

Refried Forensics: Screening Expert Testimony in Criminal Cases Through *Frye* Plus Reliability

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I. INTRODUCTION

Nowhere in the justice system is a witness granted such responsibility and respect as the expert¹—the only witness not limited to first-hand knowledge, but allowed to proffer opinions about why and how an event occurred.² In response to the growing importance of experts, a great deal of jurisprudence developed over the past century regarding the admission of expert testimony, though initially it developed slowly.³ The debate around the admissibility of expert testimony truly picked up steam when scientifically complex civil litigation started to boom.⁴ This led to a nationwide sea change concerning the admission of expert testimony—eventually referred to as the *Daubert*⁵ revolution.⁶

Although civil litigation underwent a tectonic shift following the adoption of *Daubert*,⁷ the roles and responsibilities of the forensic expert did not change.⁸ In criminal cases, forensic experts offer jurors a wealth of information for understanding the crime, often serving as the lynchpin of a criminal case, relaying to jurors the importance of specific characteristics that link evidence to a particular person or object.⁹ This includes examining patterns (e.g., fingerprint, toolmark, or bloodstain patterns), analyzing certain substances (e.g., DNA, chemicals—especially drugs, or body fluids), or interpreting digital evidence.¹⁰ No matter the forensic discipline,

¹ See Edward J. Imwinkelried, *The Importance of Daubert in Frye Jurisdictions*, 42 CRIM. L. BULL. 215 (2006) (“[T]he primary rationale for the Frye test is the policy concern that lay jurors will ascribe inflated importance to expert testimony.”).

² See Dave G. Owen, *A Decade of Daubert*, 80 DENV. U. L. REV. 345, 346 (2002) (“[T]he law of evidence gives experts especially wide latitude to offer opinions not available to ordinary witnesses.”); see also FED. R. EVID. 701, 702, 703, 705 and similar state evidentiary rules.

³ See NATIONAL RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 88–92 (2009), <http://www.nap.edu/catalog/12589.html> (outlining the historical development of law concerning the admission of expert testimony).

⁴ See Arvin Maskin & Isabella C. Lacayo, *Expert Evidence In The Federal Courts: A Historical Perspective*, 20 WESTLAW J. CLASS ACTION 18, 1 (2013) (“modern admissibility rules were largely shaped in the context of mass-tort case”).

⁵ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

⁶ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 88–90 (detailing the deficiencies of the standard outlined under *Frye v. United States*, the case history of *Daubert*, and the policy justifications for replacing *Frye* with *Daubert* and Federal Rule of Evidence 702).

⁷ See ALEX STEIN, FOUNDATIONS OF EVIDENCE LAW 236–37 (2005) (calling the replacement of *Frye* by *Daubert* a “profound improvement” in “civil, as opposed to criminal” litigation).

⁸ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 4 (expanding on the continuity in forensic science over the decades).

⁹ See Jessica G. Cino, *An Uncivil Action: Criminalizing Daubert in Procedure and Practice to Avoid Wrongful Convictions*, 119 W. VA. L. REV. 651, 654 (2016) (finding “uniqueness” to be the key notion upon which forensic science is grounded).

¹⁰ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 25.

however, the forensic expert has two essential duties: (1) providing a scientific basis for identifying persons who commit crime; and (2) “protecting innocent persons from being convicted of crimes that they did not commit.”¹¹ In fulfilling these critical duties, the word of the expert is often determinative.¹² Forensic experts provide invaluable testimony both for the prosecution of the guilty and for the exoneration of the innocent.¹³ Too often, however, the admission of forensic evidence is a system of high stakes and tragic shortcomings.¹⁴ Very infrequently, the system fails completely as a result of outright fraud.¹⁵ More often, when it falls short, it does so due to a reliance on flawed,¹⁶ unverified,¹⁷ erroneous,¹⁸ or subsequently discredited evidence.¹⁹ In these circumstances, the cost of failure may be the accused’s liberty. *Quis custodiet ipsos custodiet?* Translated: Who, then, watches the experts?

In both theory and practice, the answer should be the court. As stated, however, in the landmark 2009 report by the National Research Council (NRC), “[i]n a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem.”²⁰ That gulf, between evidence and empirical validity—a gap which is shrinking, but remains too large nonetheless—has

¹¹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 96.

¹² See Imwinkelried, *supra* note 1 (finding the primary rationale for the *Frye* test to be the policy rationale that jurors will “ascribe inflated importance to expert testimony”); see also Bert Black et al., *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715, 789 (1994) (“[M]ost commentators believe ostensibly scientific testimony may sway a jury even when as science it is palpably wrong. Science can be greatly distorted by the pressures of litigation, but once admitted into evidence, it has an imprimatur of legitimacy and validity, and cross-examination often will not expose its flaws.”).

¹³ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 4 (“For decades, the forensic science disciplines have produced valuable evidence that has contributed to the successful prosecution and conviction of criminals as well as to the exoneration of innocent people.”).

¹⁴ See *id.* at 44–46 (summarizing errors and their consequences).

¹⁵ See *id.* at 44 (describing the infamous fraud perpetrated by West Virginia State Police laboratory employee Fred Zain, in which more than 100 convictions were called into question because of Zain’s repeated falsification of lab results).

¹⁶ See *id.* at 178 (“Scientific studies support some aspects of bloodstain pattern analysis. . . . but some experts extrapolate far beyond what can be supported.”).

¹⁷ See *id.* at 173 (“Despite the paucity of research, some arson investigators continue to make determinations about whether or not a particular fire was set.”).

¹⁸ See *id.* at 176 (“. . . research is warranted in order to identify the circumstances within which the methods of forensic odontology can provide probative value.”).

¹⁹ See *Ege v. Yukins*, 485 F.3d 364, 377376 (6th Cir. 2007) (granting the appellant’s habeas corpus petition in part because the bite mark expert’s testimony was “significantly, if not completely, discredited”).

²⁰ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 53.

led all fifty states to offer some form of post-conviction DNA testing for exonerating the wrongfully convicted.²¹ This reflects a clear consensus that extending procedural relief to those whose convictions were the result of flawed science is important. Yet, in order to honor the spirit of this consensus and hew more closely to the underlying goals of forensic science, namely identifying the guilty and exonerating the innocent,²² courts must take a more proactive approach to preventing the admission of flawed science.

*Frye*²³ created the first common standard for screening scientific testimony.²⁴ Centered around “general acceptance,” the *Frye* standard made the scientific community the barrier between expert testimony and the ears of the jurors.²⁵ To be admissible, novel scientific techniques needed first to gain acceptance among members of the relevant scientific community.²⁶ *Daubert*, building on Federal Rule of Evidence (FRE) 702, shifted this gatekeeping role from the scientific community to the bench.²⁷ The *Daubert* standard, centered around relevance and grounded in the notion that the adversarial system would protect jurors from flawed science,²⁸ made the judge an arbiter of a five-part test designed, *inter alia*, to allow greater flexibility.²⁹

Although *Daubert* represented a watershed,³⁰ the *Frye* test remains a critical consideration in evaluating expert testimony for a host of reasons.³¹ First, *Daubert*’s profound influence has been largely limited to civil cases.³²

²¹ DONALD E. WILKES, JR., STATE POSTCONVICTION REMEDIES AND RELIEF HANDBOOK § 1:8, at 18 (2015–16 ed.).

²² See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 96.

²³ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

²⁴ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 88 (calling *Frye* the “first notable development” in the development of tests governing the admissibility of scientific evidence).

²⁵ See *Frye*, 293 F. at 1014 (requiring that “the thing from which the deduction is made” to have sufficient acceptance in order to be admitted as expert testimony).

²⁶ *Id.*

²⁷ See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 596–97 (1993) (detailing both the supremacy of Rule 702 and recognizing “a gatekeeping role for the judge”).

²⁸ See *id.* at 596 (anticipating “[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof” as the means by which to mitigate the impact of scientifically unsound evidence).

²⁹ See *id.* at 591 (requiring: (1) reliable methods and principles; (2) reliable application of a technique to a particular case; (3) that the expert testimony fit the facts of the case; (4) that the expert be qualified; and (5) general acceptance); see also *id.* at 594 (“The inquiry envisioned by Rule 702, we emphasize, is a flexible one.”).

³⁰ STEIN, *supra* note 7, at 237.

³¹ Adina Schwartz, A “Dogma of Empiricism” Revisited: *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, and the Need to Resurrect the Philosophical Insight of *Frye v. United States*, 10 HARV. J.L. & TECH. 149, 193 n.157 (1997) (citing *Frye*’s deference to scientists as a “fundamental philosophical insight”).

³² STEIN, *supra* note 7, at 237 (“[T]he replacement of *Frye* by the *Daubert* Trilogy

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On both the trial³³ and appellate levels³⁴ of the criminal justice system, *Daubert* challenges to prosecutorial evidence often go unheeded. Secondly, because states bring more than 200 times the number of criminal prosecutions as the federal government,³⁵ and the largest and most litigious jurisdictions retain a version of *Frye* in criminal prosecutions,³⁶ the impact of *Frye* remains significant.

More than forty percent of the U.S. population lives in a *Frye* jurisdiction.³⁷ As such, *Frye* warrants continued attention. A quarter century after *Daubert* sought to shift the “gatekeeper” role from the scientific community to the bench and restructure admission around relevance, the changes have not produced the intended improvement of verifiable scientific accuracy during criminal trials.³⁸ Instead, that hoped-for shift may have in fact ossified existing bad habits.³⁹ Although existent *Frye* tests could be improved by modification,⁴⁰ its underlying standard—general acceptance—helps to minimize the introduction of flawed scientific evidence by filtering evidentiary decisions through the scientific community, and consequently, through *Frye*’s inherently more “austere” legal standard.⁴¹

introduced a profound improvement into the civil, as opposed to criminal justice systems across the United States.”).

³³ See Peter J. Neufeld, *The (Near) Irrelevance of Daubert to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH S107, S109 (“[D]espite the frequency with which scientific and expert testimony is proffered in criminal cases, there is a dearth of *Daubert* challenges and hearings.”).

³⁴ DAVID L FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 1.35, 105 (stating that studies suggest the courts “employ *Daubert* more lackadaisically in criminal trials—especially in regard to prosecution evidence—than in civil cases—especially in regard to plaintiff evidence”).

³⁵ Neufeld, *supra* note 33.

³⁶ Edward J. Imwinkelried & William A. Tobin, *Comparative Bullet Lead Analysis (CBLA) Evidence: Valid Inference or Ipse Dixit?*, 28 OKLA. CITY U. L. REV. 43, 55 (2003) [hereinafter *Comparative Bullet Lead Analysis*].

³⁷ *United States Census 2010*, CENSUS, <https://www.census.gov/2010census/> (combining population totals for California, Florida, Illinois, Maryland, New Jersey, New York, Pennsylvania, Washington, and Washington D.C.).

³⁸ STEIN, *supra* note 7, at 237.

³⁹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 110. “The judicial system is encumbered by, among other things, judges and lawyers who generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner, trial judges (sitting alone) who must decide evidentiary issues without the benefit of judicial colleagues and often with little time for extensive research and reflection, and the highly deferential nature of the appellate review afforded trial courts’ *Daubert* rulings.” NATIONAL RESEARCH COUNCIL, *supra* note 3, at 110.

⁴⁰ Schwartz, *supra* note 31, 198–99 (advocating for a return to *Frye*, but stating that the case law surrounding general acceptance “requires modification”).

⁴¹ See *Daubert v. Merrell Dow Pharm., Inc.* 509 U.S. 579, 587–89 (describing the standard of relevance under Rule 702 as “liberal,” whereas the *Frye* general acceptance test is termed “austere”).

In five parts, this paper will argue for broader application of the *Frye* standard during criminal trials. Part II will provide a general overview of forensic science. Part III will outline the history of expert evidence, from early developments, to the general acceptance of *Frye*, and finally, to the incomplete revolution of *Daubert*. Part IV will summarize current *Frye* standards in use. Part V will make a case for the relative merits of *Frye* in the criminal context, and propose a common *Frye* standard designed to limit the admission of unverified expert testimony. Part VI will apply that standard to the five stages of expert testimony outlined in Professor Imwinkelried's paper.⁴²

In cases that rest on subsequently invalidated expert testimony, it is imperative to offer post-conviction relief in a manner that balances finality and accuracy—interests which, all too often, come into conflict.⁴³ The ultimate goal for all participants in the criminal justice system, however, should be to create a world in which as few people as possible need to seek post-trial right relief—a world in which expert evidence is rigorously and effectively tested *ex ante* by trial courts. Post-conviction avenues for exonerations are necessary, but they are only curative on a case-by-case basis; reforming the admission of expert evidence at trial represents a universal solution. Both are necessary.

