Washington University Law Review

Volume 87 | Issue 1

January 2009

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Washington University
Law Review

VOLUME 87 NUMBER 1 2009

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Every year in this country, hundreds of people are convicted of having shaken a baby, most often to death. In a prosecution paradigm without precedent, expert medical testimony is used to establish that a crime occurred, that the defendant caused the infant's death by shaking, and that the shaking was sufficiently forceful to constitute depraved indifference to human life. Shaken Baby Syndrome (SBS) is, in essence, a medical diagnosis of murder, one based solely on the presence of a diagnostic triad: retinal bleeding, bleeding in the protective layer of the brain, and brain swelling.

New scientific research has cast doubt on the forensic significance of this triad, thereby undermining the foundations of thousands of SBS convictions. Outside the United States, this scientific evolution has prompted systemic reevaluations of the prosecutorial paradigm. In contrast, our criminal justice system has failed to absorb the latest scientific knowledge. This is beginning to change, yet the response has been halting and inconsistent. To this day, triad-based convictions continue to be affirmed, and new prosecutions commenced, as a matter of course.

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This Article identifies a criminal justice crisis and begins a conversation about its proper resolution. The conceptual implications of the inquiry—for scientific engagement in law's shadow, for future systemic reform, and for our understanding of innocence in a post-DNA world—should assist in the task of righting past wrongs and averting further injustice.

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I. INTRODUCTION

Natalie Beard died on October 16, 1995.[1] That morning, her mother had brought the seven-month-old to the home of her day care provider, Audrey Edmunds.[2] The baby was by all accounts fussy.[3] According to the caregiver's account, shortly after the baby was delivered to her, Edmunds

1. State v. Edmunds, 598 N.W.2d 290, 293 (Wis. Ct. App. 1999).
2. *Id.*
3. *Id.*

propped Natalie in her car seat with a bottle,[4] left the room, and returned a half-hour later to discover her limp.[5] Edmunds—herself a mother—immediately called 911 to report that Natalie appeared to have choked and was unresponsive.[6] Rescue workers responded minutes later and flew the baby to the hospital, where she died that night.[7]

Prosecutors charged Edmunds with murder based on the theory that Natalie had been shaken to death.[8] No witness claimed to have seen the defendant shake the baby.[9] There were no apparent indicia of trauma.[10] Edmunds maintained her innocence throughout.[11] Yet a jury convicted Edmunds on the sole basis of expert testimony that Natalie suffered from Shaken Baby Syndrome (SBS).[12] A court sentenced Edmunds to eighteen years in prison.[13]

In important respects, this case falls squarely within the "shaken baby" prosecution paradigm that developed in the early 1990s. The infant[14] had no external injuries suggestive of abuse.[15] The accused[16] was unable to

4. Brief of Defendant-Appellant at 4–5, State v. Edmunds, 746 N.W.2d 590 (Wis. Ct. App. 2008) (No. 2007AP000933).

5. *Id.*

6. *Id.*

7. State v. Edmunds, 598 N.W.2d at 293.

8. Edmunds was charged with reckless homicide in the first degree, *id.*, which required the prosecution to prove that she disregarded an "unreasonable and substantial risk of death or great bodily harm" under circumstances evidencing an "utter disregard for human life," *id*. at 295.

9. *Id.* at 293–94.

10. *Id.*

11. *Id.* at 293.

12. *Id.*

13. Emphasizing the lack of any evidence that "the severe injuries Natalie sustained could have been the result of an accident, rather than intentional, forceful conduct, directed specifically at Natalie," the appellate court affirmed Edmunds's conviction. *Id.* at 294. After exhausting her state remedies, Edmunds petitioned for federal habeas corpus review, which was denied. Edmunds v. Deppisch, 313 F.3d 997 (7th Cir. 2002).

14. The average age of infants diagnosed with SBS is between three months and ten months, though children up to three–years-old have been diagnosed. Stephen C. Boos, *Abusive Head Trauma as a Medical Diagnosis*, *in* ABUSIVE HEAD TRAUMA IN INFANTS AND CHILDREN: A MEDICAL, LEGAL, AND FORENSIC REFERENCE 49, 50 (Lori Frasier et al. eds., 2006).

15. In a typical case, an infant "is brought to the emergency room with the sudden onset of unconsciousness and respiratory irregularities or seizure. The given history suggests sudden and unprovoked symptoms . . . [b]ut there is no external evidence to indicate that trauma caused their ailment." *Id.*

16. The oft-quoted hierarchy of suspected perpetrators of head injury describes fathers as the most likely abusers, followed by mothers' boyfriends, and unrelated female babysitters. *Id.* at 62. Regarding the social risk factors for child abuse generally, "[y]oung unmarried parents, lack of education, low socioeconomic status, minority status, and many other risk factors have been shown to predict increased child abuse rates. However . . . [a]pplying population variables to individual cases of child abuse may be misleading, and has led to the overassessment of minority populations." *Id.* at 62.

provide an explanation for the child's condition.[17] The medical evidence against the defendant consisted of the three diagnostic symptoms comprising the classic "triad": retinal hemorrhages (bleeding of the inside surface of the back of the eye); subdural hemorrhages (bleeding between the hard outer layer and the spongy membranes that surround the brain); and cerebral edema (brain swelling).[18] The presence of these three signs was understood to be pathognomic—or exclusively characteristic—of SBS.

At trial, the prosecution's experts testified that "only shaking, possibly accompanied by impact" could explain the injuries.[19] Regarding the force necessary to cause these injuries, jurors heard the explanation typically offered in these cases: the force was equivalent to a fall from a second- or third-story window, or impact by a car moving at twenty-five to thirty miles an hour.[20] The prosecution's experts concluded that the shaking necessarily occurred while the baby was in the defendant's care, since the trauma of the shaking would have caused immediate unconsciousness.[21] The scientific basis for SBS was not challenged by the defense.[22] And

17. *See infra* notes 181–82 and accompanying text.

18. Brief of Defendant, *supra* note 4, at 5. For discussion of the classic SBS triad, see, for example, Comm. on Child Abuse and Neglect, Am. Acad. of Pediatrics, *Shaken Baby Syndrome: Rotational Cranial Injuries—Technical Report*, 108 PEDIATRICS 206 (2001); Mary E. Case et al., The Nat'l Ass'n of Med. Exam'rs Ad Hoc Comm. on Shaken Baby Syndrome, *Position Paper on Fatal Abusive Head Injuries in Infants and Young Children*, 22 AM. J. FORENSIC MED. & PATHOLOGY 112 (2001). *See also* Part III.B.1, *infra* notes 60–64 and accompanying text (elaborating on significance of diagnostic triad).

19. Brief of Defendant, *supra* note 4, at 6. *See infra* notes 60–64 and accompanying text (discussing how shaking is thought to cause triad of symptoms).

20. Brief of Defendant, *supra* note 4, at 7. According to the American Academy of Pediatrics, "[t]he act of shaking leading to shaken baby syndrome is so violent that individuals observing it would recognize it as dangerous and likely to kill the child." Am. Acad. of Pediatrics, *supra* note 18, at 206. Prosecution experts have often amplified this type of testimony with in-court demonstrations of the force believed to be necessary to inflict the brain injuries. For a computerized demonstration of this kind see Expert Digital Solutions, Inc., *Shaken Baby*, http://www.expertdigital. com/shakenbaby.html. *See infra* note 256 (noting reversal of convictions on this basis). *But see* People v. Mora, 868 N.Y.S.2d 722, 723 (N.Y. App. Div. 2008) (trial court "providently exercised its discretion" in allowing prosecution's expert to "shake his coat in order to demonstrate the amount of force necessary to inflict Shaken Baby Syndrome").

21. Brief of Defendant, *supra* note 4, at 8.

22. "Edmunds presented one medical expert witness who agreed with the State's witnesses that Natalie was violently shaken before her death but who opined that the injury occurred before Natalie was brought to Edmunds's home." State v. Edmunds, 2008 WI App 33, ¶ 3, 746 N.W.2d 590, ¶ 3. Edmunds's theory was that one or both of the parents had shaken Natalie the night before her death. Edmunds v. Deppisch, 313 F.3d 997, 998 (7th Cir. 2002). This (failure to identify the correct perpetrator) has been a common defense in shaken baby prosecutions, as has the argument that, if the defendant shook the baby, the shaking did not achieve the level of force necessary to sustain a murder conviction. *See infra* note 181 and accompanying text (describing most common caregiver accounts).

indeed, at the time of Edmunds's trial, the medical consensus on this issue was overwhelming.[23]

All of this is standard fare for an SBS prosecution.[24] With rare exception, the case turns on the testimony of medical experts. Unlike any other category of prosecution, all elements of the crime—*mens rea and actus reus* (which includes both the act itself and causation of the resulting harm)—are proven by the science. Degree of force testimony not only establishes causation, but also the requisite state of mind.[25] Unequivocal testimony regarding timing—i.e., that symptoms necessarily would appear instantaneously upon the infliction of injury—proves the perpetrator's identity. In its classic formulation, SBS comes as close as one could imagine to a medical diagnosis of murder: prosecutors use it to prove the mechanism of death, the intent to harm, and the identity of the killer.

Edmunds is a representative shaken baby case in every respect but one. On January 31, 2008, Audrey Edmunds was granted a new trial on the basis of an evolution in scientific thinking. For the first time, a court examining the foundation of SBS concluded that it had become sufficiently eroded that a new jury probably would have a reasonable doubt as to the defendant's guilt.[26] According to the court, "a shift in mainstream medical opinion"[27] had undermined the basis of the SBS diagnosis, raising the distinct possibility that Edmunds, who was still serving her eighteen-year sentence in Wisconsin, had done nothing whatsoever to harm the child. As is true of an unknown number of

23. State v. Edmunds, No. 96 CF 555, slip op. at 5 (Wis. Cir. Ct. Mar. 29, 2007) ("The medical evidence was largely consistent and unchallenged."). *See* Brief of Defendant, *supra* note 4, at 9 (discussing unanimity of medical opinions and state's reliance on this in argument to jury).

24. Once a child protection team has made an SBS diagnosis, suspected perpetrators—those with the child when symptoms appeared—are aggressively prosecuted. Each year, an estimated thousand plus defendants are convicted, most of murder, annually. Toni Blake, Jury Consultant, Address at the Forensic Truth Foundation: When Hypothesis and Data Conflict: An Analysis of an Infant Injury Database (May 12–15, 2007) (estimating that 95% of defendants prosecuted in SBS cases are convicted and 90% are serving life sentences).

25. "A key component of any expert testimony on SBS involves translating the mechanism of trauma into constructs . . . which adequately reflect the mens rea requirements for the charge." Brian Holmgren, *Prosecuting the Shaken Infant Case*, *in* THE SHAKEN BABY SYNDROME: A MULTIDISCIPLINARY APPROACH 275, 307 (Stephen Lazoritz & Vincent J. Palusci eds., 2001). As the prosecutor in *Edmunds* argued on summation, "'one can only imagine the anger and the intensity of the shaking that goes on and the impact that goes on in these cases.'" Brief of Defendant, *supra* note 4, at 8. Evidence of force was thus used to establish that the defendant was reckless and exhibited utter disregard for human life.

26. *Edmunds*, 746 N.W.2d at 599.

27. *Id.* at 598–99.

convictions like it,[28] the science upon which the defendant's conviction rested had advanced, raising the specter of innocence.

This Article explores what ensues when medical certainty underlying science-based prosecutions dissipates.[29] It asks how a scientific revolution penetrates the criminal justice system and whether our legal system effectively responds to the inevitable consequences of science outpacing the law. The remarkable transformation of SBS provides a unique vehicle for probing these questions.

This examination begins in Part II, which places SBS prosecution in historical context, exposing the recent and rapid ascendance of a paradigm that, until now, has gone largely unnoticed.[30]

Part III assesses the current scientific controversy. A critical look at the creation of SBS exposes a diagnosis flawed from its inception by a tainted methodological approach, one, in all likelihood, corrupted by a too-close medical-legal nexus.[31] In recent decades, researchers have uncovered these failings, and the diagnosis has evolved accordingly. There is now general agreement among the medical community that the previous incarnation of SBS is invalid.[32] The particulars of this evolution are striking—especially from a criminal justice standpoint. Despite continued controversy around aspects of the diagnosis, Part III identifies a number of key areas where the framework for debate itself has been significantly altered. This discussion reveals that the new SBS is different enough from what came before to raise serious challenges to a substantial number of criminal convictions.

Specifically, these scientific developments have cast into doubt the guilt of an entire category of defendants: those convicted of crimes based on a triad-only SBS diagnosis. While we cannot know how many convictions are "unsafe" without systematic case review, a comparison of the problematic category of SBS convictions to DNA—and other mass

28. *See infra* Part II.

29. This Article focuses on the criminal justice system's treatment of SBS. It should be noted that SBS's evolution also has powerful family court implications. *See, e.g.*, *In re* J.S., 785 A.2d 1041 (Pa. Super. Ct. 2001) (affirming removal of two-month-old child and his sibling based on questionable SBS diagnosis).

30. No legal scholar has attended to the proliferation of SBS prosecutions or explored the strange trajectory of SBS in science and law. This project has been given new urgency by mounting challenges to the validity of the science upon which these cases rest. At this moment, when new perspectives on old science are only just beginning to penetrate the criminal justice system, the emergence of a scholarly treatment of SBS and the law is especially critical.

31. *See infra* Part III.A.

32. *See infra* Part III.B.

exonerations—reveals that this injustice is commensurate with any seen in the criminal justice arena to date.[33]

Part IV chronicles the criminal justice system's treatment of the changing science. I do so by surveying the various stages in the criminal process where actors make decisions with the potential to account for—or overlook—scientific developments of the past decade. Police and prosecutors investigate cases and prosecutors decide whether to pursue charges.[34] Defendants and prosecutors make *Daubert* and *Frye* challenges to the admissibility of scientific evidence.[35] Jurors determine whether guilt has been proven beyond a reasonable doubt.[36] Defendants appeal and collaterally attack their convictions based on insufficiency of the evidence.[37] And defendants make motions for post-conviction relief because new evidence has been discovered.[38]

This procedural approach to understanding how the law integrates new scientific knowledge uncovers a response that is halting and inconsistent. I focus my critique on the system's treatment of cases in which SBS diagnoses rest on outmoded medical dogma. What can be discerned about the status quo is alarming. Guilt is being assigned where the best available science creates, at the very least, reasonable doubt. When an outcome reflecting the best available science is generated, it is not because the factual predicate for the prosecution diverges from the typical case but, rather, because the defendant is able to mount an aggressive attack—one that requires resources—on a body of science whose vulnerability is, in theory, equally exposed to all.

In short, prosecutors and courts are differentially absorbing scientific developments, resulting in an arbitrary distribution of justice.[39] Since

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33. *See infra* notes 142–47 and accompanying text.

34. *See infra* Part IV.A. My own intuitions about this phase of the criminal process are informed by my experiences prosecuting child abuse cases as an Assistant District Attorney in the Family Violence Bureau of the New York County District Attorney's Office.

35. *See infra* Part IV.B.

36. *See infra* Part IV.C.

37. *See infra* Part IV.D.

38. *See infra* Part IV.E.

39. The same week *Edmunds* was decided, an appeals court in Arkansas decided the appeal of Samantha Anne Mitchell, an in-home daycare provider for a four-month-old infant. Mitchell v. State, No. CACR 07-472, 2008 Ark. App. LEXIS 98, at *1 (Ark. Ct. App. Feb. 6, 2008). The baby died of what prosecution experts diagnosed as SBS based on the presence of the classic triad of symptoms (again, subdural hemorrhaging, brain swelling, and retinal hemorrhages)—the same triad that convicted Audrey Edmunds. *Id.* at *5–6. In terms of the medical findings and the prosecution's legal theory, the cases are remarkably similar. Yet the very week that Audrey Edmunds was awarded a new trial, leading prosecutors in Wisconsin ultimately to dismiss the charges against her, Samantha Anne Mitchell's murder conviction was affirmed. *Id.* at *10.

January 31, 2008, when Edmunds's new trial motion was granted, dozens of convictions based on SBS have been upheld, either on direct appeal or collateral attack. An unknown number of prosecutions have been initiated and an unknown number resulted in convictions.[40] While a portion of these cases rely on corroborating medical evidence of injury beyond the triad,[41] many do not.

The story of our legal system's response to SBS speaks to how crime is constructed and reified. It tells of institutional inertia and a quest for finality[42] that sit uneasily with our commitment to justice. And it demands consideration of where we go from here. By identifying a problem of tragic dimensions, I hope to begin a conversation that seeks solutions and situates itself in the emerging discourse on innocence.[43] The conceptual implications of this inquiry—for scientific engagement in law's shadow, for future systemic reform, and for the notion of innocence in a post-DNA world—should assist in the task of righting past wrongs and averting further injustice.

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40. *See, e.g.*, Shane Anthony, *Nanny Should Get 7 Years in Prison, Jury Says Woman, 22, was Convicted of Assaulting 4-Month-Old Boy*, ST. LOUIS POST-DISPATCH, July 30, 2008, at B1; Rebecca Baker, *Greenburgh Nanny Pleads Guilty in Shaken-Baby Case*, THE JOURNAL NEWS (N.Y.), July 30, 2008, *available at* http://m.lohud.com/news.jsp?key=110532; Sarah Kapis, *Stonewood Father Arrested in Shaken Baby Case*, W. VA. MEDIA, June 23, 2008, http://www.wboy.com/story.cfm?func=viewstory&storyid=40376; Robert Kerns, *Inquest Jury Rules Infant's Death as Homicide by Shaken Baby Syndrome*, PEKIN DAILY TIMES (Ill.), June 13, 2008, *available at* http://www.pekintimes.com/articles/2008/06/13/news5.txt (on file with author); T.C. Mitchell, *Father Pleads Guilty to Infant Daughter's Killing*, ANCHORAGE DAILY NEWS, Aug. 11, 2008; Molly Montag, *Daycare Provider Faces Charges for Injured Infant*, SIOUX CITY J., July 3, 2008, *available at* http://www.siouxcityjournal.com; Andy Nelesen, *Tot Hit Head in Tub, Murder Suspect Tells Police*, GREEN BAY PRESS GAZETTE, June 20, 2008; Jamaal E. O'Neal, *Man Charged with Felony in Baby's Injury*, LONGVIEW NEWS-JOURNAL (Tex.), Aug. 12, 2008, at 1B; Mona Ridder, *Grand Jury: Neglect Results in Child's Death*, CUMBERLAND TIMES-NEWS, June 25, 2008, *available at* http://www.times-news.com/local/local_story_177093757.html; Amy Upshaw, *Eudora Foster Mother of Dead Toddler Released on Bond*, ARK. DEMOCRAT GAZETTE, Aug. 13, 2008.

41. By one nationally prominent defense expert's account, one quarter of the cases prosecuted as SBS involve a "battered baby," or a child with substantial medical corroboration of physical abuse. Telephone Interview with John Plunkett, Retired Pathologist (June 20, 2008).

42. This quest is nicely evidenced by a Connecticut trial court's expression of concern in the wake of *Edmunds*: "the *Edmunds* case presents a potential quagmire of epic proportions: the strong likelihood of constant renewed prosecution and relitigation of criminal charges as expert opinion changes and/or evolves over time." Grant v. Warden, No. TSRCV03004233S, 2008 WL 2447272, at *1 n.1 (Conn. Super. Ct. June 4, 2008).

43. *See infra* Part V.

