

Debunked, Discredited, but Still Defended Revising State Post-Conviction Relief Statutes To Cover Convictions Resting On Subsequently Invalidated Expert Testimony

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“Science came to be seen not as a gradual, relentless accumulation of knowledge . . . , but as a succession of superseded theories.”

– Margaret G. Farrell¹

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¹ Margaret G. Farrell, *Daubert v. Merrell Dow Pharmaceuticals, Inc.: Epistemology and Legal Process*, 15 CARDOZO L. REV. 2183, 2194 (1994).

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I. INTRODUCTION

The United States has long prided itself on the quality of justice dispensed by its criminal courts. We have taken special care to ensure that convictions rest on a reliable basis. In contrast to civil law systems that recognize few exclusionary rules of evidence, the United States still adheres to the common law trilogy of exclusionary rules based on the supposed unreliability of certain types of evidence.² Since the common law preferred that witnesses recite facts and allow the trier of fact to decide which, if any, inferences to draw from the facts, American courts enforce a general opinion prohibition.³ Similarly, since the common law was skeptical of paraphrasing documents, the courts generally demand the production of the original document and exclude secondary evidence of a document's contents.⁴ Finally, the common law preferred that witnesses appear in person, testify under oath, and be subject to cross-examination in view of the trier of fact. That preference accounts for the general exclusion of hearsay testimony.⁵ Dean John Henry Wigmore famously remarked that the hearsay doctrine was the "most characteristic rule of the Anglo-American law of Evidence."⁶ Although England has substantially liberalized its version of the hearsay rule, American courts still vigorously enforce the rule.⁷ The United States arguably has the most restrictive set of evidentiary rules in the world; and if those rules serve their intended purpose of enhancing the reliability of the verdicts resting on evidence, the typical American conviction should be exceptionally reliable.

In its celebrated 1993 decision, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,⁸ the Supreme Court dealt with one aspect of the opinion prohibition, namely, the restrictions on the admissibility of expert opinions. Predictably, the Court focused on the question of the reliability of expert opinions admitted under the Federal Rules of Evidence. In Justice Blackmun's words, "under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but

² RONALD L. CARLSON, EDWARD J. IMWINKELRIED, JULIE SEAMAN & ERICA BEECHER-MONAS, *EVIDENCE: TEACHING MATERIALS FOR AN AGE OF SCIENCE AND STATUTES* 96 (7th ed. 2012).

³ FED. R. EVID. 704 advisory committee's note on proposed rule ("The older cases often contained strictures against allowing witnesses to express opinions upon ultimate issues, as a particular aspect of the rule against opinions.").

⁴ FED. R. EVID. 1002.

⁵ FED. R. EVID. 801, 802.

⁶ JOHN H. WIGMORE, *A TREATISE ON THE ANGLO-AMERICAN SYSTEM OF EVIDENCE IN TRIALS AT COMMON LAW, INCLUDING THE STATUTES AND JUDICIAL DECISIONS OF ALL JURISDICTIONS OF THE UNITED STATES AND CANADA* § 1364 (3d ed. 1940).

⁷ CARLSON ET AL., *supra* note 2, at 566–57.

⁸ 509 U.S. 579 (1993).

reliable.”⁹ He stated that to be admissible, a scientific opinion “must be derived by the scientific method . . . [,] supported by appropriate validation.”¹⁰ Justice Blackmun explained that that test “establishes a standard of evidentiary reliability.”¹¹ Thus, in his view, “evidentiary reliability [is] based upon scientific validity.”¹²

A. *The Indications That Flawed Expert Testimony Has Already Contributed to a Significant Number of Wrongful Convictions*

Given this strong judicial commitment to reliability, the revelations of the number of wrongful convictions in the United States are troubling. By late 2016, post-conviction DNA testing had resulted in the exoneration of over 340 wrongfully convicted accused.¹³ More broadly, the National Registry of Exonerations listed nearly 2,000 wrongful convictions.¹⁴ In one way or another, all fifty states now permit post-conviction DNA testing to identify wrongful convictions.¹⁵ The magnitude of the problem has prompted twenty-eight states to go to the length of enacting legislative schemes for compensating wrongfully convicted accused.¹⁶

To make matters worse, it is clear that flawed expert testimony contributed to a significant percentage of these wrongful convictions. Invalid expert testimony has become a disturbingly “recurrent theme[.]” in

⁹ *Id.* at 589. *See also id.* at 597 (“[T]he Rules of Evidence—especially Rule 702—do assign to the trial judge the task of ensuring that an expert’s testimony both rests on a reliable foundation and is relevant to the task at hand.”).

¹⁰ *Id.* at 590.

¹¹ *Id.*

¹² *Id.* at 590–91 n.9. *See also* Vincent P. Iannece, Note, *Breaking Bad Science: Due Process as a Vehicle for Post-Conviction Relief When Convictions Are Based on Unreliable Scientific Evidence*, 89 ST. JOHN’S L. REV. 195, 196 (2015) (noting “the Supreme Court’s requirement that only reliable expert testimony be admitted”).

¹³ PRESIDENT’S COUNCIL OF ADVISORS ON SCI. & TECH., REPORT TO THE PRESIDENT: FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 3 (2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf [hereinafter PCAST]. *See also* M. Chris Fabricant & Tucker Carrington, *The Shifted Paradigm: Forensic Science’s Overdue Evolution from Magic to Law*, 4 VA. J. CRIM. L. 1, 13, 19 (2016). *See also id.* at 63–93.

¹⁴ As of February 26, 2017, the registry had catalogued 1,994 exonerations. NAT’L REGISTRY OF EXONERATIONS, <http://www.law.umich.edu/special/exoneration> (last visited Apr. 18, 2018). *See also* Ken Strutin, *Report—President’s Council of Advisors on Science and Technology Casts Doubt on Criminal Forensics*, LLRX (Mar. 19, 2017), <http://www.llrx.com/2017/03/report-presidents-council-of-advisors-on-science-and-technology>; Meghan J. Ryan & John Adams, *Cultivating Judgment on the Tools of Wrongful Conviction*, 68 SMU L. REV. 1073, 1076 (2015) (“Since 1989, over 1,700 individuals have been exonerated of the crimes for which they were convicted”).

¹⁵ DONALD E. WILKES, JR., STATE POSTCONVICTION REMEDIES AND RELIEF HANDBOOK 18 (2016).

¹⁶ *Id.* at 23.

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the wrongful conviction studies.¹⁷ Of the first 250 DNA exoneration cases in the United States, more than half of the cases involved overstated or invalid expert testimony.¹⁸ One study of 156 accused exonerated by post-conviction DNA testing reported that at 60% of the trials, “forensic analysts called by the prosecution provided invalid testimony . . . —that is, testimony with conclusions misstating empirical data or wholly unsupported by empirical data.”¹⁹ In order to address these deficiencies, several states (including New York and Texas) have established forensic science commissions to oversee the government laboratories and agencies providing expert witness services.²⁰ For their part, twenty-six localities have created conviction integrity review units.²¹

B. *The Probability That in the Future the Courts Will Be Asked to Grant Post-Conviction Relief Based on Subsequently Invalidated Expert Testimony in a Significant Number of Cases*

The past revelations have raised the consciousness of the general problem of wrongful convictions. In the future the courts will probably face a large number of cases in which the basis for relief is the claim that subsequent scientific research has invalidated expert testimony that contributed to the prior conviction.

In the typical case not involving expert testimony, several factors concur to minimize the probability that there will be a future, plausible attack on the prior conviction or another accused’s conviction. Only a limited number of persons have a strong incentive to scrutinize the testimony underlying the prior conviction. To be sure, the accused, his or her counsel, and his or her family may be motivated to do so. However, it will be the rare third party whose sense of justice or curiosity is so strong that they are willing to devote time and resources to a post-conviction investigation.

¹⁷ Inger H. Chandler, *Conviction Integrity Review Units: Owning the Past, Changing the Future*, 31 CRIM. JUST. 14, 15 (2016). See also BOAZ SANGERO, SAFETY FROM FALSE CONVICTIONS (2016); Erin Murphy, *Neuroscience and the Civil/Criminal Daubert Divide*, 85 FORDHAM L. REV. 619, 634 (2016) (“The raised awareness of the problem of wrongful conviction, and the prominent role that faulty science has played in those injustices . . .”).

¹⁸ Brandon L. Garrett, *Bad Hair: The Legal Response to Mass Forensic Errors*, 42 LITIG. 32, 32, 33 (2016).

¹⁹ Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 9 (2009) (noting that there were 82 such cases: “this set of trials included invalid testimony by 72 forensic analysts called by the prosecution and employed by 52 laboratories, practices, or hospitals from 25 states”).

²⁰ Ryan & Adams, *supra* note 14, at 1110; FORENSIC TECH. CTR. OF EXCELLENCE, NAT’L INST. OF JUST. & RTI INT’L, STATE FORENSIC SCIENCE COMMISSIONS: FINAL REPORT (Nov. 2016), <https://rti.connectsolutions.com/sfsc>; Caitlin M. Plummer & Imran J. Syed, *Criminal Procedure vs. Scientific Progress: The Challenging Path to Post-Conviction Relief in Cases That Arise During Periods of Shifts in Science*, 41 VT. L. REV. 279, 333 (2016).

²¹ Chandler, *supra* note 17, at 15; Plummer & Syed, *supra* note 20, at 338.

Moreover, even when these investigators tender the court's evidence to challenge the validity of the prior conviction, many courts are skeptical of the reliability of the new evidence. Generally, investigators such as members of the accused's family are hardly impartial; and the courts fear that they might have resorted to bribery or duress to obtain the new evidence.²² For that reason, the investigators' tender of new evidence does not guarantee that the court will grant post-conviction relief.²³ The tender is often greeted with judicial skepticism. Finally, even if the investigators succeed in overturning the prior conviction, their efforts will likely affect only that case. Their investigation is usually case-specific. Thus, even if the investigators unearth persuasive evidence of false confession or mistaken eyewitness identification, that evidence ordinarily will have no impact on any other case.

In each respect, expert testimony cases differ radically. Although in the typical case only a small number of persons will pursue a later investigation into the evidence that served as the basis for the prior conviction, in an expert testimony case, thousands of scientists worldwide may be engaged in ongoing research into the validity of the expert technique in question. The state of the research into the technique's validity may very well be "in flux."²⁴ Furthermore, the vast majority of these scientific investigators will be strangers to the prior litigation and, hence, more impartial. Even if a court is reluctant to grant a new trial based on testimony by a lay witness discovered by the accused's family, the court may be receptive to testimony by a German physicist who made a discovery during her independent research. Finally, and perhaps most importantly, the significance of the scientific discovery is likely to transcend the post-trial proceeding in which testimony about the discovery is offered.²⁵ Unlike the case-specific testimony offered in the typical case,²⁶ the subsequent discovery may relate to a general scientific question²⁷ that arose in hundreds or thousands of prior criminal trials. Together, these factors create a good probability that in future post-conviction relief proceedings, many courts will have to grapple with the question of the impact of subsequent scientific research. If a prior conviction rested on expert testimony, has the later research raised such grave questions about the reliability of the testimony that the accused should receive a new trial?

²² Janice J. Repka, Comment, *Rethinking the Standard for New Trial Motions Based Upon Recantations as Newly Discovered Evidence*, 134 U. PA. L. REV. 1433, 1442 (1986).

²³ *Id.*; Tim A. Thomas, *Standard for Granting or Denying New Trial in State Criminal Case on Basis of Recanted Testimony: Modern Cases*, 77 A.L.R.4th 1031 (1989).

²⁴ *Gimenez v. Ochoa*, 821 F.3d 1136, 1146 (9th Cir. 2016).

²⁵ David L. Faigman, *Appellate Review of Scientific Evidence Under Daubert and Joiner*, 48 HASTINGS L.J. 969, 974, 976-79 (1997).

²⁶ *Id.* at 976, 979.

²⁷ *Id.* at 976-77.

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This question has become so pressing that several jurisdictions have recently amended their post-conviction relief statutes to address the question. In 2014, the California legislature amended Penal Code Section 1473. That statute governs the grant of new trial motions when a prior conviction rests on “false evidence.”²⁸ As amended, Section 1473(e)(1) now reads: “For purposes of this section, ‘false evidence’ shall include opinions of experts that have been repudiated by the expert who originally provided the opinion at a hearing or trial or that has been undermined by later scientific research or technological advances.”²⁹ The amendment took effect in 2015. In the same year, Texas revised its Code of Criminal Procedure Article 11.073. Subsection (a) of that statute now provides that an accused is entitled to a new trial if he or she presents testimony about expert research that “was not available . . . at the convicted person’s trial” and that “contradicts scientific evidence relied on by the state at trial.”³⁰

The purpose of this Article is to assess the advisability of post-conviction relief legislation specifically addressing the issue of the subsequent invalidation of expert testimony that served as the basis for a prior conviction. Part II of this Article defines and delimits the scope of this Article. It explains that this Article addresses the problem as an issue of criminal justice policy, not as a matter of constitutional law. Part III turns to the question of when, if ever, subsequent scientific research should justify a new trial. To what extent must the later research call into question the reliability of the earlier expert testimony? And which components of the prior expert reasoning can be targeted? Finally, Part IV takes up the question of the adequacy of the existing state post-conviction relief legislation. Assume that as a matter of policy an accused should obtain relief in the situations identified in Part III. Are the existing statutes worded broadly enough that we can be confident that a deserving accused can obtain relief? If not, is the wording of the new California or Texas legislation an optimal model for reform?