II. CURRENT ISSUES SURROUNDING THE ADMISSION OF FORENSIC EVIDENCE

Nearly ten years ago, the NRC laid bare the structural weaknesses of forensic science, ranging from non-standardized training regimens, to a dearth of resources, to wholly unsubstantiated practice areas.⁴⁴ These revelations were not intended to disparage a deeply necessary intersection of science and the law. Rather, keeping in mind Brandeis' maxim that sunshine is the best disinfectant,⁴⁵ these findings were released to spur further improvements to assist law enforcement in identifying the perpetrators of crime and to reduce the frequency of wrongful convictions.⁴⁶ The fact

⁴² Edward J. Imwinkelried, *Debunked, Discredited, but Still Defended Revising State Post-Conviction Relief Statutes to Cover Convictions Resting on Subsequently Invalidated Expert Testimony*, 48 SETON HALL L. REV. 1095 (2018).

⁴³ See Vincent P. Iannece, *Breaking Bad Science: Due Process as a Vehicle for Postconviction Relief When Convictions Are Based on Unreliable Scientific Evidence*, 89 ST. JOHN'S L. REV. 195, 227 (2015) (contrasting the institutional need for finality with the broader societal goal of fairness and accuracy).

⁴⁴ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 96; see also Cino, *supra* note 9, at 652 (“[A] lack of research led to testimony—and closing arguments—that exceed[] the boundaries of science.”).

⁴⁵ LOUIS D. BRANDEIS, OTHER PEOPLE'S MONEY AND HOW BANKERS USE IT 92 (1914) (“Sunlight is said to be the best of disinfectants; electric light the most efficient policeman.”).

⁴⁶ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 4–5. The NRC also included

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remains, however, that nine years ago, a non-partisan, congressionally appointed committee found the state of forensic science to be lacking.⁴⁷

Forensic science is grounded in the notion that a piece of evidence has unique characteristics that can relate it back to another object or a specific user.⁴⁸ In some forms of pattern identification, however, techniques have been found to lack scientific backing.⁴⁹ Arson evidence and forensic odontology are examples of disciplines whose credibility in the courtroom is thought to rest largely on faith.⁵⁰

Although a scientific foundation exists to support the analysis of explosions (i.e., reconstructing the materials from which a bomb was built), the variability of burn patterns has not been studied to a degree that would allow forensic scientists to reliably determine whether a particular fire was the work of nature or arson.⁵¹ In spite of a “paucity of research,” evidentiary techniques amounting to little more than “rules of thumb” have been permitted in front of jurors.⁵² Such evidence was critical in securing a guilty verdict for Han Tak Lee.⁵³ Mr. Lee was ultimately exonerated after serving twenty-four years in prison, partially because his conviction rested on a faulty scientific inference from testimony regarding “charring patterns and glass fracturing indicat[ing] a deliberately set fire.”⁵⁴ Similarly, many of the commonplace forensic techniques used to indicate the presence of an accelerant have not held up under scientific scrutiny.⁵⁵

Forensic odontology, the application of dentistry to criminal investigations, may be the most controversial area of forensic science.⁵⁶ Bite marks are often created during the course of particularly violent crimes,

homeland security as one of the key policy imperatives underpinning a needed improvement in forensic science. NATIONAL RESEARCH COUNCIL, *supra* note 3, at 4–5.

⁴⁷ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 5 (“[M]ajor challenges still face the forensic science community.”).

⁴⁸ Cino, *supra* note 9, at 654 (finding “uniqueness” to be the key notion upon which forensic science is grounded).

⁴⁹ *Id.*

⁵⁰ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 170–76 (highlighting the weaknesses of the aforementioned disciplines).

⁵¹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 172–73.

⁵² NATIONAL RESEARCH COUNCIL, *supra* note 3, at 173.

⁵³ Kirk Semple, *Locked Away for 24 Years, an Exonerated Man Still Feels Imprisoned*, N.Y. TIMES (Mar. 10, 2016), <https://www.nytimes.com/2016/03/11/nyregion/locked-away-for-24-years-han-tak-lee-still-feels-imprisoned.html>.

⁵⁴ *Id.*

⁵⁵ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 173 (“[M]any of the rules of thumb that are typically assumed to indicate that an accelerant was used (e.g., ‘allegatoring’ of wood, specific char patterns) have been shown not to be true.”).

⁵⁶ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 173 (calling bite mark comparison the most controversial of the areas surveyed by the NRC).

including homicides, sexual assaults, and cases of child abuse.⁵⁷ These marks can reliably be used to *exclude* suspects.⁵⁸ Forensic odontology, however, cannot *positively* identify a suspect in an accurate manner, because “[u]nfortunately, bite 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.”⁵⁹

The gap between science and legal substantiation does not exist in a vacuum; it exists in the courtroom. Unfortunately, once an expert is able to present scientifically unsound evidence to the jury, it is often too late for the defendant to recover, even if that evidence is “palpably wrong.”⁶⁰ As a discipline, forensic science took the 2009 NRC Report incredibly seriously, and has responded earnestly.⁶¹ Legislatures, too, are beginning to respond in kind.⁶² The courts, however, have lagged behind.⁶³

Part of the problem is that, broadly speaking, “judges and lawyers [] lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner.”⁶⁴ Moreover, beyond the lack of specialized scientific knowledge in the legal community, it is the intellectual gap that exists between how jurists and scientists pursue the truth that often leads to incongruous results.⁶⁵ Whereas the law embraces the adversarial system to pursue a final and just resolution of disputes⁶⁶—a particularly fraught process for criminal defendants attempting to introduce expert testimony⁶⁷—science is allowed the time to determine the truth

⁵⁷ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 173.

⁵⁸ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 176.

⁵⁹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 174.

⁶⁰ *See* United States v. Addison, 498 F.2d 741, 744 (D.C. Cir. 1974) (“[S]cientific proof may in some instances assume a posture of mystic infallibility in the eyes of a jury of layman.”); *see also* Black et al., *supra* note 12, at 789 (“Though there is some disagreement, most commentators believe ostensibly scientific testimony may sway a jury even when as science it is palpably wrong.”).

⁶¹ *See* NATIONAL RESEARCH COUNCIL, *supra* note 3, at 1–2 (detailing the recommendations derived from the National Commission on Forensic Science’s four-year congressional mandate, as well as recommendations for the future).

⁶² *See, e.g.*, CAL. PENAL CODE § 1473.7 (West 2017); TEX. CODE CRIM. PROC. ANN. art. 11.073 (West 2015).

⁶³ *See* NATIONAL RESEARCH COUNCIL, *supra* note 3, at 110 (labeling the adversarial process as unsuited “to the task of finding ‘scientific truth’”).

⁶⁴ *Id.* at 110.

⁶⁵ *Confronting the New Challenges of Scientific Evidence*, 108 HARV. L. REV. 1481, 1484 (1995) (“[D]ifferences between law and science have engendered both systemic and pragmatic dilemmas for the law and the actors within it.”).

⁶⁶ *See id.* (finding the purpose of the adversarial process, and its version of “truth,” to contrast with the goals of science).

⁶⁷ Margaret A. Berger, *Procedural Paradigms for Applying the Daubert Test*, 78 MINN. L. REV. 1345, 1359 (1994) (“Studies show that courts have been quite reluctant to authorize funds for defense experts.”); *see also* Paul C. Giannelli, “Junk Science”: *The Criminal Cases*,

empirically.⁶⁸

According to the NRC report “[m]uch forensic evidence . . . is introduced in criminal trials without “meaningful scientific validation, determination of error rates, or reliability testing to explain the limits of the discipline,” forcing the system to instead rely upon the adversarial process (or lack thereof) to separate the wheat from the chaff.⁶⁹ In an extreme example of this process falling short, ballistics evidence was admitted even when the testifying sergeant “conceded, over and over again, that he relied mainly on his subjective judgment.”⁷⁰ Although the judge opined that the sergeant’s testimony “ought not be considered admissible under *Daubert*,”⁷¹ she admitted the evidence under pressure from the decisions of her peers, as similar ballistics evidence had been admitted by “every single court post-*Daubert*”⁷² Remarkably, using bitemark evidence for the purposes of positive identification remains good law, even in the wake of the 2009 NRC report.⁷³ Given the reality of what criminal defendants face when confronted with the state’s forensic experts—namely, an unequal battle for the minds of jurors⁷⁴—it is time to revisit the standards by which those experts are introduced, in order to improve the test necessary for delimiting science from pseudoscience.⁷⁵

84 J. CRIM. L. & CRIMINOLOGY 105, 124–25 (1993) [hereinafter *Junk Science*] (detailing cases in Oklahoma and Alabama where “the defense did not retain experts, because the presiding judge had refused to authorize funds”).

⁶⁸ *Confronting the New Challenges of Scientific Evidence*, *supra* note 65, at 1484.

⁶⁹ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 107–08 (finding fraught areas of forensic science—namely bite mark, firearm, and tool mark identification, to regularly be introduced without any meaningful examination of their scientific underpinnings).

⁷⁰ *United States v. Green*, 405 F. Supp. 2d 104, 107 (D. Mass. 2005).

⁷¹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 108.

⁷² *Green*, 405 F. Supp. 2d at 108 (italicized emphasis omitted). The judge continued by stating: “I reluctantly come to [this] conclusion because of my confidence that any other decision will be rejected by appellate courts, in light of precedents across the country, regardless of the findings I have made. While I recognize that the *Daubert-Kumho* standard does not require the illusory perfection of a television show . . . the standards should be higher than were met in this case, and than have been imposed across the country. The more courts admit this type of toolmark evidence without requiring documentation, proficiency testing, or evidence of reliability, the more sloppy practices will endure; we should require more.” *Id.* at 109.

⁷³ See *Milone v. Camp*, 22 F.3d 693, 702 (7th Cir. 1994) (finding the inclusion of forensic odontology in a murder trial insufficiently prejudicial to warrant a new trial); see also *Burke v. Town of Walpole*, 405 F.3d 66, 82–83 (1st Cir. 2005) (rejecting petitioners claim that being jailed for forty-one days on the basis of bite mark evidence, even in the presence of exculpatory DNA evidence, represented “reckless disregard for the truth”).

⁷⁴ Paul C. Giannelli, *Daubert and Criminal Prosecutions*, 26 CRIM. JUST. 61, 62 (2011) [hereinafter *Daubert and Criminal Prosecutions*]; see also NATIONAL RESEARCH COUNCIL, *supra* note 3, at 98 (“[P]rosecutors usually have an advantage over most defendants in offering expert testimony in criminal cases.”).

⁷⁵ See *Berger*, *supra* note 67, at 1359 (noting the difficulties defendants face in procuring

III. THE DEVELOPMENT OF EXPERT EVIDENCE: EARLY COMMON LAW TO *DAUBERT*

A. *Early Developments*

Throughout the history of the Anglo-American justice system, experts have had a hand in settling disputes.⁷⁶ Over time, common law courts employed two methods for drawing upon the knowledge of experts, one of which forms the basis for expert testimony as we know it today.⁷⁷ The first method, in place for hundreds of years, employed expert jurors when issues extended outside the ken of the layman.⁷⁸ Pulled from a pool of skilled tradesmen, a special jury would be tasked with a case that directly related to their craft.⁷⁹ The second method, “call[ing] to the aid of the court skilled persons whose opinion it might adopt or not as it pleased,”⁸⁰ was a far more permissive process than that seen in today’s courtrooms.⁸¹ If an individual was proffered as an expert in a given area, he would be admitted and allowed to testify.⁸² Although overbroad, this standard nonetheless represents the lineage from which today’s system of expert testimony derives; experts were qualified according to their area of specialization, they outlined a particular scientific method (the major premise), then applied that method to the particular fact pattern before them (the minor premise).⁸³ The devil, however, is indeed in the details when it comes to the admission of expert testimony. *Laissez-faire* was not to last.⁸⁴

expert testimony).

⁷⁶ See Learned Hand, *Historical and Practical Considerations Regarding Expert Testimony*, 15 HARV. L. REV. 40, 40 (1901) (describing developments in Anglo-American expert testimony, from 1345 until 1901).

⁷⁷ See *id.* (stating that “there seem to have been two modes of using what expert knowledge there was”—namely, impaneling a special jury and offering expert testimony to lay jurors).

⁷⁸ See *id.* at 41 (outlining the history and procedures involved in impaneling a special jury).