II. THE AGE OF SBS

The first appeal of an SBS-related conviction was reported in 1984.[44] Based on the presence of bilateral retinal hemorrhages and subdural hematoma, the prosecution's expert concluded that a four-month-old infant had been shaken to death,[45] and the appellate court affirmed the sufficiency of the evidence to convict.[46] Over the next five years, less than fifteen appeals of convictions based on an SBS diagnosis were reported.[47]

Beginning in 1990, however, the number of appeals grew dramatically. In five-year increments, published appellate decisions increased from 74 (January 1, 1990–December 31, 1994), to 160 (January 1, 1995–December 31, 1999), to 315 (January 1, 2000–December 31, 2004).[48] The numbers from the first half of the current five-year period suggest that this trend toward rising SBS appeals is continuing: from January 1, 2005 to June 30, 2008, 259 written opinions in this category were issued.[49]

Appellate case law is admittedly an inadequate measure of prosecutions, both because most convictions do not result in a written appellate decision,[50] and because not all prosecutions result in conviction. Notwithstanding these limitations, the appellate case law can suggest, as it does in this instance, that the total volume of prosecutions has been on a sharply upward trajectory since 1990.

Ascertaining the absolute number of SBS prosecutions is of course far more difficult.[51] Approximately 1500 babies are diagnosed with SBS in

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44. Ohio v. Schneider, No. L-84-214, 1984 Ohio App. LEXIS 11988 (Ohio Ct. App. Dec. 21, 1984). For an overview of the diagnostic origins of SBS, see *infra* notes 60–64 and accompanying text.

45. *Schneider*, 1984 Ohio App. LEXIS 11988 at *3–4. At trial, the defense expert cited disagreement among scientists as to the quantity of force necessary to produce the observed injuries:

> There are several articles which suggest that just playing with your child and throwing him up and down in the air when they are small infants, the reason infants are very risky incidences, they have very small bodies and large heads so the head tends to flop back and forth. Many people play with their children and throw up and down in the air and there are several experts suggesting that that definitely should not occur because it can cause small areas of brain damage and therefore injure your child. There really is no real documentation of whether or not a tremendous amount of force or several episodes can severely damage an infant.

Id. at *5. The defendant was convicted by jury of involuntary manslaughter. *Id.* at *1.

46. *Id*. at *14.

47. Based on culling results of search of "'shaken baby' and convict!"

48. *Id.*

49. *Id.*

50. According to Sam Gross, a leading expert on wrongful convictions, it would be conservative to estimate that, in this context, there are at least twice as many trial convictions as appeals, which would represent a higher incidence of appeals than average. Telephone Interview with Samuel Gross, Thomas and Mabel Long Professor of Law, Univ. of Mich. (July 21, 2008).

51. Media accounts tell of SBS prosecutions commencing daily across the country. *See supra* note 40. Given the number of SBS diagnoses made each year, *see* text accompanying *infra* note 52,

the United States each year.[52] How many of these cases result in prosecution and conviction is unknown, however, since no comprehensive data on SBS cases has ever been collected.[53] That said, there are a number of ways to estimate the magnitude of defendants potentially impacted by recent scientific developments.[54] One might conservatively assume that the approximately 800 appeals reported since 1990 reflect about 1500 convictions after trial.[55] To focus on more recent figures only, it seems fair to conclude that around 200 defendants a year are being convicted of SBS.[56] Without additional data, we cannot reasonably speculate about the number of defendants who plead guilty to this type of crime,[57] although the estimated 1500 SBS diagnoses a year may provide an outside parameter.

When placed against the backdrop of recent scientific developments, these numbers reflect a crisis in the criminal justice system.

III. SCIENTIFIC EVOLUTION

As a categorical matter, the science of SBS can no longer support a finding of proof beyond a reasonable doubt in triad-only cases[58]—cases

this comes as no surprise.

52. Blake, *supra* note 24. *See also* Nat'l Shaken Baby Coal., *Facts About SBS!!!*, http://www.shakenbabycoalition.org/facts.htm (last visited July 13, 2009) ("Experts say 1,000–1,500 cases of SBS occur each year in the United States, but the true number of cases is unknown because of misdiagnoses and underreporting.").

53. This void has allowed the phenomenal aspects of SBS prosecutions to remain largely obscured.

54. *See infra* note 58 (noting that not all SBS convictions have been undermined.); *infra* note 143.

55. *See supra* note 50. But national trial consultant Toni Blake has herself been contacted by 2000 to 3000 lawyers over the past decade regarding assistance with SBS trials and appeals, suggesting that the actual number of trial convictions is significantly higher. Mark Anderson, *Does Shaken Baby Syndrome Really Exist?*, DISCOVER, Dec. 2, 2008, http://discovermagazine.com/2008/dec/02-does-shaken-baby-syndrome-really-exist.

56. This estimate is based on the number of reported decisions from January 1, 2005 through June 30, 2008 (259) and a multiplier of two. *See supra* note 50 [Sam Gross's conservative assumption].

57. According to Andrea Lyon, a law professor with experience representing clients in SBS cases, pleas in this type of prosecution are very much the norm given the likelihood that a jury will convict, *see infra* Part IV.C, and the almost certain harshness of a post-trial sentence. Interview with Andrea D. Lyon, Assoc. Dean for Clinical Programs and Clinical Professor of Law, DePaul Univ. Coll. of Law, in Chi., Il. (Oct. 16, 2008). A similar sentiment was voiced by one public defender, who articulated the dilemma faced by his SBS client: "if he went to trial and lost, [the sentence] was either 20 to 50 years, 20 years to life, or life without parole. Agreeing to confess to shaking the child . . . would considerably reduce any sentence." Anderson, *supra* note 55. *See infra* note 150 (noting Ontario's Goudge Commission recommendations regarding review of guilty pleas).

58. By this, I mean those whose convictions rest exclusively on the presence of retinal hemorrhage and/or subdural hematomas. In contrast, a sizeable number of SBS prosecutions rely on

which represent a significant number of SBS prosecutions. Put simply, here "change has raised the real possibility of past error."[59]

In the past, the mere presence of retinal hemorrhaging, subdural hematoma, and cerebral edema was taken to mean that a baby had been shaken hard enough to produce what were conceptualized as whiplash forces.[60] According to the conventional understanding of SBS,[61] "[t]he application of rotational acceleration and deceleration forces to the infant's head causes the brain to rotate in the skull. Abrupt deceleration allows continuing brain rotation until bridging veins are stretched and ruptured, causing a thin layer of subdural haemorrhage on the surface of the brain."[62] Retinal hemorrhages were thought to result from a similar causal mechanism.[63] Most significantly, the triad of symptoms was believed to be distinctly characteristic—in scientific terms, pathognomonic—of violent shaking.[64]

Despite its lingering presence in the popular imagination, the scientific underpinnings of SBS have crumbled over the past decade[65] as the medical establishment has deliberately discarded a diagnosis defined by shaking.[66] Although no single nomenclature has emerged in its place,[67] doctors are now in widespread agreement that SBS is an unhelpful characterization,[68]

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corroborative evidence beyond the triad; convictions which result in these cases are therefore less dramatically undermined by recent scientific developments. *See infra* note 143. It should be noted that what constitutes real, as opposed to apparent, "corroboration" in SBS cases is often a difficult question. *See infra* notes 80–82, 181–90 and accompanying text (challenging validity of perpetrator "confessions"); *infra* note 146 (critiquing United Kingdom Attorney General's definition of corroboration). *See also* Stein v. Eberlin, No. 1:07CV3696, 2009 WL 650363 (N.D. Ohio Mar. 10, 2009) (defense expert opined that "parietal cranial irregularities in the victim's skull likely represent suture variants rather than fractures"); P. Weir et al., *Normal Skull Suture Variant Mimicking Intentional Injury*, 332 BRIT. MED. J. 1020 (2006). Nevertheless, this Article focuses on those cases predicated on the "pure triad," or triad-only prosecutions.

59. STEPHEN T. GOUDGE, INQUIRY INTO PEDIATRIC FORENSIC PATHOLOGY IN ONTARIO 531 (Ontario Ministry of the Att'y Gen. 2008) (on file with author).

60. *See, e.g.*, John Caffey, *On the Theory and Practice of Shaking Infants*, 124 AM. J. DISEASES CHILDREN 161 (1972); Mary E. Case et al., *supra* note 18**.**

61. The term "came into general usage in the 1980s." Robert Reece, *What Are We Trying to Measure: The Problems of Case Ascertainment*, 34 AM. J. PREVENTATIVE MED. S116 (2008).

62. Brian Harding, R. Anthony Risdon, & Henry F. Krous, Letter, *Shaken Baby Syndrome*, 328 BRIT. MED. J. 720, 720 (2004).

63. *Id.*

64. *See infra* Part III.A.

65. *See infra* Part III.B.

66. *See infra* Part III.B.3. This move away from etiological diagnosis toward anatomical diagnosis reflects a key concession to the limits of medical science. Telephone Interview with Stephen Boos, Dep't of Pediatrics, Armed Forces Ctr. for Child Prot., Nat'l Naval Med. Ctr. (June 17, 2008).

67. Reece, *supra* note 61, at S116 (noting "lack of common nomenclature").

68. "SBS" has been supplanted by a number of different terms: shaken impact syndrome (SIS); inflicted childhood neurotrauma; abusive head trauma (AHT); inflicted traumatic brain injury (inflicted TBI); and non-accidental head injury (NAHI). Reece, *supra* note 61. Indeed, the Committee

and that the presence of retinal hemorrhages and subdural hematoma cannot conclusively prove that injury was inflicted.[69]

Although it may be tempting to conclude simply that "science evolves," and leave the inquiry there, the story is more complex; an object lesson in scientific overreaching and the challenge of correction.

A. Flawed Science

A number of forces coalesced to transform SBS from a certain diagnosis into its current state of flux. Most importantly, in the mid- to late-1990s,[70] medical research, including the SBS literature, became subject to a heightened level of scrutiny. The new "evidence-based medicine" standards required doctors to derive their research from methods that are scientific and statistically rigorous.[71] The change triggered a review of the evidence supporting a number of areas of medicine,[72] and included a comprehensive effort to examine the science underlying SBS.[73]

The application of the evidence-based framework to the SBS literature resulted in a remarkable determination: the medical literature published prior to 1998 contained "inadequate scientific evidence to come to a firm conclusion on most aspects of causation, diagnosis, treatment, or any other matters pertaining to SBS."[74] More specifically, "[s]erious data gaps, flaws of logic, [and] inconsistency of case definition" meant that "the commonly held opinion that the finding of SDH [subdural hematoma] and RH [retinal

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on Child Abuse and Neglect of the American Academy of Pediatrics (AAP) recently recommended that "[p]ediatricians should use the term 'abusive head trauma' rather than a term that implies a single injury mechanism, such as shaken baby syndrome." Cindy Christian et al., *Abusive Head Trauma in Infants and Children*, 123 PEDIATRICS 1409, 1411 (2009). Notwithstanding this proliferation of alternative diagnostic labels and the AAP's newly articulated recommendation, both the medical and legal establishments continue to employ the terminology of SBS. For the sake of clarity, I will do so here as well.

69. *See infra* Part III.B.1.

70. "1998/1999 is regarded as the turning point in acceptance of the tenets and practice of EBM." Mark Donohoe, *Evidence-Based Medicine and Shaken Baby Syndrome: Part I: Literature Review, 1966–1998*, 24 AM. J. FORENSIC MED. & PATHOLOGY 239, 239 (2003).

71. Testimony of Patrick Barnes in Transcript of Evidentiary Hearing (Day One) at 17–19, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. 2008) (No. 96 DF 555) [hereinafter Barnes testimony, Evidentiary Hearing (Day One)]. *See* Donohoe, *supra* note 70, at 239 ("In recent years, there has been a clear move toward basing medical practice and opinions on the best available medical and scientific evidence.").

72. Donohoe, *supra* note 70, at 239.

73. *Id*. at 241.

74. *Id.*

hemorrhage] in an infant was strong evidence of SBS was unsustainable."[75]

A logical fallacy of profound importance was uncovered by a close examination of the pre-1999 SBS literature: researchers had chosen subjects for study based on the presence of subdural hematomas and retinal hemorrhages and, with little or no investigation into other possible causes of these symptoms, simply concluded that the infants were shaken.[76] Scientists accordingly inferred that subdural hematomas and retinal hemorrhages must necessarily result from shaking.[77] Put differently, researchers "select[ed] cases by the presence of the very clinical findings and test results they [sought] to validate as diagnostic. Not surprisingly, such studies tend[ed] to find their own case selection criteria pathognomonic of SBS."[78] The circularity of this logic is represented by the following equation: "SBS = SDH + RH [inclusion criteria], therefore SDH + RH = SBS [conclusion]."[79]

Other studies purporting to support the validity of the SBS diagnosis relied on "confessions" to establish the mechanism of injury. Here, too, a number of problems undermined the validity of the research.[80] Putting aside momentarily the possibility that a suspected abuser would be less than candid with doctors and investigators,[81] the classification of an account as a confession in these studies was highly problematic from a

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75. *Id.* As defenders of the scientific research are quick to note, there are obvious "difficulties in performing experiments in this area," since "[i]t is clearly unethical to intentionally shake infants to induce trauma." *Id.* at 239.

76. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 28–29. "The major criticism of those who would indict and convict based on one or two talismanic findings of 'shaken baby syndrome' is that the justification for their opinions is based on nothing but circular reasoning." Thomas L. Bohan, Letter to Editor, *Evaluating Evidence*, CHI. TRIBUNE, June 30, 2005.

77. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 28–29.

78. Donohoe, *supra* note 70, at 239. As Dr. Patrick Barnes, chief of pediatric neuroradiology at Stanford's Children's Hospital and a leading national expert in this area, has explained, "we as a group that wrote those papers assumed what we were concluding." Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 27–28. According to Dr. Barnes's testimony, he—along with many other scientists—"told a lie on child abuse based on old diagnostic criteria." *Id.* at 70–71. He has since made every effort to correct his past mistakes. Interview with Thomas Bohan, President, Am. Acad. of Forensic Scis., in Peaks Island, Me. (June 11, 2008). Telephone Interview with John Plunkett, *supra* note 41.

79. Patrick D. Barnes, *Imaging of the Central Nervous System in Suspected or Alleged Nonaccidental Injury, Including the Mimics*, 18 TOPICS MAGNETIC RESONANCE IMAGING 53, 55 (2007). "The evidence for SBS appears analogous to an inverted pyramid, with a small database (most of it poor-quality original research, retrospective in nature, and without appropriate control groups) spreading to a broad body of somewhat divergent opinions." Donohoe, *supra* note 70, at 239.

80. Jan E. Leestma, "*Shaken Baby Syndrome": Do Confessions by Alleged Perpetrators Validate the Concept?*, 11 J. AM. PHYSICIANS & SURGEONS 14 (2006).

81. *See infra* notes 181–90 and accompanying text (discussing perpetrator accounts).

methodological perspective: "where caretakers said that they shook the baby, it was never detailed how much they shook the baby, how long they shook the baby, and did the baby's symptoms precede the shaking or did they follow the shaking."[82]

Once the edifice upon which SBS had been constructed cracked, researchers began looking beyond the child abuse literature to the expertise of neurosurgeons, biomechanical engineers,[83] and pathologists.[84] Knowledge gained from these disciplines further eroded confidence in the existence of a pathognomonic relationship between shaking and the SBS triad.[85]

Around the same time, magnetic resonance imaging (MRI) revolutionized the field of radiology and significantly altered the diagnostic universe.[86] Compared to its precursor, computed tomography (CT), MRI enabled a far more detailed assessment of the "pattern, extent, and timing" of central nervous system injuries.[87] New radiological findings challenged what had become akin to scientific gospel,[88] revealing the presence of triad symptoms in the "mimics" of abuse: accidental injury and medical disorders manifesting as SBS.[89] And as technology and scientific methodology advanced, researchers questioning the basis for SBS reached a critical mass.[90]

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82. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 31. One expert has remarked that it is not surprising that a caregiver would shake a child found unconscious, both because this response is almost instinctual and because the medical establishment once instructed that "if you have an unresponsive child, one of the first things you do is you jiggle or shake them and see if they will respond." *Id. See also infra* notes 181–90 and accompanying text [same as above]. *Cf.* Hess v. Tilton, No. CIV S-07-0909WBSEFBP, 2009 WL 577661 (E.D. Cal. Mar. 5, 2009) (defendant "admitted that he shook [the baby] but insisted it was only in an attempt to clear her throat because she was choking on her own vomit").

83. Biomechanical research has practical application to "child safety, car seats, [and] playground equipment. . . ." Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 25.

84. *Id.* at 24–25. Although "much of [this] literature was available before 1998, [it] was not widely read or applied by the child protection teams . . . and, particularly, the forensic pediatricians . . . ." *Id.* at 25.

85. *Id.* at 24–25.

86. *Id.* at 26, 115.

87. Patrick D. Barnes, *Ethical Issues in Imaging Nonaccidental Injury: Child Abuse*, 13 TOPICS MAGNETIC RESONANCE IMAGING 85, 89 (2002); *see also* Marguerite M. Caré, *Neuroradiology*, *in* ABUSIVE HEAD TRAUMA IN INFANTS AND CHILDREN: A MEDICAL, LEGAL, AND FORENSIC REFERENCE **#,** 89 (Lori Frasier et al. eds., 2006).

88. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 26.

89. *Id.* at 23, 52–53. *See infra* notes 132–36 and accompanying text (discussing SBS mimics).

90. Interview with Thomas Bohan, *supra* note 78. For an interesting discussion of the "critical role that groups play in social epidemics," see *Power of Context (Part Two)*, *in* MALCOLM GLADWELL, THE TIPPING POINT: HOW LITTLE THINGS CAN MAKE A BIG DIFFERENCE 169, 171 (Little, Brown and Co. 2000).

This momentum was catalyzed by the high-profile prosecution of British au pair Louise Woodward, which in 1997 brought shaken baby syndrome into the international spotlight.[91] The case was widely perceived as "one of the more intriguing legal dramas of the age—one that [left] unresolved a mystery of sickening fascination to parents everywhere."[92] In its wake, an already divided scientific community became even more polarized. Physicians felt "compelled to speak out regarding the scientific evidence as portrayed in the trial of Louise Woodward," contending that "media publicity surrounding the case has led to considerable sentiment that she was convicted despite allegedly irrefutable scientific evidence presented by the defense that the infant's injuries had occurred days to weeks earlier."[93] And critics of the SBS diagnosis were galvanized by a legal and symbolic victory that commanded the world's attention.

In response to these developments, an uneasy equilibrium has been reached. Once considered a "fringe" group, scientists challenging the SBS dogma have emerged as a significant force in terms of numbers as well as influence. Meanwhile, rather than abandon it altogether, defenders of the

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91. Commonwealth v. Woodward, No. CRIM. 97-0433, 1997 WL 694119, at *1 (Mass. Sup. Ct. Nov. 10, 1997). The defendant called 911 to report that she could not rouse eight-month-old Matthew Eappen from his nap. Debra Rosenberg & Evan Thomas, '*I Didn't Do Anything*', NEWSWEEK, Nov. 10, 1997, *available at* http://www.newsweek.com/id/97361. Doctors found massive intracranial bleeding, brain swelling, and a retinal hemorrhage, and Matthew later died. *Nanny Murder Trial—Jury Still Out*, BBC NEWS, Oct. 30, 1997, *available at* http://news.bbc.co.uk/1/hi/programmes/from_our_own_correspondent/16726.stm. The prosecution, as is typical in SBS cases, rested almost entirely on medical evidence. Experts testified that "'there was no doubt . . . that this infant was a victim of shaken baby syndrome;'" and that this was "'a classic picture of acute shaken baby injury.'" *Id*.

