

CHANGED SCIENCE STATUTES: CAN COURTS ACCOMMODATE ACCELERATING FORENSIC SCIENTIFIC AND TECHNOLOGICAL CHANGE?

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ABSTRACT: In the past several years, the nation's two most populous states have passed new statutes specifically intended to address the issue of rapidly changing scientific and technological knowledge, perhaps signaling a national trend. This reflection article situates a discussion of these "changed science statutes" within a sociological understanding of the nature of scientific knowledge, exploring the question of what it means for scientific knowledge to "change." It then traces the procedural history of the two cases widely credited with prompting the passage of the statutes and courts' varying interpretations of the statutes. It suggests that, while changed science statutes offer broad potential for redressing the use of impugned science in closed cases, courts have thus far limited their applicability through narrow interpretation of the statutes.

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In the past several years, the nation's two most populous states have passed new statutes specifically intended to address the issue of rapidly changing scientific and technological knowledge, perhaps signaling a national trend. The statutes have been variously called *junk science statutes*, *junk science writs*, and *forensic writ statutes*. I find the term *junk science* pejorative and simplistic. Professor Jennifer Laurin, more neutrally, calls them "changed-science writs."¹ Since this article focuses primarily on the statutes, not the writs, I will use the term "changed science statutes."

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1. See Jennifer E. Laurin, *Criminal Law's Science Lag: How Criminal Justice Meets Changed Scientific Understanding*, 93 *TEX. L. REV.* 1751, 1776 (2015).

I. LAW, SCIENCE, AND TIME

Perhaps the most oft-mentioned topic in discussions of the differences between law and science is that of time. Law's time is limited—cases must be decided—and the principle of finality argues strongly in favor of letting those decisions stand, even in circumstances where, for one reason or another, one suspects that a better job of investigating the facts might be done at a later time. Science's time is unlimited; by its very nature, science is a temporally unbounded effort to produce ever better understandings of the nature of the world.

This fundamental difference between law and science has been discussed most frequently in the now voluminous literature on the admissibility and treatment of scientific evidence. Given this difference, how is law to decide when and how to heed scientific knowledge? While science is supposedly comfortable with knowledge being in a state of perpetual revision, true comfort with such a state is not tenable for law. Law dispenses justice. It will not do to have the science upon which those decisions are based revised tomorrow. True reliance on the state of scientific knowledge in the moment would presumably produce a plethora of legal embarrassments, as tomorrow's science blithely went about disrupting and even shattering the supposed "knowledge" upon which yesterday's legal decisions were based.

It is generally assumed, therefore, that legal admissibility standards must be at least somewhat temporally conservative. Law cannot rely on brand new scientific knowledge; it must demand some degree of ripening. Thus, we have the demand for "general acceptance in the field to which it belongs" in *Frye v. United States*² and the demand for validation testing in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*³ It is understood that these demands have a cost: the admission of some well warranted scientific knowledge will be delayed until it is accepted or validated. And, it is likewise understood that the reliability of this "test of time" should not be overstated; there are plenty of examples of scientific knowledge that were "generally accepted" for centuries before becoming widely viewed as false.⁴

Legal admissibility regimes, then, are premised on the belief that this temporal conservatism enables law to rely on reasonably ripe scientific knowledge without degenerating into an excess of legally embarrassing decisions. Is this belief reasonable?

Law's rough and reasonable temporal conservatism may have sufficed when the pace of scientific and technological change was relatively slow. But another oft-mentioned truism in discussions of law and science is the claim that the pace of scientific and technological is accelerating. This claim is difficult for any member of contemporary society to deny, but, if it is true, it suggests that we might likewise expect a shortening of the period of time it takes for scientific knowledge upon which legal decisions rest to be exposed as false. A

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

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

4. Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Ruling from Jennings to Llera Plaza and Back Again*, 41 AM. CRIM. L. REV. 1189, 1224 (2004).

consequence of this might be that the principals affected by these legal decisions are more likely to be alive and active by the time scientific knowledge changes. The shifting perception of the reliability of medieval trials by ordeal occurred over the course of centuries, and the principals of the earliest trials were all long dead.⁵ Similar developments in the contemporary world may be compressed into mere decades with living principals capable of voicing complaint.

There are reasons to believe that this issue of temporality may be most acute in the criminal context. For example, there are individuals condemned on death row and prisoners serving life sentences who claim to have been convicted on now discredited science, something Professor Laurin calls “science lag.”⁶ One judge described the dilemma as follows:

This disconnect between changing science and reliable verdicts that can stand the test of time has grown in recent years as the speed with which new science and revised scientific methodologies debunk what had formerly been thought of as reliable forensic science has increased. The potential problem of relying on today’s science in a criminal trial (especially to determine an essential element such as criminal causation or the identity of the perpetrator) is that tomorrow’s science sometimes changes and, based upon that changed science, the former verdict may look inaccurate, if not downright ludicrous. But the convicted person is still imprisoned.⁷

Admissibility law and the scholarly debate that accompanies it have established that it is difficult for law to determine when scientific knowledge is *accepted*. It is presumably equally difficult to determine when scientific knowledge *changes*. How, then, is a criminal court to deal with claims that its treatment of scientific evidence was *insufficiently conservative*—in other words, despite the court’s efforts to be temporally conservative, it nonetheless relied on scientific knowledge that mere decades later no longer seems accepted or valid? The conventional forum for such claims has been postconviction proceedings, but legal commentators have noted that “[t]he postconviction route most commonly available, namely a new-trial claim based on newly discovered evidence, frequently features doctrinal [and procedural] constraints that uniquely and inappropriately suppress receptivity to changed science.”⁸ Therefore, legal scholars conclude that “relief from a conviction premised on expert evidence that was, but is no longer, viewed as valid by the scientific community is exceedingly rare.”⁹

5. Jane Campbell Moriarty, *Wonders of the Invisible World: Prosecutorial Syndrome and Profile Evidence in the Salem Witchcraft Trials*, 26 VT. L. REV. 43, 48 (2001).