⁷⁹ See *id.* (listing, for example, the leader of a guild as a potential expert juror).

⁸⁰ *Id.* at 40.

⁸¹ Owen, *supra* note 2, at 354 (“The courts generally allowed . . . experts to provide relevant testimony about technical matters as a matter of course: once a person was qualified as an expert, the judge simply admitted into evidence his or her relevant opinion testimony.”).

⁸² See *id.* (“At early common law, the only real limit[] on expert testimony was that the person proffered as an expert be qualified as an expert in the field.”).

⁸³ Hand, *supra* note 76, at 52. (“Having no experience . . . [the jury] should take those generalizations into the stock of the major premises which they apply to the facts, and using them, say whether A wrote the note or did not.”).

⁸⁴ See *Frye v. United States*, 293 F. 1013, 1013–14 (D.C. Cir. 1923) (representing the first major test constricting the free flow of expert testimony in court).

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B. *The Formulation of Frye*

As the sciences began to exert greater and greater influence in the early twentieth century, the legal system struggled to create a coherent test to govern the admissibility of evidence outside the ken of the layman.⁸⁵ *Frye v. United States*⁸⁶ represented the first major development in reforming the admission of expert evidence.⁸⁷ Although *Frye* was barely a two-page opinion with its jurisdictional influence limited to Washington D.C.,⁸⁸ it grew to become the predominant test governing the admission of expert evidence in the United States.⁸⁹ This unlikely landmark case, citing no authority, and offering no explanation, reshaped the landscape of admissible expert evidence around “general acceptance.”⁹⁰ *Frye*’s underlying facts were simple. The defendant appealed from a conviction of second degree murder, alleging a single assignment of error—the denial of a defense expert offered to testify to the result of a “deception test.”⁹¹ In essence, the test was an early version of a lie detector that relied on measuring systolic blood pressure in order to discern true answers from false ones.⁹²

On appeal, the court affirmed the exclusion of the expert’s testimony on the grounds that use of this proto-lie detector had not been accepted by physiological or psychological authorities.⁹³ Laying the groundwork for decades of evidentiary decisions to come, *Frye* laid out an “evolutionary” process by which a technique was to be vetted by the relevant scientific community.⁹⁴ The key language states:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the

⁸⁵ *Confronting the New Challenges of Scientific Evidence*, *supra* note 65, at 1486.

⁸⁶ 293 F. 1013 (D.C. Cir. 1923).

⁸⁷ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 88 (calling *Frye* the “first notable development” in the development of tests governing the admissibility of scientific evidence).

⁸⁸ *Frye*, 293 F. at 1014.

⁸⁹ See Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, A Half-Century Later*, 80 COLUM. L. REV. 1197, 1205 (1980) [hereinafter *Admissibility of Novel Scientific Evidence*] (declaring that the *Frye* test “dominated the admissibility of scientific evidence for more than half a century”).

⁹⁰ *Frye*, 293 F. at 1014.

⁹¹ *Id.* at 1014.

⁹² *Id.* at 1013 (“Scientific experiments, it is claimed, have demonstrated that fear, rage, and pain always produce a rise of systolic blood pressure, and that conscious deception or falsehood, concealment of facts, or guilt of crime, accompanied by fear of detection . . . raises the systolic blood pressure . . .”).

⁹³ *Id.* at 1014.

⁹⁴ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1204 (stating that the evolutionary process by which expert evidence is vetted through the scientific community hinges on an “experimental” stage whereby it undergoes scrutiny).

principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.⁹⁵

This passage ushered in a two-step analysis.⁹⁶ First, a judge must decide under which scientific field a technique falls.⁹⁷ Second, that judge must determine whether the members of that field have generally accepted that technique.⁹⁸ For seventy years following its formulation, *Frye*'s "'general acceptance' test [was] the dominant standard for determining the admission of novel scientific evidence at trial."⁹⁹

On its own, however, *Frye* did not delineate either the boundaries or the justifications for centering its test around the general acceptance of the scientific community.¹⁰⁰ The test was promulgated *ipse dixit*; courts across the country, however, have provided post-hoc rationalizations, offering a pluralistic, regional approach to the idea of general acceptance.¹⁰¹ The common crystallization of the policy underpinning *Frye* could best be summarized as "a standard which in effect permits the experts who know most about a procedure to experiment and to study it,"¹⁰² thus assuring that "those persons most qualified to assess the validity of a scientific technique [] have the determinative voice."¹⁰³ In this way, the *Frye* test was viewed as an attempt to limit the risk of exposing jurors—broadly thought to be overawed in the presence of an expert—to flawed scientific testimony¹⁰⁴ by first screening the testimony through a test of an "essentially conservative nature."¹⁰⁵

⁹⁵ *Frye*, 293 F. at 1014.

⁹⁶ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1208.

⁹⁷ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1208.

⁹⁸ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1208.

⁹⁹ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 585 (1993).

¹⁰⁰ See Imwinkelried, *supra* note 1 ("In *Frye* itself the court did not articulate any policy justification for the general acceptance standard; the court merely mandated the standard as *ipse dixit*.").

¹⁰¹ See *id.* ("Later courts developed the policy rationale that was conspicuously missing in the original *Frye* opinion.").

¹⁰² *People v. Barbara*, 255 N.W.2d 171, 194 (Mich. 1977). The court would go on to ground the *Frye* test in the tradition of the expert jury described by Learned Hand, *supra* notes 60–62, describing the general consensus test as, "[i]n effect, [] a kind of technical jury, which must first pass on the scientific status of a procedure before the lay jury utilizes it in making its findings of fact." *Id.*

¹⁰³ *People v. Leahy*, 882 P.2d 321, 325 (Cal. 1994).

¹⁰⁴ See Imwinkelried, *supra* note 1 (describing the historical fear held by the court that a risk will "overawe lay jurors").

¹⁰⁵ *Leahy*, 882 P.2d at 325.

Within these broad confines, there existed, and exists, a great deal of variation and consternation about how to quantify when a technique has achieved general acceptance, and who constitutes the relevant scientific community.¹⁰⁶ There are, however, some common patterns that can be delineated. First, the test is limited to novel scientific theories.¹⁰⁷ This creates, in effect, an inevitable twilight period between the time when a scientific principle is discovered, and when that principle is sufficiently validated by peer review.¹⁰⁸ Secondly, in many jurisdictions, the *Frye* test is not triggered by “soft” sciences such as psychiatry, psychology, or the social sciences.¹⁰⁹ Across jurisdictions, however, the *Frye* test was understood to be a deliberate obstacle, interposed between uncertain scientific principles and the jury.¹¹⁰

Although it would assume a position of massive import, *Frye* almost became an afterthought.¹¹¹ After twenty-five years, the case had only been cited in two federal cases¹¹² and nine state cases.¹¹³ By the time the Federal Rules of Evidence were adopted in 1975, fifty-two years later, general acceptance itself was broadly accepted across jurisdictions, though it was

¹⁰⁶ See generally Cino, *supra* note 9, at 660 (calling *Frye* “one of the most vague and ambiguous decisions in American jurisprudence”); see also *Comparative Bullet Lead Analysis*, *supra* note 36, at 58 (“If the *Frye* standard is to have any teeth at all, the only sensible way to apply it is to expand the inquiry to canvass the sentiment in any group of experts whose education and training equip them to assess the validity of the theory”).

¹⁰⁷ See Imwinkelried, *supra* note 1 (stating that the courts “have limited the reach of the test in three respects” including liming the test to novel theories, excluding soft sciences, and exempting non-scientific expertise); cf. *Ramirez v. State*, 810 So.2d 836, 848–50 (Fla. 2001) (modifying the novelty requirement starkly in the process of excluding an established forensic technique—knife mark analysis—from the jury). Notably, the court finds the testimony of the state’s forensic experts as to the technique’s general acceptance to be facially insufficient on its own. *Id.*

¹⁰⁸ See *Frye v. United States*, 293 F. 1013, 1014 (D.C. 1923).

¹⁰⁹ See, e.g., *People v. McDonald*, 690 P.2d 709 (Cal. 1984), *overruled by* *People v. Mendoza*, 4 P.3d 265 (Cal. 2000) (rejecting the application of the California variant of *Frye* by distinguishing between expert testimony and scientific evidence).

¹¹⁰ See *People v. Kelly*, 549 P.2d 1240, 1245 (Cal. 1976) (“*Frye* was deliberately intended to interpose a substantial obstacle to the unrestrained admission of evidence based upon new scientific principles.”).

¹¹¹ See Cino, *supra* note 9, at 660.

¹¹² See *Refohle v. Ellis*, 74 F. Supp. 336 (N.D. Ga. 1947) (rejecting the use of a polygraph by citing its disapproval in *Frye*); *Medley v. United States*, 155 F.2d 857 (D.C. 1946) (finding that spectroscopy had sufficient acceptance within the scientific community).

¹¹³ *State v. Bohner*, 246 N.W. 314 (Wis. 1933); *Beuschel v. Manowitz*, 271 N.Y.S. 277 (Sup. Ct. 1934); *People v. Kenny*, 3 N.Y.S.2d 348 (Co. Ct. 1938); *People v. Forte*, 4 N.Y.S.2d 913 (Co. Ct. 1938); *Bednarik v. Bednarik*, 16 A.2d 80 (N.J. Super. Ct. Ch. Div. 1940); *State v. Cole*, 188 S.W.2d 43 (Mo. 1945); *State v. Lowry*, 185 P.2d 147 (Kan. 1947); *Boeche v. State*, 37 N.W.2d 593 (Neb. 1949); *People v. Morse*, 38 N.W.2d 322 (Mich. 1949). In seven out of the nine cases, the holding of *Frye* was interpreted extremely narrowly, and only applied to either similar versions of the systolic blood pressure device, or subsequent lie detectors. *Id.*

infrequently litigated.¹¹⁴ Yet, although *Frye* was widely accepted in the criminal world,¹¹⁵ it was not cited federally in a civil case until 1984.¹¹⁶ Ultimately, following years of mounting frustration with the general acceptance standard in both arenas, it was ultimately a civil case that wrote *Frye* out of the law books in a majority of jurisdictions.¹¹⁷

C. *An Incomplete Revolution*

Daubert was a revolution a long time in the making.¹¹⁸ Based in part on the vagueness of the *Frye* test, courts found it difficult to determine the appropriate body to evaluate whether an idea was generally accepted, and to determine the degree to which a scientific technique needed to be accepted in order to constitute general acceptance.¹¹⁹ Beyond the difficulties associated with the ambiguities of *Frye*, there was concern that the test was “unduly conservative,” serving to obscure the “principles of relevance and probity.”¹²⁰ There was also a push by scholars for a test which served the goal of *Frye*, filtering out unsound science without serving as an obstacle to cutting-edge techniques.¹²¹

The adoption of FRE 702 in 1975 was intended to respond to these concerns, and to guide the introduction of expert evidence for federal courts in both civil and criminal litigation.¹²² Despite its admirable goal, however, Rule 702 only served to further divide jurisdictions.¹²³ On its face, the

¹¹⁴ See Cino, *supra* note 9, at 660 (showing that, though *Frye* had been accepted by almost every U.S. jurisdiction by the time the Federal Rules of Evidence were adopted, it was infrequently litigated).

¹¹⁵ Thomas Lyons, *Frye, Daubert and Where Do We Go From Here?*, R.I. B.J., Jan. 1997, at 5 (“Virtually every federal and state court addressing the general acceptance standard adopted it.”).

¹¹⁶ *Barrel of Fun, Inc. v. State Farm Fire & Cas. Co.*, 739 F.2d 1028 (5th Cir. 1984) (representing the first federal civil opinion to invoke *Frye*).

¹¹⁷ See Cino, *supra* note 9, at 661 (listing *Frye*’s shortcomings as a series of unanswered questions, including “[w]ho determines the relevant scientific community,” “[h]ow does the court define the relevant scientific community,” and “[h]ow mainstream should a theory or technique be before it becomes relevant”).

¹¹⁸ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1207–08 (writing fourteen years before the passage of *Daubert* that “the problems *Frye* has engendered—the difficulties in applying the test and the anomalous results it creates—so far outweigh these advantages that the argument for adopting a different test has become overwhelming”).

¹¹⁹ Cino, *supra* note 9, at 661.

¹²⁰ *Confronting the New Challenges of Scientific Evidence*, *supra* note 65, at 1486.

¹²¹ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1224; see also Cino, *supra* note 9, at 661 (“The argument against using the *Frye* rule is that it may frustrate or foreclose the use of innovative techniques.”).