²⁸ WILKES, JR., *supra* note 15, § 7:61 (“[T]he legislation was originally introduced to address a problem illustrated by the so-called Rampart scandal in which it was discovered that certain Los Angeles Police Department officers had engaged in misconduct, including planting evidence, filing false police reports, committing perjury, and creating nonexistent confessions.”). See Fabricant & Carrington, *supra* note 13, at 33–35 (discussing the new California and Texas legislation).

²⁹ CAL. PENAL CODE § 1473(e)(1) (West 2017).

³⁰ TEX. CODE CRIM. PROC. ANN. art. 11.073 (West 2015).

II. DELIMITING AND DEFINING THE TOPIC

This problem area raises a plethora of issues. An article of this length can mention some of those issues in passing, but it cannot hope to adequately address all the aspects of the problem. Therefore, before defining the topic of this Article, it is critical to delimit the topic and identify the issues that are beyond its scope. In particular, this Article does not address three related topics: (A) constitutional claims; (B) claims based on scientific research available at the time of the prior trial; and (C) the role that the subsequently invalidated scientific evidence played at the prior trial.

A. *Constitutional Claims*

This Article does not discuss the question of whether there is a constitutional right to post-conviction relief in the situations identified in Part III. In the past, the Supreme Court has indicated that

[t]he Constitution . . . protects a defendant against a conviction based on evidence of questionable reliability, not by prohibiting the introduction of the evidence, but by affording the defendant means to persuade the jury that the evidence should be discounted as unworthy of credit. Constitutional safeguards available to defendants to counter the State's evidence include the Sixth Amendments right to counsel; compulsory process; and confrontation plus cross-examination of witnesses.³¹

In *Herrera v. Collins*,³² the Court observed that it has never treated a claim of innocence based on newly discovered evidence as a basis for federal habeas corpus relief absent an independent constitutional violation.³³

However, in her concurrence in *Herrera*, Justice O'Connor was willing to assume *arguendo* that "a truly persuasive of actual innocence would render any . . . execution unconstitutional . . ." ³⁴ Later in *House v. Bell*,³⁵ the Court referred to a "hypothetical freestanding innocence claim." The

³¹ Perry v. New Hampshire, 565 U.S. 228, 237 (2012). See Iannece, *supra* note 12, at 210–11; Plummer & Syed, *supra* note 20, at 305 ("the Due Process Clause has traditionally been understood to guarantee procedures, not outcomes").

³² *Herrera v. Collins*, 506 U.S. 390 (1993). See Plummer & Syed, *supra* note 20, at 323–24.

³³ 506 U.S. at 389–99. See Justin Brooks, Alexander Simpson & Paige Kaneb, *If Hindsight Is 20/20, Our Justice System Should Not Be Blind to New Evidence of Innocence: A Survey of Post-Conviction New Evidence Statutes and a Proposed Model*, 79 ALB. L. REV. 1045, 1051 (2016).

³⁴ 506 U.S. at 427 (O'Connor, J., concurring). See Plummer & Syed, *supra* note 20, at 324 ("[A]t least five members of the Court . . . would have explicitly held that a freestanding claim of actual innocence is cognizable, at least under certain circumstances.").

³⁵ *House v. Bell*, 547 U.S. 518, 555 (2006).

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freestanding theory enjoys some scholarly support.³⁶ A number of state courts have held that “the conviction of an innocent person [is itself] . . . a violation of due process.”³⁷ Moreover, several lower federal courts have acknowledged the theoretical possibility of a “freestanding” constitutional “innocence claim.”³⁸ However, those courts have cautioned that even if such a claim is possible, the threshold would be “extraordinarily high”³⁹ and that relief would be available “only in very narrow circumstances.”⁴⁰

This Article does not venture into that constitutional thicket. It undertakes a non-constitutional policy analysis. Rather than invoking due process, this Article poses this question: If our criminal justice system is now so dependent on expert testimony and the trajectory of science makes it inevitable that subsequent research will sometimes invalidate the expert testimony that a prior conviction rests on, should post-conviction relief statutes afford the wrongly accused a remedy?

B. *Claims Based on Scientific Research Available at the Time of the Prior Trial*

This Article has the same temporal focus as the new California and Texas legislation. California Penal Code Section 1473(e)(1) expressly refers to expert testimony that has “been undermined by later scientific research or technological advances.” Likewise, under Texas Code of Criminal Procedure Article 11.073(a)(1), the scientific research that the accused relies on must “not [have been] available . . . at the convicted person’s trial.”⁴¹ The research must constitute after-discovered evidence that could not have been offered at trial despite the exercise of due diligence by the defense counsel.

If the scientific studies were available at the time of the prior trial, the accused’s primary avenue for relief is an ineffective assistance of counsel claim.⁴² The Supreme Court upheld such a claim in its 2014 decision in

³⁶ Iannece, *supra* note 12.

³⁷ See e.g., Chandler, *supra* note 17, at 16 (Texas law).

³⁸ Gimenez v. Ochoa, 821 F.3d 1136, 1144 (9th Cir. 2016) (citing Albrecht v. Horn, 485 F.3d 103 (3d Cir. 2007)).

³⁹ Albrecht, 485 F.3d at 122.

⁴⁰ Gimenez, 821 F.3d at 1145.

⁴¹ *Ex parte Avila*, No. WR–59,662–02, 2016 WL 922191 (Tex. Crim. App. Mar. 9, 2016). See Plummer & Syed, *supra* note 20, at 284–89 (noting that new scientific information is not distributed perfectly; it takes time for the research to “percolate;” even if it is circulating within the scientific community, as a practical matter, it may be unavailable to defense counsel; it is too much to expect counsel to discover new scientific research as soon as it is released); Caitlin M. Plummer & Imran J. Syed, “*Shifted Science*” Revisited: *Percolation Delays and the Persistence of Wrongful Convictions Based on Outdated Science*, 64 CLEV. ST. L. REV. 483 (2016). See Fabricant & Carrington, *supra* note 13, at 33–35.

⁴² Brandon L. Garrett, *Constitutional Regulation of Forensic Evidence*, 73 WASH. & LEE L. REV. 1147, 1164 (2016); Brooks et al., *supra* note 33, at 1050, 1066 (noting due diligence);

Hinton v. Alabama.⁴³ Hinton's conviction rested in large part on firearms identification testimony. When he later sought federal habeas relief, Hinton did not point to any new breakthroughs in the field of firearms identification. Rather, the thrust of his argument was that his prior defense counsel had not presented a competent attack on the prosecution expert testimony:

The defense lawyer did hire an expert, one with poor vision and poor qualifications. He testified that the revolver was corroded and could not be compared to any bullet. The expert admitted that he had only the use of one eye, making it difficult to see through a forensic microscope. Later, during federal habeas proceeding, new lawyers argued that Hinton's trial attorney was ineffective for failing to hire competent and qualified ballistics experts. The new attorneys hired three new and highly qualified experts from leading laboratories, who all concluded that the bullets were not fired from Hinton's gun[.]⁴⁴

Even before *Hinton*, numerous lower courts had granted post-conviction relief when the trial defense counsel neglected to marshal readily available scientific data that would have permitted an effective attack on prosecution expert testimony. These lower court cases involve arson analysis, cell tower evidence, fingerprint examination, pathology testimony, and pharmacological evidence.⁴⁵

Plummer & Syed, *supra* note 20, at 295 (noting that there are "two possible" relevant ineffective assistance claims: "(a) ineffective assistance of counsel for failure to discover the present an alternative to the science presented by the State; and (b) ineffective assistance of counsel for failure to object to and/or prevent the prosecution's experts from testifying at all by moving to exclude their testimony . . ."). See *State v. Behn*, 868 A.2d 329 (N.J. Super. Ct. App. Div. 2005) (discussing the reasonable diligence requirement).

⁴³ *Hinton v. Alabama*, 134 S. Ct. 1081 (2014).

⁴⁴ *Garrett*, *supra* note 42, at 1164–65.

⁴⁵ *Id.* at 1169–70 (collecting cases). See also Paul C. Giannelli & Sarah Antonucci, *Forensic Experts and Ineffective Assistance of Counsel*, 48 CRIM. L. BULL. 1360 (2012). As the official Comment to American Bar Association (ABA) Model Rule of Professional Conduct 1.1 notes, these fact situations can raise legal ethical issues as well as constitutional law questions. See also MODEL RULES PROF'L CONDUCT r. 1.1 cmt. (AM. BAR ASS'N 1983) (citing *Strickland v. Washington*, 466 U.S. 668 (1984)). In the classic statistical testimony case, *People v. Collins*, 438 P.2d 33 (Cal. 1968), the court suggested that it was unfair to expect defense attorneys, unschooled in mathematics, to detect the flaws in the prosecution's statistical evidence. However, it is arguably the responsibility of the opposing party to learn enough about the discipline to educate the jurors about the limitations of the testimony. Under the ABA Model Rules of Professional Conduct 1.1 and 1.3, counsel owes duties of competence and diligence to his or her client. MODEL RULES PROF'L CONDUCT r. 1.1, r. 1.3 (AM. BAR ASS'N 1983). The Comment to Rule 1.1 contemplates that it may sometimes be appropriate for counsel to research topics on the Internet in order to provide competent counsel. MODEL RULES PROF'L CONDUCT r. 1.1 cmt. (AM. BAR ASS'N 1983) (citing Ellie Margolis, *Surfin' Safari: Why Competent Lawyers Should Research on the Web*, 10 YALE J.

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Simply stated, when the defense counsel could feasibly have accessed the scientific research at the time of the accused's original trial, there is no need to resort to special legislation such as the new California and Texas statutes. Instead, the accused can invoke the well-settled doctrine of ineffective assistance of counsel and cite favorable, recent precedents such as *Hinton*.

C. *The Related, But Distinct Issue of the Impact of the Subsequently Invalidated Expert Testimony at the Prior Trial*

When an accused seeks post-conviction relief based on the subsequent invalidation of the testimony that his or her conviction rests on, the accused must satisfy a both/and proposition: the accused must not only demonstrate that later scientific research undermined prosecution expert testimony introduced at the prior trial, but also must establish that the testimony played a major role in persuading the trier of fact to convict at the prior trial. Thus, the defense must prove the effect of the subsequent scientific research on the prosecution expert testimony as well as the effect of the expert testimony on the trier of fact's decision. Even when subsequent scientific research utterly discredits the prosecution expert testimony introduced at the prior trial, the accused should not be entitled to a new trial if that testimony played a minor role at the trial.

The standard for the latter showing deserves extended treatment in a separate article.⁴⁶ The showing of the impact of the testimony on the prior verdict is just as essential to the accused's claim for relief as the showing of the effect of the subsequent scientific research on the reliability of the expert testimony. Moreover, the courts are currently divided over the standard for proving the requisite material impact. One school of thought is that the

L. & TECH. 82 (2007)). Any contemporary counsel ought to realize that scientific testimony is frequently proffered at trial. That is especially true in jurisdictions with discovery rules modeled after Federal Rule of Criminal Procedure 16. By virtue of Rule 16, if the defense makes a timely request, each testifying prosecution expert must provide a report outlining his or her testimony. PAUL C. GIANNELLI, EDWARD J. IMWINKELRIED, ANDREA ROTH & JANE CAMPBELL MORIARTY, *SCIENTIFIC EVIDENCE* § 3.03 (5th ed. 2015). Even if it was justifiable to excuse a defense attorney's ignorance in 1968, a half century later, that excuse rings hollow.

⁴⁶ That issue is the central focus of Brooks et al., *supra* note 33, at 1056–65. The question is also one of the principal concerns of Plummer & Syed, *supra* note 20, at 299 (“material”). Neither article addresses the question of the method of determining whether the new scientific research raises sufficient doubts about the accuracy of the prior testimony. Some of the published literature merges and thereby confuses the two, analytically distinct issues. *See, e.g.,* Caitlin Plummer & Imran Syed, “*Shifted Science*” and *Post-Conviction Relief*, 8 STAN. J. C.R. & C.L. 259, 268 (2012) (“The mere fact that a valid competing scientific theory has emerged suffices as ‘shifted science’ potentially calling the conviction into doubt. . . . [T]he legal standard for new evidence warranting a new trial, while it varies by jurisdiction, is generally targeted at whether the new evidence would have caused reasonable doubt if presented at trial.”).

systemic interest in finality is so weighty that the accused must demonstrate that it is likely or probable that the exclusion of the prosecution expert testimony at the prior trial or the presentation of new research challenging that testimony would have changed the outcome of the earlier trial.⁴⁷ In contrast, other courts are satisfied with a showing of a reasonable possibility of an acquittal—in other words, a showing that the trier of fact might have reached a different conclusion.⁴⁸ To muddy the waters, still other courts sometimes employ the standard of a reasonable probability that the newly discovered scientific evidence could have affected the outcome.⁴⁹ That issue is a question for another day. Rather than discussing the standard for evaluating the impact of the new evidence on the verdict, this Article focuses on the effect of the new scientific research on the prosecution expert testimony. Part III.A addresses the policy question of when the availability of such research trumps finality and justifies granting a new trial. Part III.B argues that there are five situations in which a new trial is warranted. Part III then turns to the question of whether the existing post-conviction relief statutes have to be amended to allow a new trial in those situations. Are the statutes broad enough to allow relief?