6. See Laurin, *supra* note 1, at 1754.

7. *Ex Parte Robbins (Robbins I)*, 360 S.W.3d 446, 470 (Tex. Crim. App. 2011) (Cochran, J., dissenting).

8. Laurin, *supra* note 1, at 1774–75.

9. *Id.* at 1753–54.

II. CHANGED SCIENCE STATUTES

The new changed-science statutes are Texas's article 11.073 of the Code of Criminal Procedure, first enacted in 2013 and then amended in 2015,¹⁰ and California's Chapter 623 of California Penal Code section 1473, enacted in 2014.¹¹

The two statutes bear some important similarities. Both statutes amend the states' habeas corpus rules to clarify that relief may be obtained if a showing of changed scientific evidence is made. Under the Texas statute, the key question is "whether the field of scientific knowledge, a testifying expert's scientific knowledge, or a scientific method on which the relevant scientific evidence is based has changed."¹² The California statute states that "'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."¹³

Perhaps the most interesting similarity between the two statutes is that both were apparently passed by their respective legislatures in reaction to specific cases in which the states' courts of last resort deemed themselves legally unable to provide postconviction relief to applicants who alleged that the integrity of their convictions had been undermined by subsequent scientific developments. Both cases, moreover, involved scientific experts who proffered incriminating testimony for the State at trial and who subsequently came to doubt their original testimony.

The Texas statute was prompted by *Ex Parte Robbins*.¹⁴ Neal Robbins was convicted of capital murder and sentenced to life in prison in the death of his girlfriend's daughter, Tristen Rivet, in 1999.¹⁵ Tristen had been left in Robbins's care and was found dead.¹⁶ Based on an autopsy, Harris County Assistant Medical Examiner Patricia Moore testified at Robbins's trial that "it was her opinion that Tristen was asphyxiated, and she believed that beyond a reasonable doubt."¹⁷

In 2007, the Harris County Medical Examiner's Office reviewed Moore's findings.¹⁸ The Deputy Chief Medical Examiner found that the autopsy did not support Moore's conclusions and amended the cause of death from "asphyxia" to "undetermined" and the manner of death from "homicide" to "undetermined."¹⁹ A second medical examiner concurred in this result.²⁰ Dr. Moore concurred too.²¹ In a letter to the District Attorney, she stated: "Given my review of

10. TEX. CODE CRIM. PROC. ANN. art. 11.073 (West, Westlaw through the end of the 2017 Reg. Sess. of the 85th Legislature).

11. CAL. PENAL CODE § 1473 (West, Westlaw current with urgency legislation through ch. 179 of 2017 Reg. Sess.).

12. Art. 11.073, § (d) (Westlaw).

13. PENAL § 1473, § (e)(1) (Westlaw).

14. *Robbins I*, 360 S.W.3d 446.

15. *Id.* at 448.

16. *Id.* at 449.

17. *Id.* at 451.

18. *Id.* at 453.

19. *See id.*

20. *Id.* at 453–54.

21. *Id.* at 454.

all the material from the case file and having had more experience in the field of forensic pathology, I now feel that an opinion for a cause and manner of death of undetermined, undetermined is best for this case.”²²

Robbins filed a habeas corpus petition, and the State joined it, recommending that Robbins be granted a new trial.²³ In a 5–4 decision in 2011, the Texas Court of Criminal Appeals denied Robbins’s writ of habeas corpus because the new evidence did not unquestionably establish his innocence and did not fit the definition of “false evidence.”²⁴ Subsequently, the Legislature enacted Article 11.073 in 2013. Robbins’s attorney was among the witnesses at the legislative hearings, and *Robbins* has been credited with changing the legislature’s—and some District Attorneys’—minds on the necessity of the statute.²⁵

The California statute was provoked by *In re Richards*.²⁶ William Richards was convicted in 1997 of the murder of his wife, Pamela Richards.²⁷ In addition to other evidence, at Richards’s fourth trial (after two mistrials and a judicial recusal) forensic dentist Norman Sperber testified about an association between a lesion on Pamela’s hand and William’s dentition.²⁸ Sperber testified that the lesion was a human bite mark, that it was “consistent with” William’s dentition, and that William’s dentition was unusual.²⁹ Sperber estimated the frequency of the unusual features of William’s dentition at “one or two or less” per one hundred people, although he conceded that this estimate was based on his experience rather than any scientific studies.³⁰ Another forensic dentist, Gregory Golden, testified for the defense that the bite mark evidence was “inconclusive and should be disregarded, in part because of the angular distortion in the photograph of the mark.”³¹

Richards filed a habeas corpus petition in 2007.³² Included with this petition were declarations by two additional forensic dentists, Charles M. Bowers and Raymond Johansen.³³ Bowers and Johansen had improved upon a technique, first developed around 1996 or 1997 by a Canadian dentist, for digitally removing angular distortion from a photograph of a bite mark.³⁴ They testified that the technique had “become accepted in the field of forensic dentistry.”³⁵ Using this technique, Johansen testified that the bite mark did not match Richards’s dentition, that the mark was just as likely to have been caused by fencing material

22. *Id.*

23. *Id.*

24. *Id.* at 463.