¹²² See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 586–87 (1993) (casting the merits of *Frye* in a dubious light and asserting that the *Frye* test “was superseded by the adoption of the Federal Rules of Evidence”).

¹²³ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 89 (showing how Rule 702’s

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original version of Rule 702 stood in opposition to the conservative *Frye* test, mandating that specialized knowledge be heard by the trier of fact, so long as: (1) the expert was qualified; and (2) that the evidence served to help the fact finder understand a relevant issue in the case.¹²⁴ Assistance to the jury was thus substituted for acceptance by the scientific community.¹²⁵ In the wake of the adoption of Rule 702, there was much consternation over whether *Frye* had been subsumed by the Federal Rules.¹²⁶ And although *Frye* had largely been confined to criminal trials, by the last quarter of the twentieth century it was complaints of “junk science” in tort claims that ignited the most visible debates.¹²⁷ From this point on, criminal trials were to take a backseat to tort claims in the debate over expert evidence.¹²⁸

Daubert v. Merrell Dow Pharmaceuticals, Inc., a civil case, finally resolved the question of Rule 702’s supremacy.¹²⁹ Merrell Dow, the makers of Bendectin, had moved for summary judgment, supported by an affidavit from a qualified expert who stated that there had been no study demonstrating a link between Bendectin and deformations in embryonic development.¹³⁰ The plaintiffs attempted to counter with experts of their own.¹³¹ The district court, however, excluded the plaintiffs’ experts on the grounds that their testimony relied on animal studies, unsubstantiated pharmacological studies, and re-analyses of previously unpublished epidemiological data—information that the district court found to have insufficient acceptance among the relevant scientific community.¹³² The appellate court, citing *Frye*, affirmed.¹³³

The U.S. Supreme Court not only found that *Frye* had been superseded by the Federal Rules of Evidence, but also that a “rigid standard” was “at odds with [the] Rules’ liberal thrust, and their general approach of relaxing the traditional barriers to ‘opinion’ testimony.”¹³⁴ The *Daubert* Court found that Rule 702’s gatekeeping function was more properly the responsibility

apparent substitution of the requirement of general acceptance with “mere ‘assistance’ to the trier of fact” caused a great deal of controversy among the courts).

¹²⁴ FED. R. EVID. 702.

¹²⁵ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 89.

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ See *Junk Science*, *supra* note 67, at 110–11 (contrasting the vigor with which “civil litigation with high financial stakes” is litigated, with the relative absence of attention received in criminal cases by stating “[t]he neglect of the problems of expert testimony in criminal prosecutions is deplorable, if not inexplicable”).

¹²⁹ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 589 (1993).

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Daubert v. Merrell Dow Pharm., Inc.*, 727 F. Supp. 570, 575 (S.D. Cal. 1989).

¹³³ *Daubert v. Merrell Dow Pharm., Inc.*, 951 F.2d 1128, 1129–30 (9th Cir. 1991).

¹³⁴ *Daubert*, 509 U.S. at 588.

of the judge, who would then be tasked with assessing the “scientific validity of a particular technique or methodology on which an opinion is premised.”¹³⁵ Drawing from Rule 702’s language concerning scientific knowledge, the Court formed a five part test for assessing the validity of a theory or technique, consisting of asking: (1) whether a theory has been tested; (2) whether that theory has been subjected to peer review; (3) whether a known rate of error has been demonstrated; (4) whether there were standards governing the technique; and lastly, (5) whether the theory met the traditional *Frye* general acceptance standard.¹³⁶ Thus, the *Daubert* Court subsumed the scientific community’s consensus within a broader, jurist-centered approach to expert evidence, open to the admission of cutting-edge techniques.¹³⁷ The Court emphasized that the standard was a flexible one, focusing on principles and methodology, not conclusions.¹³⁸ To combat the introduction of faulty evidence, the Court leaned on the advantages of the adversarial system’s “[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof [as] the traditional and appropriate means of attacking shaky but admissible evidence.”¹³⁹

Daubert’s impact was dramatic, spurring an additional amendment of the Federal Rules,¹⁴⁰ and two subsequent cases that came to be seen as comprising the *Daubert* trilogy.¹⁴¹ As the evolving standard has established itself, it is evident that questions concerning the admissibility of expert evidence are generally raised pretrial¹⁴² and are largely immunized against reversal.¹⁴³ Moreover, “whether *Daubert*’s specific factors are, or are not, reasonable measures of reliability in a particular case[, it] is a matter with which the law grants the trial judge broad latitude to determine.”¹⁴⁴

¹³⁵ *Id.* at 594.

¹³⁶ *Id.* at 592–94.

¹³⁷ *See id.* at 594–95 (stating that the “overarching subject is the scientific validity and thus the evidentiary relevance and reliability—of the principles that underlie a proposed submission”).

¹³⁸ *Id.*

¹³⁹ *Id.* at 596.

¹⁴⁰ FED. R. EVID. 702 advisory committee’s note to 2000 amendment.

¹⁴¹ *See Gen. Elec. Co. v. Joiner*, 522 U.S. 136 (1997) (holding that the “abuse of discretion” standard applies to the trial court’s decision to exclude evidence); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999) (finding that *Daubert*’s gatekeeping role applies to all expert testimony, not just scientific testimony).

¹⁴² *See Alfred v. Caterpillar, Inc.*, 262 F.3d 1083, 1087 (10th Cir. 2001) (“district courts [can] reject as untimely *Daubert* motions raised late in the trial process”).

¹⁴³ *See Gen. Elec. Co.*, 522 U.S. at 142–43 (quoting *Spring Co. v. Edgar*, 99 U.S. 645, 658 (1879) (“Cases arise where it is very much a matter of discretion with the court whether to receive or exclude the evidence; but the appellate court will not reverse in such a case, unless the ruling is manifestly erroneous.”)).

¹⁴⁴ *Kumho Tire Co.*, 526 U.S. at 138.

D. Daubert and the Admission of Faulty Forensic Science

Just as the goals of science and law are different, the aims and means of civil and criminal law are different, precluding the use of a uniform solution for expert testimony. Replacing *Frye* with *Daubert* produced “a profound improvement” in the civil justice system,¹⁴⁵ resulting in rising standards of dependability, and an environment open to cutting-edge science.¹⁴⁶ These benefits, however, have not been similarly reflected in the criminal system.¹⁴⁷ In the seven years following *Daubert*, there were sixty-seven federal appellate cases involving challenges to the government’s evidence in criminal cases.¹⁴⁸ Of those sixty-seven cases, sixty-one were won by the prosecution.¹⁴⁹ Of those six won by the defense, just one resulted in the reversal of a conviction.¹⁵⁰ This indicates a low likelihood of overturning evidentiary rulings in criminal cases on *Daubert* grounds.¹⁵¹

The question, then, is why the difference in results between civil and criminal cases? The answers are largely straightforward. The first reason is money. In civil cases, which frequently involve experts when litigating toxic tort suits, the contingency fee structure means that even a financially-limited party can still afford to hire an expert.¹⁵² Criminal defendants, on the other hand, often cannot afford experts. And the criminal justice system generally does not afford them the means to procure experts.¹⁵³ This frequently puts

¹⁴⁵ STEIN, *supra* note 7, at 237.

¹⁴⁶ See D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being left on the Dock?*, 64 ALB. L. REV. 99, 149 (2000) (crediting the *Daubert* trilogy with the heightening of standards in civil cases).

¹⁴⁷ See STEIN, *supra* note 7, at 237 (“[T]he replacement of *Frye* by the *Daubert* Trilogy introduced a profound improvement into the civil, as opposed to the criminal justice systems across the United States.”); see also *Daubert and Criminal Prosecutions*, *supra* note 74 (“There is little question that *Daubert* has had a substantial impact on civil litigation”).

¹⁴⁸ Risinger, *supra* note 146, at 104.

¹⁴⁹ Risinger, *supra* note 146, at 104.

¹⁵⁰ Risinger, *supra* note 146, at 104.

¹⁵¹ Risinger, *supra* note 146, at 104.

¹⁵² See Neufeld, *supra* note 33, at S109–10. “The reality is that if a corporation is sued for millions of dollars in a toxic tort case, plaintiffs’ attorneys hire scientific experts because they stand to share in any settlements or award. The substantial legal fees paid by the corporation enable civil defendants to secure the services of equally well-regarded experts. Judges consider the science with far greater scrutiny and caution.” Neufeld, *supra* note 33, at S109–10.

¹⁵³ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 11 (highlighting, among the differences between criminal and civil cases, the fact that civil defendants have equal access to experts as plaintiffs, whereas “prosecutors usually have an advantage over most defendants in offering expert testimony in criminal cases”). This is not to say that indigent defendants require further public funds for procuring experts to vindicate their rights. *Frye* is markedly less reliant on the adversarial process, as the decision-making body—the scientific community—is not party to litigation. See, e.g., *People v. Barbara*, 255 N.W.2d 171, 194 (Mich. 1977) (describing the general consensus test as, “[i]n effect, [] a kind of technical jury,

criminal defendants on an unequal playing field in offering expert testimony.¹⁵⁴ The second reason is incentive. In a civil case, either party has the right and incentive to appeal a non-frivolous loss, whereas criminal cases offer more restricted appellate access and a lower chance of success.¹⁵⁵ The third reason is experiential. A criminal defendant's challenge will often fail because courts "routinely affirm admissibility citing earlier decisions rather than facts established at a hearing."¹⁵⁶ In addition, defense lawyers frequently lack the scientific background or funds to proceed with a *Daubert* challenge to forensic science.¹⁵⁷ It appears that appellate courts are more willing "to second-guess trial court judgments on the admissibility of purported scientific evidence in civil cases than in criminal cases."¹⁵⁸ A broad survey of cases found the thoroughness with which criminal cases were evaluated to be sorely lacking.¹⁵⁹

Has, then, *Daubert's* liberal criteria for admitting expert testimony proven incompatible with the realities of the criminal justice system? The legacy of *Daubert* would suggest it either opened the door too wide, or relied on "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction," which are factors better suited to civil trials.¹⁶⁰ Moving the gatekeeping role from the laboratory to the courtroom may have proven too great a burden for the criminal justice system.¹⁶¹ In their concurrence to the *Daubert* opinion, Justice Rehnquist and Justice Stevens, as odd a pair of bedfellows as there ever was, cautioned against issues related to relocating the gatekeeper function.¹⁶² While FRE 402 provides guidance governing the

which must first pass on the scientific status of a procedure before the lay jury utilizes it in making its finding of fact").

¹⁵⁴ *Daubert and Criminal Prosecutions*, *supra* note 74, at 62; *see also* NATIONAL RESEARCH COUNCIL, *supra* note 3, at 98 ("Prosecutors usually have an advantage over most defendants in offering expert testimony in criminal cases.").

¹⁵⁵ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 98.

¹⁵⁶ Neufeld, *supra* note 33, at S109–10.

¹⁵⁷ Neufeld, *supra* note 33, at S109–10.

¹⁵⁸ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 11.

¹⁵⁹ Risinger, *supra* note 146, at 100. "The system shipwreck I fear is that . . . we will find that civil cases are subject to strict standards of expertise quality control, while criminal cases are not. The result would be that the pocketbooks of civil defendants would be protected from plaintiffs' claims by exclusion of undependable expert testimony, but that criminal defendants would not be protected from conviction based on similarly undependable expert testimony. Such a result would seem particularly unacceptable given the law's claim that inaccurate criminal convictions are substantially worse than inaccurate civil judgments, reflected in the different applicable standards of proof." Risinger, *supra* note 146, at 100.

¹⁶⁰ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 596 (1993).

¹⁶¹ *See* Neufeld, *supra* note 33, at S109–10 ("If no one challenges the speculative science or scientists, there is nothing for a gatekeeper to tend to.").