The defense challenged the science more aggressively—and far more publicly—than had ever been done before. *See id.* (describing "clash of the medical men" in which "[b]oth teams produced 'the world's leading experts' to make their own case"). Woodward was represented by Barry Scheck, one of the nation's preeminent defense attorneys, whose advocacy proved the difference that resources can make. *See* Rosenberg & Thomas, *supra* ("Scheck and his team hired medical experts (at the cost of thousands of dollars a day) who testified that Matthew's skull fracture had occurred about three weeks before he died, and that the fatal bleeding could have been unleashed by just a slight jar."). The defense presented a number of experts to testify to an alternative theory of Matthew's death. According to this testimony, the fatal hemorrhage was caused by a "re-bleed" of a chronic brain clot resulting from an undetected injury. *Woodward*, 1997 WL 694119, at *1. *See infra* note 194 (citing supporting re-bleed theory). The trial "roil[ed] two nations." Rosenberg & Thomas, *supra*. After a jury convicted the defendant of murder, the trial judge reduced the verdict to involuntary manslaughter and sentenced Woodward to time already served. Commonwealth v. Woodward, 694 N.E.2d 1277, 1281 (Mass. 1998). In his order, the judge articulated one rational view of the evidence which would constitute manslaughter: the baby had a chronic blood clot which re-bled upon "rough" handling by Woodward. *Id*. at 1287.

92. Rosenberg & Thomas, *supra* note 91.

93. David L. Chadwick et al., Letter to the Editor, *Shaken Baby Syndrome—A Forensic Pediatric Response*, 101 PEDIATRICS 321, 321 (1998).

validity of the diagnosis have adapted it in subtle but important ways: SBS has been reincarnated to reflect a shifted consensus.[94]

B. Shifted Consensus

Since the mid-1990s, the science surrounding SBS has undergone a striking transformation. With little attention outside of the medical community, universally held tenets have been undermined, leading a segment of the scientific establishment—including some formerly prominent supporters of its validity—to perceive the diagnosis as illegitimate. Others, equally distinguished in their respective fields, have responded to the new research by defending SBS against attack.[95] Thus, despite the progression of scientific discourse, the current debate about shaken baby syndrome is remarkably polarized.[96] Scientists on each side of the controversy espouse their respective views with a passion and certainty matched in intensity by that of their opponents.[97]

This polarization, and the bitterness that accompanies it, can tend to obscure a significant area of consensus that has developed around the invalidity of previously accepted dogma. Doctors who defend the legitimacy of SBS and dismiss many of its critics' attacks are willing to concede that the science has evolved—and that even mainstream thinking has changed in a number of areas. The testimony of prosecution experts marks this movement.[98]

The movement is subtle, but undeniable. Its significance may depend upon the context in which it is being evaluated. From the perspective of "pure" science, the similarities between the two factions may be overshadowed by their unresolved differences;[99] but in the criminal justice

94. Defenders of the new SBS adhere to the view that the cluster of triad symptoms, while not *pathognomonic* of abuse, are *generally indicative* of violent shaking and/or impact. *See infra* notes 107–09 and accompanying text.

95. Defenders of the validity of the diagnosis fall along a spectrum. For instance, without rejecting the construct in its entirety, many physicians have revised their thinking about the original or "strong" version of SBS—i.e., the syndrome defined by a triad of symptoms understood to be pathognomonic of shaking. *See infra* Part III.B.1.

96. *See infra* notes 109, 113, 123, 128–29 and accompanying text.

97. *Id*.

98. *See, e.g.*, Testimony of William Perloff in Transcript of Evidentiary Hearing (Day Four) at 11–12, State v. Edmunds, 746 N.W.2d 590 (2008) (No. 96 CF 555); Testimony of Betty Spivak in Transcript of Evidentiary Hearing (Day Three) at 12–14, State v. Edmunds, 746 N.W.2d 590 (2008) (No. 96 CF 555) [hereinafter Spivak testimony, Evidentiary Hearing (Day Three)].

99. Evaluating this claim is complicated, given that the notion of "pure science" in the domain of SBS may well be a fiction.

setting, the new common ground should be of critical importance. A brief overview of what has become uncontroversial reveals why.

1. The Myth of Pathognomony

An emerging body of research has undermined the scientific basis for defining the triad of SBS symptoms as exclusively diagnostic of abuse.[100] No longer are physicians willing to state with certainty that the constellation of symptoms that once characterized SBS individually[101] and collectively[102] must in every case indicate that a child was abused.[103] In particular, as scientific study has generated new explanations for the presence of subdural hematomas[104] and retinal hemorrhages,[105] doctors have become increasingly reluctant to use the word pathognomonic when discussing these symptoms.[106] While many disagree vehemently with the contention that shaking alone cannot possibly cause the diagnostic triad,[107] they have conceded that the triad is not *necessarily* induced by shaking,

100. *See, e.g.*, J. Plunkett and J.F. Geddes, Letter, *The Evidence Base for Shaken Baby Syndrome*, 328 BRIT. MED. J. 719, 720 (2004) (urging "reconsider[ation of] the diagnostic criteria, if not the existence, of shaken baby syndrome").

101. In cases, the presence of subdural hematoma or retinal hemorrhage alone has provided the basis for an SBS diagnosis. *Id.* at 719. *See infra* note 280 and accompanying text (describing prosecutions of this kind).

102. *See* Clinical Statement of American Academy of Opthamology, http://one.aao.org/CE/PracticeGuidelines/ClinicalStatements_Content.aspx?cid=c379ec3e-8251-48e6-a88e-fb6f37954b14 (last visited July 20, 2009).

103. *See supra* notes 60–64 and accompanying text.

104. *See, e.g.*, Marta C. Cohen & Irene Scheimberg, *Evidence of Occurrence of Intradural and Subdural Hemorrhage in the Perinatal and Neonatal Period in the Context of Hypoxic Ischemic Encephalopathy*, 12 PEDIATRIC DEVELOPMENTAL PATHOLOGY 169 (2009); Julie Mack et al., *Anatomy and Development of the Meninges: Implications for Subdural Collections and CSF Circulation*, 39 PEDIATRIC RADIOLOGY 200 (2009) (on file with author); Eva Lai Wah Fung et al., *Unexplained Subdural Hematoma in Young Children: Is it Always Child Abuse?*, 44 PEDIATRICS INT'L 37 (2002); V.J. Rooks et al., *Prevalence and Evolution of Intracranial Hemorrhage in Asympotomatic Term Infants*, 29 AM. J. NEURORADIOLOGY 1082 (2008).

105. *See, e.g.*, P.E. Lantz et al., *Perimacular Retinal Folds from Childhood Head Trauma*, 328 BRIT. MED. J. 754 (2004); Gregg T. Leuder et al., *Permacular Retinal Folds Simulating Nonaccidental Injury in an Infant*, 124 ARCHIVES OPHTHAMOLOGY 1782 (2006).

106. There has been widespread acknowledgment that what one researcher has called "the proposed pathognomonic association between unexplained subdural hematoma/retinal hemorrhages and child abuse" may be suspect. Fung et al., *supra* note 104, at 37 (adopting a cross-cultural perspective and concluding that the diagnosis may be a "self-fulfilling prophecy"). This concession has been articulated by even those physicians who maintain the validity of the diagnosis. Interview with Lawrence Ricci, Dir., Spurwink Child Abuse Program, in Portland, Me. (June 12, 2008); Telephone Interview with Stephen Boos, *supra* note 66. *See also* C. Smith & J. Bell, *Shaken Baby Syndrome: Evidence and Experts*, 50 DEVELOPMENTAL MED. & CHILD NEUROLOGY 6, 7 (2008) (arguing that "trauma remains the most likely cause of SDH [subdural hemorrhage] in infancy" while "stress[ing] that the triad is not pathognomonic of inflicted injury").

107. *See infra* Part III.B.3.

and that a differential diagnosis must be considered.[108] This represents a dramatic evolution in mainstream scientific thinking.

Critics of the new research argue that shaking is still the most likely explanation for retinal hemorrhaging and subdural hematoma.[109] Nevertheless, given that the diagnostic paradigm rests fully on the triad, the move away from pathognomony inevitably reframes ongoing debate.

2. Lucid Intervals

In the past, defendants prosecuted for SBS were identified by the science—that is, by the certainty of doctors that the perpetrator of abuse was necessarily the person with the infant immediately prior to the loss of consciousness. However, studies have since shown that children suffering fatal head injury may be lucid for more than seventy-two hours before death.[110] Because the prospect of a lucid interval lessens the ability to pinpoint when an injury was inflicted, this research dramatically alters the forensic landscape. Without other evidence, the identity of a perpetrator—assuming a crime has occurred—simply cannot be established.[111]

Similarly, whereas before, doctors effectively foreclosed the possibility that prior accidental injury caused an infant's later symptoms, lucid interval studies support the notion of a lag time.[112]

Those who dispute the importance of this research note that the concept of lucidity is ambiguous and argue that, even in an interval classified as lucid, an infant suffering from fatal head trauma would show signs of severe neurological damage.[113] At least one documented case—where a hospitalized child was observed by medical personnel in a "clingy, but

108. In SBS cases, the differential diagnosis is a list of possible causes of the infant's symptoms. It results from a methodology that seeks to eliminate those factors that cannot have contributed to the injuries. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 12, 32. For further discussion of the differential diagnosis, see *infra* notes 134–36 and accompanying text.

109. This perspective was articulated repeatedly in my conversations with physicians. It is also represented in the scientific literature. *See, e.g.*, David L. Chadwick et al., *Annual Risk of Death Resulting from Short Falls Among Young Children: Less than 1 in 1 Million*, 121 PEDIATRICS 1213 (2008).

110. *See, e.g.*, M.G.F. Gilliland, *Interval Duration Between Injury and Severe Symptoms in Nonaccidental Head Trauma in Infants and Young Children*, 43 J. FORENSIC SCI. 723 (1998); Kristy B. Arbogast et al., In Reply to Letter to Editor, *Initial Neurologic Presentation in Young Children Sustaining Inflicted and Unintentional Fatal Head Injuries*, 116 PEDIATRICS 1608 (2005).

111. *See infra* note 250 (noting, among others, cases where identity is in dispute).

112. *See supra* note 110.

113. Interview with Lawrence Ricci, *supra* note 106; Spivak testimony, Evidentiary Hearing (Day Three), *supra* note 98, at 94–102.

perfectly responsive" state for sixteen hours before her death[114]—has proven otherwise.[115]

But here, again, the emerging consensus dwarfs the continuing disagreement.[116] A period of time can exist where a child is impaired but functioning,[117] making the lucid interval "a distinct discomforting but real possibility."[118] In the past, caregiver accounts of seemingly unprecipitated neurological crises were dismissed or even deemed inculpatory.[119] These accounts must now be evaluated with the possibility of a lucid interval in mind.

3. Removing the Shaking from the Syndrome

New debate has emerged regarding whether shaking can generate the force levels sufficient to cause the injuries associated with SBS. Those who believe it cannot point to a number of biomechanical studies, as well as research using animal and computer models.[120] Many of these scientists assume *arguendo* that rotational acceleration-deceleration forces can, in theory, cause retinal hemorrhage and subdural hematoma, but contend that shaking an infant with sufficient force to do so would necessarily damage

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114. Testimony of Robert Huntington in Transcript of Evidentiary Hearing (Day Two) at 36, State v. Edmunds, 746 N.W.2d 590 (2008) (No. 96 CF 555) [hereinafter Huntington testimony, Evidentiary Hearing (Day Two)].

115. *See* Robert Huntington, Letter, *Symptoms Following Head Injury*, 23 AM. J. FORENSIC MED. & PATHOLOGY 105 (2002) (describing case study in which infant was observed by hospital personnel in prolonged lucid state before dying from injuries associated with SBS). This case ("Hernandez") had a transformative effect on Dr. Huntington, the pathologist who performed the autopsy in *Edmunds*. At trial, Dr. Huntington testified that it was "highly probable" that Natalie had been injured within two hours of being seen by medical personnel. Huntington testimony, Evidentiary Hearing (Day Two), *supra* note 114, at 33. Based on his subsequent involvement with the Hernandez case, Dr. Huntington testified on behalf of Edmunds at her 2007 post-conviction evidentiary hearing that he had "changed [his] opinion about whether there could be a significant lucid interval after injury[.]" *Id.* at 34. *See infra* Part IV.E.1. Although Hernandez is factually *sui generis*, "everybody agrees that the single incident, the single validated case can falsify a theory. That's what's significant about them." Attorney for the Defense in Transcript of Oral Argument (Day 5) at 132–33, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. Mar. 8, 2007) (No. 96 CF 555).

116. There seems to be general agreement in the medical community that, in nonlethal cases, where a child typically presents as lucid, the science can even less readily identify a perpetrator. Interview with Ricci, *supra* note 106; Telephone Interview with Stephen Boos, *supra* note 66.

117. Experts may debate whether the exhibiting signs were so severe that medical professionals would have been aware of a problem, but this does not equate to what a nonmedical person would necessarily conclude—which, for purposes of evaluating a caregiver history, would seem to be the relevant inquiry.

118. Huntington testimony, Evidentiary Hearing (Day Two), *supra* note 114, at 44.

119. *See infra* notes 80–82 and accompanying text. *See also* Part IV.A.2.

120. *See, e.g.*, A.C. Duhaime et al., *The Shaken Baby Syndrome: A Clinical, Pathological, and Biomechanical Study*, 66 J. NEUROSURGERY 409 (1987); A.K. Ommaya et al., *Biomechanics and Neuropathology of Adult and Paediatric Head Injury*, 16 BRIT. J. NEUROSURGERY 220 (2002).

the neck and cervical spinal cord or column. Since most infants diagnosed with SBS do not present this type of injury,[121] they could not have been simply shaken.[122]

This perspective remains subject to considerable criticism within the medical establishment.[123] But even those who vehemently dispute the conclusion that shaking alone cannot cause the triad have revised their thinking. No longer is shaking advanced as an exclusive etiology.[124] Instead, the current position of this group of physicians with respect to nonnatural forces (i.e., intentional or accidental trauma) is that either shaking *or impact* may cause the classic triad.[125] More important is the widespread recognition that the two possible mechanisms cannot be clinically differentiated. Thus, the most committed defenders of the validity of the SBS diagnosis now allow that impact cannot be eliminated as a potential causal mechanism.

Once this fact is acknowledged, the question of how much force is required to generate the types of injury associated with SBS becomes critical to whether trauma was inflicted, accidental, or undeterminable.

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121. "As forensic pathologists are keenly aware, neck injuries in a 'shaken' child are a rarity, not a commonality." Kimberley Molina, *Neck Injuries and Shaken Baby Syndrome*, 30 AM. J. FORENSIC MED. & PATHOLOGY 89 (2009) (citing data presented at Annual Meeting of the National Association of Medical Examiners indicating 0% incidence of neck injuries in seventy-nine potential "shaking" cases).

122. *See, e.g.*, Faris A. Bandak, *Shaken Baby Syndrome: A Biomechanics Analysis of Injury Mechanisms*, 151 FORENSIC SCI. INT'L 71 (2005).

123. Among those who believe that shaking *can* cause the constellation of SBS injuries, some are willing to concede that this has not been scientifically proven. These physicians posit that the absence of proof is a reflection of poor modeling, rather than anatomical impossibility. They also note that researchers are obviously unable to shake live babies (and ethical considerations prevent this kind of experiment on animals that would be useful for comparison). According to those who adhere to the notion that shaking may result in the diagnostic triad, these realities make it extremely difficult to prove the causal mechanism involved in SBS. Telephone Interview with Stephen Boos, *supra* note 66; Interview with Lawrence Ricci, *supra* note 106.

Along these same lines, in the past, doctors were certain, not only that shaking was the mechanism at issue, but also that the shaking necessary to cause the triad of symptoms associated with SBS was of such an extremely forceful nature that the causal act could not be anything other than abuse. To illustrate the point, doctors compared the hypothesized forces at issue to known causes of subdural hematoma and retinal hemorrhage—i.e., falls off of multi-story buildings and car crashes—and they modeled this violent shaking with baby dolls. *See supra* notes 19–20 and accompanying text. Today, confronting the absence of a solid scientific basis for these claims, and in recognition of the logic that such extreme force might be expected to cause neck and cervical cord injury, the conventional wisdom regarding degree of force has been disavowed. Telephone Interview with Stephen Boos, *supra* note 66; Interview with Lawrence Ricci, *supra* note 106. Disagreement continues, however, regarding whether this type of injury is always clinically discernable.

124. *See supra* notes 60–64 and accompanying text (describing original formulation of SBS diagnosis).

125. Telephone Interview with Stephen Boos, *supra* note 66; Interview with Lawrence Ricci, *supra* note 106. *See also* Duhaime, *supra* note 120.

The latest thinking about force thresholds complicates this inquiry. New research shows that relatively short-distance falls may cause fatal head injury that looks much like the injury previously diagnosed as SBS.[126] Moreover, these signs and symptoms may not appear immediately.[127]

While the "short-fall" literature continues to be a source of debate[128] and its scientific significance minimized by some,[129] the potential impact of these findings on criminal prosecutions is enormous.[130] Where doctors would previously have been certain that an infant was shaken, in many cases[131] a fall must now be entertained as an explanation for injuries.[132] Once the threshold of force sufficient to cause the injuries at issue has been cast into doubt, scientific identification of a causal mechanism that is

126. "The injury may be associated with bilateral retinal hemorrhage, and an associated subdural hematoma. . . ." John Plunkett, *Fatal Pediatric Head Injuries Caused by Short-Distance Falls*, 22 AM. J. FORENSIC MED. & PATHOLOGY 1, 10 (2001). *See generally* Scott Denton, *Delayed Sudden Death in an Infant Following an Accidental Fall: A Report with Review in the Literature*, 24 AM. J. FORENSIC MED. & PATHOLOGY 239 (2003).

127. *Id. See infra* Part III.B.2.

128. *See, e.g.*, Robert M. Reece, Letter, *The Evidence Base for Shaken Baby Syndrome: Response to Editorial from 106 Doctors*, 328 BRIT. MED. J. 1316 (2004).

129. *See, e.g.*, Testimony of Jeffrey Jentzen, in Transcript of Evidentiary Hearing (Day Three) at 30–35, State v. Edmunds, 746 N.W.2d 590 (2008) (No. 96 CF 555). Other physicians, even those who generally testify on behalf of the prosecution in SBS cases, have conceded the importance of the short-falls findings. *See, e.g.*, Testimony of Alex Levin in Transcript of Evidentiary Hearing (Day Four) at 133, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. 2008) (No. 96 CF 555) (characterizing this research as "valuable addition to the literature").

130. The implications of this research extend beyond traditional SBS prosecutions. For instance, in Texas, one death row inmate, Cathy Lynn Henderson, was recently granted a stay of execution and a hearing on her habeas motion based on newly available scientific evidence regarding the effects of short falls on pediatric head trauma. *Ex parte* Henderson, 246 S.W.3d 690 (Tex. Crim. App. 2007). At her trial in 1995, Henderson claimed that she had accidentally dropped the infant from her arms—a contention effectively rebutted by the testimony of prosecution experts, who unanimously concluded that the infant's extensive brain injuries must necessarily have been caused by intentionally slamming of the head against a hard surface. *Id.* at 691. The certainty attending this conclusion has since been undermined by the short-fall literature, as evidenced by the affidavits and reports submitted by the defendant in support of her motion for habeas relief. *Id.* Most notably, the medical examiner who testified for the prosecution "in essence, recant[ed] his trial-time conclusive opinion" as a result of the "new scientific information" not available when Henderson was convicted of capital murder. *Id.* at 692. As this Article goes to print, the trial court has not yet ruled on an evidentiary hearing held earlier this year.