25. See Scott Ehlers, *Lessons Learned from Legislative Victories in the Lone Star State*, CHAMPION, May 2014, at 47, 52.

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

27. *Id.*

28. *Id.* at 865.

29. *Id.*

30. *Id.*

31. *Id.* at 866.

32. *Id.*

33. *Id.*

34. *Id.* at 867.

35. *Id.* at 863.

found near the body as by a bite, but that he could not exclude Richards's dentition as a possible source of the mark.³⁶ Bowers testified that the mark did not "match" Richards's dentition and that he doubted that the mark was a human bite mark.³⁷

Drs. Sperber and Golden also viewed images produced by Bowers and Johansen's technique for removing angular distortion.³⁸ At the habeas hearing, Golden testified that the mark might be a dog bite and that he "would tend to rule out Mr. Richards . . . as the suspected biter."³⁹ Sperber testified that he was not sure the mark was a bite mark and that "[m]y opinion today is that [Richards's] teeth . . . are not consistent with the lesion on the hand."⁴⁰

In a 4–3 decision in 2012, the California Supreme Court denied Richards's habeas corpus petition.⁴¹ The court reasoned that "the new technology has not proved that any portion of Dr. Sperber's trial testimony was objectively untrue."⁴² The court added:

With the benefit of new technology, petitioner's experts at the habeas corpus evidentiary hearing shed doubt on those conclusions, but even with the new technology, these experts still could not definitively rule out petitioner's teeth as a possible source of the mark. Dr. Johansen, for example, could not exclude petitioner's teeth as a possible source of the mark, but in his opinion it was just as likely that the indistinct lesion was caused by the fencing material as it was by petitioner's teeth. The other doctors found no match to petitioner's teeth, but they also did not absolutely rule out petitioner's teeth as a possible source of the mark. Petitioner's habeas corpus evidence at most calls into question Dr. Sperber's opinion at trial that petitioner's teeth could have been the source of the mark, but it has not proved that opinion to be objectively untrue. Hence, Dr. Sperber's trial opinion is not "false evidence" for purposes of section 1473, subdivision (b).⁴³

The dissent, in contrast, argued:

Here, the critical underlying fact—that the single uncorrected photograph provided Dr. Sperber with a sufficient basis for matching petitioner's teeth to a lesion on the victim's hand—was proven false. Without that premise, Dr. Sperber's trial testimony that the lesion was consistent with petitioner's teeth was false evidence. . . . [T]he expert testimony here was false because it depended crucially on Dr. Sperber having seen something—a true photographic representation of the lesion on the victim's hand—that it turns out he did not actually see. In sum, because petitioner has shown by a preponderance of the evidence that the essential premise of Dr. Sperber's trial testimony was false, it follows that the testimony was false evidence under section 1473(b).⁴⁴

36. *Id.*

37. *Id.*

38. *Id.* at 878–79 (Liu, J., dissenting).

39. *Id.* at 879.

40. *Id.* at 878.

41. *Id.* at 876.

42. *Id.* at 872.

43. *Id.* at 872–73.

44. *Id.* at 879 (Liu, J., dissenting).

The California legislature passed Chapter 623 in 2014. The act was widely viewed as being “in response” to *Richards*.⁴⁵ With this statute in place, the California Supreme Court just overturned Richards’s conviction.⁴⁶

III. A SIGN OF HOPE?

The two changed science statutes have been hailed “as a sign of hope,”⁴⁷ and some commentators have urged that “All Fifty States Should Adopt Their Own Junk Science Writ.”⁴⁸ Professor Laurin writes that “changed-science writs like Texas’s present an opportunity to override aspects of generally applicable postconviction doctrines that uniquely impinge on new science claims.”⁴⁹ And, indeed, the widespread adoption of changed science statutes—at least in those jurisdictions where the case law leads appellate courts to believe that they are constrained from granting relief to prisoners alleging changed science—may well help bring justice to cases of alleged wrongful conviction involving scientific evidence. But a closer look at the cases illustrates that it may be as difficult for courts to decide when science has changed as it has been for them to decide when it is accepted and valid. Indeed, it might be argued that changed science statutes place the responsibility to assess the quality of scientific evidence on the same courts that did such a poor job of regulating forensic science in this first instance. The courts, in the words of the 2009 National Research Council (NRC) report *Strengthening Forensic Science in the United States*, were “utterly ineffective” at demanding that forensic scientists validate their techniques and “establish . . . the accuracy of its practitioners’ conclusions.”⁵⁰ Accordingly, the NRC recommended looking outside the courts, to scientific institutions, to evaluate the validity of scientific evidence.⁵¹ Changed science writs remain within the, arguably discredited, paradigm of having judges evaluate the validity of science.

Science is a highly variegated activity, and scientific change cannot be expected to follow a single predictable pattern. The notion of “changed science,” therefore, would seem to potentially encompass a range of scenarios. A key question is: who represents “science” for the purposes of a changed science claim? The answer to this question will very often be contested and may not be self-evident. Thus, another key question becomes: whose scientific knowledge has changed? At one extreme, those scientists who gave the original scientific

45. Natasha Machado, *Chapter 623: Giving the Wrongfully Convicted a Better Chance at Review*, 46 MCGEORGE L. REV. 387, 388 (2014).