¹⁶² *Daubert*, 509 U.S. at 596–97 (Rehnquist, C.J., & Stevens, J., concurring) (agreeing with the majority that the Federal Rules of Evidence superseded *Frye*, but presciently expressing a belief in the court system's capacity to handle matters of statute and case law, as

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relevance of admissible evidence, there is no such guidance for jurists to assess scientific “reliability.”¹⁶³ Of this added responsibility, Justice Rehnquist stated that he did “not doubt that Rule 702 confides to the judge some gatekeeping responsibility . . . but I do not think it imposes on them either the obligation or authority to become amateur scientists in order to perform that role.”¹⁶⁴

IV. CURRENT *Frye* STANDARDS

As it exists in criminal cases, *Daubert* represents a two-part problem. First, the standard is too permissive.¹⁶⁵ Second, there are structural issues inherent in the criminal system, not present in the civil system, which dampen the effectiveness of *Daubert*’s intended safeguards against unsound science.¹⁶⁶ Therefore, it is worthwhile to re-examine the standard the *Daubert* court deemed too austere.¹⁶⁷

The *Frye* test offers a chance to obviate the two key issues posed by *Daubert* as a result of its inherently conservative nature, potentially offering criminal defendants a better chance of having scientifically unsound evidence excluded before trial.¹⁶⁸ It is appropriate, therefore, to review the state of *Frye* as currently implemented in state courts, with an eye toward assessing the factors critical to aiding the twin goals of forensic science specifically, and justice generally; namely, the goals of convicting the guilty and exonerating the innocent. To do so, this paper reviews the existing *Frye* jurisdictions’ definition of “general acceptance,” the sources the courts look to for validation, and the criteria under which the courts assess “general acceptance,” as well as each jurisdiction’s policy justifications for doing so.

A. *California: People v. Leahy*

California, our nation’s most populous state, remains a *Frye* jurisdiction.¹⁶⁹ *People v. Leahy*,¹⁷⁰ a post-*Daubert* challenge, involved a criminal defendant who appealed the admission of a horizontal gaze

opposed to defining “scientific knowledge”).

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 600.

¹⁶⁵ See *infra* Part II.D for a discussion of the issues surrounding the admission of expert evidence in criminal trials under *Daubert*.

¹⁶⁶ *Id.*

¹⁶⁷ *Daubert*, 509 U.S. at 589.

¹⁶⁸ See STEIN, *supra* note 7, at 196–97 (expressing skepticism at the ability of *Daubert* to offer individualized testing to criminal defendants, and support for excluding evidence based on the *Frye* standard in the criminal setting).

¹⁶⁹ *People v. Leahy*, 882 P.2d 321 (Cal. 1994) (confirming the vitality of *Frye* in California).

¹⁷⁰ *Id.*

nystagmus (HGN) field sobriety test¹⁷¹ used as evidence against him in a DUI trial.¹⁷² The trial court found that *Kelly-Frye*,¹⁷³ the California variant of the *Frye* test, was inapplicable, on the basis that the HGN field sobriety test was not in fact a true test, but merely a description of symptoms.¹⁷⁴ The California Supreme Court both overturned the trial court's decision and required the application of *Kelly-Frye*, while also reasserting the validity of the *Kelly-Frye* analysis in the wake of *Daubert*.¹⁷⁵

As defined by the court, "general acceptance" does not require a unanimous opinion, or even majority support by the scientific community.¹⁷⁶ It is instead a decision of whether "the technique is deemed unreliable by 'scientists significant in number or expertise.'"¹⁷⁷ Those tasked with making the determination as to the reliability of an evolving technique are the members of the scientific community developing a given method.¹⁷⁸ *Kelly-Frye* defines general acceptance along the lines of the traditional, *Frye*, two-step process, requiring: (1) that reliability be established by expert testimony; and (2) that such testimony be given by a properly qualified expert.¹⁷⁹ California, however, added the requirement that "the proponent of the evidence must demonstrate that correct scientific procedures were used in the particular case."¹⁸⁰ Moreover, California affords limited *de novo* appeal rights to those challenging *Kelly-Frye* decisions. Boundaries of review are generally limited to the evidence available on the record. In special circumstances, exceptions allow the appellate court to view scientific evidence outside the record.¹⁸¹

From a policy standpoint, the *Leahy* court's justifications for maintaining the *Frye* standard were identified as:

- (1) assuring that those persons most qualified to assess the validity of a scientific technique would have the determinative voice, (2) providing a 'minimal reserve of experts' to critically examine each technique in a particular case, (3) promoting uniformity of decision based on finding a consensus in the

¹⁷¹ *Id.* at 323 ("Nystagmus is an involuntary rapid movement of the eyeball, which may be horizontal, vertical, or rotary. An inability of the eyes to maintain visual fixation as they are turned from side to side . . . is known as horizontal gaze nystagmus.").

¹⁷² *Id.* at 323.

¹⁷³ *People v. Kelly*, 549 P.2d 1240 (Cal. 1976).

¹⁷⁴ *Leahy*, 882 P.2d at 324.

¹⁷⁵ *Id.* at 325.

¹⁷⁶ *Id.* at 329.

¹⁷⁷ *Id.* at 336 (quoting *People v. Shirley*, 723 P.2d 1354, 1377 (Cal. 1982)).

¹⁷⁸ *Id.* at 325.

¹⁷⁹ *Id.*

¹⁸⁰ *Leahy*, 882 P.2d at 325.

¹⁸¹ *Id.* at 330 (citing *People v. Barney*, 10 Cal. Rptr. 2d 731, 736 (Ct. App. 1992)).

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scientific community, and (4) protecting the parties by its ‘essentially conservative nature.’¹⁸²

These four points, in combination with the relative austerity of *Kelly-Frye*, are credited by the *Leahy* court as serving to prevent unreliable techniques from being used to determine the guilt or innocence of criminal defendants by precluding “the vagaries of pseudoscience.”¹⁸³

B. *Washington, D.C.—Roberts v. United States*

Washington, D.C. remains a *Frye* jurisdiction, as confirmed in 2000.¹⁸⁴ In *Roberts v. United States*,¹⁸⁵ a defendant challenged the trial court’s decision to admit DNA evidence on the grounds that the F.B.I.’s statistical formula failed to incorporate the rate of false positives.¹⁸⁶ In evaluating that evidence, the D.C. Court of Appeals defined general acceptance along strict *Frye* lines.¹⁸⁷ The *Roberts* court determined that it was permitted to consider “not only expert evidence of record, but also judicial opinions in other jurisdictions, as well as pertinent legal and scientific commentaries.”¹⁸⁸ The court’s criteria for assessing general acceptance were quite simple, formulated as “consensus versus controversy . . . not its validity.”¹⁸⁹ In D.C. courts, *Frye* decisions are reviewed *de novo*.¹⁹⁰ Before *Roberts*, the court had outlined its justifications for maintaining *Frye* as a safeguard against exposing the jury to the particular weight exercised by expert testimony.¹⁹¹ In the view of the *Roberts* court, in order to be admissible, “the totality of expert testimony must be sufficiently extensive and coherent so that one can reasonably say that an expert . . . testified that the elements at issue . . . have been established under sound scientific principles.”¹⁹² Ultimately, the

¹⁸² *Id.*

¹⁸³ *Id.* at 331.

¹⁸⁴ See *Bahura v. S.E.W. Inv’rs*, 754 A.2d 928, 943 n.15 (D.C. 2000) (“[A] division of this court lacks the authority to supplant *Frye* with *Daubert* and *Kumho Tire Co.*”; see also *M.A.P. v. Ryan*, 285 A.2d 310, 312–13 (D.C. 1971) (detailing how the District of Columbia Court Reform and Criminal Procedure Act of 1970 stripped the United States Court of Appeals of the power to review judgments of the D.C. Court of Appeals).

¹⁸⁵ 916 A.2d 922 (D.C. 2007).

¹⁸⁶ *Id.* at 929.

¹⁸⁷ *Id.* (citing *Frye v. United States*, 293 F. 1013 (1923)).

¹⁸⁸ *Id.* (citing *United States v. Porter*, 618 A.2d 629, 635 (D.C. 1992)).

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*

¹⁹¹ *Bahura v. S.E.W. Inv’rs*, 754 A.2d 928, 947 (D.C. 2000) (Stedman, J., concurring) (“While ordinarily it is within the province of a jury to pick and choose among the evidence that it hears on the basis of its common sense and experience, I think that given the nature of expert testimony, the same freedom cannot be uncritically admitted.”).

¹⁹² *Id.* at 948.

Roberts court rejected the defendant's appeal, concluding that the *Frye* standards do not require testimony regarding laboratory error rates.¹⁹³

C. *Florida—Ramirez v. State*

Although at one point the state legislature attempted to mandate use of the *Daubert* standard in both civil and criminal trials, the Florida Supreme Court overruled the legislature and reasserted the vitality of the *Frye* test.¹⁹⁴ Florida's variant of the *Frye* test may serve as the best model for excluding forensic evidence that lacks scientific backing.¹⁹⁵ Its version of the test offers a "reinvigorated *Frye* test" that incorporates elements of *Daubert*,¹⁹⁶ creating a "*Frye*-plus-reliability" standard.¹⁹⁷ Under this variant, the court uses a more malleable definition of the traditional novelty requirement,¹⁹⁸ which makes a greater number of cases eligible for an evidentiary challenge, while also enveloping expert evidence within a reliability standard.¹⁹⁹

In this 2001 appeal, the defendant, Ramirez, challenged his murder conviction, which, in part, rested on the testimony of a Miami crime technician who concluded that the defendant's knife "was *the* murder weapon to the exclusion of all others."²⁰⁰ Although it took three appeals and the influence of *Daubert*,²⁰¹ the Florida Supreme court ultimately excluded the State's tool mark evidence on the grounds that it lacked an adequate scientific basis to be presented to the jury.²⁰²

The *Ramirez* court defined general acceptance as requiring more than a mere "nose count" of experts in the field; rather it is the court's role to accord weight to relevant sources, including "expert testimony, scientific and legal

¹⁹³ *Roberts v. United States*, 916 A.2d 922, 931 (D.C. 2007).

¹⁹⁴ *In re Amendments to the Florida Evidence Code*, 210 So.3d 1231, 1240 (Fla. 2017).

¹⁹⁵ Paul C. Giannelli, *Daubert Revisited*, 41 CRIM. LAW. BULL. (2005) [hereinafter *Daubert Revisited*].

¹⁹⁶ *Id.*

¹⁹⁷ *See Donaldson v. Cent. Ill. Pub. Serv. Co.*, 767 N.E.2d 314, 326 (Ill. 2002) (naming the revised *Frye* test).

¹⁹⁸ *See Ramirez v. State*, 810 So.2d 836, 852 (Fla. 2001) (particularizing *Frye*'s novelty requirement such that it applies to a specific forensic expert's version of knife mark identification procedure). Toolmark identification generally, and knife-mark identification particularly, were well-established branches of forensic science in 2001, when this appeal was decided, and in 1983, when the murder in question was committed. *See id.* at 845 ("Traditional 'knife mark' evidence is a subgroup of the broad category of evidence referred to as 'tool mark' evidence. The theory underlying tool mark evidence . . . has long been upheld by courts.").

¹⁹⁹ *See id.* at 842 (expanding novelty by finding the particular application of a traditional technique to be novel enough to trigger the need for *Frye*).

²⁰⁰ *Id.* at 839.

²⁰¹ *See Daubert Revisited*, *supra* note 195 (explaining the impact of *Daubert* on *Frye*, with particular reference to *Ramirez*).

²⁰² *Ramirez*, 810 So.2d at 849–54.

publications, and judicial opinions,” and render a decision based on the facts of the case and the scientific methodology at hand.²⁰³ General acceptance requires impartial and independent proof.²⁰⁴ “A bald assertion by the expert that his deduction is premised upon well-recognized scientific principles is inadequate to establish its admissibility if the witness’s application of these principles is untested”²⁰⁵

In its decision, the *Ramirez* court established a four-part relevance test for establishing acceptance, which incorporated an understanding of scientific accuracy drawn from *Daubert*.²⁰⁶ First, the court should look to determine whether the methodology has been formally tested.²⁰⁷ Second, the court should evaluate whether the technique has been subjected to meaningful peer review.²⁰⁸ Third, the proponent of the evidence must prove the general acceptance of “both the underlying scientific principle” and “the testing procedures used to apply the principle to the facts of the case at hand.”²⁰⁹ Lastly, the court must consider whether a given technique has a quantified error rate, and if so, what that error rate is.²¹⁰ As in Washington, D.C., all *Frye* decisions in Florida are subject to *de novo* review.²¹¹ These criteria are grounded in the “underlying theory . . . that . . . [i]f the scientific community considers a procedure or process unreliable for its own purposes, then the procedure must be considered less reliable for courtroom use.”²¹²

In the process of affirming *de novo* as the appropriate standard of review for *Frye*, Florida chose to highlight the applicability of both legal reliability and scientific reliability.²¹³ The existence of, and contrast between, the two standards, gives appellants an avenue by which to challenge the scientific evidence underpinning a conviction, irrespective of whether or not that evidence was deemed novel.²¹⁴ Traditional applications of established scientific techniques must pass through the classic Rule 403 test, which should inherently exclude evidence that is “unduly prejudicial,

²⁰³ *Id.* at 844.