131. To be clear, falls are not the only alternative explanation for the SBS triad. *See infra* notes 134–36 and accompanying text (discussing natural causes). Depending on the case—in particular, the available physical/forensic evidence (or lack thereof) and the caregiver's account—a fall may be more or less likely than other possible causes of injury.

132. Infants' heads may encounter impact in a variety of ways: babies fall from high chairs, beds and stairs; babies are accidentally dropped. "A history by the caretaker that the child may have fallen cannot be dismissed." Plunkett, *supra* note 126, at 10. Given the frequency with which caregivers offer a fall as explanation for the child's injuries, *see infra* note 181, this scientific development has real criminal justice significance.

abusive[133] becomes problematic. Put differently, the medical testimony can no longer do the work of establishing *mens rea*.

Just as researchers have identified the possibility of accidental trauma as a cause of the SBS triad, so, too, has increasing attention been given to of a number of nontraumatic causes of symptoms previously assumed to be pathognomonic of shaking.[134] A "number of medical disorders documented in the medical peer-reviewed literature . . . can mimic [abusive head trauma]," including congenital malformations, metabolic disorders, hematological diseases, infectious diseases and autoimmune conditions.[135] In sum, depending upon the clinical picture presented, the differential diagnosis for symptoms previously associated exclusively with SBS now contemplates a wide range of nontraumatic possibilities: medical or surgical interventions; prenatal, perinatal and pregnancy-related conditions; birth effects; infections; diseases; disorders; malformations; post-vaccinal conditions; re-bleeds; and hypoxia (lack of oxygen to the brain).[136]

Notwithstanding these rather seismic shifts in medical thinking, the criminal justice system has—with only rare and recent exception—been unyielding to new thinking about a diagnosis that proves a crime.

IV. SBS AND THE LAW

Given the scientific developments described, we may surmise that a sizeable portion of the universe of defendants convicted of SBS-based crimes is, in all likelihood, factually innocent. Even more certainly, a far greater number of defendants among this group were wrongfully convicted. The distinction is an important one:

> The expression "wrongful conviction" is not a legal term of art and it has no settled meaning. Plainly the expression includes the conviction of those who are innocent of the crime of which they have been convicted. But in ordinary parlance the expression would, I think, be

133. The use of "abusive" in this context is meant to convey a mental state beyond negligence, which accords with the vast majority of SBS-based criminal prosecutions. *See infra* note 248 (elaborating on requisite mens rea).

134. *See supra* note 108 (defining "differential diagnosis").

135. Andrew P. Sirotnak, *Medical Disorders that Mimic Abusive Head Trauma*, *in* ABUSIVE HEAD TRAUMA IN INFANTS AND CHILDREN: A MEDICAL, LEGAL, AND FORENSIC REFERENCE 191 (Lori Frasier et al. eds., 2006). *See also* Barnes, *supra* note 79.

136. *See generally* K. Hymel et al., *Intracranial Hemorrhage and Rebleeding in Suspected Victims of Abusive Head Trauma: Addressing the Forensic Controversies*, 7 CHILD MALTREATMENT 329 (2002); Barnes, *supra* note 87; *see also supra* notes 104–05.

> extended to those who, whether guilty or not, should clearly not have been convicted at their trials . . . . In cases of this kind,[137] it may, or more often may not, be possible to say that a defendant is innocent, but it is possible to say that he has been wrongly convicted. The common factor in such cases is that something has gone seriously wrong in the investigation of the offence or the conduct of the trial, resulting in the conviction of someone who should not have been convicted.[138]

In SBS cases, identifying the factually innocent is complicated by two related propositions. First, no crime whatsoever may have occurred, thus eliminating the opportunity to establish someone else's culpability.[139] Second, at least to date, science has not definitively established an alternative explanation for the injuries associated with SBS.[140] What this means is that a significant number of people convicted in triad-only prosecutions[141] are likely innocent of wrongdoing, but others are not, and we have no way of differentiating between these groups.[142] Accordingly, we may rightly be troubled by the convictions of those whose factual innocence is unproven.

The criminal justice implications of all of this are staggering.[143] To put the scope of the problem in a more familiar framework, it is helpful to

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137. Cases in which "flawed expert evidence was relied on to secure conviction" are specifically referenced. *Infra* note 138.

138. This passage is taken from a speech of Lord Bingham, the senior law lord in the United Kingdom until his retirement, in *R (on the application of Mullen) v. Secretary of State for the Home Department* [2005] 1 AC 1, 4, *cited in* Stephanie Roberts & Lynne Weathered, *Assisting the Factually Innocent: The Contradictions and Compatibility of Innocence Projects and the Criminal Cases Review Commission*, 29 OXFORD J. LEGAL STUD. 43, 50 (2009).

139. "Proving that someone else committed the crime is by far the most common method of achieving an exoneration, but it is unavailable if there was no crime at all." Samuel R. Gross, *Convicting the Innocent*, 4 ANN. REV. L. & SOC. SCI. 173, 183 (2008).

140. *See infra* notes 233–45 and accompanying text (discussing the challenges associated with the differential diagnosis).

141. *See supra* note 58 (defining term). For the moment, I put aside cases in which a suspect's seemingly incriminatory account was used—in retrospect, incorrectly—to corroborate the prosecutor's case. *See infra* notes 183–90 and accompanying text.

142. My thanks to Robert Mosteller for helping me to arrive at this formulation. E-mail from Robert Mosteller, Harry R. Chadwick Sr. Professor of Law, Duke University, to Deborah Tuerkheimer, Professor, University of Maine School of Law (Aug. 29, 2008, 15:46 EST) (on file with author).

143. In the estimation of one forensic medical expert, SBS cases may be divided into four groups. One includes those where injury is clearly inflicted, in all likelihood, by impact. Although, in this group, the causal mechanism may not be shaking, medical evidence apart from the triad indicates to a reasonable degree of scientific certainty that the baby was abused. In these cases, a finding of guilt seems just. The three remaining groups of cases involve evidence that, from a criminal justice stance, tends to negate proof beyond a reasonable doubt of a defendant's guilt: evidence of natural disease, the

consider the number of known exonerations in the United States over the past thirty years. From 1989 through 2007, there were 210 DNA exonerations, mostly for rape.[144] It is reasonable to suspect that this number of SBS-based convictions after trial occurred in the past year alone.[145] Additional (non-DNA) exonerations include those of 111 inmates on death row, 135 other individuals, and perhaps another 200 or so defendants whose convictions were overturned based on a "mass" scandal implicating widespread systemic corruption.[146] Unlike SBS cases, none of these exonerations involve a set of paradigmatic facts later determined to be a faulty basis for prosecution.[147]

Despite the large numbers of potentially impacted cases—or perhaps, because of them—our criminal justice system has yet to respond to new scientific realities.[148] Its failure to do so stands in marked contrast to other nations' recognition of the problematic nature of pure-triad prosecutions. The emphatic institutional responses of the United Kingdom[149] and

presence of chronic hematomas, and those in which no likely mechanism presents itself. Telephone Interview with John Plunkett, *supra* note 41.

144. Gross, *supra* note 139, at 175. Of course, DNA has uncovered only a fraction of the cases in which an innocent person was convicted. For a comprehensive examination of what is known—and all that we have yet to learn—about false convictions over the past thirty years, see Gross, *supra* note 139.

145. *See supra* note 56 and accompanying text. To be clear, I do not mean to suggest that every one of these post-trial convictions would, upon review, be found wrongful. *See supra* notes 58, 143 (refining subset of problematic cases). That said, a fair accounting of the number of defendants whose convictions have been undermined by scientific developments must also contemplate the possibility that some defendants who pleaded guilty before trial were innocent. *See supra* note 57; Gross, *supra* note 139, at 180–81 (generally discussing the difficulty of assessing how many innocent defendants plead guilty). Moreover, any inquiry aimed at quantitative measure should also acknowledge that triad-only prosecutions continue to this day; therefore, a true reckoning of the magnitude of injustice implicates a somewhat prospective outlook.

146. Gross, *supra* note 139, at 175–76.

147. As Sam Gross suggested to me, arson cases may provide the closest analogy, albeit an imperfect one, to the problem that I am describing. Telephone Interview with Samuel Gross, *supra* note 50. In 1992, the National Fire Protection Association "issued new guidelines that for the first time applied scientific principles to the analysis of the remains of suspicious fires, and revealed that the expert evidence of arson in [one death row inmate's] case, and many others, had no scientific basis." Gross, *supra* note 139, at 183.

148. As a general proposition, the U.S. criminal justice system—in contrast to those of many other nations—does not respond to extra-legal developments in a monolithic manner. Our system is atomized by its federalist, multi-state nature and by the multiplicity of actors involved in decision making throughout the criminal process. To explicate how scientific developments around SBS have penetrated the justice system, is, therefore, a formidable challenge. This difficulty is compounded by the extent to which SBS prosecutions, as a phenomenon of increasing importance, have gone largely unnoticed and data related to them correspondingly uncollected. Despite this, a procedural analysis of the various stages at which legal standards guide the exercise of discretion follows. It provides a holistic perspective on a system that has not widely absorbed new scientific realities.

149. In 2005–2006, the Attorney General, Lord Goldsmith, conducted a seven-month review of eighty-eight SBS cases, including guilty verdicts and pleas. (SBS convictions are significantly less commonplace in the United Kingdom than in the States.) Lord Goldsmith's investigation was triggered

Canada[150] are particularly instructive. Just as our criminal justice system has seemed to operate within a time bubble, largely untouched by scientific evolution, so, too, it remains insulated from unmistakable signs

by a 2005 Court of Appeal decision, now the governing case law, which concluded that "[i]n cases where the triad alone is present . . . the triad alone 'cannot automatically or necessarily' lead to a conclusion that the infant has been shaken." THE RT HON THE LORD GOLDSMITH QC, THE REVIEW OF INFANT DEATH CASES: ADDENDUM TO REPORT SHAKEN BABY SYNDROME at 9–10 (2006). The Attorney General's review methodology is vulnerable to criticism, particularly because among the evidence considered "to support the finding of SBS" was a defendant's "[a]dmissions to shaking" and the presence of chronic subdural hematomas, *id.* at 12, each of which may be of limited corroborative value, *see infra* notes 104, 183–90 and accompanying text. This may explain why only three of the cases reviewed—a not insubstantial false conviction rate of 3.4%, but fewer than what many had expected—were identified as "giving rise to concern" and referred to the Criminal Court of Appeal. Goldsmith, *supra*, at 14. Irrespective of methodological shortcomings, however, Lord Goldsmith's systemic review and the Court of Appeal decision that preceded it have appreciably altered the course of SBS prosecutions. As one commentator has suggested, "in [the] future there will be demands for each case to be assessed individually, on the evidence available, rather than on a formula which has now been proved to have weaknesses." Sam Lister, *Q&A: Shaken Baby Syndrome*, TIMES ONLINE, Feb. 14, 2006, www.timesonline.co.uk/tol/news/uk/article546383.ece.

150. On April 25, 2007, the Province of Ontario established an inquiry into pediatric forensic pathology and appointed Justice Stephen Goudge of the Court of Appeal its Commissioner. Seventeen months and $8.3 million later, Justice Goudge issued a 1000 page report which told what he called a "tragic story of pediatric forensic pathology in Ontario from 1981 to 2001. . . ." COMMISSIONER'S STATEMENT ON RELEASE OF THE REPORT, Oct. 1, 2008. Many of the Commission's findings related specifically to the mistakes of one particular forensic pathologist and a failed oversight mechanism. But apart from the work of any individual, the report expressed deep concerns about the legitimacy of triad-based SBS prosecutions, concluding that in this set of cases, "a further review is warranted as part of restoring public confidence." *Id. See* Goudge, *supra* note 59, at 531 ("[O]ur systemic examination has identified this particular area of forensic pathology as one where change has raised the real possibility of past error."). In light of his doubts regarding "convictions based on the pure 'triad,' where no other pathology evidence is identified, and possibly in other SBS cases," *id.* at 528, Justice Goudge recommended that a review be conducted with the objective of "identify[ing] those cases in which the pathology opinion can be said to be unreasonable in light of the understandings of today and in which the pathologists' opinions were sufficiently important to the case to raise significant concerns that the convictions were potentially wrongful," *id.* at 531. Because many of the convicted parties are now claiming that their pleas were "induced by various factors, including the serious consequences of potentially being convicted of murder charges and the acknowledged difficulties in challenging [the state's forensic pathologist's] opinions," the report emphasized that "cases should not be excluded from review only because an accused pleaded guilty." *Id.* at 532–33. Justice Goudge's findings and conclusions are detailed extensively in his full report, *supra* note 59.

Upon issuance of the Goudge Commission Report, the Ontario coroner's office quickly identified 220 cases where a determination was made that an infant died after being shaken. Antonella Artuso, *Shaken Baby Doubts Surface*, OTTAWA SUN, Oct. 2, 2008, at 7. Under the auspices of the Attorney General, 142 of these cases are being reviewed by a team which includes the province's former associate chief justice, its chief forensic pathologist, a regional supervising coroner, a senior defense counsel, and a senior Crown attorney. Theresa Boyle, *Team Selected to Probe 142 Shaken Baby Cases*, THE TORONTO STAR, Dec. 2, 2008, *available at* thestar.com. On November 6, 2008, Anna Sokoynyuk was the first person to have a case dismissed based on the Attorney General's review. She had been charged with murder for the death of her three-month-old daughter. *Mom of Dead Baby Walks Free After Charges Against Her Withdrawn in Court*, TORONTO CITY NEWS, Nov. 6, 2008, http://www.citynews.ca/news/news_28894.aspx.

that, elsewhere in the world,[151] other legal systems are assimilating new scientific understandings and adapting accordingly. When viewed in a global perspective, our continued adherence to a prosecution template that rests on discredited science is particularly jarring.

What follows is an account of how we have arrived at this place.

A. Investigation and Prosecution

In the United States, unlike the United Kingdom and Canada, the SBS prosecution paradigm that ascended in the 1990s has remained largely untouched by scientific developments of the past decade.[152] This systemic failure should not be equated with the prosecutorial pursuit of charges against defendants believed to be innocent of wrongdoing.[153] Rather, SBS cases are going forward because law enforcement officers genuinely believe in the validity of the diagnostic triad that has fallen from scientific grace.[154] But this explanation, while more benign than its alternative, begs the question of why the triad continues to exert an almost talismanic effect.[155]

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151. Apart from the institutional review mechanisms instituted by the United Kingdom and Canada, it is worth noting that Australia's criminal justice system has also begun to absorb new scientific understandings. In 2003, the Supreme Court of Western Australia issued an important decision in an SBS case. *R. v. Court* (2003) 308 WASCA 1. At a bench trial for murder, the defendant was acquitted by a judge of all charges in a prosecution based on the presence of retinal hemorrhages and subdural hematoma, as well as spinal injury. *Id.* ¶¶ 1, 9. Central to the verdict was the court's reliance on the testimony of a prominent forensic pathologist, who testified that it was "not tenable" that the *only* possible cause of death was violent shaking. *Id.* ¶ 5. According to the trial judge,

> [a]s I understand [the defense expert's] evidence, he was suggesting that unless a witness had seen the deceased being shaken or unless there was some medical evidence consistent with the child having been shaken, such as bruising or other external injury, or acceptable admissions, then to conclude that the deceased had died by being shaken in a prolonged or violent way was, as he expressed it, "highly suspect."

Id. The Supreme Court affirmed the reasonableness of this verdict. *Id.* ¶¶ 76, 95.

152. *See supra* notes 52–57 and accompanying text (discussing quantitative measures). Qualitative data also supports this proposition. Telephone Interview with Toni Blake, Jury Consultant, 2nd Chair Servs. (June 17, 2008); Telephone Interview with Brian Holmgren, Assistant Dist. Attorney, Davidson County Dist. Attorney Gen.'s Office, Child Abuse Unit (July 1, 2008).

153. While it is easy, and even fashionable, to vilify prosecutors, they are typically motivated by a desire to hold the guilty responsible for their actions. Many child abuse prosecutors seem almost missionary about their task, but this may come with the territory.

154. According to the database maintained by Toni Blake, *see supra* note 24, the vast majority of prosecutions go forward based solely on the presence of one or more triad symptoms. Telephone Interview with Toni Blake, *supra* note 152.

155. Apart from the dynamics discussed in the remainder of this Part, it must be noted that the death of an infant—the embodiment of innocence—inevitably provokes an intense emotional response among participants in the criminal process. It is quite reasonable that those affected would experience what Susan Bandes has insightfully described as an "urge to find an event blameworthy [in order] to

It is worth noting the considerable deference given to child-abuse doctors[156]—who, as a general rule, remain believers in the diagnosis.[157] Accordingly, prosecutors may exhibit a disinclination to interrogate the science upon which these physicians' opinions rest. There is nothing novel about the observation that prosecutors tend to defer to their experts; but, in this context, the relationship between the prosecutor and the allied medical professionals is a particularly close one.[158] In the typical SBS case, the expert *is* the case: there is no victim who can provide an account, no eyewitness, no corroborative physical evidence, and no apparent motive to kill.[159] Doctors identify both the occurrence of a crime and its perpetrator, and their assurance regarding each is essential for a conviction.[160] These dynamics may well contribute to a prosecutorial reluctance to challenge the validity of an SBS diagnosis. But they do not fully explain a continued willingness to pursue charges in cases built entirely on contested expert testimony.[161]

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convert a loss into a crime." Interview with Susan A. Bandes, Distinguished Research Professor of Law, DePaul Univ. Coll. of Law, in Chi., Il. (Oct. 16, 2008).

156. In 2006, "the American Board of Pediatrics approved a petition for subspecialty certification in child abuse pediatrics." Kent P. Hymel & Karen Seaver Hill, *Child Advocacy: New Board Specialty Signals Positive Change in Child Abuse Pediatrics*, CHILDREN'S HOSPITALS TODAY (2007), *available at* http://www.childrenshospitals.net/AM/Template.cfm?Section=Archives&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=31157 (last visited May 6, 2009). The first board certification examination will take place in the fall of 2009. *Id.*

157. *See* Robert Parrish, *Prosecuting a Case*, *in* ABUSIVE HEAD TRAUMA: A MEDICAL, LEGAL, AND FORENSIC REFERENCE 393, 396–97 (Lori Frasier et al. eds., 2006) (noting that American Prosecutors Research Institute and other prosecutors are a good source of referral to experts in area).

158. In many cases, this relationship has been formalized in a manner unique to the child-abuse setting. As described by one leading expert on nationwide prosecutorial practices: Many local prosecutors across the country have formed or participate in interdisciplinary teams intended to bring together child protective service (CPS) workers, law enforcement investigators, medical professionals, mental health providers, educators, and others who play a role in ensuring that justice is appropriately sought for severely abused children. *Id.* at 395; *see also* Holmgren, *supra* note 25, at 276.

159. The hypothesis generally advanced by pediatricians and prosecutors is that shaking "results from tension and frustration generated by a baby's crying or irritability . . . ." Am. Acad. of Pediatrics, *supra* note 18, at 206. *See also* Holmgren, *supra* note 25, at 289–90 ("Prosecutors will often not be able to point to a traditional 'motive' (e.g., hatred, jealousy, vengeance, greed) to explain the caretaker's conduct. Rather, they must reorient jurors to think about motive in a unique context—one that does not reflect a purposeful mental state but instead a risk factor, stressor or catalyst that prompts the caretaker's reactive and abusive conduct . . . . The most common motive in SBS cases is anger or frustration resulting from the infant's crying.").