46. *In re Richards (Richards II)*, 371 P.3d 195 (Cal. 2016).

47. Sabra Thomas, *Addressing Wrongful Convictions: An Examination of Texas’s New Junk Science Writ and Other Measures for Protecting the Innocent*, 52 HOUS. L. REV. 1037, 1055, 1056, 1059 (2015).

48. *Id.* at 1059; see Catherine E. White, Comment, “*I Did Not Hurt Him This Is a Nightmare*”: *The Introduction of False, but Not Fabricated, Forensic Evidence in Police Interrogations*, 2015 WIS. L. REV. 941, 961 (2015).

49. Laurin, *supra* note 1, at 1776.

50. COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY., NAT’L RESEARCH COUNCIL OF THE NAT’L ACADS., *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 109* (2009) [hereinafter NRC REPORT].

51. *Id.* at 12–13.

testimony might come to no longer have confidence in their original testimony. At another extreme, those scientists who gave the original scientific testimony might retain confidence in their original testimony, perhaps adamantly so. However, there might yet be a reasonable claim that science has changed. For example, the relevant discipline might no longer support the claims made in the original testimony. Or, the discipline might support the claims, but a broader scientific community might doubt those claims. Even more extremely, the broader scientific community might doubt the legitimacy of the entire discipline that supports such claims.

At first glance, the former cases would seem like the easiest, while the latter would seem to pose much more difficult issues. However, a look at the first set of cases involving changed science writs suggests that even these seemingly easy cases have proven surprisingly difficult for courts to resolve.

For example, *Richards I* would seem like the easiest case of all. The claim of changed science actually traces back to the development of a new technology, Bowers and Johansen's technique for digitally correcting for angular distortion in photographs. It is almost as if a *new machine* had been invented, like the invention of the microscope or telescope (or of forensic DNA profiling). This should seemingly have made it relatively easy for the court to reason, as the dissent did, that something previously invisible was now visible and see it as just that finality should not preclude a life sentenced prisoner from availing himself of the benefit of this new technology. In addition, there was the fact that the original State's expert essentially recanted. Thus, the court was not required to arbitrate between dueling experts. The *Richards II* ruling was narrow, however, in that it relied upon the experts' recantations and the new imaging technology, rather than on the broader issues concerning bite-mark identification.

Superficially, an expert witness recantation would seem to be the easiest case for relief under a changed science writ because the original experts themselves no longer adhere to their own opinion, leaving no credentialed expert espousing that view. Although the first three convictions overturned under the Texas statute involved expert recantations,⁵² *Robbins II* illustrates that in some ways an expert recantation presents a harder, not an easier, case. In *Robbins I*, the State's expert essentially recanted her original testimony, causing great difficulty in *Robbins II*, which was decided under the original 2013 version of Texas's changed science statute.

The problem lay in the notion of changed scientific knowledge. As the court asked rhetorically, "Moore's conclusion certainly has changed, but does 'scientific knowledge' apply to the knowledge of an individual?"⁵³ A majority of five

52. In addition to *Robbins*, two convictions for day care sexual abuse, including the high-profile "San Antonio Four" case, were overturned after the state's experts who testified on medical scarring of the hymen recanted. See Thomas, *supra* note 47, at 1037, 1052; see also Associated Press, *Women Known as 'San Antonio Four' Are Exonerated by Texas' Highest Court After Almost 15 Years in Prison*, L.A. TIMES (Nov. 23, 2016, 10:55 AM), <http://www.latimes.com/nation/nationnow/la-na-san-antonio-4-exonerated-20161123-story.html> [perma.cc/MH2E-RWRV]. The *San Antonio Four* case is the subject of a documentary film, *SOUTHWEST OF SALEM: THE STORY OF THE SAN ANTONIO FOUR* (Motto Pictures & Naked Edge Films 2016).

53. *Ex Parte Robbins (Robbins II)*, 478 S.W.3d 678, 691 (Tex. Crim. App. 2014).

judges concluded that it does and ordered a new trial.⁵⁴ The court's question is somewhat analogous to the question of whether a changed expert opinion constitutes "new evidence." The Sixth Circuit has concluded that it does because, in the case of expert testimony, the expert opinion itself is the evidence.⁵⁵

However, in *Robbins II*, as Judge Keasler noted in dissent, the majority's explanation of how scientific knowledge applies to an individual was not entirely convincing.⁵⁶ The majority reasoned that Moore's opinion was "an inference or assertion supported by appropriate validation based of the scientific method" and, therefore, counted as "scientific knowledge."⁵⁷ While an autopsy is certainly a scientific endeavor, it is questionable whether the formation of causes and manners of death by forensic pathologists are either "supported by appropriate validation" or that they deploy "the scientific method" as conventionally understood—itsself a highly contested and frequently misused term.⁵⁸ But the larger issue is that the majority did not address Judge Keasler's argument that "scientific knowledge" is generally thought to inhere in a collective—a group of scientists, a specialty, a discipline—rather than in an individual.⁵⁹ It is a commonplace of the sociology of science "that knowledge has to be understood as a collective good and its application as a collective process. If there is a fundamental and irreducibly sociological point to be made about scientific knowledge, it is this one."⁶⁰ As Shapin observed: "No one individual keeps the whole of a discipline's knowledge in his or her head, and even the technical knowledge involved in the conduct of a single experiment in modern physics or biology is typically distributed across a range of specialist actors."⁶¹ This is consistent with Judge Keasler's view "that scientific knowledge for purposes of this article [11.073] refers to the collective knowledge within a field of study, not an individual's opinion."⁶² Moreover, Judge Keasler correctly pointed out that "the scientific method"—if one is to take that notion seriously—is the process by which scientific knowledge is produced.⁶³ To the extent that there is a unitary "scientific method," it does not change; only the scientific knowledge that is produced by it changes.⁶⁴