²⁰⁴ *Id.* at 851 (“In applying the *Frye* criteria, general scientific recognition requires the testimony of impartial experts or scientists. It is this independent and impartial proof of general scientific acceptability that provides the necessary *Frye* foundation.”).

²⁰⁵ *Id.* at 844.

²⁰⁶ *Daubert Revisited*, *supra* note 195.

²⁰⁷ *Ramirez*, 810 So.2d at 849.

²⁰⁸ *Id.* at 849–50.

²⁰⁹ *Id.* at 851.

²¹⁰ *Id.*

²¹¹ *Id.* at 844.

²¹² *Id.* at 843 (quoting *Stokes v. State*, 584 So.2d 188, 193–94 (Fla. 1989)).

²¹³ *See Ramirez*, 810 So.2d at 842–46 (describing both the standards of review and appropriate applications of scientific and legal reliability).

²¹⁴ *Id.*

misleading, or confusing”—in other words, patently untrue evidence.²¹⁵ Challenges under the traditional 403 test are reviewed on appeal under an abuse of discretion standard.²¹⁶ Rule 403 analysis is “inapposite” in the presence of novel scientific methods or novel applications of existing scientific methods, as the “court may be unable to gauge accurately” the degree to which the jury may be misled.²¹⁷ Therefore, challenges to *Frye* hearings are reviewed *de novo*, which has the beneficial effect of encouraging lower courts to rigorously apply the general acceptance test, lest they be reversed.²¹⁸ In the instant case, the Florida Supreme Court found that the state’s proffered evidence failed the *Frye* test, and went so far as to call it a classic example of junk science.²¹⁹ In this *de novo* review, assessing a novel application of a traditional scientific technique, the court reinforced the need to stringently apply *Frye* by stating:

[i]n sum, [the state expert’s] knife mark identification procedure—at this point in time—cannot be said to carry the imprimatur of science. The procedure is a classic example of the kind of novel ‘scientific’ evidence that *Frye* was intended to banish—i.e., a subjective, untested, unverifiable identification procedure that purports to be infallible. The potential for error or fabrication in this procedure is inestimable. In order to preserve the integrity of the criminal justice system in Florida, particularly in the face of rising nationwide criticism of forensic evidence in general, our state courts—both trial and appellate—must apply the *Frye* test in a prudent manner to cull scientific fiction and junk science from fact.²²⁰

D. *Illinois—In re* Commitment of Simons

As stated in Illinois Rule of Evidence 702,²²¹ and as confirmed by *In re Commitment of Simons*,²²² Illinois is without a doubt a *Frye* jurisdiction. Unlike Florida, Illinois hearkens to an earlier version of *Frye*, rejecting the incorporation of *Daubert*-era innovations by stating that “*Frye* does not make the trial judge a ‘gatekeeper of’ all expert testimony.”²²³ Moreover, the Supreme Court of Illinois also explicitly rejected the burgeoning test it

²¹⁵ *Id.* at 843.

²¹⁶ *Id.* at 842–43.

²¹⁷ *Id.*

²¹⁸ *Id.* at 844–45.

²¹⁹ *Ramirez*, 810 So.2d at 853.

²²⁰ *Id.*

²²¹ ILL. R. EVID. 702.

²²² 821 N.E.2d 1184 (Ill. 2004).

²²³ *Donaldson v. Cent. Ill. Pub. Serv. Co.*, 767 N.E.2d 314, 324–326 (Ill. 2002).

termed “*Frye*-plus-reliability.”²²⁴

In Illinois, the general acceptance test only applies to a scientific methodology that is “original or striking” or if that method “does not resemble something formerly known or used.”²²⁵ A theory will be deemed generally accepted if it is reasonably relied upon by experts in the field at issue.²²⁶ Once a principal has gained general acceptance it is almost impossible to dislodge it from the legal system, as its “general acceptance is presumed in subsequent litigation.”²²⁷ This viewpoint stems from the idea that the trial judge’s role is limited merely to ruling on the acceptance of a technique, and does not encompass shielding the fact finder from potentially baseless or later discredited scientific techniques.²²⁸ Any generally accepted technique will be presented to the fact finder, who then accords that expert what weight they will.²²⁹

E. *Maryland*—*Wilson v. State*

Like Illinois, Maryland is also a *Frye* state by statute. Unlike Illinois, however, the Maryland Supreme Court found merit in the so-called *Frye*-plus-reliability standard, stating that, “[t]estimony concerning an unreliable scientific process . . . or unreliable opinion is of little value to a jury.”²³⁰ In 2002, this principle was formalized in *Wilson v. State*,²³¹ a case which reviewed the trial court’s decision to admit expert testimony that relied on the product rule—a statistical rule governing the probability of independent events—to prove that the appellant’s children almost certainly could not have both died of SIDS, thus implicating the appellant as a murderer.²³²

In Maryland, general acceptance is defined as an absence of genuine controversy within the relevant scientific community.²³³ To determine whether or not the deaths of the petitioner’s children were conclusively independent, something the prosecution’s expert sought to disprove, the court consulted medical journals concerning pediatrics and genetics.²³⁴

²²⁴ *Id.* at 326.

²²⁵ *In re Commitment of Simons*, 821 N.E.2d at 1189 (quoting *Donaldson*, 764 N.E.2d at 325).

²²⁶ *Id.*

²²⁷ *Donaldson*, 767 N.E.2d at 325.

²²⁸ *In re Commitment of Simons*, 821 N.E.2d at 1188–89 (limiting the judge’s role to consideration of general acceptance of novel scientific techniques).

²²⁹ *Donaldson*, 767 N.E.2d at 326 (“Questions concerning underlying data, and an expert’s *application* of generally accepted techniques, go to the weight of the evidence, rather than its admissibility.”).

²³⁰ *Wilson v. State*, 803 A.2d 1034, 1039 (Md. 2002).

²³¹ *Id.* at 1039–47.

²³² *Id.* at 1039–40.

²³³ *Id.* at 1045.

²³⁴ *Id.* at 1044.

Although the State cited articles suggesting there was no link between genes and SIDS, the broader scientific consensus, as observed in a majority of articles, took the position that it is “*unknown* whether there is a genetic component to SIDS.”²³⁵ Thus, because of the lively debate within the scientific community concerning the independence, or lack thereof, of SIDS deaths within a single family, the evidence was excluded under *Frye*.²³⁶

Importantly, from Maryland’s initial acceptance of the general acceptance test in 1978, their courts mandated that the reliability of a novel scientific technique be a precondition for the admission of expert testimony, even before considering whether or not that technique had garnered general acceptance.²³⁷ As such, the state adopted a somewhat unique approach to incorporating the notion of novelty. Established, non-novel techniques with broad and general acceptance within the scientific community, such as ballistics tests and blood tests, can be judicially noticed without a *Frye* hearing.²³⁸ Importantly, the inverse applies to techniques based on unsound science; “a court may take judicial notice that certain procedures, widely recognized as bogus or experimental, are unreliable.”²³⁹ When judicial notice is inappropriate, and a *Frye* hearing is necessary, the proponent of the evidence must demonstrate the reliability of the technique, and the court should also take notice of reliable scientific journals that evaluate the acceptance of a particular process.²⁴⁰ This affords a procedural avenue by which proven techniques can move through efficiently, and whereby dubiously valid techniques—even established ones—can appropriately be screened and eliminated from evidence where appropriate.

F. *New Jersey*—*State v. Doriguzzi*

With facts similar to *People v. Leahy* in California, *State v. Doriguzzi*²⁴¹ affirmed New Jersey’s continued use of *Frye*—albeit in a more limited capacity—in a case evaluating the horizontal gaze nystagmus (HGN) test.²⁴²

²³⁵ *Id.*

²³⁶ *Wilson*, 803 A.2d at 1044–45.

²³⁷ *Id.* at 1039 (citing *Reed v. State*, 391 A.2d 364 (Md. 1978)).

²³⁸ *Id.* at 1039–40.

²³⁹ *Id.*

²⁴⁰ *Id.* The court clarified its procedure in the following manner: “When the reliability of a particular technique is not subject to judicial notice, however, ‘it is necessary that the reliability be demonstrated before testimony based on the technique can be introduced into evidence. Although this demonstration will normally include testimony by witnesses, a court can and should also take notice of law journal articles, articles from reliable sources that appear in scientific journals, and other publications which bear on the degree of acceptance by recognized experts that a particular process has achieved.’” *Id.* (quoting *Reed*, 391 A.2d at 368).

²⁴¹ 760 A.2d 336 (N.J. Super. Ct. App. Div. 2000).

²⁴² *Id.* at 337.

Unique among the several states, New Jersey offers an example of a jurisdiction that divides its evidentiary test along criminal/civil lines.²⁴³ The state applies *Daubert* in toxic tort cases, while remaining a *Frye* jurisdiction in all other matters.²⁴⁴ The key issue in *Doriguzzi* was whether evidence gleaned from the HGN test was properly admitted at trial without any foundational testimony from an expert to establish general acceptance within the scientific community.²⁴⁵ Trial courts in New Jersey are not permitted to introduce evidence from novel techniques without evidence of expert acceptance, unless there exists a previously published New Jersey Supreme or Superior Court opinion that verifies that technique.²⁴⁶ In this instance, the prosecution argued that the HGN test was not scientific at all, but was simply an observation of the officer, thereby making it more properly characterized as lay testimony.²⁴⁷

In New Jersey at the time, a proponent of a new scientific technique could demonstrate general acceptance in three ways: (1) by expert testimony from those in the relevant profession; (2) by “authoritative scientific and legal writings”; or (3) by judicial opinions.²⁴⁸ The *Doriguzzi* court surveyed court opinions from outside jurisdictions, as well as scientific and legal articles.²⁴⁹ The vast majority of states have found the HGN test to be scientific.²⁵⁰ The *Doriguzzi* court acknowledged that “[r]eliance on other courts’ opinions can be problematic ‘[u]nless the question of general acceptance has been thoroughly and thoughtfully litigated in [] previous cases.’”²⁵¹ This latter consideration led the *Doiguzzi* court to give credence to a Illinois Supreme Court opinion that had disallowed use of the technique.²⁵² Illinois had rejected HGN testing on the grounds that the relevant scientific community sharply diverged as to “the correlation between the BAC level and the angle of onset at which nystagmus occurs.”²⁵³ Because New Jersey adheres to the notion that jurists are not scientists, it leaned on this science-backed legal opinion in deciding not to admit evidence of HGN testing.²⁵⁴

²⁴³ State v. Harvey, 668 A.2d 596 (N.J. 1997).

²⁴⁴ *Id.*

²⁴⁵ *Doriguzzi*, 760 A.2d at 337.

²⁴⁶ *Id.*

²⁴⁷ *Id.* at 339.

²⁴⁸ *Id.* at 341–42.

²⁴⁹ *Id.* at 342–43.

²⁵⁰ *Id.* at 342.

²⁵¹ *Doriguzzi*, 760 A.2d at 346 (quoting *People v. Kirk*, 681 N.E.2d 1037 (Ill. 1997)).

²⁵² *Id.* at 337.

²⁵³ *Id.* at 341–46 (quoting *State v. Witte*, 836 P.2d 110, 1119–21 (Kan. 1992)).

²⁵⁴ *Id.* at 342.

G. *New York*—State v. LeGrand

New York offers a version of the *Frye* standard that directly prevents the court from considering the reliability of a technique.²⁵⁵ In 2007, the Court of Appeals of New York opined on whether it was proper to admit expert testimony concerning the reliability of eyewitness testimony.²⁵⁶ In its opinion, the *LeGrand* court stated that the *Frye* test asks whether a technique generates “results accepted as reliable within the scientific community.”²⁵⁷ In doing so, the emphasis lies on the importance of “counting scientists’ votes, rather than . . . verifying the soundness of a scientific conclusion.”²⁵⁸ Once a technique is validated by *Frye*, further hearings need not be conducted.²⁵⁹ Largely on these grounds, the court concluded that expert testimony concerning eyewitness identification was admissible in that instance,²⁶⁰ and that it was an “abuse of a court’s discretion to exclude expert testimony on the reliability of eyewitness identifications.”²⁶¹

Although *LeGrand* is a rare instance of a defendant prevailing in an evidentiary challenge, it is worth noting that the case involved evidence that the defendant was seeking to enter—not a challenge to the scientific underpinnings of the prosecution’s evidence.²⁶² Under the formula outlined by the *LeGrand* court, New York’s version of the *Frye* test does not take the scientific reliability of a technique into consideration.²⁶³ Instead, it adheres to a version of the *Frye* test explicitly rejected in other jurisdictions²⁶⁴—a simple poll.²⁶⁵ As there is minimal inquiry beyond a headcount, it offers defendants few chances to the scientific validity of a forensic technique.²⁶⁶

²⁵⁵ See *People v. LeGrand*, 867 N.E.2d 374, 379 (N.Y. 2007) (finding that establishing scientific reliability under the *Frye* test is based on a poll of scientists within the relevant community).