III. WHEN, IF EVER, SHOULD NEW SCIENTIFIC RESEARCH JUSTIFY AWARDING THE POST-CONVICTION RELIEF OF A NEW TRIAL?

This Part addresses two issues. The first, discussed in Part III.A, is the general standard for determining when subsequent scientific research has invalidated the prosecution expert testimony introduced at a prior trial to the extent that it ought to triumph over the public interest in finality. Next, Part III.B identifies five situations in which later scientific research can satisfy that general standard.

⁴⁷ *Albrecht v. Horn*, 485 F.3d 103, 121 (3d Cir. 2007) (“more likely than not”), *cert. denied*, 552 U.S. 1108 (2008); *United States v. Mahdi*, 172 F. Supp. 3d 57, 68 (D.D.C. 2016); *United States v. Slough*, 144 F. Supp. 3d 4, 14 (D.D.C. 2015); *In re Miles*, No. G046534, 2017 WL 222569 (Cal. Ct. App. Feb. 10, 2017); *In re Richards*, 371 P.3d 195, 202 (Cal. 2016); *State v. Behn*, 868 A.2d 329, (N.J. Super. Ct. App. Div. 2005); Chandler, *supra* note 17, at 15 (noting that the defendant “would not have been convicted . . .”); Iannece, *supra* note 12, at 231; Plummer & Syed, *supra* note 20, at 316 (“a reasonable probability”); Repka, *supra* note 22, at 1439; Thomas, *supra* note 23, § 2 (noting that the leading authority is *Berry v. State*, 10 Ga. 511 (1851)).

⁴⁸ Repka, *supra* note 22, at 1454; Thomas, *supra* note 23, at § 2 (noting that the leading authority is *Larrison v. United States*, 24 F.2d 82 (7th Cir. 1928)).

⁴⁹ *In re Richards*, 371 P.3d 195, 202 (Cal. 2016); *In re Figueroa*, 412 P.3d 356 (Cal. 2018).

A. *The General Invalidation Standard*

Suppose that at a criminal trial, the prosecution relies on expert testimony to gain a conviction. After the trial, the scientific community produces new research relevant to the reliability of the expert testimony. The new research could have several impacts on the prior testimony. At one extreme, the research could confirm the validity of the prior testimony. At the other extreme, the research could completely discredit the expert testimony. To complicate matters, there are several points on the spectrum between the two polar extremes. For example, the new research could simply call into question the validity of the expert testimony and create a controversy over its validity. Or, even if the research does not affirmatively disprove the prior testimony, the research could raise such grave doubts about the reliability of the testimony that it would undermine any rational decision-maker's confidence in the prior testimony. As Holmes observed, the courts are always drawing lines.⁵⁰ Where should the line be drawn here? At what point do the profound public interests in liberty and accurate judicial outcomes outweigh the considerable systemic interest in finality?⁵¹

1. One Extreme, Subsequent Research Confirming the Validity of the Earlier Testimony

At the two extremes, the answer is obvious. If the later scientific studies generally confirm the validity of the prior testimony, there certainly is no justification for awarding a new trial. Consider the relationship between two DNA typing techniques, the earlier Restriction Fragment Length Polymorphism (RFLP) technique using single-locus probes⁵² and the later Short Tandem Repeat (STR)⁵³ technique. Although the latter technique analyzes shorter fragments than the former technique, both techniques rely on length polymorphisms. Depending on the number of loci STR fragments sampled, STR can yield more impressive random match probabilities (RMP) than RFLP. However, the two technologies often yield results that are generally consistent. In many instances, both technologies produce matches; and in a large number of cases, both yield exclusions. In short, although STR proved to have more practical utility than RFLP, the advent of STR did not call into question the essential validity of single-locus probe RFLP. If a litigant's resources and time permitted, a litigant well might employ both RFLP and STR; and the result of one technique could corroborate the other

⁵⁰ OLIVER W. HOLMES, *THE COMMON LAW* 127 (1881).

⁵¹ *Ex parte White*, 506 S.W.3d 39 (Tex. Crim. App. 2016) (noting the choice between finality and accuracy in the results of cases).

⁵² PAUL C. GIANNELLI, EDWARD J. IMWINKELRIED, ANDREA ROTH & JANE CAMPBELL MORIARTY, *SCIENTIFIC EVIDENCE* § 18.03[b] (5th ed. 2012) [hereinafter GIANNELLI ET AL.].

⁵³ *Id.* § 18.03[c].

test result. In this situation, it would be a waste of time to grant a new trial solely because subsequent research made a new technology available. A new technology can represent an improvement over a prior technology without condemning the prior technology as junk science.

2. The Other Extreme, Subsequent Research Thoroughly Discrediting the Validity of the Earlier Testimony

If we go back farther in the history of DNA typing, though, we encounter the other extreme in which the subsequent studies almost thoroughly invalidate the prior testimony. When American forensic laboratories began utilizing DNA typing in the early 1980s, they employed a different version of RFLP based on multi-locus probes.⁵⁴ When a laboratory uses multi-locus probes, the probe can strike several proximate locations on the same chromosome. As the 1992 National Research Council DNA Report emphasized, the use of multi-locus probes made it improper for laboratories to employ the multiplication or product rule to compute the random match probability.⁵⁵ After the laboratory had identified the genetic markers at the various locations, the laboratory would find the population frequency for each marker and multiply all the frequencies to compute the overall RMP—the probability that a random person in the same population would have the same genetic profile. However, it is axiomatic that the multiplication or product rule may not be used unless the multiplicands (the probabilities or frequencies being multiplied) are independent. If the sites are close together on the same chromosome, there is no assurance of independence. For that reason, the 1992 Report recommended the immediate discontinuation of the use of multi-locus probe RFLP results as a basis for computing the RMP. Laboratories shifted en masse to single-locus probes targeting sites on different chromosomes.

In this situation, two factors concurred. First, the two technologies yielded different outcomes. An RMP based on multi-locus probe analysis often differed radically from the RMP based on single-locus probe analysis. Secondly, molecular biologists and population geneticists advanced a direct, foundational criticism of reliance of multi-locus probes; they identified a fatal flaw in an essential premise of the prior methodology, the lack of proof of independence. The concurrence of those factors so completely discredited the earlier technology that multi-locus probe RFLP is now “passe.”⁵⁶ This development reflected an immediate, widespread recognition that the subsequent scientific analysis had invalidated the prior methodology. This is the rare case in which the later research exposed the prior methodology as

⁵⁴ *Id.* § 18.03[a].

⁵⁵ *Id.* § 18.04[c][2].

⁵⁶ *Id.* § 18.03[a].

“almost entirely unreliable.”⁵⁷

In that light, suppose that at an earlier trial, the prosecution had presented an impressive RMP based on multi-locus probe RFLP analysis. A later single-locus probe RFLP analysis yields either an outright exclusion or a dramatically smaller RMP. Given the foundational flaw in the use of RFLP multi-locus probe results to compute the RMP, it would be justifiable to grant the accused a new trial—assuming, of course, that the defense satisfied the other post-conviction relief requirements such as the requisite showing of the effect of the earlier RFLP testimony on the verdict.⁵⁸

3. Subsequent Research Raising Doubts About the Validity of the Prior Testimony

Assume that after a criminal trial at which the prosecution relied on expert testimony, later scientific research raises a question about the validity of the testimony. Standing alone, that should not lead to a new trial. One of the most important passages in *Daubert* is Justice Blackmun’s frank recognition of the unavoidable uncertainty in investigational science: “it would be unreasonable to conclude that the subject of scientific testimony must be ‘known’ to a certainty; arguably, there are no certainties in science.”⁵⁹ In making that remark, Justice Blackmun drew on several amicus curiae briefs filed by individual scientists and scientific organizations.⁶⁰ The traditional, popular view was that this is an orderly universe, governed by invariable physical laws that can be discovered by the classical scientific methodology of formulating a hypothesis, subjecting the hypothesis to empirical testing, and critically evaluating the test results.⁶¹ On that assumption, absolute certainty is attainable.

⁵⁷ Iannece, *supra* note 12, at 219 (quoting *United States v. Berry*, 624 F.3d 1031, 1041 (9th Cir. 2010)). *See also id.* at 220 (citing *Byrd v. Collins*, 209 F.3d 486, 517–18 (6th Cir. 2000)) (stating “indisputably false”); Brooks et al., *supra* note 33, at 1048 (stating “completely undermine”); *State v. Behn*, 868 A.2d 329, 336–39, (N.J. Super. Ct. App. Div. 2005) (noting that subsequent research undermined the assumptions of Comparative Bullet Lead Analysis (CBLA) testimony; the opinion describes the research conducted by experts such as Erik Randich, a metallurgist at the Lawrence Livermore National Laboratories, and William Tobin, a retired chief metallurgist at the FBI; and in a letter, Dr. Randich flatly stated that the available empirical data demonstrated that the assumptions underlying CBLA—namely, that each production batch was unique and homogeneous—were “not valid”).

⁵⁸ *See supra* Part II.

⁵⁹ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 590 (1993).

⁶⁰ *Id.*

⁶¹ Edward J. Imwinkelried, *Evidence Law Visits Jurassic Park: The Far-Reaching Implications of the Daubert Court’s Recognition of the Uncertainty of the Scientific Enterprise*, 81 IOWA L. REV. 55, 59–60 (1995).

However, as the amicus briefs informed the Court, that is no longer the modern understanding of the scientific enterprise. Today there is a more realistic sense of the limitations of investigational science. In some cases, scientists rely on deductive reasoning. If one defines “two” in a certain way and “four” in a certain way, one can deduce that two plus two equals four. However, that is not how investigational science proceeds. Modern scientists rely on inductive and abductive reasoning. Suppose that when a scientist subjects a hypothesis to an empirical test, the result appears to validate the hypothesis. That gives the scientist a measure of confidence in the hypothesis. If a second test also seems to verify the hypothesis, the scientist can have even greater confidence in the hypothesis. However, no matter how many test outcomes seemingly confirm the hypothesis, another test is always conceivable; and so long as that is the case, there is a possibility of subsequent falsification of the hypothesis.⁶² Thus, no matter how many test results apparently validate the hypothesis, in principle the hypothesis can be accepted only provisionally or tentatively.⁶³ Absolute certainty is beyond reach.

Suppose that after the trial, a single new scientific study reaches an outcome at odds with the validity of the expert technique relied on at trial. The subsequent research may render the prior testimony debatable but, at this point, the testimony has hardly been debunked. The outcome in the new research could easily be an artifact. The Ninth Circuit’s analysis of shaken baby syndrome (SBS) in *Gimenez v. Ochoa*⁶⁴ is illustrative. Some lower courts had earlier granted post-conviction relief to wrongfully convicted persons on the basis of SBS,⁶⁵ but in this 2016 decision the Ninth Circuit refused to do so.

The thesis of SBS is that the violent shaking of an infant can cause fatal brain injuries even if the infant’s brain does not strike any object or surface.⁶⁶ Many pediatricians and pathologists subscribe to the SBS hypothesis because there are documented cases in which the autopsy revealed such brain injuries when there was evidence of shaking but no striking. These experts typically rely on three hallmarks to diagnose SBS: subdural hematoma, brain

⁶² *Id.* at 60–62.

⁶³ Bert Black, Francisco J. Ayala & Carol Saffran-Brinks, *Science and the Law in the Wake of Daubert: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715 (1994); Brian Stuart Koukoutchos, *Solomon Meets Galileo (And Isn’t Quite Sure What to Do With Him)*, 15 CARDOZO L. REV. 2237, 2253 (1994).

⁶⁴ See generally *Gimenez v. Ochoa*, 821 F.3d 1136 (9th Cir. 2016).

⁶⁵ *State v. Edmonds*, 746 N.W.2d 590 (Wis. Ct. App. 2008); Iannece, *supra* note 12, at 217.

⁶⁶ See generally Edward J. Imwinkelried, *Shaken Baby Syndrome: A Genuine Battle of the Scientific (and Non-Scientific) Experts*, 46 CRIM. L. BULL. 156 (2010).

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swelling, and retinal hemorrhage.⁶⁷ However, in recent years biomechanical experts have sharply criticized the hypothesis.⁶⁸ They rely primarily on studies with primates and anthropomorphic models. Those studies suggest that without more, mere shaking cannot generate enough force to cause fatal injury to the infant brain.

At Gimenez's original trial, the prosecution presented a pediatrician's testimony about SBS. After his conviction, Gimenez sought post-conviction relief. He cited the subsequent studies questioning SBS:

He points to a number of articles supporting his claim that medical knowledge surrounding SBS has changed in the years since his conviction. In his view, no longer do forensic pathologists diagnose SBS simply by noting the presence of the telltale triad of injuries. Now, the medical community requires evidence of impact injuries before diagnosing SBS.⁶⁹

Judge Kozinski wrote for the court. He conceded that several studies lent support to Gimenez' position. However, in the judge's mind, a comprehensive literature review "reveal[ed] not so much a repudiation of triad only SBS, but a vigorous debate over about its validity within the science community. The debate continues to the present day."⁷⁰ Indeed, some of the most recent scholarly analyses of SBS vigorously defend the hypothesis and dismiss the criticisms of the hypothesis.⁷¹

⁶⁷ Gimenez, 821 F.3d at 1139, 1143.

⁶⁸ Imwinkelried, *supra* note 66, at 174–80.

⁶⁹ Gimenez, 821 F.3d at 1143. *See Cavazos v. Smith*, 565 U.S. 1 (2011) (Ginsburg, J., dissenting) (stating that there has been a shift in scientific opinions about SBS).