In contrast to the majority opinion, the concurring opinions did wrestle with the contradiction pointed out by Judge Keasler. Judge Johnson wrote: "Because evidence is what is presented at trial by a witness and is therefore limited by the personal knowledge of that witness, logically the statute must be intended to

54. *Id.*

55. *Souder v. Jones*, 395 F.3d 577, 592 (6th Cir. 2005).

56. *Robbins II*, 478 S.W.3d at 708 (Keasler, J., dissenting).

57. *Id.* at 692 (majority opinion).

58. See Susan Haack, *Irreconcilable Differences? The Troubled Marriage of Science and Law*, 72 LAW & CONTEMP. PROBS. 1, 8 (2009).

59. *Robbins II*, 478 S.W.3d at 710 (Keasler, J., dissenting).

60. Steven Shapin, *Here and Everywhere: Sociology of Scientific Knowledge*, 21 ANN. REV. SOC. 289, 302 (1995).

61. *Id.*

62. *Robbins II*, 478 S.W.3d at 710 (Keasler, J., dissenting).

63. *Id.* at 709.

64. *Id.*

address the personal knowledge of scientific witnesses.”⁶⁵ Judge Cochran reasoned that since Article 11.073 was clearly a response to *Robbins I*, and *Robbins I* involved a change in an individual scientist’s knowledge not a change in collective scientific knowledge, then Article 11.073 must have been intended to apply to individual, as well as collective, scientific knowledge.⁶⁶

After the decision in *Robbins II*, the State, apparently having changed its position in favor of granting Robbins a new trial, filed a motion for rehearing.⁶⁷ The motion was granted *per curiam* with three judges dissenting.⁶⁸ However, before rehearing, the legislature amended the statute in 2015, inserting the words “a testifying expert’s scientific knowledge” to clarify that the statute covered individual, as well as collective, scientific knowledge.⁶⁹

A recomposed court then decided the case yet again under the 2015 version of the statute.⁷⁰ In a *per curiam* decision with one dissenting vote, the court found that the motion for rehearing had been improvidently granted.⁷¹ Several judges complained that this result was not optimal in terms of clarifying the law. Judges Richardson and Johnson would have preferred that the court grant relief under the 2015 statute, rather than reinstating *Robbins II*.⁷² Judge Alcala noted that at least two and perhaps three of the *Robbins II* dissenters now joined the *per curiam* decision, thus suggesting they no longer supported their own *Robbins II* opinions and described this as “an extremely strange and unprecedented turn of events.”⁷³ Judge Newell argued that even in the 2013 statute “the phrase ‘scientific knowledge’ in Article 11.073 could reasonably be interpreted as including both a scientist’s individualized scientific knowledge as well as the sum of knowledge in a given field.”⁷⁴

This rather tortured debate raised some important issues. For instance, how are we to understand Dr. Moore’s appeal to “having had more experience in the field of forensic pathology” as a partial explanation for her recantation?⁷⁵ Forensic science is rife with claims—rarely, if ever, empirically supported—that equate expertise with experience. But, if we take seriously the rough equation of expertise with experience, it raises troubling questions about the notion of changed science. First, it suggests that we should expect changed science to be quite common. With all the country’s scientists continually acquiring experience, scientific knowledge should be expected to be in a state of perpetual flux. Second, what are the implications of this for equality under the law? Are we willing to subject some defendants to less expert scientific analyses than others, based just on whether they draw a novice scientist?

65. *Id.* at 693 (Johnson, J. concurring).

66. *Id.* at 695–704 (Cochran, J., concurring).

67. *Ex parte Robbins (Robbins III)*, No. WR-73,484-02, 2016 WL 370157, at *2 (Tex. Crim. App. Jan. 27, 2016) (Alcala, J., concurring).

68. *Id.* at *2.

69. *Id.* at *11.

70. *Id.* at *3.

71. *Id.* at *1 (per curiam).

72. *Id.* at *3 (Richardson, J., concurring).

73. *Id.* at *3 (Alcala, J., concurring).

74. *Id.* at *24 (Newell, J., concurring).

75. *Robbins II*, 478 S.W.3d 678, 685 (Tex. Crim. App. 2014).