²⁵⁶ *Id.* at 376.

²⁵⁷ *Id.* at 379 (quoting *Parker v. Mobil Oil Corp.*, 857 N.E.2d 1114, 1120 (N.Y. 2006)).

²⁵⁸ *Id.* (quoting *People v. Wesley*, 633 N.E.2d 451, 464 (N.Y. 1994)).

²⁵⁹ *Id.* at 380 (quoting *Wesley*, 633 N.E.2d at 462).

²⁶⁰ See *id.* (finding that “a number of New York courts” admitted eyewitness identification through the *Frye* test).

²⁶¹ *LeGrand*, 867 N.E.2d at 379.

²⁶² *Id.* at 375.

²⁶³ *Id.* at 379 (quoting *Wesley*, 633 N.E.2d at 464).

²⁶⁴ See, e.g., *supra* Part III.C, discussing *Ramirez v. State*, specifically the text at footnote 202, where the Florida Supreme Court defined general acceptance as more than a “nose count” of experts, designating the court’s role as rendering a decision based on all relevant sources, the facts of the case, and the scientific methodology at hand. *Id.*

²⁶⁵ *LeGrand*, 867 N.E.2d at 354.

²⁶⁶ *Id.*

H. *Pennsylvania*—Commonwealth v. Dengler

Like Illinois, Pennsylvania is a *Frye* state by statute.²⁶⁷ Also, like Illinois, and New York as well, it offers a test of limited utility.²⁶⁸ Confirmed as a *Frye* state in *Grady v. Frito-Lay, Inc.*,²⁶⁹ Pennsylvania's test is triggered by novel science, or scientific techniques used in a novel way.²⁷⁰ Novelty is determined on an individualized basis; science initially deemed novel can be affected by a developing consensus or the strength of a later proponent's offer.²⁷¹ Items that are the subject of statutory provisions, such as the psychiatric criteria by which a sexual offender is deemed a sexually violent predator, are ineligible for consideration under *Frye*.²⁷² Once novelty is established, the test then requires the proponent to show that the methodology used is generally accepted within the relevant scientific community, but not that the scientific community has generally accepted an expert's conclusions.²⁷³ On appeal, *Frye* rulings are judged by an abuse of discretion review.²⁷⁴ The *Frye* test in Pennsylvania remains one designed to protect the jury from the "mystic infallibility" of scientific evidence,²⁷⁵ and employs a strict definition of novelty.²⁷⁶

I. *Washington*—State v. Greene

In admitting expert evidence, the state of Washington employs a two-part inquiry.²⁷⁷ First, testimony must pass its version of the *Frye* test.²⁷⁸ Second, the testimony must be admissible under state rule of evidence 702 (ER 702).²⁷⁹ In *State v. Greene*,²⁸⁰ the Supreme Court of Washington evaluated whether evidence of dissociative identity disorder was admissible

²⁶⁷ PA. R. EVID. 702(c).

²⁶⁸ See *supra* Parts III.D and III.G.

²⁶⁹ 839 A.2d 1038 (Pa. 2003).

²⁷⁰ Commonwealth v. Dengler, 890 A.2d 372, 382 (Pa. 2005).

²⁷¹ *Id.*

²⁷² *Id.* at 382–83.

²⁷³ *Id.* at 386 (citing *Grady v. Frito-Lay, Inc.*, 839 A.2d 1038, 1045 (Pa. 2003)).

²⁷⁴ *Id.* at 378.

²⁷⁵ *Id.* at 381 (quoting Commonwealth v. Topa, 369 A.2d 1277, 1282 (Pa. 1977)).

²⁷⁶ See *Dengler*, 890 A.2d at 382 (limiting *Frye* to novel evidence and emphasizing the court's ability to rely on previous decisions in lieu of further *Frye* hearings on a given subject).

²⁷⁷ State v. Greene, 984 P.2d 1024, 1027 (Wash. 1999).

²⁷⁸ See *id.* Under Washington State's version of the *Frye* test, novel evidence is admissible if "(1) the scientific theory or principal upon which the evidence is based has gained general acceptance in the relevant scientific community of which it is a part; and (2) there are generally accepted methods of applying that theory or principle in a manner capable of producing reliable results." *Id.*

²⁷⁹ WASH. REV. CODE ANN. § 702 (West 2017).

²⁸⁰ 984 P.2d 1024 (Wash. 1999).

to establish a defense of either insanity or diminished capacity.²⁸¹ In order to evaluate the admissibility of the defense's proffered evidence, the court analyzed "the level of recognition accorded to the scientific principle involved."²⁸² That level of recognition hinged on whether there was "significant dispute between *qualified* experts" or not.²⁸³ Specifically, the court looked to general acceptance within the scientific community, "without reference to its forensic application in any particular case."²⁸⁴

In spite of the fact that the court determined that there existed a moderate, ongoing dispute as to the strength of dissociative identity disorder, the *Greene* court found that testimony regarding the condition met the *Frye* standard.²⁸⁵ To meet ER 702, however, a scientific principle must not only be generally accepted, but it must also be capable of forensic application to the facts of a particular case.²⁸⁶ Ultimately, the Supreme Court of Washington excluded the testimony on the grounds that it could not be applied to the facts, as such testimony could not help the fact finder determine whether the defendant was mentally culpable.²⁸⁷ This adds another mechanism for evaluating the validity of established expertise which may be flawed as offered in the particular case in a different fashion than takes place in Florida or Maryland.²⁸⁸

V. EVOLVING *Frye*

A. *The Merits of Frye in Criminal Prosecution*

In an ideal world, *Daubert* would be a perfectly adequate test for assessing the validity of expert evidence in the criminal justice system. Were defendants able to afford to wage a bona fide battle of the experts,²⁸⁹ were the system unburdened of costs, time, and a full caseload, then perhaps each case could live up to the *Daubert* court's expectations.²⁹⁰ In reality, however,

²⁸¹ *Id.* at 1025.

²⁸² *Id.* at 1027.

²⁸³ *Id.* (emphasis added).

²⁸⁴ *Id.*

²⁸⁵ *Id.*

²⁸⁶ *Greene*, 984 P.2d. at 1029.

²⁸⁷ *See id.* at 1032 (holding that dissociative identity disorder is generally accepted in the psychiatric and psychological communities).

²⁸⁸ *Compare Greene*, 984 P.2d at 1024–32 (using a statutory mechanism to tie *Frye* to a relevance standard), *with Ramirez v. State*, 810 So.2d 836 (Fla. 2001), *and Wilson v. State*, 803 A.2d 1034, 1039 (Md. 2002) (modifying the common law in order to add a relevance requirement to *Frye*).

²⁸⁹ *See NATIONAL RESEARCH COUNCIL*, *supra* note 3, at 11 (outlining the limitations which bear upon criminal defendants).

²⁹⁰ *See Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 596 (1993) (detailing the Court's hopes for the adversarial process with respect to expert evidence).

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we need to account for the system of criminal justice that we have. It is one where inescapable and practical constraints mean that in most trials it is only the prosecution that presents expert evidence.²⁹¹ It is one where “most commentators believe ostensibly scientific testimony may sway a jury even when, as science, it is palpably wrong.”²⁹² In far too many instances, the realities of criminal prosecution have forced an unequal application of *Daubert* whereby

civil cases are subject to strict standards of expertise quality control, while criminal cases are not. The result [is] that the pocketbooks of civil defendants [are] protected from plaintiffs’ claims by exclusion of undependable expert testimony, but that criminal defendants [are not] protected from conviction based on similarly undependable expert testimony.²⁹³

How, then, can we serve the twin goals of criminal justice—apprehending the guilty and exonerating the innocent?²⁹⁴ Although the potential of *Frye*’s test seems never to have been fully realized,²⁹⁵ *Frye*, at its core, possessed the requisite muster.²⁹⁶ This may explain why, in the wake of *Daubert*, some jurisdictions revitalized their respective *Frye* tests.²⁹⁷ At the center of *Frye* lies an “essentially conservative nature”²⁹⁸ that affords scientists a leading role in determining which techniques are sound enough to be presented to lay jurors.²⁹⁹ This directly dovetails with the driving purpose behind this conference. In essence, *Frye* hews towards the antiquated but desirable goal of appointing a jury of experts, in the end allowing those qualified to offer a preliminary assessment.³⁰⁰

²⁹¹ Berger, *supra* note 67, at 1359 (“Studies show that courts have been quite reluctant to authorize funds for defense experts.”).

²⁹² Black et al., *supra* note 12, at 789.

²⁹³ Risinger, *supra* note 146, at 99.

²⁹⁴ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 96.

²⁹⁵ See *Daubert Revisited*, *supra* note 195 (explicating the underlying issues with *Frye*, but offering up a Florida Supreme Court case as “a reinvigorated *Frye* test”).

²⁹⁶ *Frye v. United States*, 293 F. 1013, 1014 (D.C. 1923) (“The thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.”).

²⁹⁷ See *id.*

²⁹⁸ *People v. Leahy*, 882 P.2d 321, 325 (Cal. 1994).

²⁹⁹ See *People v. Kelly*, 549 P.2d 1240, 1245 (Cal. 1976) (“*Frye* was deliberately intended to interpose a substantial obstacle to the unrestrained admission of evidence based upon new scientific principles.”).

³⁰⁰ See *People v. Barbara*, 255 N.W.2d 171, 194 (Mich. 1977) (describing *Frye* as an extension of the tradition of the expert jury).

Filtering expert testimony through *Frye* in trial level rulings—rulings which are subject to a highly deferential standard of appellate review—redirects the foundation of evidentiary decisions away from judges and lawyers who “generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner.”³⁰¹ It stands to reason that criminal justice’s drastically higher burden of proof—where the penalty is freedom as opposed to pecuniary loss—deserves a more stringent standard that will better shield determinations of guilt from the “vagaries of pseudoscience.”³⁰²

B. *Building a Better Frye Test*

The ultimate goal of *Frye* was to ensure that expert evidence is based on “sound scientific principles.”³⁰³ Sadly, it has frequently failed to live up to that goal.³⁰⁴ Its flaws lie in either excluding good science, or allowing past admission of bad science to serve as grounds for future admission.³⁰⁵ Up to this point, however, these issues stem not from the spirit of *Frye*, but rather from its implementation. The vagueness of key elements of the case have “allowed judges to pay lip service to *Frye*, yet base admissibility decisions on their own substantive scientific judgments and/or personal biases.”³⁰⁶

The core of *Frye*, on its face, is in line with the goals of excluding junk science and banning flawed methods. What is needed to bridge the gap between theory and practice, then, is renewed focus on *Frye*’s key terms, allowing *Frye* to live up to its original promise. To do so, one must take a hard look at current *Frye* standards, and identify the factors that advance these goals and those that hinder them. As described above, some state standards have been strengthened—by adding *Daubert*’s reliability elements into the general acceptance test.³⁰⁷ It is this “*Frye*-plus-reliability”³⁰⁸ model which offers the best hope to “preserve the integrity of the criminal justice

³⁰¹ NATIONAL RESEARCH COUNCIL, *supra* note 3, at 110.

³⁰² *Leahy*, 882 P.2d at 332.

³⁰³ *Bahura v. S.E.W. Inv’rs*, 745 A.2d 928, 948 (D.C. 2000).

³⁰⁴ See *Admissibility of Novel Scientific Evidence*, *supra* note 89, at 1207–08 (writing fourteen years before the passage of *Daubert* that “the problems *Frye* has engendered—the difficulties in applying the test and the anomalous results it creates—so far outweigh these advantages that the argument for adopting a different test has become overwhelming”).

³⁰⁵ See *Cino*, *supra* note 9, at 660 (listing *Frye*’s shortcomings as a series of unanswered questions, including “[w]ho determines the relevant scientific community,” “[h]ow does the court define the relevant scientific community,” and “[h]ow mainstream should a theory or technique be before it becomes relevant”).

³⁰⁶ See *Schwartz*, *supra* note 31, at 154.