⁷⁰ Gimenez, 821 F.3d at 1145. *See People v. Flores-Estrada*, 2017 WL 1520895 (N.Y. Sup. Ct. Apr. 26, 2017) (although there is currently a legitimate debate over the validity of SBS, an expert may still base an opinion on that theory); Plummer & Syed, *supra* note 20, at 327 ("the science is still very much in debate in that field . . .").

⁷¹ Joelle Anne Moreno, *Extralegal Supreme Court Policy-Making*, 24 WM. & MARY BILL RTS. J. 451, 513–14 (2015) (stating there is "overwhelming scientific support and near-consensus in the relevant medical community of pediatric healthcare" that shaking a baby can be fatal); Joelle Moreno & Brian Holmgren, *The Supreme Court Screws Up the Science: There is No Abusive Head Trauma/Shaken Baby Syndrome "Scientific" Controversy*, 2013 UTAH L. REV. 1357 (2013) (noting that in *Cavazos v. Smith*, *supra*, the prosecution relied in part on testimony about SBS; on the one hand, the majority of the Court upheld the legal sufficiency of the evidence to support the conviction; on the other hand, in a dissent joined by Justices Breyer and Sotomayor, Justice Ginsburg asserted that "doubt has increased in the medical community whether infants can be fatally injured through shaking alone"; the dissenters cited several papers as support for their assertion; the authors presented a detailed critique of the papers cited by the dissent; the authors concluded that the dissenters were "uninformed" and "promote[d] a false controversy").

This situation is distinguishable from the previous situation in which the accused relies on an exculpatory exclusion or RMP, based on single-locus probe RFLP, to attack prior expert testimony resting on multi-locus probe RFLP analysis. It is true that in both situations, the outcome of the subsequent scientific analysis is at odds with the prior testimony. In the RFLP hypothetical, the single-locus probe result undercuts the RMP based on a multi-locus probe analysis, just as a biomechanical expert's testimony could seemingly contradict a pediatrician's opinion based on SBS.

However, there are two differences between the hypotheticals. First, in the RFLP hypothetical, at the post-conviction stage, the defense experts can mount a direct attack on the methodology employed at trial by the prosecution expert; the prosecution expert had no right to use the multiplication or product rule absent proof of the independence of the markers. In the SBS hypothetical, the defense biomechanical experts make an essentially indirect attack on the prosecution expert's methodology; the thrust of the defense's argument is that since the prosecution expert's methodology yields different outcomes than the biomechanical analysis, the differing outcomes imply that the prosecution expert's methodology is flawed.⁷²

Second, although many studies demonstrate the validity of the methodology of single-locus probe RFLP analysis, there are doubts about the methodology used by the defense biomechanical experts. To be sure, the defense experts have every right to question the studies used by the pediatricians and pathologists subscribing to SBS. The prosecution experts can point to documented cases of fatal brain injury without evidence of striking, but it is fallacious to leap to the conclusion that there was no striking in those cases:

⁷² The fact that technique number two yields a conclusion contrary to the conclusion produced by technique number one indirectly calls into question the methodology supporting technique number one. It is true that in *Daubert*, Justice Blackmun cautioned trial judges that in passing on admissibility, "[t]he focus . . . must be solely on principles and methodology, not on the conclusions they generate." *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 595 (1993). However, in *Joiner*, the Court stated that "conclusions and methodology are not entirely distinct from one another." *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997). If the new technique has been validated and consistently produces conclusions at odds with the conclusions yielded by the prior technique, there is circumstantial—but not direct—evidence that the methodology underlying the prior technique is unreliable. The Advisory Committee Note accompanying the 2000 amendment to Rule 702 approvingly quotes *In re Paoli Railroad Yard PCB Litigation*. FED. R. EVID. 704 advisory committee's note to 2000 amendment (quoting *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 744 (3d Cir. 1994) ("Proponents do not have to demonstrate to the judge by a preponderance of the evidence that the assessments of their experts are correct, they only have to demonstrate . . . that their opinions are reliable The evidentiary requirement of reliability is lower than the merits standard of correctness.")).

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[T]he caregiver could easily be traumatized by the event; and as a consequence, he or she might experience amnesia or “defensive forgetting” of any impact. A loving parent’s recollection of their child’s head accidentally striking an object or wall might be a painful memory that the parent would want to repress. On the alternative assumption that the caregiver acted in bad faith, in order to minimize his or her culpability the caregiver might deliberately withhold the detail that they struck the child’s head against an object or surface.⁷³

But for their part, the prosecution experts can criticize the defense’s biomechanical studies. Medical ethics preclude shaking or striking infants in controlled experiments. The result is that we know little about the infant neck and brain. Consequently, we cannot be confident that the defense studies utilizing primates or anthropomorphic models accurately approximate infant physiology.⁷⁴

In the RFLP hypothetical, the defense experts not only employ a validated, single-locus probe RFLP methodology, but can also advance a direct criticism of multi-locus probe methodology employed by the prosecution expert at the earlier trial. In the instant case, there are common sense doubts about the defense expert’s own methodology. Further, even if the results of the biomechanical studies are accepted at face value, the studies merely indirectly raise questions about the methodology employed by the prosecution experts. This controversy amounts to a genuine battle of the experts.⁷⁵ It was therefore defensible for the Ninth Circuit to conclude in *Gimenez* that the later biomechanical studies do not thoroughly discredit or invalidate the prosecution expert’s SBS testimony at the prior trial.

4. Subsequent Research That Falls Short of Thoroughly
Discrediting the Prior Expert Testimony But Seriously
Undermines Confidence in the Testimony

In the prior variation of the state of the record, although the new biomechanical studies point to a different conclusion than the SBS theory, there are doubts about the studies themselves. There are questions about the reliability of extrapolating⁷⁶ from studies using primates and models to inferences about human infants. However, contrast the following variation. Suppose that as in the case of the SBS, the new scientific technique yields different outcomes than the technique employed in the prior expert

⁷³ Imwinkelried, *supra* note 66, at 174.

⁷⁴ Imwinkelried, *supra* note 66, at 175–80.

⁷⁵ Imwinkelried, *supra* note 66, at 200.

⁷⁶ Joiner, 522 U.S. at 146.

testimony, thereby at least indirectly raising doubts the prior expert's methodology. But now the new technique has been more convincingly validated than the biomechanical analysis. That is the case with hair analysis.

Assume that at the prior trial, the prosecution presented testimony about microscopic hair analysis.⁷⁷ In the past, hair analysts have frequently overstated the probative value of a finding that two hair samples—perhaps one from the crime scene and another from the defendant's person—were microscopically indistinguishable. In an analysis of 268 cases involving testimony about microscopic hair analysis, the F.B.I. found that 257 transcripts—96% of the cases—included exaggerated testimony about the significance of a match.⁷⁸ Twenty-six of the twenty-seven examiners made such statements.⁷⁹ In its 2009 report on forensic science, the National Research Council harshly criticized microscopic hair analysts' use of language that expressly or implicitly indicates that a particular person was the source of a hair sample.⁸⁰ In its 2016 report, the President's Council of Advisors on Science and Technology reviewed the black box studies of microscopic hair analysis and found them wanting.⁸¹

Assume further that after trial, defense experts conducted a mitochondrial DNA (mtDNA) test that excluded the accused. In an F.B.I. study of eighty hair comparisons in which microscopic analysts reported matches or associations, mtDNA analysis demonstrated that nine samples (12.5%) came from different persons.⁸² In short, just as the biomechanical analysts sometimes reach different outcomes than pathologists relying on SBS, molecular biologists employing mtDNA can come to a different conclusion than a microscopic hair analyst. Would defense testimony about the mtDNA test result justify a new trial? Here the answer should be Yes. The courts have repeatedly ruled that mtDNA analyses are admissible under

⁷⁷ Giannelli et al., *supra* note 52, § 24.02[1]. See also Fabricant & Carrington, *supra* note 13, at 63–92.

⁷⁸ Norman L. Reimer, *The Microscopic Hair Comparison Analysis Review Project: A Milestone in the Quest for Forensic Science Reform*, 39 CHAMPION 9 (May 2015).

⁷⁹ *Id.* See also Ryan & Adams, *supra* note 14, at 1084; Spencer S. Hsu, *FBI Admits Flaws in Hair Analysis Over Decades*, WASH. POST (Apr. 18, 2015), https://www.washingtonpost.com/local/crime/fbi-overstated-forensic-hair-matches-in-nearly-all-criminal-trials-for-decades/2015/04/18/39c8d8c6-e515-11e4-b510-962fcfab310_story.html?noredirect=on&utm_term=.e7b2cecf4c1.

⁸⁰ NAT'L RES. COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 5–25 (2009) [hereinafter A PATH FORWARD].

⁸¹ PCAST, *supra* note 13, at 118–23 (noting that in one study, the test conditions did not come close to approximating normal casework where “the examiner . . . knew that all hairs being examined came from different individuals;” and in another study, half of the declared matches were false positives).

⁸² A PATH FORWARD, *supra* note 80, at 25–26 (citing Max M. Houck & Bruce Budowle, *Correlation of Microscopic and Mitochondrial DNA Hair Comparisons*, 47 J. FORENSIC SCI. 964 (2002)).

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Daubert.⁸³ Given the extent of the empirical validation of mtDNA methodology,⁸⁴ a court can have far more confidence in an mtDNA exclusion than in a biomechanical analysis concluding that shaking did not cause an infant's death.

One court has already granted post-conviction relief in a hair case. In 2016 in *Commonwealth v. Perrott*,⁸⁵ a Hampden County, Massachusetts Superior Court granted the accused a new trial. At the prior trial, an FBI expert testified about hair analysis. He conducted a microscopic analysis of the samples with respect to such characteristics as color, the medulla, the cuticle, the cortex, scales, and pigment arrangement. He opined that the hair samples "matched" in all respects and were "microscopically indistinguishable." The expert conceded that microscopic hair analysis cannot yield an absolute personal identification. However, he added that a match in so many respects was evidence of a "strong association." Elaborating, he asserted that "it's my experience in 10 years it's extremely rare I will have known hair samples from two different people I can't tell apart." In awarding a new trial, the judge approvingly cited the 2009 NRC report. Even assuming that the F.B.I. mtDNA hair study and the 2009 NRC report do not completely discredit microscopic hair analysis, in such cases the accused should be accorded a new trial when there is a subsequent mtDNA exclusion. Evidence of an exclusion seriously diminishes confidence in the accuracy of the prior expert hair testimony.⁸⁶ In the microscopic technique, the pigment of the hair is determined by the subjective judgment of the microscopist. In mtDNA, the color of the dye is determined by a laser scanner whose accuracy has been tested and measured. Although the biomechanical studies raise some doubt about the validity of the SBS hypothesis, here the mtDNA evidence has a more profound effect. In the words of a Mississippi court, the subsequent evidence undermines confidence in the correctness of the earlier testimony.⁸⁷

What general standard emerges from the above analysis? It is submitted that an accused ought to be entitled to a new trial when: (1) the accused presents testimony about a new analytic technique developed in

⁸³ Giannelli et al., *supra* note 52, §§ 18.02[b], 18.05[a][1].

⁸⁴ *Id.* § 18.03[e]. The validation studies break the process down into its various stages—extraction, amplification, and sequencing—and attempt to establish objective standards for each step. *Id.*

⁸⁵ *Commonwealth v. Perrott*, Nos. 85-5415, 5416, 5418, 5420, 5425, 2016 WL 380123 (Mass. Super. Ct. Jan. 26, 2016). See Lizzy McLellan, *Getting a Conviction Overturned Without DNA*, NAT'L L.J. 38 (Apr. 3, 2017), <https://www.law.com/nationallawjournal/sites/nationallawjournal/2017/04/03/getting-a-conviction-overturned-without-dna/?sreturn=20180124162524>.

⁸⁶ The Supreme Court used similar language in *Penry v. Lynaugh*, 492 U.S. 302, 313 (1989).

⁸⁷ *Yarborough v. State*, 514 So.2d 1215 (Miss. 1987).

subsequent scientific research; (2) that technique yields a different outcome than the expert technique used at the prior trial; and (3) the validation of the new technique is so extensive that it *either* discredits the prior expert testimony *or* seriously undermines confidence in its correctness. At the most recent meeting of the American Bar Association, the Criminal Justice Section's report to the House of Delegates proposed a resolution that defendants be entitled to post-conviction relief when forensic evidence presented at the earlier trial has been "undermined or discredited" by subsequent scientific research. As we shall see in subpart B, subsequent empirical research discredited Comparative Bullet Lead Analysis (CBLA) by exposing a fatal weakness in an essential premise of the technique; the research demonstrated that contrary to the FBI experts' claims, the elemental composition of a batch of bullet production (a single day's production at a particular manufacturing plant) is not unique and uniform. As we have already seen, the advent of mtDNA testing seriously undermined microscopic hair analysis; given the findings in the black box studies of the latter technique, the validation studies of mtDNA provide a solid empirical basis for preferring the mtDNA result whenever the mtDNA result is at odds with a microscopist's claim that a person was the source of the hair tested. The Constitution may not mandate a new trial in these circumstances. However, the American criminal justice is intensely concerned about the reliability of the evidence it relies on to justify convictions, and the proposed general standard operationalizes that concern.

B. Illustrative Fact Situations Satisfying the General Standard

Part III.A proposed a general standard for granting new trials based on subsequent scientific developments. This Part attempts to identify specific fact situations in which an accused ought to be entitled to relief under this standard.