These problems, of course, stem from the notion of scientific knowledge inhering in the individual scientist. If scientific knowledge inheres in the collective, the problem should be easier: we hold the individual scientist, no matter how inexperienced, to the standard of the collective knowledge of the discipline. But what of those seemingly “hard” cases in which *collective* scientific knowledge changes? It is difficult not to notice that all the successful cases in Texas involved recantations by state’s experts. Will the scope of changed science writs be limited only to such cases, thus essentially giving state’s experts veto power over the issue of whether scientific knowledge has changed? Or will courts be open to broader challenges, allegations of changed science that are *not* based on state’s expert recantations? After all, the Texas statute “does not require anyone to recant his or her original testimony.”⁷⁶ Some prisoners may advance changed science claims, even when the State’s expert does not recant, on the basis that collective scientific knowledge has changed. For example, a Tarrant County District Court recently recommended overturning a conviction under Article 11.073 in a case that did not involve a recantation.⁷⁷ When John Nolley was convicted, a bloody palm print was deemed not suitable for comparison.⁷⁸ In a manner reminiscent of *Richards*, an expert using digital technology concluded that both Nolley and the victim could be excluded as sources of the print.⁷⁹

The legislative history makes it clear that the Texas statute was motivated not merely by *Robbins*, but also by examples of forensic science that had been in some sense debunked.⁸⁰ The prime examples given were comparative bullet lead analysis⁸¹ and arson evidence, which has been especially notorious in Texas because of the debunking of the scientific evidence adduced in the conviction and execution of Cameron Todd Willingham.⁸² Although *Robbins* was not a case of changed collective scientific knowledge, infant death is another

76. Linda Rodriguez McRobbie, *In Texas, a New Law Lets Defendants Fight Bad Science*, ATLANTIC (Feb. 28, 2014), <https://www.theatlantic.com/national/archive/2014/02/in-texas-a-new-law-lets-defendants-fight-bad-science/283895/> [perma.cc/NUM2-BGTZ].

77. *With Consent of the Tarrant County District Attorney, Texas Court Frees Man Who Served 19 Years of a Life Sentence for Murder*, INNOCENCE PROJECT (May 17, 2016), <http://www.innocenceproject.org/texas-court-frees-man-served-19-years-life-sentence-murder/> [perma.cc/K7GM-ZN5M].

78. *Id.*

79. *Id.*

80. See generally Naina Soni, *New Science, Old Convictions—Texas Senate Bill 344: Identifying Further Necessary Reform in Forensic Science*, 2 J.L. & BIOSCIENCES 149 (2015) (discussing the legislative history of SB 344).

81. D.H. Kaye, *Bullet-Proofing the NRC Bullet Lead Report: Should Science Committees Make Legal Findings?*, 46 JURIMETRICS J. 91 (2005); William C. Thompson, *Analyzing the Relevance and Admissibility of Bullet Lead Evidence: Did the NRC Report Miss the Target?*, 46 JURIMETRICS J. 65 (2005).

82. Rachel Dioso-Villa, *Scientific and Legal Developments in Fire and Arson Investigation Expertise in State of Texas v. Cameron Todd Willingham*, 14 MINN. J. L. SCI. & TECH. 817 (2013).

area in which such claims could be made.⁸³ Another such area might be post-mortem root hair banding.⁸⁴

Consider also *Richards*. In *Richards*, like *Robbins*, the state's expert essentially recanted. But, had he not recanted, Richards might still have had a strong changed science claim. There is a strong argument to be made that the scientific community has lost faith in the ability of forensic dentists to associate alleged bite marks on skin with individuals' dentition. Such a challenge would be quite different from a recanting expert challenge. In the case of bite mark analysis, there is a discipline that has long claimed an ability to both determine whether marks on skin are from human bites and to associate such marks with individuals' dentition. A variety of individuals and institutions from outside that discipline have challenged those claims.⁸⁵ (In the case of bite mark analysis, it should be noted that the discipline's strongest claims have also been challenged from *inside* the discipline as well for some years now.⁸⁶ This is not the case for all challenged forensic disciplines.) In 2009, the NRC Report summarized the debate as follows:

Although the majority of forensic odontologists are satisfied that bite marks can demonstrate sufficient detail for positive identification, no scientific studies support this assessment, and no large population studies have been conducted. In numerous instances, experts diverge widely in their evaluations of the same bite mark evidence, which has led to questioning of the value and scientific objectivity of such evidence.⁸⁷

At some point in the debate, courts might have viewed the increasing number of scientists who dispute the discipline's claims as a change in scientific knowledge. But exactly when, and on what basis, a court can conclude this are difficult questions.⁸⁸ The courts might have treated the NRC report as the change in scientific knowledge since the NRC report was the product of a committee of prestigious scientists and others and of a prestigious scientific institution, and it was deliberately written to address scientific controversies. Or, they

83. Compare DEBORAH TUERKHEIMER, *FLAWED CONVICTIONS: "SHAKEN BABY SYNDROME" AND THE INERTIA OF INJUSTICE* (2014); and EMMA CUNLIFFE, *MURDER, MEDICINE AND MOTHERHOOD* (2011); with Joëlle Anne Moreno & Brian Holmgren, *Dissent into Confusion: The Supreme Court, Denialism, and the False "Scientific" Controversy over Shaken Baby Syndrome*, 2013 UTAH L. REV. 153 (2013).

84. Joseph B. Kadane, *Post-Mortem Root Banding of Hairs: A Sceptical Review*, 14 LAW, PROBABILITY & RISK 213 (2015).

85. See, e.g., Erica Beecher-Monas, *Reality Bites: The Illusion of Science in Bite-Mark Evidence*, 30 CARDOZO L. REV. 1369 (2009).

86. See, e.g., C. Michael Bowers, *Identification from Bitemarks: Scientific Issues*, in SCIENCE IN THE LAW: FORENSIC SCIENCE ISSUES 244 (David L. Faigman et al. eds., 2002); Mary A. Bush et al., *Statistical Evidence for the Similarity of Human Dentition*, 56 J. FORENSIC SCI. 118 (2011); Iain A. Pretty & David Sweet, *A Paradigm Shift in the Analysis of Bitemarks*, 201 FORENSIC SCI. INT'L 38 (2010).