160. The dominance of the "team approach to investigation," erodes a sharp differentiation between the roles of prosecutor and physician. Parrish, *supra* note 157, at 395–96. I found this to be true when, as a prosecutor, I participated in a medical grand rounds regarding a case that was the subject of one of my investigations.

161. Cognitive biases on the part of jurors, *infra* notes 243–47 and accompanying text, may also affect prosecutors.

To complete the account, it is helpful to consider first, how prosecutors are trained in the science of SBS; second, how prosecutors perceive the accounts of those suspected of abuse; and, third, how prosecutors are influenced by the systemic nature of SBS convictions.

1. Prosecutorial Training

Training is especially critical in this area, where a complex and evolving body of science is outcome determinative.[162] As one prominent instructor recently urged, "investigators and prosecutors should obtain a basic education on medical issues common to all of these cases."[163] Since most prosecutors encounter SBS cases infrequently, few become experts in the issues they raise.[164] It is unsurprising, then, that a nationwide training apparatus has developed to disseminate information about the basic structure of an SBS prosecution. For instance, the American Prosecutors Research Institute of the National District Attorneys Association[165] transmits newsletters,[166] organizes conferences,[167] and

162. Parrish, *supra* note 157, at 395–96.

163. *Id.* at 395. "A fundamental understanding of the medical knowledge concerning AHT committed against children is absolutely essential to a prosecutor's success in refuting commonly offered defenses, clarifying and dispelling myths introduced by opposing expert witnesses, and providing juries with sufficient information to reach a just decision." *Id.* at 396.

164. "It is rare for a particular prosecuting attorney to handle multiple cases involving AHT [abusive head trauma] in child victims unless the prosecutor works in a specialized team assigned to handle physical abuse and child homicide." *Id.* at 396**.** Even those prosecutors who do develop an expertise in this type of case "must be ever mindful that science is an ongoing process and medical research can quickly become dated . . . . Without a full understanding of the medical research that underlies an expert's opinion, the prosecutor can neither make full use of the physician's expertise, nor adequately cross-examine the opposing expert." Holmgren, *supra* note 25, at 305.

165.

> The mission of the American Prosecutors Research Institute is to provide state and local prosecutors knowledge, skills and support to ensure that justice is done and the public safety rights of all persons are safeguarded. To accomplish this mission, APRI serves as a nationwide, interdisciplinary resource center for research and development, technical assistance, training and publications reflecting the highest standards and cutting-edge practices of the prosecutorial profession.

American Prosecutors Research Institute, http://www.ndaa.org/apri/index.html (last visited July 21, 2009).

166. *See, e.g.*, Erin O'Keefe, *Shaken Baby Syndrome: Overcoming Untrue Defenses*, 10 UPDATE 11 (1997), *available at* http://www.ndaa.org/publications/newsletters/update_index.html; Devon Lee et al., *Tips for Investigating Child Fatalities*, 13 UPDATE 1 (2000), *available at* http://www.ndaa.org/ publications/newsletters/update_index.html; Victor I. Vieth, *Tips for Medical Professionals Called as Witnesses*, 13 UPDATE 7 (2000), *available at* http://ndaa.org/publications/ newsletters/update_index. html.

167. Most recently, in July 2008, the National District Attorneys Association convened a conference on the "Investigation and Prosecution of Child Fatalities and Physical Abuse," which

provides other support for prosecuting the SBS case.[168] The National Center on Shaken Baby Syndrome, an organization dedicated in part to training law enforcement officers,[169] has hosted and collaborated on nine conferences since 2000.[170] And prosecutors who have become leaders in the field have published book chapters with instruction in handling SBS cases from investigation through trial.[171]

These training materials present a view of the science refracted through an advocate's lens. For instance, a 2001 publication asserts: "the [prosecution] expert can testify that the forces the child experiences are the equivalent of a 50–60 m.p.h. unrestrained motor vehicle accident, or a fall from 3–4 stories on a hard surface;"[172] and "current research and professional consensus within the medical literature clearly supports the conclusion that . . . there is no lucid interval."[173] Similarly, from a chapter published in 2006: "there is emerging consensus among credible medical experts that when children have suffered serious or potentially fatal head injuries, they will start to experience symptoms almost immediately after injury;"[174] "[t]he collection of ocular damage, subdural or subarachnoid bleeding over the brain, axonal damage, and severe brain swelling is not seen in the same patterns in any forms of accidental trauma, but is seen in cases involving severe and violent shaking;"[175] and "the medical field has reached substantial consensus concerning many of the issues pertinent to criminal [SBS] cases."[176]

While it should be expected that materials used to educate prosecutors would be strategically focused with respect to trial, this same orientation with respect to case investigation is more problematic. And while we might also anticipate that the most extreme critiques of the science underlying SBS convictions would be soundly—and passionately—attacked, many of these materials fail to acknowledge the shifting of the

included discussion of Abusive Head Trauma. More information may be found at http://www.ndaa.org/education/apri/investigation_child_fatalities_abuse_2008.html (last visited July 21, 2009).

168. *See* Parrish, *supra* note 157, at 396.

169. National Center on Shaken Baby Syndrome, About the Center, http://www.dontshake.org/sbs.php?topNavID=2&subNavID=10 (last visited July 21, 2009).

170. National Center on Shaken Baby Syndrome, Conferences, http://www.dontshake.org/sbs.php?topNavID=5&subNavID=38 (last visited May 6, 2009).

171. *See generally* Holmgren, *supra* note 25; Parrish, *supra* note 157.

172. Holmgren, *supra* note 25, at 307.

173. *Id.* at 305. *See id.* at 307 (stating that "the onset of symptoms is virtually contemporaneous with the abusive act").

174. Parrish, *supra* note 157, at 398.

175. *Id.* at 405.

176. *Id.* at 395.

center. In defending the science of old,[177] the authors tend to obscure the changed consensus around fundamental aspects of the SBS diagnosis.[178] At the same time, significant challenges to the conventional medical wisdom are ignored.[179] Nomenclature aside,[180] few concessions to developments in research have been made. The digested science describes a diagnosis upon which prosecutors can securely rely.

2. Caregiver Accounts

Prosecutorial confidence in guilt is augmented by statements on the part of SBS suspects—statements which are inevitably perceived as incriminatory. The three accounts most often offered to explain an infant's loss of consciousness or other obviously severe neurological symptoms are that: (i) their onset was unprovoked/without explanation, (ii) the infant fell from a short distance, and (iii) the infant was shaken playfully or in the course of revival efforts.[181] Research over the past decade has made each of these explanations newly plausible.[182] But because law enforcement officers interrogating the SBS suspect "know" that the infant's injuries were caused by violent shaking—the science is believed to prove this definitively—the narratives are all perceived as false and, therefore, incriminating.[183]

Moreover, if the suspect's story changes in response to familiar interrogation techniques,[184] this fact itself is used to support an SBS

177. *See supra* notes 172–76. Support for the assertions made in recent publications is often found in sources from the past that have since been challenged. For instance, a 2001 publication asserts that "the expert can testify that the forces the child experiences are the equivalent of a 50–60 m.p.h. unrestrained motor vehicle accident, or a fall from 3–4 stories on a hard surface" and cites evidence from the records of cases ranging from 1986–1994. Holmgren, *supra* note 25, at 307. In the same publication, the claim that "the onset of symptoms is virtually contemporaneous with the abusive act" is bolstered by studies from the 1990s. *Id. See also supra* note 173.

178. *See supra* notes 174–76 and accompanying text.

179. *See supra* notes 173–76 and accompanying text.

180. *See supra* notes 67–68 and accompanying text (discussing new diagnostic labels). Most notable, pathognomony as the defining feature of SBS has been supplanted by the more ambiguous claim that "retinal hemorrhages, bilateral subdural hematoma, and diffuse axonal injury are highly specific for SBS as a mechanism." Holmgren, *supra* note 25, at 306.

181. Boos, *supra* note 14, at 50.

182. *See supra* Part III.B.3.

183. Holmgren, *supra* note 25, at 276 ("[T]he initial history provided by the caretaker is false in the vast majority of abuse cases and frequently evolves or changes over time as the caretaker is confronted with medical findings.") (citations to scientific literature omitted).

184. *See* Leestma, *supra* note 80, at 14 (noting that the "interrogator may communicate to the accused that 'if you could tell us exactly what happened and if you shook the baby, we could do something for the baby and maybe save its life.'"). While the particular tactics employed in the SBS context may be unique, the underlying techniques are not. *See* Richard A. Leo et al., *Bringing*

diagnosis.[185] The ensuing interrogation confirms the suspect's guilt, as this veteran SBS prosecutor's characterization suggests: Each of the three most common histories, and others, may be combined in patterns of changing histories as guilty adults attempt to fabricate new explanations to respond to the probing or suggestive questions of one or multiple interviews.[186]

But even if the caregiver's story remains constant, it too may be used as evidence of guilt.[187] The "discrepant history"—"when the history does not match the physical condition in front of you"—is also seen as proof that the infant was shaken.[188] Whatever contradicts the scientific "givens" is deemed "discrepant" and a confession.

In sum, law enforcement officers confirm their suspicions of SBS whenever a suspect provides "a false, discrepant, evolving *or* absent history."[189] The suspect cannot avoid self-incrimination; the investigator's certainty of guilt can only be reinforced.[190]

Reliability Back In: False Confessions and Legal Safeguards in the Twenty-First Century, 2006 WIS. L. REV. 479, 512–20 (2006) (surveying empirical evidence on false confessions).

185. *See, e.g.*, Carole Jenny et al., *Analysis of Missed Cases of Abusive Head Trauma*, 282 JAMA 621 (1999); Robert Reece, *Medical Evidence in the Context of Child Abuse Litigation*, NEW ENG. L. REV. 607, 610 (2002) ("[T]he history does not match the physical condition in front of you . . . . Does the history fit what you see? If it does not, then you must question how such an injury could have occurred."). *See also* Anderson, *supra* note 55 (citing a nationally prominent pediatrician's observation, based on his consulting experience, that "'[i]f a parent does not know exactly what's happening, very frequently the first conclusion is that they're trying to hide something. And sometimes parents are racking their brains, coming up with one or two possibilities. Then it looks like they're changing their stories. That can be used to damn them.'").

186. *See* Boos, *supra* note 14, at 50 ("[W]hose story has evolved or changed to fit new information revealed by medical reports, medical personnel, or investigators?"); Parrish, *supra* note 157, at 416.

187. A model prosecutorial summation makes this point as follows: "it just couldn't happen the way the defendant says—not unless the laws of physics and gravity are different in the defendant's house. These doctors tell us that the defendant is a liar . . . . A defendant who lies to protect himself points the finger of guilt upon himself." Holmgren, *supra* note 25, at 325.

188. Reece, *supra* note 61, at 610. Put differently, "[t]he false histories help identify the likely individual who caused the child's injuries by providing compelling evidence of the abuser's consciousness of guilt." Holmgren, *supra* note 25, at 277.

189. Holmgren, *supra* note 25, at 277.

190. Consider the dynamics reflected in the following interrogation of a day care provider suspected (based on the presence of the triad) of shaking a six-month-old infant to death. According to the caregiver's initial account, after leaving the children unattended for a short time, she returned to find a toddler sitting on the neck of the baby, who was having trouble breathing. After waiving her *Miranda* warnings, the caregiver (Rogers) was told by the interrogating officer (Wheeler) that: according to a "panel of doctors," a child "could not have caused" the baby's injuries; that "anyone could have been pushed 'over the top' by all of the children in Rogers's care," and "if Rogers was just overwhelmed, then that was 'explainable'"; that Wheeler "already knew something 'aggressive' happened, but now she just needed to know why;" that "only an adult could have inflicted the force necessary to hurt [the baby] in this manner and that the injury occurred close to the time that [the baby] began seizing," when only Rogers was present; that "if [police] could not go to the doctors with a logical explanation for what happened, then it looked 'very, very bad' for Rogers; and that Rogers's

3. Reification

Finally, prosecutorial thinking about these cases is pervaded by an echo of the methodological fallacy of the early SBS literature.[191] If, across the country over the years, defendants have been proven guilty of shaking babies to death based on the presence of retinal hemorrhages, subdural hematomas and cerebral edemas, then the presence of these symptoms must mean that someone is guilty of shaking a baby to death. All that remains is to identify the last person with the conscious child. That person becomes the suspect, who can then be confidently pursued. In this manner, the triad-based crime constructed by the medical establishment[192] has been reified—its existence affirmed—by the systematic conviction of its apparent perpetrators.[193]

B. Evidentiary Challenges

Defense motions to exclude expert testimony regarding SBS have, almost without exception, proven unsuccessful.[194] Despite new challenges to the scientific underpinnings of the diagnosis, the admission of SBS testimony is facilitated by its once-uncontroversial nature. Even recently, and in cases involving triad symptoms alone, courts in both *Daubert* and

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story "had to match the medical evidence." Two hours after the interview began, Rogers confessed to shaking the baby and ("she thought") repeatedly slamming his head on the floor. She was arrested, charged and convicted of intentional child abuse resulting in death, and sentenced to life imprisonment.

In an extraordinary decision, the Nebraska Supreme Court reversed the defendant's conviction due to a violation of her Fifth Amendment right against self-incrimination. Specifically, the court held that Rogers had invoked her right to silence, and that this invocation was not scrupulously honored by the police. The case will be tried later this year. Telephone Interview with Tim Burns, Douglas County Pub. Defender's Office (June 10, 2009).

191. The cognitive dissonance resulting from having prosecuted people whose guilt has now been scientifically undermined should not be discounted. But here I am identifying a dynamic that is more systemic.

192. *See supra* Part III.A.

193. This dynamic has likely been perpetuated by media coverage of always sensational "baby-killing" cases. *See supra* note 40. *See also* Vanessa Bauza, *Abusive Shaking Top Killer of Babies; Police Say Infant Latest Area Victim*, SUN SENTINEL (Fort Lauderdale, Fla.), Oct. 4, 1999.

194. In the course of my research, I have not been made aware of any case in which the testimony of defense experts challenging the basis for an SBS diagnosis was excluded on *Daubert* or *Frye* grounds. See *infra* note 195 for a summary of the *Daubert* and *Frye* standards. Prosecutors are either declining to make these challenges or are making them unsuccessfully. *See* Holmgren, *supra* note 25, at 316 ("There is no scientific research which supports the re-bleed theory of causation in very young children. . . . Accordingly, the application of this theory to infants should be challenged on Frye and Daubert grounds.").

Frye jurisdictions[195] have rejected arguments that SBS is not generally accepted in the medical community[196] and that it is not based on reliable scientific methods.[197]

Given the importance placed on the criterion of general acceptance within the "relevant" scientific community—even in *Daubert* jurisdictions, where it is not dispositive—the consensus among pediatricians has been given particular emphasis by admitting trial judges.[198] In the absence of legally binding precedent, judges are well aware that "for some time, courts in other states have found shaken baby syndrome to be a generally accepted diagnosis in the medical community."[199] Judges have also noted that research into SBS has been peer reviewed, and that there has been "considerable literature put out by professional scientific organizations that substantiate the findings."[200] While at least one court has explicitly recognized "[t]he absence of a

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> Two approaches [to the admissibility of scientific testimony] are dominant—general acceptance [*Frye*] and scientific soundness [*Daubert*]. Under the former, the proponent must show that the scientific community agrees that the principles or techniques on which the expert relies are capable of producing accurate information and conclusions. Under the latter standard, general acceptance remains an important consideration, but the court must consider other factors to decide for itself whether the expert's methodology is scientifically valid.

CHARLES MCCORMICK ET AL., MCCORMICK ON EVIDENCE 335 (Kenneth S. Brown et al. eds., 6th ed. 2006).

196. *See, e.g.*, Middleton v. State, 980 So. 2d 351, 353 (Miss. Ct. App. 2008) (defendant contended that "Shaken Baby Syndrome is not a condition or theory that is generally accepted in the medical community").

197. *See, e.g.*, State v. Leibhart, 662 N.W.2d 618, 623 (Neb. 2003) (defendant argued "that the theory of shaken baby syndrome as a cause of certain injuries was not supported by reliable scientific authority, data, or research").

198. *See, e.g.*, *id.* at 627–28 (SBS "is generally accepted within the scientific medical community of pediatrics") (internal quotations omitted). The *Leibhart* court concluded that

> [w]ith respect to general causation, the district court did not abuse its discretion in concluding on this record that the reasoning or methodology underlying testimony regarding shaken baby syndrome was valid, and with respect to specific causation, the district court did not abuse its discretion in concluding that such reasoning or methodology properly could be applied to the facts in issue in this case.

Id. at 628.

199. *Id.* at 628 (citing State v. Lopez, 412 S.E.2d 390 (S.C. 1991); State v. McClary, 541 A.2d 96 (Conn. 1988); *In re* Lou R., 499 N.Y.S.2d 846 (N.Y. Fam. Ct. 1986)). *See also* State v. Vandemark, No. 04-01-0225, 2004 Del. Super. LEXIS 376, at *8–9 (Del. Super. Ct. 2004) ("[I]t seems that the science behind Shaken Baby Impact Syndrome has been accepted in Delaware and just about every other jurisdiction."). *See* Holmgren, *supra* note 25, at 306 ("Expert testimony involving a diagnosis of SBS is well recognized and does not need to satisfy the *Daubert* or *Frye* Standards governing the admissibility of expert testimony or novel scientific evidence.").

200. *Leibhart*, 662 N.W.2d. at 627 (internal quotation omitted).

known rate of error," this void was dismissed as merely "reflect[ing] the limitations of the subject matter."[201]

The standards for determining the admissibility of scientific evidence in effect privilege the institutionalized theoretical framework—even despite serious doubts about the validity of underlying methodologies. Perhaps judicial reluctance to keep testimony regarding SBS from the jury derives from faulty evaluations of the science, or from an overly deferential respect for the establishment that recommends it. But it is also quite likely that judges are allowing this type of testimony because our justice system is structured in a way that makes its admission the default. "[T]he standard for admissibility is relevance and reliability, not certainty," as courts often remark when allowing SBS testimony.[202]

As is widely recognized, the law of evidence is fundamentally premised on the functioning of our adversary system. As the United States Supreme Court emphasized in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."[203] Courts often justify the admission of SBS testimony by reference to this foundational principle. For instance: "The 'gate-keeping function of the court was never meant to supplant the adversarial trial process. The fact that experts disagree as to methodologies and conclusions is not grounds for excluding relevant testimony;'"[204] "'[a] party confronted with an adverse expert witness who has sufficient, though perhaps not overwhelming, facts and assumptions as the basis for his opinion can highlight those weaknesses through effective cross-examination.'"[205]

Admissibility determinations are also grounded in the proper allocation of decision-making authority between judge and juror. In a recent reversal on interlocutory appeal of a trial judge's order excluding the prosecution's

201. *Vandemark*, 2004 Del. Super. LEXIS 376, at *16–17. Discussing a particular study where the rate of false positives (i.e., cases incorrectly diagnosed as abuse) was admittedly unknown, the trial judge noted that "no suggestion was made about how to structure [a more rigorous] analysis." *Id.* at *16. In *Leibhart*, the court made a similar observation regarding the limits of the science proffered by the prosecution: "it [has] been clinically tested as the best it can." *Leibhart*, 662 N.W.2d at 627.

202. *See, e.g.*, People v. Martinez, 74 P.3d 316, 322 (Colo. 2003).

203. Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 596 (1993).

204. Commonwealth v. Martin, Nos. 2006-CA-002236-MR, 2006-CA-002237-MR, 2008 WL 2388382, at *7 (Ky. Ct. App. June 13, 2008) (quoting LP Matthews LLC v. Bath & Body Works, Inc., 458 F. Supp. 2d 198, 210 (D. Del. 2006)).