³⁰⁷ See *Daubert Revisited*, *supra* note 195 (saying that *Ramirez v. State*, 810 So.2d 836 (Fla. 2001) “represents a reinvigorated *Frye* test, and it is not alone”).

³⁰⁸ *Donaldson v. Cent. Ill. Pub. Serv. Co.*, 767 N.E.2d 314, 326 (Ill. 2002).

system” by distinguishing “science fiction and junk science from fact.”³⁰⁹ To achieve this goal, this article proposes a five-pronged approach: first, expand the definition of novelty; second, clarify the meaning of general acceptance; third, determine the makeup of the relevant scientific community, and the role that group plays in conjunction with the trial judge; fourth, clarify the test for determining reliability; and fifth, build in pressure valves for correcting errors.

Novelty is the characteristic that triggers the *Frye* test.³¹⁰ Too often, however, courts rest their decisions on the fact that the proffered scientific method had previously been admitted into evidence, even in the face of evidence that the proffered technique had lost the general acceptance of the scientific community.³¹¹ Therefore, the definition of novelty needs to be broadened to apply *Frye* analysis to a larger category of expert analysis. The novelty requirement should not only be triggered by the novelty of a whole field of science, but it also should be particularized to the way in which a forensic scientist is applying that field in a given case.³¹² Florida provides an admirable example.³¹³ In *Ramirez v. State*, the Florida Supreme Court applied the *Frye* test to a case involving tool mark evidence, even though tool mark evidence had been used in court for decades prior to the *Ramirez* case.³¹⁴ What the court was reviewing, and what triggered the *Frye* test, was the particular expert’s application of the expertise to the facts in the case at hand.³¹⁵ The court excluded his examination, which claimed to be able to identify the defendant’s knife with perfect accuracy, as a new application of a very old scientific principle.³¹⁶ Broadening the mandatory application of the *Frye* test in this fashion will require courts to re-examine old techniques when applied to novel fact patterns, thus ensuring that more cases are exposed to the rigor of evaluating the underlying veracity of scientific principles in the concrete setting of the case, rather than as an abstract concept.

³⁰⁹ *Id.* at 853.

³¹⁰ *Frye v. United States*, 293 F. 1013, 1014 (D.C. 1923).

³¹¹ See NATIONAL RESEARCH COUNCIL, *supra* note 3, at 107 (“[C]ourts often ‘affirm admissibility citing earlier decisions rather than facts established at a hearing’”) (quoting Neufeld, *supra* note 33, at S109)).

³¹² *Ramirez v. State*, 810 So.2d 836 (Fla. 2001).

³¹³ *Id.*

³¹⁴ See *id.* at 842 (expanding novelty by finding the particular application of a traditional technique to be novel enough to trigger the need for *Frye*).

³¹⁵ See *id.* (particularizing *Frye*’s novelty requirement such that it applies to a specific forensic expert’s version of knife mark identification procedure).

³¹⁶ *Id.*

Second, after the trigger for *Frye* analysis is better defined, *Frye*'s parameters require further clarification. The definition of "general acceptance" has frustrated judges and academics alike for decades.³¹⁷ Fortunately, one of the great gifts of common law jurisprudence is the ability to redefine key terms after the fact.³¹⁸ In this instance, several state courts have offered a lesson in how to (and how not to) define general acceptance. As *Frye* seeks to account for the power of experts over fact finders,³¹⁹ and to ensure protection from spurious science,³²⁰ general acceptance cannot merely be limited to a headcount. It should be properly defined as an absence of genuine controversy within the relevant scientific community at the time of the court's analysis.³²¹

Third, it is important to properly identify both the makeup of the relevant scientific community, and to clarify the role(s) that group should play in the trial judge's analysis. In order to determine whether controversy exists with regard to the particular scientific principle, it is helpful to think of support for a given theory as akin to sufficiency, whereas the quality of that support is analogous to weight. To meet *Frye*'s requirement of general acceptance, a theory should have both broad support, as well as the support of the key leaders in that field.³²² In answering this question, the judge serves as the bridge between the scientific and legal worlds. It is her or his role to ensure that the proponent's claim rests on more than a bald assertion of acceptability.³²³ Rather, the judge must make a determination of whether the scientific principle enjoys general acceptance by weighing all relevant scientific sources, including "expert testimony, scientific and legal publications, and judicial opinions."³²⁴

³¹⁷ See Cino, *supra* note 9, at 660 (stating the lack of a workable definition as a key flaw in *Frye*).

³¹⁸ See Imwinkelried, *supra* note 1 ("Later courts developed the policy rationale that was conspicuously missing in the original *Frye* opinion."). Edward J. Imwinkelried, *The Importance of Daubert in Frye Jurisdictions*, 42 CRIM. L. BULL. 215 (2006).

³¹⁹ See Imwinkelried, *supra* note 1 (describing the historical fear held by the court that a risk will "overawe lay jurors").

³²⁰ *People v. Leahy*, 882 P.2d 321, 332 (Cal. 1994) (seeking to protect jurors from "the vagaries of pseudoscience" via *Frye*).

³²¹ See *e.g.*, *Wilson v. State*, 803 A.2d 1034, 1045 (Md. 2002) (defining general acceptance as an absence of genuine controversy within the relevant scientific community).

³²² See *id.* at 844. See *id.* at 1039–40.

³²³ *Ramirez v. State*, 810 So.2d 836, 844 (Fla. 2001) ("A bald assertion by the expert that his deduction is premised upon well-recognized scientific principles is inadequate to establish its admissibility if the witness's application of these principles is untested[.]").

³²⁴ *Id.* at 844.

Fourth, the judge must ensure that the sources being used to evaluate acceptance are indeed reliable. Drawing on the “*Frye*-plus-reliability” tests featured in Florida³²⁵ and Maryland,³²⁶ which fold *Daubert*-esque factors into general acceptance, judges should consider a three-step process for evaluating reliability. First, judges should look to the methodology used in the given field, and whether standards have been established. Second, tests used to prove a defendant’s guilt beyond a reasonable doubt should themselves be subject to statistical scrutiny in the form of both meaningful peer review, and the establishment of a quantifiable error rate. Lastly, the proponent of a theory should be obligated to prove general acceptance of both the underlying scientific principle and the acceptance of the procedure used to apply that principle to the facts at hand in a case. Applying these three factors will exclude “[t]estimony concerning an unreliable scientific process,” as an “unreliable opinion is of little value to a jury.”³²⁷

Fifth, *Frye* requires mechanisms on both the trial and appellate levels designed to excise extreme examples of flawed science from the system. Maryland offers a prime example for course correcting at the trial level in circumstances involving non-novel procedures.³²⁸ Currently, non-novel techniques with broad acceptance, including ballistics tests and blood tests, can be excused from *Frye* analysis through judicial notice. In Maryland, the inverse is also true; when patently unsound science comes before the bench, “a court may take judicial notice that certain procedures, widely recognized as bogus or experimental, are unreliable.”³²⁹ If Maryland’s procedure were to be applied in conjunction with Federal Rule of Evidence 201’s requirement that a noticed fact “be accurately and readily determined from sources whose accuracy cannot reasonably be questioned,”³³⁰ the trial judge’s inquiry would expand to include a contemporary understanding of any given scientific technique. Judicial notice affords a procedural avenue by which proven techniques can move through efficiently, and whereby suspect techniques—even established ones—can be screened out of the trial process.

At the appellate level, removing unsound science would be facilitated by emphasizing the opportunities for relief that apply to techniques that meet the expanded definition of novelty, as well as established scientific

³²⁵ *Id.*

³²⁶ *Wilson*, 803 A.2d at 1039.

³²⁷ *Id.*

³²⁸ *See id.* (allowing judges to take judicial notice that techniques are empirically unreliable).

³²⁹ *Id.* at 1039–40.

³³⁰ FED. R. EVID. 201.

techniques. Florida³³¹ and California³³² review their *Frye* decisions *de novo*. As no judge wants to be reversed, *de novo* review will encourage trial judges to be especially conscientious in adjudicating *Frye* issues. For addressing non-novel evidence, the *Ramirez* court made it clear that there are two avenues for relief: one under which evidence that meets its expanded definition of novelty can be challenged *de novo*; and another under which traditional applications of traditional techniques can be challenged, albeit by an abuse of discretion standard.³³³ Though the likelihood of success is drastically lower under an abuse of discretion standard, emphasizing both avenues highlights a commitment to excising convictions that rest on faulty science.

VI. *FRYE*, REVISED AND APPLIED

In Professor Imwinkelried's 2017 article,³³⁴ he outlined five stages at which prejudicial errors can be introduced into the trial process via flawed expert testimony: (1) the witness's status as an expert; (2) the general technique or theory on which the witness relies, otherwise known as the major premise; (3) the witness's case-specific facts, or the minor premise; (4) the application of the major premise to the minor premise; and (5) the final conclusion. His statutory, post-conviction remedy, offers a clear step forward in terms of remedying past mistakes that balances the need for finality against the demands of accuracy.³³⁵ Trial courts, however, remain the best cost avoiders, with the greatest ability to mitigate the risk of convictions that rest on faulty evidence, thereby helping to obviate the need for post-conviction litigation.

This paper's proposed *Frye*-plus-reliability standard most clearly helps to mitigate the introduction of error at stages two and four of Professor Imwinkelried's outline of the trial process. It is beyond the scope of this paper to propose tighter standards upon experts (step one), or their conclusions (step five), as those concerns can only be addressed by the forensic community itself. Moreover, case specific facts (step three) must be accepted as given. By addressing error at steps two and four, the expert's technique and the application of that technique to the facts of a case, the updated *Frye* model encourages a more thorough screening of forensic analysis.

³³¹ *Ramirez v. State*, 810 So.2d 836 (Fla. 2001).

³³² *People v. Leahy*, 882 P.2d 321 (Cal. 1994).

³³³ *Ramirez*, 810 So.2d. at 843.

³³⁴ Imwinkelried, *supra* note 42.

³³⁵ Imwinkelried, *supra* note 42.

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On its face, *Frye* has always been designed to address the second step governing the admission of expert evidence: the technique which an expert will apply to the facts of a case. The trigger for the test, however, has traditionally been limited to novel techniques. Expanding the trigger for the test—a broadening of the novelty requirement—will expose a greater number of techniques and theories to the scrutiny of the scientific community. Moreover, the proposed expansion of judicial notice would afford a second layer of protection against the presentation of flawed scientific evidence. Judges would be allowed to exclude egregious examples of faulty techniques, even non-novel ones, thus preserving the scientific integrity of the trial through the second stage.

The proposed model offers a chance to stretch *Frye* to cover the introduction of error at stage four by expanding the novelty requirement to include the major premise's application to the minor premise. Florida's example, where a forensic scientist was applying tool mark evidence, offers a case-in-point example for excluding subsequently invalidated evidence through *Frye*. The Florida Supreme Court's justification for excluding that technique stemmed from the idea that the application of the technique itself was novel. Expanding novelty in this fashion provides a new layer for effectively monitoring expert testimony in criminal cases.

Frye can never be stretched to incorporate Professor Imwinkelried's final stage where error can be introduced—the ultimate conclusions of experts. The court cannot regulate what forensic experts decide. The knowledge and training of these experts positions them as key to interpreting forensic evidence. By interposing the scientific community between individual experts and the ears of jurors, however, the conclusions of those experts will not need to be regulated. The *Frye*-plus-reliability test is designed to screen out error, whether because of the expert's reliance on unsound techniques, or unsound application of existing techniques to particular facts, at the earliest possible stage.

VIII. CONCLUSION

There were excellent reasons for trying to improve upon the *Frye* standard. Conventional wisdom is not the arbiter of ultimate truth, particularly scientific truth. Just tell Galileo that the sun revolves around the earth, or Marie Curie that there are no new elements to be discovered, or Elon Musk that electric cars are insipid. *Daubert* and Rule 702 enormously improved the world of civil litigation, affording attorneys on both sides the opportunity to offer cutting edge science in pursuit of civil justice. Criminal law, however, is simply a different world. On a practical level, it is not feasible to expect criminal defendants—the majority of whom are represented by defenders' associations—to wage a battle of the experts

against the state. Simply put, *Frye* is a standard of exclusion and *Daubert* is a standard of inclusion. When it is liberty that is at risk, scientific consensus and certainty are the pillars upon which reasonable doubt should rest. This is why a return to the *Frye* test, updated for the *Daubert* age, offers the best chance to improve the quality of expert evidence underpinning criminal convictions.