reform risk its being characterized as simply more of the same: an agendized, partisan philosophical position about the state of the criminal justice system, albeit this time costumed with an abundance of data and excerpts from case law. Were that characterization correct, then equally partisan responses in opposition could follow as a matter of course. The end result would be a stalemate: one side arguing that what this article documents is the natural by-product of a broken system; the other that it is the natural, collateral consequence of a system trying, albeit with too much aspiration, to balance public safety against the competing claims of defendants' due process rights.

The fact of the matter is, however, that this article, though it certainly documents disturbing failures – both in individual cases as well in

trial."); *see also* *United States v. Cronic*, 466 U.S. 648, 657 (1984) ("The right to the effective assistance of counsel is thus the right of the accused to require the prosecution's case to survive the crucible of meaningful adversarial testing."); *Strickland v. Washington*, 466 U.S. 668, 696 (1984) ("[T]he ultimate focus of inquiry must be on the fundamental fairness of the proceeding whose result is being challenged. In every case the court should be concerned with whether, despite the strong presumption of reliability, the result of the particular proceeding is unreliable because of a breakdown in the adversarial process that our system counts on to produce just results."); *accord Michigan v. Bryant*, 131 S.Ct. 1143, 1163 n. 13 (2011) ("The Due Process Clauses of the Fifth and Fourteenth Amendments may constitute a further bar to admission of, for example, unreliable evidence.")

several disciplines – is nevertheless focused on a finite number of specific cases, a circumscribed jurisprudence, and a group of individuals and entities that can themselves provide an immediate and effective solution. Or not. The results of that decision, though, are stark. To the extent that it is an overstatement to claim that a decision one way or the other defines the character of the system as a whole, it is not too much to claim that given what we know about the kinds of failures documented here, a decision to act, or not, characterizes specific individuals and entities. And that characterization works from the bottom up, as it were, to create a larger, more resonant definition.

To illustrate, consider the following case: The defendant was convicted of sexual assault in Mississippi in 1981 and sentenced to twenty-five years in prison. The evidence against him, as the Mississippi Supreme Court noted, “was conflicting.”³⁸² He was identified by the victim as the person who had assaulted her, as well as by another individual, who testified that she had observed the defendant at the victim’s house on the day of the assault.³⁸³ The defendant denied having committed the offense and testified that he had been in Chicago on the day it occurred.³⁸⁴ He voluntarily surrendered to police upon his return.³⁸⁵

³⁸² Hyde v. State, 413 So.2d 1042, 1044 (Miss. 1982).

³⁸³ *Id.*

³⁸⁴ *Id.* at 1043.

³⁸⁵ *Id.*

The only physical evidence that connected the defendant to the crime scene was human hair. According to the court, “[h]air samples taken from the appellant and the prosecutrix's clothing were compared in the F.B.I. laboratory. All twenty individual characteristics identified in appellant's hair matched the characteristics of the hair taken from the victim's clothing.”³⁸⁶

In 2001, after the DOJ and FBI became aware that the analyst who had provided the testimony in the Mississippi case was Michael Malone, known by then “as the agent making the most frequent exaggerated testimony,”³⁸⁷ the DOJ wrote a letter to the district attorney in Mississippi whose office had prosecuted the case.³⁸⁸ The letter alerted the prosecutor to the fact that the Mississippi case was under federal review and asked the prosecutor for “any other information you may have related to the . . . case to determine if Malone's laboratory work was material to the conviction.”³⁸⁹

By that time, the case had been appealed and affirmed, and the trial transcript – at least the copy that the Mississippi Supreme Court had used – was located in the State archives in Jackson. The authors recently read it. Among the claims that the FBI analyst Malone made were these: in order to

³⁸⁶ *Id.*

³⁸⁷ Spencer S. Hsu, *Convicted Defendants Left Uninformed of Forensic Flaws Found by Justice Department*, Washington Post, April 16, 2012.

³⁸⁸ Letter from Amy Jabloner, U.S. Dept. of Justice, to Ben Saucier, District Attorney (July 26, 2001).

³⁸⁹ *Id.*

be qualified for his job, he had to perfectly match fifty hairs to fifty people;³⁹⁰ that the hairs recovered from the crime scene microscopically matched the head hairs of . . . [the defendant]. In other words, they were indistinguishable from his head hairs. How unlikely [would it be for two different people to share the same observed characteristics]? In about ten thousand hair exams, I've only seen two occasions where I had hairs from two different people that I couldn't distinguish.”³⁹¹

In March of 2002, eight months after the DOJ had alerted the district attorney to the potential problem and asked for assistance, the district attorney responded. In a handwritten response on a single fax cover page, the district attorney said “This is a 20 year old case with all record files having been previously destroyed. No determination to your request can be made.”³⁹²

No substantive additional action has been taken on the case since.

³⁹⁰ Transcript of Record at 161, State v. Hyde, No. 53424 (Jackson Cnty. Cir. Ct. Apr. 24, 1982).

³⁹¹ *Id.* at 170.

³⁹² Fax from Ben Saucier, District Attorney, to Ellis Gordon, U.S. Dept. of Justice, (March 23, 2002).