205. *Id.* at *8 (quoting Stecyk v. Bell Helicopter Textron, Inc., 295 F.3d 408, 414 (3d Cir. 2002)).

SBS testimony, this consideration was explicitly invoked:[206] "The gatekeeping function of the trial court is restricted to keeping out unreliable expert testimony, not to assessing the weight of the testimony. This latter role is assigned to the jury."[207] Even more emphatically, "[t]he court is *only* a gatekeeper, and a gatekeeper alone does not protect the castle . . . ."[208]

Systemic factors construct a presumption of admissibility: if the evidence is not "pseudoscientific" or "junk science,"[209] it comes in. This presumption is overcome only rarely by still-evolving research.[210] In recent years, testimony regarding SBS has been excluded only twice.[211] In Kentucky, after hearing from experts on both sides, a trial court concluded that the diagnosis "presupposes the cause."[212] The court's order continued: "To allow a physician to diagnose SBS with only the two classical markers, and no other evidence of manifest injuries, is to allow a physician to diagnose a legal conclusion."[213] Accordingly, the judge precluded the state from presenting expert testimony regarding SBS based exclusively on subdural hematoma and retinal hemorrhage and in the absence of "any other indicia of abuse."[214] As noted, this order was subsequently

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206. According to the appellate court, the trial judge's order

> was an abuse of discretion, because it was founded on the unsupported legal conclusion that because there was dispute amongst the experts as to the possible cause of the infants' injuries, it was the court's role to choose the side it found more convincing and exclude the side it found less convincing, based in part on giving greater weight to "scientific" as opposed to "clinical" studies.

Id. at *7. For further discussion of the evidentiary ruling in *Martin*, *see infra* notes 212–16 and accompanying text.

207. *Martin*, 2008 WL 2388382, at *7.

208. *Id.* at *8 (quoting United States v. Mitchell, 365 F.3d 215, 245 (3d Cir. 2004)).

209. *Id.* at *7 (noting that testimony of prosecution experts, "even accepting . . . its flaws" cannot be so described).

210. State v. Leibhart, 662 N.W.2d 618, 628 (Neb. 2003) (reexamination under *Daubert* appropriate "where recent developments raise doubts about the validity of previously relied-upon theories") (citation omitted).

211. This conclusion is based on searches of the LEXIS database and the web, as well as my conversations with the likely participants in these litigation efforts. Telephone Interview with John Plunkett, *supra* note 41; Telephone Interview with Toni Blake, *supra* note 152; Telephone Interview with Brian Holmgren, *supra* note 152. In addition to the two admissibility decisions discussed above, a few trial courts have disallowed experts from using the SBS terminology. For instance, a judge in Ohio precluded reference to SBS, concluding that testimony to this effect would improperly usurp the role of the jury. The prosecution expert was, however, allowed to testify "as to the characteristics of the injuries suffered by a child believed to have been subjected to rotational acceleration/deceleration." Renee Brown, *Judge Denies Reference to Syndrome During Trial*, TIMES REPORTER (New Phila., Ohio) (on file with author).

212. Order and Opinion Re: Daubert Hearing, Kentucky v. Davis, Case No. 04-CR-205 at *21 (Ky. Cir. Ct. Apr. 17, 2006).

213. *Id.* at *23.

214. *Id.*

reversed.[215] The defendant has appealed the decision to the state supreme court.[216]

The other court to exclude SBS evidence did so in a case also involving a diagnosis based on retinal hemorrhage and subdural hematoma.[217] After hearing testimony from experts on both sides, the Missouri trial judge determined that the SBS diagnosis "appears to have gained considerable acceptance . . . among pediatricians. However, there is substantial, persistent and continuing criticism of this diagnosis among many in the medical and scientific research communities."[218] In its unpublished order, the court concluded that the state had failed to meet its burden of establishing that SBS is generally accepted in the scientific and medical communities.[219] The state was thus precluded from offering testimony that the infant was a victim of violent shaking based on the diagnostic triad alone.[220] This ruling was not appealed.[221]

Although the two trial court decisions to exclude testimony about SBS are outliers, they foretell more aggressive defense challenges to the

215. Commonwealth v. Martin, Nos. 2006-CA-002236-MR, 2006-CA-002237-MR, 2008 WL 2388382, at *9 (Ky. Ct. App. June 13, 2008).

216. The appeal to the Kentucky Supreme Court was filed on July 14, 2008 and is pending as the Article goes to print. The "CaseInfo" sheet for *Martin* is available at http://apps.kycourts.net/coa_public/CaseInfo.aspx?Case=2006CA002236.

217. Order, State v. Hyatt, No. 06M7-CR00016-02 (Mo. Cir. Ct. Nov. 6, 2007). In *Hyatt*, the one-year-old who was being cared for by the defendant was released from the hospital without lasting injury. The caregiver has been charged with abuse of a child for "knowingly inflict[ing] cruel and inhuman punishment upon [the baby] by shaking her, and in the course thereof . . . caus[ing] serious emotional injury. . . ." The felony is punishable by five to fifteen years in prison. Felony Complaint, State v. Hyatt, No. 06M7-CR00016-02 (on file with author).

218. Order, *supra* note 217. The court further noted: "The critics contend that subdural hematoma and retinal bleeding can have many other causes and that the diagnosis of shaken baby syndrome is merely a 'default' diagnosis, one which pediatricians use when they have no other explanation for the cause of the child's injuries." *Id.*

219. *Id.* Missouri is a *Frye* jurisdiction. Request for 'Frye' Hearing and Brief in Support of Request, State v. Hyatt, No. 06M7-CR00016-02 (Mo. Cir. Ct.) (on file with author).

220.

> The Court therefore finds that in the absence of some other evidence or indicia of abuse besides subdural hematoma, retinal bleeding and absence of cranial trauma, neither party may call a witness to give an expert opinion that the child was the victim of violent shaking; the Court further finds that an expert may not opine that a (small) subdural hematoma and retinal bleeding in an infant can only be caused by manual shaking.

Order, *supra* note 217.

221. Nevertheless, the state attempted to proceed on the theory that previously occurring injuries (i.e., a small bruise and scrape) constituted "other indicia of abuse." Telephone Interview with Kirk Zwink, Esq., Sole Practitioner, Karl Zwink Law Office (July 21, 2008). According to Kirk Zwink, who represented Kathy Hyatt, the state's evidence at trial included claimed inconsistencies in the defendant's account, as well as the expert testimony of two pediatricians. *Id.* The defendant testified and presented an expert pathologist on her behalf. After a three-day trial in January 2009, the jury returned its verdict within a half hour: not guilty. *Id.*

admissibility of the science, as well as greater pressure on judges to restrict the scope of expert testimony. If research in this area continues to erode the foundations of the diagnosis, evidentiary rulings will evolve accordingly—but only after a lag guaranteed by judicial deference to precedent, to physicians, and to the workings of the adversary system. For now, with few exceptions, if an SBS case goes to trial, juries will decide the worth of the science and the fate of the accused.

C. Jury Verdicts

Little is known about the operation of juries in shaken baby cases.[222] One national trial consultant who assists the defense in this area has estimated a conviction rate of 95%;[223] a prosecutor widely recognized as a national authority on SBS has suggested that the figure is closer to 50%;[224] and a forensic pathologist who has consulted on many hundreds of cases for the defense places the figure somewhere between the two.[225] In the absence of meaningful empirical documentation,[226] the impressionistic data of those who see the largest number of these cases—and have done so for at least a decade—becomes a helpful source of information.

Such experts in SBS trial outcomes seem to agree upon certain basic propositions. Juries continue to convict based on medical testimony about the triad of symptoms.[227] They are, however, acquitting more frequently today than ever before.[228] Although the most important predictor of an

222. "Typically, a jury verdict in a criminal case is inscrutable; the jury performs its paradigmatic function as fact finder shrouded in secrecy, and it is impossible to say why or how the jury convicted or acquitted in any given case." Julie A. Seaman, *Black Boxes*, 58 EMORY L.J. 427, 432 (2008). For reasons already discussed, the "black box" nature of the jury may well be compounded in the SBS context. *See supra* note 148 (observing that ascendance of the prosecution paradigm has gone largely unnoticed and remarking on a corresponding failure to collect data).

223. Telephone Interview with Toni Blake, *supra* note 152. As a basis for comparison, for an analysis of overall conviction rates, see Andrew D. Leipold, *Why are Federal Judges so Acquittal Prone*?, 83 WASH. U. L.Q. 151 (2005). *See also* Daniel Givelber, *Lost Innocence: Speculation and Data about the Acquitted*, 42 AM. CRIM. L. REV. 1167 (2005).

224. Telephone Interview with Brian Holmgren, *supra* note 152.

225. Telephone Interview with John Plunkett, *supra* note 41 (estimating conviction rate of 1/2 to 2/3 of cases tried).

226. The National Center on Shaken Baby Syndrome keeps no centralized database, and no other organization tracks prosecutions. The largest database containing this type of information belongs to Toni Blake, the leading trial consultant in this area. Blake's database contains over 500 SBS cases from 1997–2007. Telephone Interview with Toni Blake, *supra* note 152.

227. Where there is medical corroboration of abuse beyond the triad—*e.g.*, rib fractures, grip marks, long bone fractures, and evidence of injuries in various stages of healing—the case is often resolved by a guilty plea before trial. *See supra* note 41.

228. Telephone Interview with Toni Blake, *supra* note 152; Telephone Interview with Brian Holmgren, *supra* note 152; Telephone Interview with John Plunkett, *supra* note 41. For an account of

acquittal is the defense presentation of nationally prominent experts who challenge the science,[229] the presentation of this type of evidence still results in conviction more often than acquittal.[230] Therefore, while an increasing reliance on defense experts[231] and a growing population of such experts for defendants to draw on[232] should be expected to result in a greater number of acquittals proportionally, there is every reason to believe that SBS-based convictions will persist.

In prosecutions that rely on science to prove causation, *mens rea* and identity, how can jurors faced with genuine scientific debate as to each of these elements be convinced of guilt beyond a reasonable doubt? To make sense of this question, consider how the prosecution's burden of proof may be effectively eased, first, by the skepticism that greets the "differential diagnosis" offered by the defense experts[233] and, second, by the sheer inertial force of SBS.

The current state of the science does not typically allow the defense to identify one cause with certainty. Instead, experts provide a complex forensic analysis. From the defendant's perspective, the differential diagnosis is strategically important because it provides an alternative version of events—albeit a less definitive one—that gives jurors a different way of thinking about what happened. But the differential diagnosis is also dangerous, as it tends to functionally shift the prosecutor's burden of proving its theory of the case onto the defense.[234]

The state's winning argument to juries is this: *the defendant has not established what caused the child's death while the prosecution experts are in full agreement regarding their diagnosis. They told you what the three presenting symptoms mean—how they are caused, how much force is*

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one recent acquittal, see Wendy Davis, *Danforth Woman Found Not Guilty of First Degree Murder*, WATSEKA TIMES REPUBLIC, Mar. 3, 2009.

229. Toni Blake has also suggested that mothers are convicted at the highest rates. Telephone Interview with Toni Blake, *supra* note 152.

230. *Id.*; Telephone Interview with Brian Holmgren, *supra* note 152; Telephone Interview with John Plunkett, *supra* note 41.

231. As noted by the expert who is widely credited (or, depending on perspective, maligned) for spearheading the movement of SBS skeptics, the more doctors a defendant can afford, the greater the likelihood of an acquittal. Telephone Interview with John Plunkett, *supra* note 41. While the equity concerns raised by SBS cases are not unique to this context, they may be particularly acute where, as here, the science dictates outcomes.

232. The minority view is becoming more prevalent. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 70; Testimony of George R. Nichols in Transcript of Evidentiary Hearing (Day One) at 170, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. 2008) (No. 96 CF 555); Telephone Interview with John Plunkett, *supra* note 41; Interview with Thomas Bohan, *supra* note 78.

233. *See supra* notes 132–36 and accompanying text.

234. A specifically crafted jury instruction could explain the interplay between defense evidence of a differential diagnosis and the prosecution's burden of proof.

required, and how soon after the trauma the baby would have lost consciousness. The defense experts gave you a list of various possibilities, but admitted that they could not be sure about what happened here. And, indeed, they did not even agree amongst themselves regarding this child's death.[235]

In the *Edmunds* post-conviction hearing, where the determination for a judge was whether new scientific research would probably result in a different outcome at trial,[236] the prosecutor made this appeal: "The primary flaw [in the defendant's theory of post-conviction relief] is the fact—and it's not an opinion; it is a fact—that no one on this defense team could agree on the cause of death in this case."[237] Indeed, no defense expert testified to certainty regarding any particular theory of death.[238]

This reasoning would seem to have considerable traction with jurors.[239] Indeed, the differential diagnosis—or, from the perspective of the prosecution, "a veritable laundry list of alternative medical possibilities which are commonly proffered" by the defense[240]—has become a critical area of contention in SBS trials.[241]

The defense must concede that it cannot definitively prove a mechanism of injury.[242] According to the accused in an SBS case, testimony regarding other plausible diagnoses is important not because it definitively establishes the occurrence of a scenario other than the one

235. For sample prosecutorial closing argument in SBS case, see Holmgren, *supra* note 25, at 324–27. *See also* Attorney for the State in Transcript of Oral Argument at 89–90, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. 2008) (No. 96 CF 555) ("It might be interesting, it might be fun for the defendant to have the jury speculate, but that's not what we do in courts of law.").

236. More precisely, the court must determine "whether a reasonable probability exists that a different result would be reached at trial." *Edmunds*, 2008 WI App 33, ¶ 13, 746 N.W.2d 590, ¶ 13 (citation omitted). *See infra* Part IV.E.1.

237. Attorney for the State in Transcript of Oral Argument, *supra* note 235, at 75–76. The prosecutor reiterated this point later in the argument: "the mud balls; throw, throw, see if something sticks. Differential Diagnosis." *Id.* at 87–88.

238. *See, e.g.*, Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 71.

239. As one prosecutor has instructed, "[d]efenses are frequently focused on other possible medical explanation for the injuries. A responsive theme might be that 'arguments derived from possibilities are idle.'" Holmgren, *supra* note 25, at 288.

240. *Id.* at 314. *See id.* at 319 ("The expert who acknowledges the classic findings of SBS include subdural hematoma, retinal hemorrhage and edema, but chooses to ignore this constellation of findings in favor of an alternative hypothesis will appear foolish."); *id.* at 312–19 (discussion of "meeting untrue defenses and cross-examination of defense experts").

241. *See* Parrish, *supra* note 157, at 410 (suggesting prosecutorial strategy for dealing with defense experts' testimony regarding differential diagnosis).

242. Edmunds acknowledged as much in her post-conviction relief hearing, but argued that this burden was not properly hers: "The state says in terms of differential diagnosis, bring it home . . . . [p]rove your other causes. Well, this . . . puts the burden backwards. We don't have a burden of proving some alternative cause." Attorney for the Defense in Transcript of Oral Argument, *supra* note 115, at 141. *See id*. at 138.

hypothesized by the prosecution, but because it casts doubt on the claim that no other scenario *could* explain the symptoms.

This mode of argument tends to be deeply unsatisfying to the human psyche and, as a consequence, problematic for jury decision making. It is widely recognized that "fact finders look for stories, not just discrete nuggets of fact to fit into a set of legal rules."[243] Burdens of proof notwithstanding, a consensus that identifies a single narrative will almost invariably trump an amalgam of possibilities that challenge it.[244] In SBS cases, what the defense asks the jury to do is surmount this psychological barrier[245] and acquit.

The likelihood of this occurring is diminished by the context in which the medical dispute is presented to jurors. In a typical SBS case, as a matter of law, the prosecution must establish that the presence of retinal hemorrhages, subdural hematoma, and cerebral edema proves beyond a reasonable doubt that the defendant on trial shook the baby to death. If the science cannot bear this burden, the jury must acquit—even in the absence of a known cause.[246] The reality is quite different on the ground, where, to prevail at trial, a defendant must disprove the validity of a medical diagnosis with impressive establishment bona fides.

Until only recently, SBS had been embraced nearly unanimously by the scientific community, and it still commands the faithful adherence of a majority of physicians. To the general public, the diagnosis has come to be understood as a meaningful marker of criminality. Substance aside, these measures of acceptance serve as powerful proxies for truth, enabling jurors to discount the insights of the skeptics and the challenges raised by their research.

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243. Mary I. Coombs, *Telling the Victim's Story*, 2 TEX. J. WOMEN & L. 277, 288 (1993).

244. I have previously observed that "verdicts reflect which narrative was more persuasive to the jury." Deborah Tuerkheimer, *Recognizing and Remedying the Harm of Battering: A Call to Criminalize Domestic Violence*, 94 J. CRIM. L. & CRIMINOLOGY 959, 981 (2004).

245. This type of reasoning is "speculative," *see supra* note 235, insofar as it requires jurors to reach a verdict in the absence of a proven causal mechanism. But thus defined, where the prosecution's version of events has not been adequately established, a speculative verdict is completely appropriate, and indeed dictated by the presumption of innocence. Put differently, SBS defendants who challenge the science do not advance any particular explanation as the definitive cause of death, but, rather, insist that since a number of possibilities could have been causal, the prosecution cannot satisfy its burden of proof. The jury need not speculate that any one of the alternatives is in fact *the cause*; the very existence of alternatives negates proof of inflicted injury beyond a reasonable doubt.

246. As Edmunds's attorney argued in her post-conviction relief hearing, the "evidence is now there that undermines the state's ability to prove the mechanism and timing of death." Attorney for the Defense in Transcript of Oral Argument, *supra* note 115, at 138.

D. Insufficiency Claims

Defendants challenging the sufficiency of the evidence against them in SBS cases[247] focus on two areas of arguably deficient proof: mens rea,[248] and causation/identity.[249] While many prosecutions involve physical evidence of other abuse (i.e., beyond shaking) apart from the triad,[250] a substantial number rests solely on the presence of retinal hemorrhaging and subdural hematoma.[251] Even in this latter subcategory, courts are invariably affirming convictions.[252]

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247. Defendants may move for a judgment of acquittal based on an insufficiency of the evidence at the conclusion of the prosecution's case, after the defense has rested, and again after the jury has returned its verdict. A denial of this motion is given considerable deference, but is reviewable on direct appeal or on collateral attack. While the applicable legal standards differ, claims that a conviction rests on insufficient evidence raise similar issues across jurisdictional and procedural contexts.

248. *See* Charles A. Phipps, *Responding to Child Homicide: A Statutory Proposal*, 89 J. CRIM. L. & CRIMINOLOGY 535, 551–74 (1999) (discussing mental states associated with traditional homicide statutes used to prosecute defendants under SBS theory). For a sampling of cases from just this past year, see, e.g., Mitchell v. State, No. CACR 07-472, 2008 Ark. App. LEXIS 98 (Ark. Ct. App. Feb. 6, 2008); People v. Lemons, No. 273058, 2008 Mich. App. LEXIS 387 (Mich. Ct. App. Feb. 26, 2008); State v. Gilbert, No. M2007-00260-CCA-R3-DC, 2008 Tenn. Crim. App. LEXIS 326 (Tenn. Crim. App. Apr. 8, 2008).

249. *See, e.g.*, U.S. v. Dimberio, 56 M.J. 20 (C.A.A.F. 2001); State v. Cort, 766 A.2d 260 (N.H. 2000). *See also infra* notes 257–68.