Before attempting to do so, though, it is important to appreciate the general structure of a prosecution expert's direct testimony. Commentators sometimes refer to the "use"—in the singular—of an expert at trial. In truth, an expert can be used in a variety of ways.⁸⁸ Although there are other

⁸⁸ An expert can give purely factual testimony under Rule 602. FED. R. EVID. 602. Suppose that while driving, an eminently qualified toxicologist witnessed a car run through a red light and crash into another vehicle. The toxicologist may possess a Ph.D. that qualifies him or her as an expert under Rule 702, but that does not preclude him or her from giving factual testimony based on perception. FED. R. EVID. 702. Alternatively, assume that after witnessing the accident, the toxicologist walked toward a driver's car. When the driver exited, the toxicologist noticed that the driver's eyes were bloodshot, his speech was slurred, and his breath had a strong alcohol odor. Like any competent witness under Rule 701, the toxicologist could testify to a lay opinion that the driver was intoxicated. FED. R. EVID. 701. Finally, suppose that at the driver's trial for drunk driving, the prosecution has already called a police officer to testify about the result of an intoxilyzer test administered to the driver at the accident

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legitimate uses of an expert witness under the Federal Rules, in most cases when a litigant calls an expert, the litigant wants the expert to testify in the form of a syllogism.⁸⁹ The proponent of a psychiatrist's testimony might call the witness solely to testify in general terms about the set of symptoms that, according to the American Psychiatric Association's *Diagnostic and Statistical Manual V*,⁹⁰ is diagnostic for a certain mental disorder. However, the proponent usually desires more from the psychiatrist; the proponent typically wants the psychiatrist to apply the diagnostic criteria to a particular person's case history and opine whether the person suffers from that mental disorder. In the final analysis, the psychiatrist's testimony is syllogistic in structure. After testifying to the credentials that qualify the witness as an expert, the expert: states the diagnostic criteria, the general technique or theory (the major premise); describes the patient's case history (the minor premise); applies the major premise to the minor; and finally derives a conclusion whether the patient's symptomatology meets the criteria.

The provisions of the Federal Rules of Evidence regulate each element of the witness's testimony:

- Federal Rule of Evidence 702 provides that in order to qualify as an expert, the witness must possess "knowledge, skill, experience, training, or education."
- Federal Rule 702(c) states that the expert's major premise must consist of "reliable [general] principles and methods."
- The rules impose two restrictions on the witness's minor premise. Rule 702(b) decrees that the minor premise must include "sufficient facts or data." Rule 703 adds qualitative restrictions. Under Rule 703, the facts included in the minor premise must: (a) be based on the witness's firsthand knowledge, e.g., a physician's personal observation of a wound; (b) rest on admissible testimony of every element of a hypothetical question; or (c) be premised on secondhand, out-of-court reports if it is the specialty's reasonable/customary

scene. If the toxicologist takes the stand, under Rule 702 the toxicologist could "give a dissertation or exposition of [the] scientific . . . principles" underlying the intoxilyzer. FED. R. EVID. 702 advisory committee's note to 2000 amendment. The note explains that the committee included the wording, "in the form of an opinion or otherwise," to permit such general testimony. *Id.* The note accompanying the 2000 amendment to Rule 702 refers to "the venerable practice of using expert testimony to educate the factfinder on general principles." FED. R. EVID. 702.

⁸⁹ See generally Edward J. Imwinkelried, *The "Bases" of Expert Testimony: The Syllogistic Structure of Scientific Testimony*, 67 N.C. L. REV. 1 (1988).

⁹⁰ AM. PSYCHIATRIC ASS'N, *DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS* (5th ed. 2013).

practice to consider reports from such sources.

- Rule 702(d) requires a showing that the expert “reliably applied the principles and methods [the major premise] to the facts of the case [the minor premise].”
- Rule 704 relates to the phrasing of the witness’s ultimate conclusion or opinion.

The Advisory Committee Note accompanying the 2000 amendment to Rule 702 states that “any step that renders the analysis unreliable . . . [can] render[] the expert’s testimony inadmissible.”⁹¹ “Any step” should be interpreted as including all five components of the expert’s testimony: the witness’s status as an expert, the validity of the witness’s major premise, the trustworthiness of the information about the case-specific facts constituting the minor premise, the manner in which the witness applied the major premise to the minor, and the formation of the final opinion. As we shall now see, a post-conviction scientific development affecting any of these five components could conceivably satisfy the proposed general standard for awarding a new trial.

1. The Witness’s Status as an Expert

In a disturbing number of cases, post-conviction investigation has revealed that witnesses called as experts have misstated—usually overstated—their credentials.⁹² If the witness had accurately described his or her credentials, he or she might not have qualified as an expert at all; or his or her credentials could have paled in comparison to the actual credentials of an opposing expert. In either case, the false testimony might have affected the outcome of the trial.

However, far more often than not, it will not be subsequent scientific research that exposes the falsity of the witness’s prior testimony about their credentials. Rather, it will be ordinary fact investigation such as contacting the educational institution that supposedly awarded the witness a Ph.D. That type of investigation does not produce new scientific evidence. Furthermore, the potential discoverability of that information at the time of the prior trial

⁹¹ FED. R. EVID. 702 advisory committee’s note to 2000 amendment (quoting *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 745 (3d Cir 1994)). See also Iannece, *supra* note 12, at 232.

⁹² In the District of Columbia, there was a scandal over the lies by one government expert, Johnny St. Valentine Brown, about his credentials. *United States v. Williams*, 233 F.3d 592 (D.C. Cir. 2000); *United States v. Spinner*, 109 F.Supp.2d 18 (D.D.C. 2000), *aff’d*, 22 Fed. App’x 6 (D.C. Cir. 2001); *United States v. Jones*, 84 F. Supp. 2d 124 (D.D.C. 1999); David E. Rovella, *D.C. Cop’s Lies Taint Trials*, NAT’L L.J. (2000). See also *United States v. Gale*, 326 F.3d 228 (D.C. Cir. 2003) (a government narcotics expert misrepresented his academic credentials).

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suggests that any post-conviction claim based on the discovery will lend itself more readily to an ineffective assistance of counsel claim.⁹³

However, there can be exceptional cases in which later scientific research discredits this element of the witness's testimony or seriously undermines confidence in the witness's qualification as an expert. Suppose that at an earlier homicide trial years before, the prosecution called a witness to testify about bloodstain pattern analysis (BPA). Initially, the courts routinely accepted testimony on that subject from police officers who had been trained by showing them photographs or drawings of patterns that were supposedly caused by a certain type of blood shedding event.⁹⁴ In the early cases, as a matter of course the courts permitted such testimony even if the witness lacked a scientific background. Some courts were satisfied by testimony that the officer had attended a two-week training course on the subject.⁹⁵ In the intervening years, though, physicists turned their attention to bloodstain pattern analysis.⁹⁶ Thanks to their research, today we have a much more sophisticated understanding of the behavior of blood. For example, we now know that unlike water, blood behaves like a non-Newtonian fluid⁹⁷ and that its viscosity has a direct effect on its behavior.⁹⁸ A strong case can be made that only a witness with an understanding of physics, in particular, the significance of blood viscosity, is competent to opine about bloodstain pattern analysis. Assume that at the time of trial it was well settled that a police officer with minimal training could testify about bloodstain pattern analysis. In a post-conviction proceeding the defense can argue that subsequent studies of bloodstain patterns by physicists seriously undermine confidence in a pattern analysis by anyone lacking a knowledge of even the rudiments of physics.⁹⁹

⁹³ See *supra*, notes 39–43 and accompanying text.

⁹⁴ Giannelli et al., *supra* note 52, § 24.13(a).

⁹⁵ *Id.* In the state conviction involved in *Smith v. Massey*, the witness was permitted to testify although his training course lasted only one week. *Smith v. Massey*, 235 F.3d 1259 (10th Cir. 2000).

⁹⁶ *Id.* § 24.12.

⁹⁷ *Id.* § 24.12, at 878. See also ANITA Y. WONDER, BLOODSTAIN PATTERN EVIDENCE: OBJECTIVE APPROACHES AND CASE APPLICATIONS ch. 3 (2007); Aaron D. Gopen & Edward J. Imwinkelried, *Bloodstain Pattern Evidence Revisited*, 45 CRIM. L. BULL. 485 (2009).

⁹⁸ *Id.* (noting that rheology is the study of non-Newtonian fluids).

⁹⁹ Of course, in these cases, it will often be possible to conceptualize the fact situation as one in which the expert used an invalid major premise. For instance, in the above bloodstain pattern analysis hypothetical, the defense could argue that at the prior trial, the expert relied on the primitive methodology of comparing the crime scene bloodstain to a pattern in a binder that the officer received in his or her training course. The defense could then argue that subsequent scientific research has demonstrated that the only way to reliably analysis such patterns is to apply the laws of physics. Even if the fact situation is not reconceptualized, the defense will have a strong argument that the attack has the requisite impact on the prior verdict. If the original court should have ruled the witness unqualified as an expert, none of

2. The Witness's Major Premise: The General Technique or Theory the Witness Is Relying On

As previously stated, after the witness's proponent establishes the witness's status as an expert, the proponent next may attempt to elicit the witness's description of the general technique or theory that the witness contemplates using to evaluate the significance of the case-specific facts. This is the component of the witness's testimony at the prior trial that can be most directly discredited by subsequent scientific research. The history of forensic science is littered with theories that once enjoyed judicial acceptance but have since been exposed as "junk science."

Two notorious examples will suffice. First, at one time, forensic scientists used the paraffin test to determine whether a person had recently discharged a firearm.¹⁰⁰ The paraffin method tested the sample for the presence of nitrate residues.¹⁰¹ However, later research revealed that nitrates are so common that the paraffin method was very susceptible to false positive results.¹⁰² That revelation led most crime laboratories to abandon the use of the paraffin test.¹⁰³ Second, in many cases, the forensic scientist is not interested in whether a particular person fired a weapon. Rather, the crucial question is whether a bullet was discharged from a particular handgun or rifle.¹⁰⁴ In the typical case, the prosecution analyst microscopically analyzes the striations on the bullet and attempts to match them to the striations of other bullets fired from the same weapon.¹⁰⁵ However, suppose that the crime scene bullet is so deformed that it is impossible to visualize striations. Until relatively recently, in such cases the FBI sometimes conducted Comparative Bullet Lead Analysis (CBLA).¹⁰⁶ The analyst used inductively

the witness's purportedly expert testimony would have been admitted. If the prosecution needed the expert testimony to sustain its initial burden of production at the prior trial, the judge should have directed a verdict or entered an acquittal judgment as a matter of law. Even if the remaining evidence made out a submissible case for the jury, the complete exclusion of the expert testimony will often make a defense verdict much more probable.

¹⁰⁰ Giannelli et al., *supra* note 52, § 14.13(a).

¹⁰¹ Giannelli et al., *supra* note 52, § 14.13(a).

¹⁰² Giannelli et al., *supra* note 52, § 14.13(a) (noting that there were false positive reactions with tobacco, fertilizers, pharmaceuticals, leguminous plants, and urine).

¹⁰³ Giannelli et al., *supra* note 52, § 14.13(a); Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 COLUM. L. REV. 1197, 1224 (1980).

¹⁰⁴ Edward J. Imwinkelried & William A. Tobin, *Comparative Bullet Lead Analysis (CBLA) Evidence: Valid Inferences or Ipse Dixit?*, 28 OKLA. CITY U. L. REV. 43 (2003).

¹⁰⁵ The 2016 PCAST report flatly asserts that this methodology lacks foundational validity. PCAST, *supra* note 13, at 112. However, assume for purposes of argument that that technique is sufficiently reliable. As we shall see, the reliability of Comparative Bullet Lead Analysis (CBLA) is a different question. Even if striation analysis is sufficiently reliable, CBLA has been exposed as junk science. See Imwinkelried & Tobin, *supra* note 104.

¹⁰⁶ Imwinkelried & Tobin, *supra* note 104.

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coupled plasma atomic (or optical) emission spectroscopy (ICP-AES or ICP-OES) to analyze the elemental composition of the crime scene bullet and other bullets connected to the suspect such as ammunition found at the suspect's residence. The analyst evaluated the bullets for the presence of several elements, including antimony, bismuth, and cadmium.¹⁰⁷ When the analysis indicated that the bullets contained the same elements in the similar minute quantities, many courts allowed FBI experts to testify that the bullets came from the same batch (a day's production at a manufacturing plant), the same shipment delivered to a retailer where the accused purchased bullets, or even the same box of bullets found in the accused's home.¹⁰⁸ Even if the expert gave the most limited opinion (the same batch), the opinion rested on the premise that each day's batch is not only unique but also uniform in composition.¹⁰⁹ Later studies of the bullet manufacturing process demonstrated that this premise was unfounded.¹¹⁰ Given those studies, in 2004 the National Research Council released a report concluding that CBLA lacked scientific validity.¹¹¹ Together, the report and the studies so thoroughly undermined CBLA that the FBI discontinued the use of the technique.¹¹² In the preceding BPA example, the defense arguably satisfies the "seriously undermine" prong of the proposed general standard. This case is an even stronger case for relief, since it can be said that the subsequent research triggers the "discredited" prong.

3. The Witness's Minor Premise: The Sources of the
Witness's Information About the Case-Specific Facts That
the Witness Will Apply the General Technique or Theory to

After eliciting the witness's description and validation of the major premise, the witness's proponent may ask the witness to identify the case-specific facts that serve as the minor premise. As previously stated, under Federal Rule 703, the expert can rely on three different sources for information about those facts:¹¹³ (i) the expert personally observed the fact; (ii) prior witnesses have provided admissible testimony about the facts, and the proponent includes those facts in a hypothetical question posed to the expert; or (iii) the expert relied on a secondhand, out-of-court report if experts in the same field "reasonably" rely on that type of report.