87. NRC REPORT, *supra* note 50, at 176 (references omitted).

88. Caitlin Plummer & Imran Syed, *"Shifted Science" and Post-Conviction Relief*, 8 STAN. J. CIV. RTS. & CIV. LIBERTIES 259 (2012); 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).

might view White House Office of Science and Technology Policy Associate Director Jo Handelsman's even more blunt 2015 statement that bite-mark evidence should be discontinued as the change in scientific knowledge.⁸⁹ Or, they might view the Amicus Curiae Brief by 37 scientists, statisticians and law-and-science scholars and practitioners filed in *Richards* itself in 2015 as the change in scientific knowledge.⁹⁰ Or, they might view the Texas Forensic Science Commission's 2016 recommendation for a "moratorium on bite-mark evidence" as the change in scientific knowledge.⁹¹ Or, they might view the President's Council of Advisers on Science and Technology's statement "that bitemark analysis does not meet the scientific standards for foundational validity, and is far from meeting such standards" as the change in science.⁹²

IV. HARD CASES

There may be still more challenging cases. Consider, for example, microscopic hair comparison. The FBI, Department of Justice, National Association of Criminal Defense Lawyers, and Innocence Project recently announced the results of a comprehensive review of microscopic hair comparison testimony, finding the testimony inaccurate in 96% of cases.⁹³ In some sense, this appears to be an easy case because consensus has been reached among erstwhile adversaries.

But articulating the change in science is more difficult. By calling the testimony inaccurate, the review did not mean that the suspect was excluded from being the source of the hair in those cases. It meant that the FBI experts' testimony was unsupported; they had exaggerated the probative value of the evidence.⁹⁴ Scientific knowledge changed in that the FBI came around to the view that the way in which it had been teaching its hair analysts to report their findings was scientifically and statistically unsound.⁹⁵

Undoubtedly, there is something unjust about convicts sitting in prison today based on testimony given yesterday that we now view as overprobative.

89. Jo Handelsman, Assoc. Dir. for Sci., White House Office of Sci. & Tech. Pol'y, Plenary Address at International Forensics Symposium: Forensic Science Error Management (July 21, 2015), <https://www.nist.gov/associate-director-laboratory-programs/recorded-sessions> [perma.cc/5SEW-UPZE]; see also Seth Augenstein, *Is This the End of Bite-Mark Analysis?*, FORENSIC MAG. (Aug. 24, 2015, 3:38 PM), <https://www.forensicmag.com/article/2015/07/end-bite-mark-analysis> [perma.cc/W74P-EZAC] (analyzing Handelsman's comments at the International Symposium on Forensic Science Error Management).

90. Application for Leave to File *Amici Curiae* Brief of Michael J. Saks, Thomas Albright, Thomas L. Bohan, Barbara E. Bierer and 34 Other Scientists, Statisticians and Law-and-Science Scholars and Practitioners in Support of the Petition for Writ of Habeas Corpus by William Joseph Richards, *In re Richards*, 371 P.3d 195 (Cal. 2016) (No. S22365).

91. Jon Herskovitz, *Influential Texas Panel Recommends Halt to Use of Bite-Mark Evidence*, REUTERS (Feb. 11, 2016, 5:08 PM), <http://www.reuters.com/article/texas-bitemark-idUSL2N15R00N> [perma.cc/VET9-7KCD].

92. PRESIDENT'S COUNCIL OF ADVISORS ON SCI. & TECH., FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS 87 (2016).

93. Simon A. Cole & Troy Duster, *Microscopic Hair Comparison and the Sociology of Science*, CONTEXTS, Winter 2016, at 28, 29.

94. *Id.* at 33.

95. *Id.*

There is a duty to correct this testimony. However, it should be noted that the scientific change is quite different—and less tangible—than the invention of new method of visualizing a photograph in *Richards*. Here the change is more conceptual; it concerns the proper way of interpreting and reporting the testimony. Moreover, the scientific change did not consist of anyone “inventing” or “discovering” anything. Many scholars have long questioned the strength of the conclusions offered by hair examiners, and professional statisticians, had they been consulted—they were not—would never have endorsed the testimonial reports the FBI was making. The change was rather more in the nature of persuading a group of scientists of a particular conclusion, than an invention or discovery. The change also lay in persuading relevant parties that statistical expertise was relevant to the knowledge claims made by hair examiners. Sociologists of science would argue that this is still a change of science—that the progression of scientific knowledge consists as much of these acts of collective persuasion as it does of inventions and discoveries⁹⁶—but it may be less intuitively recognizable to courts.

What has been said about microscopic hair comparison evidence can be said about much pattern evidence testimony that has been given in court over the past century. Forensic statisticians argue it is improper to report associations of such evidence without attempting to estimate the rarity of the consistent characteristics. But, historically, the pattern recognition disciplines—fingerprints, firearms and toolmarks, handwriting, bite marks, footwear, tire tread—have almost never reported these rarities. In some cases, such as fingerprints and firearms and toolmarks, the disciplines have systematically institutionalized the exaggeration of the probative value of associations.

Efforts are now underway to develop ways of properly characterizing the results of forensic analyses in probabilistic fashion. However, thousands of inmates were convicted on forensic evidence reported in a categorical, not probabilistic, fashion that, as for the microscopic hair comparison evidence described above, often overstated the probative value of the evidence. These inmates might have valid changed science claims.