250. *See, e.g.*, People v. Frank, No. A109619, 2007 Cal. App. Unpub. LEXIS 3777 (Cal. Ct. App. May 10, 2007); People v. Heredia, No. A112828, 2007 Cal. App. Unpub. LEXIS 9537 (Cal. Ct. App. Nov. 28, 2007); Moore v. State, 656 S.E.2d 796 (Ga. 2008); State v. Hollins, 981 So. 2d 819 (La. Ct. App. 2008); State v. Hill, 250 S.W.3d 855 (Mo. Ct. App. 2008); State v. Batich, No. 2006-A-0031, 2007 Ohio App. LEXIS 2127 (Ohio Ct. App. May 11, 2007); Commonwealth v. Hardy, 918 A.2d 766 (Pa. Super. Ct. 2007); State v. Sweet, No. E2007-OD202-CCA-R3-PC, 2008 Tenn. Crim. App. LEXIS 280 (Tenn. Crim. App. Apr. 15, 2008); Hammond v. State, No. 2-06-417-CR, 2008 Tex. App. LEXIS 969 (Tex. Ct. App. Feb. 7, 2008).

While this Article is largely concerned with triad-based SBS prosecutions, it bears mentioning that even cases involving proof apart from the triad may be problematic. Some physical evidence is of questionable corroborative value. *See, e.g.*, People v. Montgomery, No. 269957, 2007 Mich. App. LEXIS 2412 (Mich. Ct. App. Oct. 23, 2007) (bruise on right temple). Moreover, even where the physical evidence clearly indicates abuse, the identity of the perpetrator may be disputed. *See, e.g.*, People v. Garcia, No. H023327, 2003 Cal. App. Unpub. LEXIS 3479 (Cal. Ct. App. Apr. 7, 2003). In *Garcia*, the defense expert testified to preexisting injuries unrelated to head trauma. *Id.* at *10. He "agreed that [the baby] was a battered child, that his injuries were nonaccidental, and that his death was a homicide. But he believed that it was impossible to determine with medical certainty whether the injuries that caused his death occurred shortly before the time of death or whether death resulted from complications from earlier patterns of injuries." *Id.* Finally, reliance on perpetrator "confessions" to prove guilt may be misplaced. *See supra* Part IV.A.2

251. *See, e.g.*, People v. Jackson, No. D049865, 2007 Cal. App. Unpub. LEXIS 9866 (Cal. Ct. App. Dec. 6, 2007); Middleton v. State, 980 So. 2d 351 (Miss. Ct. App. 2008).

252. In the past year, the only court to reverse an SBS conviction did so because the defendant was denied effective assistance of counsel. In *Schoonmaker*, the New Mexico Supreme Court noted that "[e]xpert testimony was critical to the defense to call into question the State's expert opinions that [the child's] injuries could only have been caused by shaking of a violent nature." State v. Schoonmaker, 176 P.3d 1105, 1113 (N.M. 2008). Based on the testimony of defense experts in other

Deference to the fact-finding functions of juries translates into a legal regime generally hostile to insufficiency arguments.[253] In the evidentiary context, this judicial deference is exercised at the front-end of the trial process; here it comes at the back-end, after the prosecution has rested, after the defense has rested, and/or after the jury has returned its guilty verdict.[254] The governing standard on appeal is "whether, considering the evidence in a light most favorable to the prosecution, *any* rational trier of fact could have found the essential elements of the offense charged beyond a reasonable doubt."[255] It is thus to be expected that defendants rarely persuade courts to overturn SBS-based convictions on sufficiency grounds.[256]

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cases and published scientific research, the court found that "disagreement exists in the medical community as to the amount of time between when injuries occur and when the child becomes symptomatic, and whether injuries like [the child's] can be caused by short-distance falls. . . ." *Id.* at 1114. It was clear, therefore, that the defendant's failure to call experts to testify on his behalf was due not to the absence of supporting science, but to poverty. *Id.* at 1113–16. In a remarkable opinion, the court concluded that because of the trial courts' role in "deny[ing] counsel access to the necessary funding," the defendant was entitled to a new trial. *Id.* at 1114.

In another appeal based on ineffective assistance, the Utah Supreme Court in 2007 reversed a murder conviction based on defense counsel's failure to retain a qualified expert to examine CT scans of the infant's injuries. State v. Hales, 152 P.3d 321 (Utah 2007). In *Hales*, SBS was diagnosed based on brain swelling and retinal hemorrhages. *Id.* at 326. According to the State's expert, these injuries could only have been caused by violent shaking which would have caused immediate unconsciousness with no possibility of a lucid interval. *Id.* at 329. In support of his motion, the defendant submitted the affidavit of a pediatric neuroradiologist stating that, based upon his (post-conviction) review of the CT scan, it would have been impossible for trauma to have occurred during the time period in which the defendant was with the baby. *Id.* In response to the court's ruling, the state determined that there was insufficient evidence to proceed with further prosecution. Stephen Hunt, *New Evidence Frees Inmate in Murder Case*, SALT LAKE TRIBUNE, June 16, 2007.

253. "The basic problem seems to be that judges to not want to look as though they are abrogating the role of the jury as trier of fact. The legal sufficiency of evidence is, technically, a question of law, but it looks and sounds like a judgment on the weight of the evidence—it *is* a judgment on the weight of the evidence, only an extreme one." Samuel R. Gross, *Substance & Form in Scientific Evidence: What Daubert Didn't Do*, *in* REFORMING THE CIVIL JUSTICE SYSTEM 234, 252 (Larry Kramer ed., 1996).

254. *See supra* note 247 (detailing procedural postures of various types of sufficiency challenges).

255. State v. Gilbert, No. M2007-00260-CCA-R3-CD, 2008 Tenn. Crim. App. LEXIS 326 (Tenn. Crim. App. Apr. 8, 2008) (citations omitted).

256. In the rare instance where an appellate court has reversed a SBS conviction, it has done so on other grounds. *See, e.g.*, United States v. Gaskell, 985 F.2d 1056 (11th Cir. 1993) (prejudicial in-court shaking demonstration with baby doll); People v. Basuta, 94 Cal. App. 4th 370 (Cal. Ct. App. 2001) (evidentiary); Andrews v. State, 811 A.2d 282 (Md. 2002) (same); State v. Maze, No. M2004-02091-CCA-R3-CD, 2006 WL 1132083 (Tenn. Crim. App. Aug. 28, 2006) (failure to instruct on lesser-included charges); *Schoonmaker*, 176 P.3d 1105 (ineffective assistance of counsel); Caban v. State, No. 5D08-279, 2009 WL 722049 (Fla. Dist. Ct. App. Mar. 20, 2009) (improper impeachment of defense expert).

Shirley Ree Smith may be the only defendant to succeed in doing so.[257] Her case is extraordinary, particularly because the procedural context in which the claim arose—an appeal of a denial of Smith's federal habeas petition—makes the result exceedingly unlikely.

In certain respects, the facts of *Smith* diverge from the paradigmatic SBS pattern. The defendant was the child's grandmother.[258] The medical evidence showed an absence of retinal bleeding.[259] Most significantly, pathologists found "no swelling, and only a small, non-fatal amount" of subdural and subarachnoid bleeding.[260]

But in other ways, the facts share important similarities with the typical triad-only SBS prosecution. No bruises on the body, fractures, or grip marks were present.[261] The accused claimed to have discovered the infant in a nonresponsive state.[262] The "discrepant history" was considered evidence of guilt.[263] The prosecution experts' testimony was "absolutely critical to its case."[264]

Even under the highly deferential standard mandated on federal habeas review,[265] a three-judge panel of the Ninth Circuit concluded that this evidence was insufficient to sustain a guilty verdict: "There was simply no

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257. I reach this conclusion based on a thorough search of the LEXIS database and my conversations with leaders on both sides of nationwide litigation efforts.

258. As the court remarked,

> [t]his is not the typical shaken baby case. Grandmothers, especially those not serving as the primary caretakers, are not the typical perpetrators. Further, Petitioner was helping her daughter raise her other children (a 2-year-old and a 14-month-old) and there was no hint of Petitioner abusing or neglecting these other children, who were in the room with [the baby] when he died.

Smith v. Mitchell, 437 F.3d 884, 889 (9th Cir. 2006).

259. *Smith*, 437 F.3d at 887. Notwithstanding this observation, it is important to note that SBS-based convictions in the absence of retinal hemorrhages are routinely affirmed on appeal. *See, e.g.*, People v. Jackson, No. D049865, 2007 Cal. App. Unpub. LEXIS 9866 (Cal. Ct. App. Dec. 6, 2007); State v. Humphries, No. 06CA00156, 2008 Ohio App. LEXIS 315 (Ohio Ct. App. Feb. 4, 2008).

260. *Smith*, 437 F.3d at 887.

261. The only external injury was "recent small abrasion, approximately 1/16 by 3/16 of an inch, on the lower skull, upper neck region, and a recent bruise beneath this abrasion." *Id.*

262. *Id.* at 886.

263. Smith apparently told police that she had given the baby a "jostle" to rouse him and responded, "Oh my God, Did I do it?" to a social worker when informed that the baby had died of shaking. *Id.* at 889 n.11.

264. *Id.* at 890.

265. *Jackson v. Virginia*, requires courts to determine whether "after viewing the evidence in the light most favorable to the prosecution, *any* rational trier of fact could have found the essential elements of the crime beyond a reasonable doubt." Jackson v. Virginia, 443 U.S. 307, 319. The Antiterrorism and Effective Death Penalty Act (AEDPA) even more "severely restricts" the scope of review of state court decisions, as it "mandates that [courts] apply the standards of *Jackson* with an additional layer of deference . . . and only grant habeas relief where the state court's adjudication of a *Jackson* claim is objectively unreasonable." Smith v. Mitchell, 453 F.3d 1203, 1203–06 (9th Cir. 2006) (Bea, J., dissenting) (internal citation omitted).

demonstrable support for shaking as the cause of death . . . . [T]here has very likely been a miscarriage of justice in this case."[266]

The court's reasoning in this regard is instructive on when a deficiency in proof rises to the level requiring reversal:

> All of the prosecution witnesses based their opinion of Shaken Baby Syndrome on their hypothesis that violent shaking had torn or sheared the brain stem in an undetectable way[[267]] . . . . [A]nd they reached this conclusion because *there was no evidence in the brain itself of the cause of death*. Thus . . . the tearing might have occurred or it might not have occurred; there simply was no evidence to permit an expert conclusion one way or the other on the point. This is simply not the stuff from which guilt beyond a reasonable doubt can be established . . . .[268]

The improbability of a court substituting its view of the sufficiency of the evidence for the jury's in this manner—and of that ruling being left intact—is indicated by *Smith*'s highly unusual procedural path. The defendant's conviction was affirmed by the state appellate court.[269] The California Supreme Court denied review.[270] The federal magistrate judge recommended that the habeas petition be denied and the district court denied the petition.[271] After the three-judge panel reversed this denial and the full court voted to deny a petition for rehearing en banc, a number of

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266. *Smith*, 437 F.3d at 890. "With all due respect to the California Court of Appeal, and even with the additional layer of deference mandated by AEDPA, we conclude that the Court of Appeal unreasonably applied *Jackson* when it held the evidence to be sufficient to convict Smith of causing [the child's] death." *Id.*

267. *See infra* note 268 (further discussing disputed significance of lack of visible shearing in brain stem).

268. *Smith*, 437 F.3d at 890. A number of Ninth Circuit judges criticized the panel for "adopt[ing] the defense experts' view of what physical evidence is necessary to support a valid diagnosis of shaken baby syndrome." *Smith*, 453 F.3d at 1207 (Bea, J., dissenting). The judges who would have affirmed Smith's conviction had a very different view of the evidence against her:

> The physicians called by the prosecution reached their conclusion *despite* the lack of visible shearing, not because of it, and explained why. Indeed, what provided the basis for the doctors' opinions was the evidence of recent trauma to [the child's] brain: (1) the subdural hemorrhaging; (2) the subarachnoid hemorrhaging; (3) the hemorrhaging around the optic nerves; (4) the blood clot between the hemispheres of [the child's] brain; and (5) the bruise and abrasion at the lower back of [the child's] head. The prosecution's experts considered and rejected other causes of [the child's] death . . . . Since none of these alternate theories explained [the child's] death, the prosecution's doctors opined that [he] died from violent shaking, as evidenced by the trauma.

Id. at 1206.

269. *Id.*

270. *Id.*

271. *Id.*

judges wrote to dissent bitterly.[272] The United States Supreme Court then granted *certiorari*, vacated the judgment, and remanded the case for further consideration[273] in light of a recent decision elaborating on the standard applicable to federal habeas review of a state court affirmance of conviction.[274] After the Ninth Circuit reinstated its earlier judgment and opinion,[275] the state once again petitioned the Supreme Court for review.[276] This petition is currently pending as this Article goes to print.[277]

Now compare *Smith* to the far more typical case of Drancy Deshann Jackson, whose conviction was recently affirmed on direct appeal by a California court.[278] Jackson is currently serving a prison term of thirteen years for felony child abuse.[279] The medical evidence consisted of subdural hemorrhaging and diffuse brain swelling—no retinal hemorrhages, no other injuries—which prosecution experts diagnosed as

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272. *Id.* ("[T]he opinion is inaccurate."); *id.* at 1207–08 ("Under our court's approach, a federal court of appeals may, effectively, set aside an expert opinion where it conflicts with the views of the other side's experts.").

273. Patrick v. Smith, 550 U.S. 915 (2007).

274. Carey v. Musladin, 549 U.S. 70 (2006).

275. Smith v. Patrick, 508 F.3d 1256 (9th Cir. 2007). The court's rationale for reinstating the opinion is emphatic:

> Nothing in the State's failure of evidence takes this case out of the class of cases subject to the test of *Jackson.* Unlike *Musladin* . . . this case presents merely one more instance where the evidence presented by a state is wholly insufficient to permit a constitutional conviction. *Jackson* makes clear that such cases cannot constitutionally stand if the evidence was insufficient "to convince a trier of fact beyond a reasonable doubt of the existence of every element of the offense." . . . *Jackson* makes clear that a conviction is unconstitutional even if there is *some* evidence of guilt when all of the evidence, viewed in the light most favorable to the prosecution, does not permit any rational fact-finder to find guilt beyond a reasonable doubt. Smith's case accordingly falls squarely within *Jackson*. Moreover, the prosecution's evidence falls so far short that it was unreasonable for the state appellate court to conclude that it met the *Jackson* standard.

Id. at 1258–59 (citations omitted).

276. Petition for Writ of Certiorari, Patrick v. Smith, No. 07-1483 (9th Cir. May 27, 2008).

277. Whether the Court decides to review the case may depend on its assessment of the following reasoning advanced by the Ninth Circuit:

> It is true, of course, that the Supreme Court has never had a case where the issue was whether the evidence, expert and otherwise, was constitutionally sufficient to establish beyond a reasonable doubt that a defendant had shaken an infant to death. But there are an infinite number of potential factual scenarios in which the evidence may be insufficient to meet constitutional standards. Each scenario theoretically could be construed artfully to constitute a class of one. If there is to be any federal habeas review of constitutional sufficiency of the evidence as required by *Jackson*, however, [AEPDA] cannot be interpreted to require a Supreme Court decision to be factually identical to the case in issue before habeas can be granted on the ground of unreasonable application of Supreme Court precedent. The Supreme Court does not interpret AEDPA in such a constrained manner.

Smith v. Patrick, 508 F.3d at 1259.

278. People v. Jackson, No. D049865, 2007 Cal. App. Unpub. LEXIS 9866 (Cal. Ct. App. Dec. 6, 2007).

279. *Id.* at *1.

SBS.[280] The defendant's account—that the baby fell from the couch where he had been propped with a bottle—was dismissed as "inconsistent" with the observed symptoms.[281]

The defense presented evidence that Jackson was an "excellent parent who never abused or hit his children or any other child for whom [he] was the caretaker."[282] The baby's pediatrician testified that "there was no evidence [the baby] had been abused" prior to the incident in question.[283] The sole defense expert, a biomechanical engineer, questioned the scientific basis for SBS.[284] Citing research showing that short-distance falls can cause subdural hematomas, he also noted "that it was an open question whether an earlier injury could make the child more susceptible to injury from a second fall."[285]

Applying the familiar standard of review,[286] the appellate court determined that:

> [t]he conflict among the experts' opinions . . . did not render the evidence insufficient. . . . In finding [against the defendant], the jury necessarily rejected his experts' contention . . . . The credibility and weight of the expert testimony was for the jury to determine, and it is not up to us to reevaluate it. The jury could reasonably believe the evidence of the prosecution witnesses and reject that of the defense witness.[287]

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280. *Id.* at *4–5. Other prosecutions have gone forward on the basis of subdural hematomas alone. *See, e.g.*, People v. Collier, No. A120808, 2009 WL 389721 (Cal. Ct. App. Feb. 18, 2009) (affirming conviction). Prosecutors have also proceeded on the basis of retinal hemhorrages (without subdural hematoma). *See, e.g.*, Hess v. Tilton, No. CIV S-07-0909, 2009 WL 577661 (E.D. Cal., Mar. 5, 2009) (affirming conviction).

281. *Jackson*, 2007 Cal. App. Unpub. LEXIS 9866, at *13.

282. *Id.* at *8.

283. *Id.*

284. *Id.* at *5–6.

285. *Id.* at *6.

286. The standard was described in *Jackson* as follows:

> When reviewing a claim attacking the sufficiency of the evidence to support a conviction, the question we ask is "whether, after viewing the evidence in the light most favorable to the prosecution, *any* rational trier of fact could have found the essential elements of the crime beyond a reasonable doubt." As an appellate court, we "'must view the evidence in a light most favorable to respondent and presume in support of the judgment the existence of every fact the trier could reasonably deduce from the evidence.'" . . . A conviction will not be reversed for insufficient evidence unless it appears "that upon no hypothesis whatever is there sufficient substantial evidence to support [the conviction]." . . . "If the circumstances reasonably justify the trier of fact's findings, the opinion of the reviewing court that the circumstances might also be reasonably reconciled with a contrary finding does not warrant a reversal of the judgment."

Id. at *9–10 (citations omitted).

287. *Id.* at *13 (citations omitted).

As the reasoning of the *Jackson* court evinces, the legal framework governing sufficiency challenges seems to virtually preordain this result.[288] Credibility determinations are within the province of the jury; when the testimony of defense experts is rejected, that rejection must be afforded deference by the appeals court. Provided that the prosecution experts testify in a manner that reasonably justifies a finding of guilt, the conviction is affirmed.[289]

In short, a conflict in expert opinions is functionally irrelevant to the disposition of sufficiency challenges. Given this, the legal landscape will not be appreciably altered by a louder chorus of SBS skeptics, but by continued movement in this direction on the part of the SBS faithful. If the testimony of *prosecution* experts comes to reflect the scientific limitations of a triad-based diagnosis of abuse, a court may well conclude that evidence of SBS is "not the stuff from which guilt beyond a reasonable doubt can be established. . . ."[290]

Even in the midst of continued scientific controversy, this judicial shift may yet occur.[291] Despite deep tensions within the competing opinions,[292] *Smith* suggests that the trial record must contain evidence of a sufficient quantum and caliber. According to the Ninth Circuit, habeas relief was warranted because "[a]n expert's testimony as to a *theoretical conclusion or inference* does not rescue a case that suffers from an underlying

288. For a recent example of this phenomenon, see Thomas v. State, No. 03-07-00646-CR, 2009 WL 1364348, at *7 (Tex. App. May 14, 2009) ("Sharply conflicting evidence was presented regarding the scientific basis of shaken baby syndrome and, consequently, the diagnosis of the State's witnesses . . . . Once admitted, this conflicting evidence presents an issue for the jury to resolve."). The same is true of manifest weight challenges. *See* State v. Humphries, No. 06CA0015b, 2008 Ohio App LEXIS 315, at *23–24 (Ohio Ct. App. Feb. 4, 2008) ("[A] conviction is not against the manifest weight of the evidence solely because the jury heard inconsistent testimony.") (internal quotations omitted). In *Humphries*, the court affirmed the child endangerment conviction of Latasha Humphries for the death of her child, whose SBS diagnosis was based on subdural hematoma and cerebral edema alone. *Id.* at *12. Humphries was identified as the perpetrator based on a perceived impossibility of a lucid interval, as well as the defendant's "fail[ure] to provide a reasonable explanation for [the child's] injuries. . . ." *Id.* at *22. Only one expert testified on behalf of the defendant. *Id.* at *2. *See supra* note 231 (noting significance of presenting more than one expert). The opinion references marijuana use, *Humphries*, 2008 Ohio App. Lexis, at *5, the defendant's status as an unmarried mother, and the impoverished environment in which the child was being raised (*e.g.*, "dingy one piece pajamas," crib missing one side, *id*. at *9–10)—factors which may well have disadvantaged Humphries at trial and on appeal.