¹⁰⁷ Imwinkelried & Tobin, *supra* note 104, at 48.

¹⁰⁸ Imwinkelried & Tobin, *supra* note 104, at 44–45.

¹⁰⁹ Imwinkelried & Tobin, *supra* note 104, at 50–54.

¹¹⁰ Imwinkelried & Tobin, *supra* note 104, at 50–54.

¹¹¹ NAT'L RES. COUNCIL, FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE (2004).

¹¹² Giannelli et al., *supra* note 52, at 795–96.

¹¹³ FED. R. EVID. 703.

In the typical post-conviction proceeding in which the accused attacks the truth of these facts, the basis for the attack is not subsequent scientific research. As in the case of the usual post-conviction attack on the earlier witness's expert status, the accused will rely on evidence unearthed during a normal fact investigation. At trial, the psychiatric expert might have relied on prior lay testimony or a secondhand report that the accused was coherent immediately after the shooting. A later factual investigation unearths substantial evidence that instead, the accused was incoherent and behaving in a highly irrational manner. In this situation, in the post-conviction proceeding the court would apply the normal standards for false lay testimony.

i. Federal Rule of Evidence 702(b)

In other cases, subsequent scientific research may impact the minor premise; but it will frequently be possible to view the later development as impacting the major premise. By way of example, consider psychiatric testimony. For some disorders, the *Diagnostic and Statistical Manual* prescribes inclusionary criteria, that is, case-specific symptoms.¹¹⁴ At the time of the earlier trial, the *DSM* may have required only two relevant symptoms. At trial, there was evidence of two—but only two—symptoms that permitted the expert to opine that the patient suffered from the disorder. However, later research persuades the psychiatric community to revise the standard and require three symptoms. The application of that standard to the minor premise at the prior trial would have resulted in the exclusion of the expert testimony. Federal Rule of Evidence 702(b) states that the expert's opinion must be “based on sufficient facts or data;” and in light of the revised standard, the minor premise is now insufficient.

In these cases, though, the facts can just as readily be viewed as the subsequent invalidation of the witness's major premise. At the prior trial, the witness relied on the theory that the presence of two symptoms was sufficient to justify the diagnosis. The subsequent research undercut that premise; the new research superseded the prior theory and supplanted it with a new major premise that the diagnosis requires three symptoms.

ii. Federal Rule of Evidence 703

However, in still other cases, later scientific research could impact only the minor premise but still conceivably warrant a new trial. Some courts construe Rule 703's language governing secondhand reports as requiring a

¹¹⁴ Jules B. Gerard, *The Usefulness of the Medical Model to the Legal System*, 39 RUTGERS L. REV. 377, 415 (1987) (discussing the research that led to the development of Feighner Criteria now included as inclusionary or exclusionary criteria for some of the disorders listed in the DSM-5).

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showing that it is a customary practice within the expert's specialty to consider that type of information in forming opinions.¹¹⁵ Suppose that at the prior trial, an arson expert testified to the opinion that an accelerant had been poured at the fire scene. In forming that opinion, the expert relied heavily on lay witnesses' description of the color of the smoke emanating from the burning building.¹¹⁶ At trial, the expert accurately testified that arson experts routinely relied on such lay reports. However, after trial, new research demonstrates that lay witnesses' color opinions are an unreliable indicator of the presence of an accelerant. Lacking any training in fire science, most laypersons do not make the nuanced color differentiations necessary to detect the shades of smoke caused by accelerants—as opposed to the colors caused by other fire fuel.¹¹⁷ The new research calls the reliability of an opinion based solely on largely such secondhand lay reports into serious doubt. In retrospect, the subsequent research would have precluded the expert at the earlier trial from opining that an accelerant was present.

4. The Application of the Major Premise to the Minor Premise

Rule 702(d) announces that proof of proper test procedure is a separate, required element of the foundation for expert testimony. That requirement is sensible, since numerous proficiency studies suggest that improper test procedure is the leading cause of flawed testimony.¹¹⁸ Even when the witness, a Nobel Laureate, is using an exquisitely validated technique, the opinion can be unsound if the witness used sloppy, hurried procedure in applying the technique to the case-specific data.

Subsequent scientific developments may call into question the procedure used at the time of the earlier trial. *In re Richards*,¹¹⁹ a 2016 California Supreme Court decision, illustrates the importance of changed procedure. *Richards* involved forensic odontology, bitemark analysis. At the original trial, the prosecution odontologist testified on the basis of an autopsy photograph. The expert stated that a lesion on the victim's hand, shown in the photograph, was a bitemark. Before and at trial, the expert

¹¹⁵ Michael H. Graham, *Expert Witness Testimony: Fed. R. Evid. 702 to 705 Primer; Hypothetical Question Discretionary Use*, 42 CRIM. L. BULL. 1460, 1467 (2016).

¹¹⁶ Giannelli et al., *supra* note 52, § 26.04(c).

¹¹⁷ The Law Revision Commission Comment to California Evidence Code § 801 points out that under prior case law, *Behr v. County of Santa Cruz*, 342 P.2d 987 (Cal. Dist. Ct. App. 1959), it was error to permit a fire expert to rely on lay bystanders' reports about the fire. CAL. EVID. CODE § 801 (West 1966).

¹¹⁸ Edward J. Imwinkelried, *The Use of Proper Procedure in Conducting Scientific Testing: Healing the Achilles Heel of Forensic Science*, 43 CRIM. L. BULL. 371, 371–73 (2007) (collecting proficiency studies finding that improper test procedure was a common cause of error).

¹¹⁹ *In re Richards*, 371 P.3d 195 (Cal. 2016). See Fabricant & Carrington, *supra* note 13, at 38–63 (discussing bitemark analysis).

relied on his visual inspection of the photograph. Later, other experts in the field developed new computer software to digitally eliminate angular distortion in such photographs. The digital technology was not available at the time of the original trial. In a post-conviction proceeding, using the digital technology, defense experts testified that the lesion either was not a bitemark or at the very least did not match the accused's dentition. Presented with the results of the new procedure for analyzing the photograph, the original prosecution expert testified "I don't know for sure that . . . that photograph depicts a bitemark" and that if it was a bitemark, "[petitioner's] teeth . . . are not consistent with the lesion" Even in the mind of the original prosecution witness, the advent of the new procedure significantly undermined confidence in the initial opinion.

This basis for subsequently invalidating prior expert testimony is likely to come into play more frequently in the future. In 2014, the Organization of Scientific Area Committees (OSAC) was created under the aegis of the Department of Justice and the National Institute of Standards and Technology.¹²⁰ There are six general OSAC Committees and 23 Subcommittees in such diverse areas as anthropology, digital evidence, DNA, explosives, friction ridge, and questioned documents.¹²¹ One of the principal purposes of the subcommittees is to promulgate new standards and guidelines for conducting forensic tests.¹²² Even in the short term, we may see a substantial number of new procedures designed to apply techniques and theories in a more standardized, systematic fashion. The promulgation of these standards may be accompanied by commentary, marshaling new research that sharply questions the reliability of the prior methods of applying the techniques and theories. If so, as in *Richards* the defense may have a plausible claim that the issuance of the new procedure significantly undermines confidence in the procedure employed at the time of the earlier trial.

5. The Witness's Final Conclusion or Opinion

One of the contemporary refrains in the critiques of forensic science is that forensic witnesses often overstate the degree of definiteness of their opinion. In its 2009 report, the National Research Council took many fingerprint examiners to task on this ground. As the report noted, in the past examiners have frequently

¹²⁰ *The Organization of Scientific Area Committees for Forensic Science*, NAT'L INST. OF STANDARDS & TECH. (Apr. 11, 2016), <https://www.nist.gov/forensics/organization-scientific-area-committees> (updated Apr. 11, 2018).

¹²¹ *Id.*

¹²² *Id.*

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claim[ed] that they have matched the latent print to the one and only person in the entire world whose fingertip could have produced it. Given the general lack of validity testing for fingerprinting, the relative dearth of difficult proficiency tests . . . , and the lack of validated standard for declaring a match, such claims of absolute, certain confidence in identification are unjustified. Therefore, in order to pass scrutiny under *Daubert*, fingerprint identification experts should exhibit a greater degree of epistemological humility. Claims of “absolute” and “positive” identification should be replaced by more modest claims¹²³

The 2016 PCAST report reiterated the criticism:

Statements suggesting or implying greater certainty are not scientifically valid and should not be permitted. In particular, courts should never permit scientifically indefensible claims such as: “zero,” “vanishingly small,” “essentially zero,” “negligible,” “minimal,” or “microscopic” error rates; “100 percent certainty” or proof “to a reasonable degree of scientific certainty;” identification “to the exclusion of all other sources;” or a chance of error so remote as to be a “practical” impossibility.¹²⁴

However, it is a mistake to leap to the conclusion that the presentation of exaggerated testimony at the prior trial necessarily warrants a new trial based on changed science. In many instances, if the defense counsel had diligently investigated the issue, he or she would have discovered the overstatement. The counsel might have been able to successfully expose the overstatement by cross-examination and the presentation of contrary expert testimony. In short, as Part II noted, the fact situation might be ripe for an ineffective assistance of counsel claim.

In other cases, though, the defense may have a meritorious claim for a new trial based on changed science. At the time of the earlier trial, the scientific community may have not appreciated that the claims were exaggerated, or the legal community may not have had reasonable access to the science needed to expose the exaggeration. Post-conviction scientific research may be responsible for the subsequent realization that the prior testimony was overstated.

Consider the case of blood or breath alcohol concentrations in drunk-driving prosecutions. In the past, the courts routinely allowed a police officer who had administered a breath test or a toxicologist who had conducted a

¹²³ A PATH FORWARD, *supra* note 80, at 5–12.

¹²⁴ PCAST, *supra* note 13, at 19.

laboratory test to provide the jury with a single point estimate of the accused's concentration.¹²⁵ Especially when presented with only a single figure by a witness with scientific credentials, lay jurors are likely to treat the estimate as an exact value. However, in the last decade the legal community has begun to understand the importance of metrology, the science of measurement. The basic tenet of metrology is that no measurement is certain. No matter how carefully the analyst conducts the measurement and no matter how well calibrated the measuring instrument is, the analyst can never be certain that he or she has captured the true value of the measure.¹²⁶ It is sound metrological practice to provide the decision-maker with both the estimate and an arithmetic measure of the estimate's uncertainty. In its 2009 report, the National Research Council recommended that "[a]ll results of every forensic science method . . . indicate the uncertainty in the measurements that are made."¹²⁷ In particular, the jury can be given a confidence interval for the estimate—a range with upper and lower boundaries.¹²⁸ The additional testimony about the interval gives the trier a sense of the imprecision of the estimate.

A Washington state drunk driving case illustrates the dramatic impact that the provision of testimony about a confidence interval can have.¹²⁹ In Washington, the per se limit for drunk driving is a blood-alcohol concentration (BAC) of 0.08%. In that case, the BAC reading, 0.081%, exceeded the limit. The reading was marginal, just barely exceeding the 0.08% limit. Nevertheless, based on the reading, on direct examination a toxicologist initially testified that the accused had violated the per se statute. However, during cross-examination the defense counsel presented the toxicologist with evidence that with a 99% level of confidence, the interval for the reading ranged from 0.00731 to 0.0877. The defense counsel then submitted an exhibit to the court. The middle of the exhibit had a vertical line representing the 0.08% threshold. The exhibit then superimposed a normal, Bell Curve distribution showing the interval. The distribution was anchored on the reading, 0.081; the midpoint of the distribution was 0.081—to the right of the 0.08 limit. However, 44% of the area under the curve fell

¹²⁵ See generally TED VOSK & ASHLEY F. EMERY, *FORENSIC METROLOGY: SCIENTIFIC MEASUREMENT AND INFERENCE FOR LAWYERS, JUDGES, AND CRIMINALISTS* (2015); see also Ted Vosk & Edward J. Imwinkelried, *Measurements in Forensic Science—Of Errors and Uncertainty*, 53 CRIM. L. BULL. 532 (2017).

¹²⁶ Edward J. Imwinkelried, *The Importance of Forensic Metrology in Preventing Miscarriages of Justice: Intellectual Honesty About the Uncertainty of Measurement in Scientific Analysis*, 7 J. MARSHALL L.J. 333, 340 (2014).

¹²⁷ A PATH FORWARD, *supra* note 80, at 184.

¹²⁸ Donald P. Land & Edward J. Imwinkelried, *Confidence Intervals: How Much Confidence Should the Courts Have in Testimony About a Sample Statistic?*, 44 CRIM. L. BULL. 257 (2008).

¹²⁹ VOSK & EMERY, *supra* note 125, at 169–71.

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to the left below the 0.08 limit. The exhibit, visually depicting the coverage interval, was powerful evidence that there was a reasonable doubt as to whether the accused had driven in violation of the statute. The legal community is just beginning to realize the pertinence of metrology in general and intervals in particular. There are only a few opinions on point.¹³⁰

Now, suppose that the direct testimony about the 0.081% reading had been presented at a prior trial that resulted in a conviction. The defense later discovered the pertinence of metrology. At the defense's request, a toxicologist later computed the interval for the estimate in the prior case. Almost half of the area of the curve fell below the 0.08% threshold. Concededly, the new evidence about the interval does not completely discredit the earlier testimony. However, the evidence would seriously undermine a rational decision-maker's confidence in the earlier testimony that the accused's BAC exceeded 0.08%.