Consider fingerprint identification. This evidence was used in court for around a century without any validation studies having been performed while accompanied by exaggerated statements about its probative value. For a period of time, this characterization of the state of affairs was held in the mainstream scientific community, but denied within the latent print discipline.⁹⁷ Was this changed science? This view is now, arguably, conceded within the discipline.⁹⁸

96. See generally *id.*

97. Simon A. Cole, *Who Speaks for Science? A Response to the National Academy of Sciences Report on Forensic Science*, 9 *LAW, PROBABILITY & RISK* 25 (2010).

98. E.g., PRESIDENT’S COUNCIL OF ADVISORS ON SCI. & TECH., *supra* note 92; DEP’T OF JUSTICE, SUPPORTING DOCUMENTATION FOR DEPARTMENT OF JUSTICE PROPOSED UNIFORM LANGUAGE FOR TESTIMONY AND REPORTS FOR THE FORENSIC LATENT PRINT DISCIPLINE (2016), <https://www.justice.gov/archives/olp/file/861906/download> [perma.cc/L8B8-ZQ29]; Henry J. Swofford, *The Emerging Paradigm Shift in the Epistemology of Fingerprint Conclusions*, 65 *J. FORENSIC IDENTIFICATION* 201–13 (2015);

Is that changed science? One might argue that a prisoner, convicted by fingerprint evidence accompanied by an overstatement of its probative value without reference to any validation studies might have a valid claim under a changed science statute. But in what way has science changed? No new machine was invented. Was anything discovered? It strains the concept to say that the lack of validation testing, for example, was “discovered.” The lack of validation was always there in plain sight. What changed, rather, over a great deal of time, was the belief of relevant parties that these things were, first, true, and, second, important. What changed also was the belief that the views of certain groups—scientists, statisticians, other scholars external to the discipline—were relevant to the discipline.

Consider next firearm and toolmark (F/T) identification. In many ways, the situation is similar to that of fingerprints. There have been inadequate validation studies and the probative value of the evidence is institutionally overstated.⁹⁹ Blue-ribbon mainstream scientific commissions have made this point.¹⁰⁰ In contrast to the fingerprint discipline, however, there is as yet almost no acceptance of these points in the F/T discipline.¹⁰¹ Here the change in science, if there is one, must be located almost entirely outside the discipline itself. This will be more challenging for courts. And yet courts must be willing to find changed science even in such cases, or else disciplines that resist change will be able to insulate themselves indefinitely against the scrutiny of changed science claims.

In these cases, the problem is not, as suggested in the introduction to this article, the courts’ temporal conservatism. Rather, the claim is that the courts were insufficiently conservative with forensic science in the first instance, admitting evidence that lacked validation. The courts may now reap the consequences of those decisions in the form of changed science claims. If that is the case, it makes little sense for the courts to suddenly become temporally conservative and invoke temporal conservatism as a reason to resist revisiting old cases in which evidence was admitted because of a lack of temporal conservatism in the first instance. If it appears to the courts that it is hard to see the “changed science” in these changed science claims—hard to see new inventions, new discoveries, or recantations—that is a consequence of the fact that many forensic disciplines were admitted without much “science” in the first instance. The “changed science,” at bottom consists of conceding the relevance of what might be called “mainstream” science to forensic science. Once this is conceded, questions asked by mainstream science—Has this been validated? What is the probative value of this evidence?—become relevant. And, it is the fact that these questions are now being asked, and were not asked before, that constitutes the change in science.

99. William A. Tobin & Peter J. Blau, *Hypothesis Testing of the Critical Underlying Premise of Discernible Uniqueness in Firearms-Toolmarks Forensic Practice*, 53 JURIMETRICS J. 121, 121–42 (2013).

100. PRESIDENT’S COUNCIL OF ADVISORS ON SCI. AND TECH., *supra* note 92, at 112; NRC REPORT, *supra* note 50, at 154–55.

101. Assoc. of Firearm & Tool Mark Exam’rs, *Response to PCAST Report on Forensic Science* (Oct. 31, 2016), https://afte.org/uploads/documents/AFTE_PCAST_Response.pdf [perma.cc/4AQP-C36Q].



Changed science writs are a promising trend with the potential to bring justice to many individuals to whom it might otherwise be denied because of an excessive legal attachment to the principle of finality. A question raised by the cases discussed above is whether the changed science statutes were poorly drafted. However, the issues discussed above, as well as the tortured history of *Robbins*, suggest that realizing the potential of these writs will depend less on their drafting and more on judicial interpretation and the courts' willingness to revisit the science they long-ago endorsed. If legislatures want the notion of changed science to capture the majority of changes currently reverberating through forensic science, the courts will have to broaden their understanding of the concept beyond new inventions, new discoveries, and recanted expert testimony. This returns us to the question posed at the beginning of this essay: how are the courts to accommodate changing scientific knowledge? Courts with an understanding of the provisional nature of scientific knowledge might have grounds for some reasonable concerns about applying today's scientific knowledge to yesterday's cases. At the same time, it seems unreasonable for the courts to remain in denial of the changes reverberating through the forensic sciences. A reasonable argument can be made that the rapid pace of change in scientific knowledge requires such statutes if the law is to avoid clinging to verdicts "that look inaccurate, if not downright ludicrous."¹⁰²

102. *Robbins I*, 360 S.W.3d 446, 470 (Tex. Crim. App. 2011) (Cochran, J, dissenting).