In short, like changed science with respect to every other essential component of the prosecution expert's testimony, new science relating to the definiteness of the opinion could satisfy the proposed general standard for granting a new trial. As a practical matter, though, it may be more difficult to obtain a new trial on this ground. In many cases in which the subsequent scientific research affects one of the other four components of the prior expert's testimony, the new scientific evidence might have resulted in the exclusion of the prosecution expert testimony at the prior trial. The new science could have led to a different qualification standard, and the prosecution witness might have been barred from giving any expert testimony. Alternatively, the changed science could have discredited the witness's major premise to the degree that the judge might have altogether excluded the witness's testimony. Here, though, the new scientific research would simply have prevented the prosecution expert from overstating the definiteness of his or her opinion. The trier would still have heard the other components of the witness's testimony. As Part II noted, obtaining post-conviction relief is a both/and proposition: The defense must demonstrate both the impact of the new science on the prior expert testimony and the impact of the attack on that testimony on the verdict. It will be harder to make the latter showing when the new scientific studies affect only the definiteness of the expert's conclusion.

¹³⁰ See *State v. King Cty. Dist. Court W. Div.*, 307 P.3d 765, 766–70 (Wash. Ct. App. 2013). See also *People v. Jabrocki*, No. 08-5461-FD (Mich. Dist. Ct. May 6, 2011), <http://www.ncids.com/forensic/metrology/Jabrocki.pdf> (noting an uncertainty budget).

IV. CAN WE BE CONFIDENT THAT WHEN AN ACCUSED SHOULD BE ENTITLED TO RELIEF DUE TO CHANGED SCIENCE, RELIEF WILL BE AVAILABLE UNDER THE EXISTING POST-CONVICTION RELIEF STATUTES?

Part III.A proposed a general standard for deciding when, as a matter of policy, later scientific research so discredits prior expert testimony or seriously undermines confidence in the testimony that the interest in reliable verdicts overrides finality. Part III.B then identified five situations in which changed science can have that effect. Now the question is whether an accused with such a claim can obtain a remedy. All 50 states have statutes regulating one or more forms of post-conviction relief.¹³¹ Furthermore, as Part II noted, a few states such as California and Texas have recently amended their statutes to provide relief when later scientific research invalidates expert testimony admitted at a prior trial. Is adequate relief available under the existing general statutes? If not, could the new California and Texas statutes serve as drafting models? If not, how should the existing statutes be amended to provide relief to accused with the types of claims described in Part III.B?

A. *The Availability of a Remedy Under the Current Post-Conviction Relief Statutes*

The early state statutes had a very narrow scope. They allowed post-conviction relief if the convicting court lacked jurisdiction.¹³² The legislatures gradually broadened the scope of the legislation.¹³³ The legislatures extended the reach of the statutes to cover constitutional violations on the theory that a constitutional violation rendered the conviction void.¹³⁴ Eventually the scope of the statutes was expanded to recognize certain types of non-constitutional grounds.¹³⁵ For instance, California Penal Code Section 1473 allows relief when the prior conviction rested on “false evidence.”

If a jurisdiction recognizes “false evidence” as a basis for relief, can we be confident that accused with the sorts of claims identified in Part III.B will obtain a new trial? Unfortunately, the answer is No.

¹³¹ Wilkes, *supra* note 15, § 1:7; Ryan & Adams, *supra* note 14, at 1105; Note, *State Post-Conviction Remedies*, 61 COLUM. L. REV. 681, 681 (1961) [hereinafter Note].

¹³² Note, *supra* note 131, at 689–90, 692, 703.

¹³³ Note, *supra* note 131, at 689.

¹³⁴ Note, *supra* note 131, at 689–90, 697, 703.

¹³⁵ Note, *supra* note 131, at 689, 698.

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1. Untruthful Testimony

Some courts have construed the expression, “false evidence,” as requiring a showing that the witness at the prior trial gave untruthful testimony—in other words, forensic fraud.¹³⁶ A classic illustration is the infamous case of Fred Zain.¹³⁷ Zain had worked as a serologist in several states, including West Virginia. The official investigation into his misconduct reached the following findings:

The acts of misconduct on the part of Zain included: (1) overstating the strength of results; (2) overstating the frequency of genetic matches on individual pieces of evidence; (3) misreporting the frequency of genetic matches on multiple pieces of evidence; (4) reporting that multiple items had been tested, when only a single item of evidence had been tested; (5) reporting inconclusive results as conclusive; (6) repeatedly altering laboratory records; (7) grouping results to create the erroneous impression that genetic markers had been obtained from all samples tested; (8) failing to report conflicting results; (9) failing to conduct or to report conducting additional testing to resolve conflicting results; (10) implying a match with a suspect when testing supported only a match with the victim; and (11) reporting scientifically impossible or improbable results.¹³⁸

The investigation revealed a “long history of falsifying evidence.”¹³⁹ The investigating judge concluded that Zain’s “pattern and practice of misconduct completely undermined the validity and reliability of any forensic work he performed or reported.”¹⁴⁰

In Zain’s case, the misconduct was so extreme and of such duration that it was easy to find “false evidence” in the sense of untruthful testimony. However, in the run-of-the-mill case in which experts disagree, the court is likely to find “simply a difference in opinion—not [intentionally] false testimony.”¹⁴¹ Even if in retrospect it is clear that the prior testimony was overstated, the court is reluctant to infer that the earlier witness lied.¹⁴² Absent evidence of subornation of perjury or the falsification of

¹³⁶ Iannece, *supra* note 12, at 232.

¹³⁷ Gardner v. Ballard, 172 F. Supp. 3d 925 (S.D. W. Va. 2016).

¹³⁸ *Id.* at 928 n.3 (citing *In re* Investigation of W. Va. State Police Crime Lab., Serology Div., 438 S.E.2d 501, 503 (1993)).

¹³⁹ *Id.* at 927 (citing *In re* Investigation, 438 S.E.2d at 503).

¹⁴⁰ *Id.* at 928 (citing *In re* Investigation, 438 S.E.2d at 504).

¹⁴¹ Gimenez v. Ochoa, 821 F.3d 1136, 1142 (9th Cir. 2016).

¹⁴² Sistrunk v. Armenakis, 292 F.3d 669, 675 & n.7 (9th Cir. 2002).

documents,¹⁴³ the defense showing will probably fall short of justifying post-conviction relief under the deliberately false evidence standard.

2. Objectively False Testimony

Part III referred to the California Supreme Court's 2016 decision in *In re Richards*.¹⁴⁴ As Part III.B explained, there the court granted relief under amended Penal Code Section 1473. The court found that new digital technology eliminated the angular distortion in an autopsy photograph and seriously undermined confidence in earlier trial testimony that a lesion on the decedent's hand was a bitemark.

While Richards eventually obtained relief in 2016, that opinion related to his second habeas petition. The court denied his first petition.¹⁴⁵ At the time of that petition, Section 1473 had not yet been amended. The statute did not incorporate the amendment addressing the impact of new scientific evidence. Rather, the unamended statute required the defense to show "false evidence." In the opinion ruling on the initial petition, the majority of the California Supreme Court read "false evidence" narrowly:

The majority in *Richards I* held that if an expert witness's opinion given at trial later changes without any significant advances in the expert's field of expertise or in any technologies employed by the expert, "it would not be accurate to say that the witness's opinion at trial was false." [T]he fact that an expert recants an opinion . . . does not necessarily establish that the opinion at trial was false. Instead, the expert's change in opinion "has merely demonstrated the subjective component of expert opinion testimony." [T]he "false evidence" standard under section 1473 [is] satisfied "[i]f, and only if . . . an expert's opinion stated at trial was objectively untrue."¹⁴⁶

After the initial 2012 decision, the California legislature adopted Senate Bill Number 1058 to amend Section 1473.¹⁴⁷ The Senate analysis read *Richards I* as interpreting "false evidence" in a manner that severely limited its application to expert testimony:

The *Richards* . . . majority upheld petitioner's conviction, holding that "expert testimony is different from other types of expert

¹⁴³ *Gimenez*, 821 F.3d at 1143.

¹⁴⁴ *In re Richards*, 371 P.3d 195 (Cal. 2016). See *supra* text accompanying note 114; see also *Fabricant & Carrington*, *supra* note 13, at 33–35.

¹⁴⁵ *In re Richards*, 289 P.3d 860 (Cal. 2012).

¹⁴⁶ *In re Richards*, 371 P.3d at 202.

¹⁴⁷ *Id.* at 207.

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testimony in that it is merely the opinion of the expert, not evidence in and of itself, and so can never be [objectively] “true” or “false.”¹⁴⁸

The upshot is that if a court construed “false evidence” in a post-conviction relief statute as requiring a showing of either subjectively untruthful testimony or testimony that would be deemed false under *Richards I*, an accused with one of the claims identified in Part III.B would probably not obtain a remedy. It is true that the language, “false evidence,” is expansive enough that a court could read it to render the claims listed in Part III.B cognizable. However, these statutes have existed for decades,¹⁴⁹ and during that period, subsequent scientific research has overtaken numerous expert techniques such as the paraffin test and the Comparative Bullet Lead Analysis (CBLA). If it is still unsettled whether “false evidence” encompasses expert testimony invalidated by later scientific research, it is unrealistic to think that a more liberal reading of the statutory terminology will become uniform throughout the states in the near future. As the Introduction noted, given the amount of ongoing forensic research worldwide, in the near future the courts will have to grapple with the impact of changed science in a large number of cases. Rather than wasting judicial resources, it would be advisable to amend the post-conviction relief statutes to clarify that accused with the claims identified in Part III.B can obtain a remedy.

B. *The Appropriateness of the Amendments to the California and Texas Post-Conviction Relief Statutes*

If an amendment is advisable, the next question that arises is whether either the California or Texas amendments should be used as a drafting model. That question should be answered in the negative. The California amendment is excessively broad while the Texas amendment is too narrow.

1. The Texas Model

The 2015 amendment to Texas Code of Criminal Procedure Article 11.073(a)(2) grants an accused a new trial when subsequent scientific research “contradicts scientific evidence relied on” at the previous trial. What standard does the term “contradicts” embody? The popular, dictionary

¹⁴⁸ *Id.* at 311 (quoting Sen. Rules Comm., third reading analysis of Sen. Bill No. 1058 (2013-2014 Reg. Sess.), as amended June 4, 2014, p. 3.) *See also* Iannece, *supra* note 12, at 220–21 (quoting *Ex parte* Robbins, 360 S.W.3d 446 (Tex. Crim. App. 2011) (“explain[ing] that the expert’s ‘trial testimony is not false just because her re-evaluation of the evidence has resulted in a different opinion . . . opinion’”).

¹⁴⁹ Note, *supra* note 131.

meaning of “contradict” a proposition is to deny its truth or assert a logical incongruity.¹⁵⁰ For example, the proponent says *A*, and the opponent responds *non-A*. The term has the same meaning in evidence law. Evidence recognizes two related impeachment techniques: specific contradiction¹⁵¹ and proof of a prior inconsistent statement.¹⁵² When the courts attempt to distinguish the latter from the former, they often emphasize that the latter does not require proof that the witness made a prior statement that is “directly contradictory”¹⁵³ or “diametrically opposed”¹⁵⁴ to the trial testimony.

The problem is that the Texas model is too restrictive. As Part III.A noted, an accused ought to be entitled to a new trial if the later scientific research either completely discredits the prior testimony or seriously undermines our confidence in the testimony. “Contradict” would probably subsume situations in which the later research altogether discredits the earlier testimony. However, later research rarely has that impact. Far more often than not, the new research will significantly undermine confidence in the accuracy of the prior testimony. Part III.A contended that an accused deserves a new trial when the later research has that more limited impact, but the Texas model would not guarantee the accused a remedy in that circumstance.

2. The California Model

Just as the Texas legislature amended its post-conviction relief statute in 2015, the amendment to California Penal Code Section 1473 took effect in that year. The amendment to Section 1473(e)(1) reads:

For purposes of this section, “false evidence” shall include opinions of experts that have either been repudiated by the expert who originally provided the opinion at a hearing or trial or that have been undermined by later scientific research or technological advances.¹⁵⁵

¹⁵⁰ MERRIAM-WEBSTER’S SEVENTH NEW COLLEGIATE DICTIONARY 171 (1972); *see also* Fabricant & Carrington, *supra* note 13, at 33–35 (discussing the new California and Texas legislation).

¹⁵¹ EDWARD J. IMWINKELRIED ET AL., COURTROOM CRIMINAL EVIDENCE § 714 (6th ed. 2016).

¹⁵² *Id.* § 711.

¹⁵³ *United States v. Richardson*, 515 F.3d 74, 84 (1st Cir. 2008); *Udebma v. Nicoli*, 237 F.3d 8, 18 (1st Cir. 2001); *Laboy v. Demskie*, 947 F. Supp. 733, 741 (S.D.N.Y. 1996) (“directly and positively contradict”), *aff’d*, 1998 U.S. App. LEXIS 3193 (2d Cir. Feb. 26, 1998).

¹⁵⁴ *United States v. Cisneroz-Gutierrez*, 517 F.3d 751, 758 (5th Cir. 2008); *United States v. Gajo*, 290 F.3d 922, 931 (7th Cir. 2002); *United States v. Cody*, 114 F.3d 772, 776–77 (8th Cir. 1997); *United States v. Matlock*, 109 F.3d 1313, 1319 (8th Cir. 1997).

¹⁵⁵ CAL. PENAL CODE § 1473(e)(1) (West 2017).

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The language “have been undermined” could serve as a useful drafting model with slight modification. It would be necessary to revise the language to clarify that the later research need not “completely” undermine the earlier testimony. Without that clarification, the language would be problematic for the same reason as the Texas model. Without that clarification, the language would be too narrow and deny relief to some accused with the types of meritorious claims identified in Part II.B.

However, the amendment’s reference to “opinions of experts that have been repudiated by the expert who originally provided the opinion” is objectionable for the opposite reason; namely, it grants relief too liberally. If the reference is interpreted literally, an accused is automatically entitled to a new trial whenever the earlier expert witness “repudiates” his or her testimony—even if the witness does not explain the reason for the repudiation. Standing alone, proof that the witness has subjectively changed his or her mind and opinion should not be deemed an adequate basis for post-conviction relief.¹⁵⁶

The prevailing view is that standing alone, a lay witness’s recantation of prior testimony is not a ground for post-conviction relief.¹⁵⁷ Admittedly, a minority of courts treats a lay witness’s repudiation of earlier testimony as a basis for relief whenever the witness’s testimony was the sole basis for the conviction.¹⁵⁸ However, that is not the general view. In the view of most courts, a recantation alone does not necessitate a new trial.¹⁵⁹ Rather than accepting the recantation at face value, the court conducting the post-conviction relief proceeding inquires into the credibility of the recantation.¹⁶⁰ The court may demand substantial corroboration for the recantation.¹⁶¹

It is especially wrong-minded to treat an expert’s repudiation of prior testimony as an adequate basis for post-conviction relief. No expert schooled in the empirical tradition would accept a scientist’s change of mind without inquiring *why* the scientist has adopted a new view. In *Daubert*, Justice Blackmun stated that reliable “‘knowledge’ connotes more than subjective belief.”¹⁶² At the original trial, the judge should never have admitted the

¹⁵⁶ United States v. Slough, 144 F. Supp. 3d 4, 7 (D.D.C. 2015) (“Some circuits have held that a witness’s recantation of trial testimony cannot be the sole basis for a new trial . . .”).

¹⁵⁷ See generally Thomas, *supra* note 23.

¹⁵⁸ *Id.* § 9.

¹⁵⁹ *Id.* § 10 (citing Antwine Equality Graves v. State, 187 So.3d 173 (Miss. Ct. App. 2015) and then State v. Brown, 927 N.E.2d 1133 (Ohio Ct. App. 2010)). See also *id.* at § 14(c) (citing several New York decisions); Williams v. Brown, 208 F. Supp. 3d 713, 733 (E.D. Va. 2016).

¹⁶⁰ See Thomas, *supra* note 23, § 5.

¹⁶¹ *Id.* § 10; see also Repka, *supra* note 22, at 1445.

¹⁶² *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 590 (1993).

expert's opinion if it amounted to nothing more than the expert's subjective opinion. By the same token, at the later post-conviction relief proceeding, the judge should not accept the expert's repudiation of the earlier opinion if the repudiation amounts to nothing more than a subjective change of mind. Yet, when the accused can advance one of the types of claims identified in Part III.B, there is a satisfactory reason for the repudiation. For example, the expert could explain that subsequent research has discredited his major premise or significantly undermined confidence in the procedure that she used for applying the major premise to the case-specific facts. However, if the expert cannot articulate such an explanation for the "repudiation," standing alone, a repudiation does not justify a new trial.¹⁶³

The bottom line is that while the Texas model is unacceptable because it is too narrow, the California model is unsatisfactory because it is too liberal.

C. *Amending the Post-Conviction Relief Statutes to Allow Relief When the Accused Has One or More of the Meritorious Claims Identified in Part III.B*

As Part I explained, this Article has a limited scope. It does not deal with constitutional bases for relief. Nor does it address the question of the required standard for establishing the effect of the invalidation of the expert testimony on the prior verdict. The narrow focus of this article is the effect of the subsequent scientific research on the validity of the earlier expert testimony. It would therefore be presumptuous to propose comprehensive language for a post-conviction relief statute.

However, what about the portion of the statute describing the required showing that the later research has invalidated the prior testimony? What lessons can be learned from the discussion in Parts III.A and III.B?

One lesson is that any amended legislation ought to enunciate a broader general standard than the "contradiction" language in the Texas model. Part III.A concluded that relief should be available in alternative situations: (1) when the subsequent research has the drastic effect of discrediting the expert testimony; and (2) when the research has the more limited effect of seriously undermining confidence in the correctness of the expert testimony. The second prong is a variation of the wording of California Penal Code Section 1473(e)(1). That alternative prong is essential. Formally, as petitioner, the accused has the ultimate burden of proof in the post-conviction relief proceeding. However, given the profound constitutional values implicated by the proof beyond a reasonable doubt standard governing at the original

¹⁶³ See Iannece, *supra* note 12, at 220–21 (discussing *Ex parte Robbins*, 360 S.W.3d 446 (Tex. Crim. App. 2011)).

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trial,¹⁶⁴ the accused should not be required to “completely dispel the old evidence.”¹⁶⁵

Secondly, unlike the California model, the amendment should not provide that without more, the prior expert witness’s repudiation or recantation of their opinion is an adequate basis for relief. In the post-conviction relief proceeding, the critical question is why the expert has recanted or why another scientist disputes that expert’s testimony. The types of subsequent scientific developments identified in Part III.B can supply adequate answers to the why question. Rather than asking whether the prior expert has changed his or her subjective state of mind, the judge ought to inquire whether the accused has established one of the five types of claims discussed in Part III.B. There is no need to even refer to recantation or repudiation in the text of the amendment. It does not matter whether the testimony of the prior witness or that of another expert proves the subsequent development; the dispositive issue is whether such a development has occurred.

The final drafting question is whether the text of the amendment should specify the five types of claims listed in Part III.B. If the statutory language did so, there would be the risk that judges applying the statute would treat the listings as pigeonholes and strain to cram the fact situation into one of

¹⁶⁴ The fundamental liberty interest led the Supreme Court to elevate the ultimate burden of proof beyond a reasonable doubt to constitutional status in *In re Winship*, 397 U.S. 358 (1970). At the end of the same decade, the Court would invoke the same interest as the basis for revising the constitutional standard for determining whether the prosecution has sustained its initial burden of production—the legal sufficiency test for determining whether the prosecution has made out a case submissible to the jury. *Jackson v. Virginia*, 443 U.S. 307 (1979). Prior to *Jackson*, the majority view was that the standard for the legal sufficiency of the evidence in a criminal case was the same as the standard in a civil case, namely, whether cumulatively the prosecution evidence was sufficient to support a permissive inference of the existence of every element of the charged crime. However, the *Jackson* Court announced that due process mandates a more exacting standard, namely, whether the evidence would necessarily leave a juror with a reasonable doubt about the existence of the element. Edward J. Imwinkelried, *Jackson v. Virginia: Reopening the Pandora’s Box of the Legal Sufficiency of Drug Identification Evidence*, 73 KY. L.J. 1 (1985). The courts have yet to carefully examine the question of whether, under the *Jackson* standard, a juror presented with testimony by both the proponents and opponents of Shaken Baby Syndrome (SBS) would necessarily have a reasonable doubt about the defendant’s guilt. In the typical case in which the courts apply *Jackson*, the focus is on the analysis of the absolute weakness of the prosecution case. As Part III.A explained, there is a plausible case for SBS. See *supra* Part III.A. Here the defense would make a slightly different argument; the defense would contend that in applying the *Jackson* test, the court should also consider the contrary defense expert testimony. The thrust of the argument would be that the strength of the defense testimony so weakens the prosecution testimony that a juror who had heard both sides’ testimony would necessarily entertain a lingering, reasonable doubt about guilt. Hopefully, in the near future, the courts will have occasion to address the merits of that argument.

¹⁶⁵ Iannece, *supra* note 12, at 217 (quoting *State v. Edmonds*, 746 N.W.2d 590, 599 (Wis. Ct. App. 2008)).

pigeonholes. In text, it is probably preferable to refer generically to “any essential element” of the prior testimony. The drafters could follow the example of the Advisory Committee Note accompanying the 2000 amendment to Rule 702, which, as previously stated, asserts that “any step that renders the analysis unreliable . . . renders the expert’s testimony inadmissible.”¹⁶⁶ In similar fashion, the drafters could indicate in the legislative history that subsequent research discrediting or seriously undermining confidence in any essential element or step is cognizable. Then, just as the 2000 Note lists five additional factors relevant to the evaluation of the reliability of proffered testimony, the drafters could list the five types of claims identified in Part III.B.

Negatively, an amendment drafted along these lines would avoid the mistakes committed by the California and Texas drafters. Affirmatively, it would provide reasonable guidance to the courts tasked to apply the amendment. Most importantly, it would largely assure that an accused with a meritorious variation of a claim identified in Part III.B will be granted the new trial that he or she deserves.

V. CONCLUSION

The wave of DNA exonerations is gradually coming to an end.¹⁶⁷ Now that most law enforcement authorities have ready access to DNA testing, DNA testing is conducted before trial; and, understandably, there are fewer DNA exonerations after a conviction.¹⁶⁸ In part, the criminal justice system embraced the process of DNA exoneration so enthusiastically because a post-conviction DNA test did not merely raise doubts about the accuracy of the prior conviction; an exclusion could “point unerringly to innocence.”¹⁶⁹ For that matter, in roughly half of the DNA exonerations, the post-conviction test not only exculpated the accused but also led to the identification of the real culprit.¹⁷⁰ Those cases played out like a Perry Mason episode. Before

¹⁶⁶ FED. R. EVID. 702 advisory committee’s note to 2000 amendment (quoting *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 745 (3d Cir. 1994)).

¹⁶⁷ Kevin Davis, *Prisoner Exonerations Are at an All-Time High, and It’s Not Because of DNA Testing*, 100 A.B.A. J. 55, 57 (Sept. 2014), http://www.abajournal.com/magazine/article/prisoner_exonerations_are_at_an_all-time_high (“[E]xonerations due to DNA evidence have been on the decline for much of the past decade. According to the registry, the number of exonerations in which DNA played any role dropped from 23 in 2005 to 20 in 2012 and 18 in 2013.”); *The National Registry of Exonerations*, <http://www.law.umich.edu/special/exoneration> (last visited Apr. 20, 2018).

¹⁶⁸ Davis, *supra* note 167, at 57 (“One of the reasons for the decline is that many of the cases in which DNA testing was available to clear the wrongfully convicted have played out. DNA testing is now routine, and it often clears suspects long before trial.”).

¹⁶⁹ *In re Richards*, 371 P.3d 195 (2016) (quoting *In re Clark*, 855 P.2d 729, 739 (Cal. 1993)).

¹⁷⁰ BRANDON L. GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS

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the end of every episode, Perry had both established his client's innocence and identified the perpetrator.

However, real life is not as simple as a Perry Mason episode. In many cases, the new scientific evidence creates grave doubts about the accuracy of the prior conviction but falls short of demonstrating the accused's undeniable innocence.¹⁷¹ When the new science undermines confidence in the earlier conviction without eliminating the possibility of guilt, the courts and legislatures have a far more difficult policy choice: they must weigh the competing interests in accuracy and finality.¹⁷²

Part III.A proposed a general standard for striking the balance between those interests. Using that standard, Part III.B identified five situations in which it contends an accused is entitled to the relief of a new trial. In all these situations, the subsequent scientific research does more than raise a doubt about the prior conviction; rather, the new science fundamentally shakes our confidence in the conviction. The new research may not entirely eliminate the possibility of the accused's guilt, but sometimes the doubts about the justice of the prior conviction are so pronounced that they trump the substantial public interest in finality of judgment.¹⁷³ In these five situations, the sounder choice is accuracy over finality.¹⁷⁴ The Idaho Supreme Court framed the stark choice aptly:

The worst consequence of granting the [new trial] motion is that the state will have the expense of another trial [T]he worst consequence of denying the motion is that the defendants remain convicted of a crime which they might have not have committed.¹⁷⁵

In that case, the trial judge sagely commented: At least in some instances, "justice is more important than expense."¹⁷⁶

GO WRONG 5 (2011) ("In 45% of the 250 postconviction DNA exonerations (112 cases), the test results identified the culprit."); Karen Kafadar & Anne-Marie Mazza, *Using Faulty Forensic Science, Courts Fail the Innocent*, LIVESCIENCE (Feb. 24, 2015), <https://www.livescience.com/49929-faulty-forensic-science-failing-united-states-court-system.html> ("[I]n roughly half of the overturned cases, the new [DNA] evidence led to the conviction of the person who actually committed the crime.").

¹⁷¹ Chandler, *supra* note 17, at 16.

¹⁷² Iannece, *supra* note 12, at 227; Brooks et al., *supra* note 33, at 1049.

¹⁷³ Note, *supra* note 131, at 703.

¹⁷⁴ *Ex parte White*, 506 S.W.3d 39 (Tex. Crim. App. 2016).

¹⁷⁵ *State v. Keely*, 620 P.2d 284, 285 n.4 (Idaho 1980). See Repka, *supra* note 22, at 1458.

¹⁷⁶ *Keely*, 620 P.2d at 285. See Repka, *supra* note 22, at 1458–59.