289. As Samuel Gross has observed in the civil context, "traditionally courts have held that the testimony of any qualified expert is sufficient to sustain a verdict on any issue on which she testified." Gross, *supra* note 253, at 252.

290. Smith v. Mitchell, 437 F.3d 884, 890 (9th Cir. 2006).

291. In what may indicate an overall trend in this direction, trial consultant Toni Blake noted that, in 2007, "'we saw one of these cases overturned about once a month.'" Anderson, *supra* note 55.

292. *See supra* notes 268, 272 and accompanying text.

insufficiency of evidence to convict beyond a reasonable doubt."[293] But the "absence of evidence"[294] cited by the court—an absence which "cannot constitute proof beyond a reasonable doubt"[295]—is, more precisely, an absence of evidence worthy of conviction. Identifying the qualitative judgment embodied in this determination is not to indict it. After all, even the "rational trier of fact" to whom courts are deferring must have certain standards.[296] In triad-only SBS cases, judges willing to assess the value of the state's evidence, as the court did in *Smith*, may conclude that an absence of evidence has convicted others.

E. Post-Conviction Proceedings

1. Edmunds

In early 2007, the judge who presided over Audrey Edmunds's trial over a decade earlier conducted a five-day evidentiary hearing in support of her motion for a new trial based on newly discovered evidence. The defense experts[297] testified that, since the mid-1990s, "significant research has undermined the scientific foundations for SBS, creating substantial challenges to matters that were nearly universally accepted in the medical community at the time of Edmunds's trial."[298]

According to the defense experts, a still-emerging body of literature had cast new doubt on previously accepted medical dogma.[299] Now in dispute: whether shaking alone can cause the constellation of injuries associated with SBS;[300] whether a specific mechanism for the injuries (i.e., shaking) can be accurately identified;[301] whether considerable force, as opposed to a minor impact, is necessary to cause the injuries associated with the syndrome;[302] whether previously unrecognized mimics of child abuse can cause the triad of symptoms said to be pathognomonic of

293. *Smith*, 437 F.3d at 890 (emphasis added).
294. *Id.*
295. *Id.*
296. *Id.* at 885.
297. The following physicians testified as experts for the defense: the chief of pediatric neuroradiology at Stanford's Children's Hospital; the former Chief Medical Examiner for Kentucky; a forensic pathologist; a pediatrician; an ophthalmologist; and the autopsy pathologist who testified at Edmunds's trial as a prosecution witness. Transcript of Evidentiary Hearing (Days One and Two), State v. Edmunds, 746 N.W.2d 590 (2008) (No. 96 CF 555).
298. Brief of Defendant, *supra* note 4, at 11.
299. *Id.* at 3 ("[T]he science that sent Audrey Edmunds to prison did not stand still.").
300. *Id.* at 13–16.
301. *Id.*
302. *Id.* at 20.

abusive head trauma;[303] and whether the occurrence of the type of head trauma leading to serious brain damage inevitably causes immediate unconsciousness.[304]

The defense experts testified that "in 1996 they themselves would have testified as the State's experts had at Edmunds's trial,"[305] but the evolving science had changed their opinions as to the likely cause of death.[306] In short, the scientific foundation for concluding beyond a reasonable doubt that Edmunds had shaken Natalie Beard to death was no longer intact.[307] The near unanimity that once characterized the medical establishment's understanding of SBS had been shattered.[308] Yet no new medical accord had been reconstituted in its place.[309] Against this disquieting backdrop, Audrey Edmunds's new trial motion was decided.

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303. *Id.* at 16–20.

304. *Id*. at 20–23.

305. *Id.* at 11.

306. Regarding the particular circumstances of Natalie's death, the defense experts testified that the evidence upon which Edmunds was convicted had been undermined by a number of scientific developments: studies using biomechanical models, animal models, and computer simulations suggested that Natalie's brain injuries could not have been caused by shaking alone; even if Natalie's death were caused by trauma (i.e., impact), considerably less force than previously suspected could have caused her injuries; new research had uncovered a number of causes of the retinal hemorrhages which, at trial, were said to conclusively prove that Natalie had been shaken; emerging science revealed that chronic subdural hematomas—like the one discovered at Natalie's autopsy—may re-bleed with little precipitation, causing further brain injury; the differential diagnosis (a range of possible explanations for Natalie's injuries other than abusive head trauma) had evolved considerably in recent years; and, finally, the evidence thought to be dispositive on the timing of injuries was contradicted by a number of "lucid interval" studies, undermining past certainty that Natalie was injured during the hour that she was in Edmunds' care. *Id.* at 14–23.

307. The appellate court summarized the evidentiary record of the post-conviction hearing as follows:

> Edmunds presented evidence that was not discovered until after her conviction, in the form of expert medical testimony, that a significant and legitimate debate in the medical community has developed in the past ten years over whether infants can be fatally injured through shaking alone, whether an infant may suffer head trauma and yet experience a significant lucid interval prior to death, and whether other causes may mimic the symptoms traditionally viewed as indicating shaken baby or shaken impact syndrome. Edmunds could not have been negligent in seeking this evidence, as the record demonstrates that the bulk of the medical research and literature supporting the defense position, and the emergence of the defense theory as a legitimate position in the medical community, only emerged in the ten years following her trial.

State v. Edmunds, 2008 WI App 33, ¶ 15, 746 N.W.2d 590, ¶ 15.

308. Even the state's experts acknowledged, to varying degrees, that scientific consensus about SBS had changed since the mid-1990s. *See* State v. Edmunds, No. 96 CF 555, slip op. at 7 (Wis. Cir. Ct. Mar. 29, 2007) ("Expert witnesses on both sides now indicate that research about Shaken Baby Syndrome has evolved . . . ."); *supra* Part III.B.

309. The defense experts maintained that Natalie's death was caused by some combination of violent shaking and impact, and that this trauma could only have been inflicted immediately prior to the onset of unmistakable and severe neurological damage. Brief Plaintiff-Respondent at 35–37, State v. Edmunds, 746 N.W. 2d 590 (Wis. Ct. App. 2008) (No. 2007AP000933) [hereinafter "State's brief"].

While expressly acknowledging that "[s]tanding alone and unchallenged, the defense witnesses provide[d] a sufficient evidentiary basis to order a new trial based upon newly discovered medical evidence,"[310] the trial judge denied the motion. But an appellate court reversed this decision and concluded that there was a reasonable likelihood that a different result would be reached at a new trial.[311]

In a remarkable opinion without judicial precedent, the court noted the "shift in mainstream medical opinion since the time of Edmunds's trial."[312] While there were "now competing medical opinions as to how Natalie's injuries arose and . . . the new evidence does not completely dispel the old evidence,"[313] the court was persuaded that "the emergence of a legitimate and significant dispute within the medical community as to the cause of those injuries that constitutes newly discovered evidence."[314] According to the appeals court,

> [at trial,] the State was able to easily overcome Edmunds's argument that she did not cause Natalie's injuries by pointing out that the jury would have to disbelieve the medical experts in order to have a reasonable doubt as to Edmunds's guilt. Now, a jury would be faced with competing credible medical opinions in determining whether there is a reasonable doubt as to Edmunds's guilt. Thus, we conclude

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310. *Edmunds*, No. 96 CF 555, slip op. at 6 (Wis. Cir. Ct. Mar. 29, 2007). Nevertheless, the court engaged in a deliberate balancing of the defense evidence against the evidence offered by the state in rebuttal. After having "look[ed] at all the evidence from the trial as well as the evidence presented by both sides on defendant's motion for a new trial," it concluded that "[t]he newly discovered evidence presented by the defense is significantly outweighed by the evidence presented by the prosecution." *Id.* at *10–11.

311. The appellate court held that the trial judge had incorrectly applied the law, and that this error constituted an abuse of discretion:

> After determining that both parties presented credible evidence, it was not the court's role to weigh the evidence. Instead, once the circuit court found that Edmunds's newly discovered medical evidence was credible, it was required to determine whether there was a reasonable probability that a jury, hearing all the medical evidence, would have a reasonable doubt as to Edmunds's guilt. This question is not answered by a determination that the State's evidence was stronger. . . . [A] jury could have a reasonable doubt as to a defendant's guilt even if the State's evidence is stronger.

Edmunds, 2008 WI App 33, ¶ 18, 746 N.W. 2d 590, ¶ 18. Noting that the trial judge had already made its credibility determinations, the appeals court proceeded to apply the correct legal standard itself rather than remand the case. *Id.* ¶ 19. On April 14, 2008, Wisconsin Supreme Court denied the petition for review. State v. Edmunds, 749 N.W.2d 663 (Wis. 2008).

312. *Edmunds*, 2008 WI App 33, ¶ 23, 746 N.W.2d 590, ¶ 23.

313. *Id.* "Indeed, the debate between the defense and State experts reveals a fierce disagreement between forensic pathologists, who now question whether the symptoms Natalie displayed indicate intentional head trauma, and pediatricians, who largely adhere to the science as presented at Edmunds's trial." *Id.*

314. *Id.*

> that the record establishes that there is a reasonable probability that a jury, looking at both the new medical testimony and the old medical testimony, would have a reasonable doubt as to Edmunds's guilt.[315]

Audrey Edmunds was granted a new trial.[316] Months later, all charges against her were dismissed.[317]

2. Beyond Edmunds

Enormous procedural and substantive hurdles confront defendants at the post-conviction stage.[318] Although the law differs depending on jurisdiction, a number of generalizations can be made about the SBS defendant's burden of proof. Put simply, there are tensions between the governing framework for collateral relief and the issues presented by SBS cases.[319] These strains were nicely illustrated by the state's arguments against post-conviction relief in *Edmunds*.

First, the evidence presented at the post-conviction stage must be deemed new, or "discovered" after the trial.[320] One problem for the

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315. *Id*.

316. *Id*.

317. On July 11, 2008, the state announced its decision to dismiss charges against Edmunds. Ed Trevelen, *Citing Wishes of Baby's Parents, Prosecutors Won't Retry Edmunds*, WIS. STATE J., July 11, 2008.

318. This discussion is confined to newly discovered evidence claims, which are most relevant to SBS cases given the trajectory of the underlying science. "[E]very state currently permits at least some form of post-trial relief on the basis of newly discovered evidence." Daniel S. Medwed, *Up the River Without a Procedure: Innocent Prisoners and Newly Discovered Non-DNA Evidence in State Courts*, 47 ARIZ. L. REV. 655, 659 (2005) (citing 1 Donald E. Wilkes, Jr., State Postconviction Remedies and Relief: With Forms, 1–13, at 55–58 (2001) (all states provide a direct remedy in the form of a new trial motion based on newly discovered evidence). Newly discovered evidence "represents a ground for relief through the principal state post-conviction remedies in thirty-two states." *Id.* at 682.

Apart from *Edmunds*, I am aware of only two SBS cases where post-conviction relief was granted. In each, murder charges were ultimately dismissed, albeit on somewhat different grounds. One defendant's conviction was overturned in 2004 based on the discovery of flaws in the autopsy. *Dad Freed from Life Sentence in Son's Death*, ORLANDO SENTINEL (Fla.), Aug. 28, 2004, at A1, *available at* http://articles.mercola.com/sites/articles/archive/2004/09/18/yurko-case.aspx. That same year, charges against another defendant were dismissed by a newly elected District Attorney after an extensive review of "new evidence that point[ed] to reasonable doubt." Maura Dolan, *Fatal Abuse or Tragedy Compounded?*, L.A. TIMES, June 16, 2006, at A1.

319. I focus here on the legal standards applicable to these claims, as opposed to the formidable procedural barriers to collateral relief. These barriers have been criticized by Professor Daniel Medwed, who has proposed reforms targeted at greater systemic embrace of newly discovered non-DNA evidence, including abolishing statute of limitations, allowing innocence claims to be heard by a new judge, and creating a de novo standard of appellate review for summary dismissals of newly discovered evidence motions. Medwed, *supra* note 318, at 686–715.

320. *Edmunds*, 2008 WI App 33, ¶ 13, 746 N.W.2d 590, ¶ 13. Related to this is the requirement that the defendant's failure to discover the evidence is not the result of negligence, which raises issues

defense is that the proffered evidence is less definitive than past "scientific improvement[s]"[321]—DNA typing, primarily.[322] In *Edmunds*, the prosecutor underscored this point: the defense could offer no "bone test . . . [that] would tell us whether that infant was . . . the subject of [shaking-inflicted] brain injury."[323] Instead, the evidence was described as "an academic debate among medical experts,"[324] and one the prosecution characterized as ongoing at the time of the trial in order to negate a showing of "newness."[325] For instance, the article widely recognized as the "classic that really set this all in motion about doubting shaking,"[326] was published in 1987,[327] and a small number of scientists were already questioning the basis for SBS in the early 1990s.[328] The state thus argued that "[t]he debate . . . was fully engaged" at the time of trial.[329] Although the court rejected this characterization,[330] future defendants collaterally attacking their convictions may have greater difficulty satisfying the "newly discovered" requirement if the evidence offered as "new" at the post-conviction stage was more fully developed when the trial occurred.[331]

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similar to those presented by the "newly discovered" standard. *Id. See infra* notes 323–33 and accompanying text.

321. Attorney for State in Transcript of Oral Arguments (Day 5) at 69, State v. Edmunds, 746 N.W.2d 590 (Wis. Cir. Ct. Mar. 8, 2007) (No. 96 CF 555).

322. Defendants making newly discovered evidence motions face impediments to relief that are very much situated against the backdrop of DNA exonerations. *See infra* notes 343–50 and accompanying text (DNA as paradigm of newly discovered evidence).

323. Attorney for State in Transcript of Oral Arguments, *supra* note 321, at 69.

324. State's brief, *supra* note 309, at 17. *Compare id.* at 17 ("Edmunds' newly discovered evidence claim is a 'non-starter' because, despite two days of expert testimony, she failed to present clear and convincing evidence of anything 'new' here.") *with* Defendant's brief, *supra* note 4, at 35–36 ("The new evidence demonstrates that the scientific basis for SBS theory is under serious challenge.").

325. State's brief, *supra* note 306, at 18–22.

326. Barnes testimony, Evidentiary Hearing (Day One), *supra* note 71, at 97 (referencing Duhaime study, *supra* note 120).

327. Duhaime, *supra* note 120.

328. At least one physician, Dr. John Plunkett, has been doing so for decades. Telephone Interview with John Plunkett, *supra* note 41; Interview with Thomas Bohan, *supra* note 78.

329. State's brief, supra note 309, at 21.

330. "While there may have been strands of disagreement about Shaken Baby Syndrome present in 1996, studies, research, debate and articles about the concept have grown exponentially since the trial . . . . All the defense experts indicated they would have agreed with the prosecution's theory if they had been testifying in 1996." State v. Edmunds, No. 96 CF 555, slip op. at 6 (Wis. Cir. Ct. Mar. 29, 2007). The appellate court affirmed this aspect of the ruling. *See supra* note 307.

331. Edmunds, unlike most defendants requesting post-conviction relief, was also able to point to the fact that the autopsy pathologist retracted important portions of his trial testimony. *See* Defendant's brief, *supra* note 4, at 24 ("Perhaps most significantly, Dr. Huntingon retracted key parts of his 1996 testimony—both on the certainty that Natalie was shaken, and the assessment that there could have been no significant lucid interval."); *supra* note 115 (explaining basis for Huntington's conversion).

Second, the evidence must be material to the case and not merely cumulative.[332] The prosecution in *Edmunds* asserted that the "academic debate" about SBS was "beside the point":[333] theoretical disagreements about whether shaking alone could cause death and whether the triad alone was pathognomonic of abuse were irrelevant to Edmunds's conviction, given the severity of the infant's injuries.[334] The court could dispense with this argument in short order,[335] given that the prosecution fell squarely within the SBS paradigm—the cause of death was said to be forceful shaking, the diagnosis was made on the basis of the classic triad,[336] and the perpetrator was identified based on the impossibility of a lucid interval.[337] But given the current state of scientific research, which (unlike DNA[338]) cannot conclusively establish a defendant's innocence, deviations from this prototypical fact pattern will tend to undermine the defendant's materiality claim.

Finally, the evidence must probably have resulted in a different verdict at trial.[339] This is the most difficult burden for the defense,[340] and was predictably the greatest area of contention in the *Edmunds* post-conviction relief proceedings.[341] The defense argued to the court that, at trial,

> [t]he jury never had any reason to doubt that diagnosis of shaking, with or without impact, and nearly immediate collapse was unassailable as medical evidence. This is simply no longer true . . . . [T]his new evidence of evolving science that rigorously challenges

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332. *Edmunds*, 2008 WI App 33, ¶ 13, 746 N.W.2d 590, ¶ 13.

333. State's brief, *supra* note 309, at 33.

334. "The severity of the injuries sustained by Natalie takes this case out of the classic 'triad' mold. Not only did Natalie sustain retinal bleeding, she sustained retinal folds and retinoschisis." *Id.* at 27.

335. "The evidence is material to an issue in the case because the main issue at trial was the cause of Natalie's injuries, and the new medical testimony presents an alternate theory for the source of those injuries." *Edmunds*, 2008 WI App 33, ¶ 15, 746 N.W.2d 590, ¶ 15.

336. According to prosecution experts, differences between retinal hemorrhages—in terms of extent, location, and pattern—are significant. *See, e.g.*, Testimony of Alex Levin in Transcript of Evidentiary Hearing (Day Four), *supra* note 129, at 99–101.

337. Defendant's brief, *supra* note 4, at 40 ("[T]he science was the whole case, and new research seriously challenges the foundations of the scientific case").

338. *See infra* notes 343–51 and accompanying text (discussing DNA as "new evidence" paradigm).

339. *Edmunds*, 2008 WI App 33, ¶ 13, 746 N.W.2d 590, ¶ 13.

340. *See* State's brief, *supra* note 309, at 16 ("'[T]he hardest requirement to meet is that the offered evidence in view of the other evidence would have probably resulted in an acquittal.'" (quoting Lock v. State, 142 N.W.2d 183 (Wis. 1966)).

341. "The real crux of the dispute in this case is whether the new expert medical testimony Edmunds offers establishes a reasonable probability that a different result would be reached in a new trial." *Edmunds*, 2008 WI App 33, ¶ 16, 746 N.W.2d 590, ¶ 16. Here the trial judge sided with the state. *See supra* note 310.

> and refutes long-presumed hypotheses . . . very well could change the outcome. . . .[342]

In refuting this notion, the prosecutor explicitly juxtaposed the scientific attacks on SBS with the certainty of DNA exonerations. Unlike the new debate offered by the defense, DNA was "real science" that established innocence "to an astronomical degree of science (sic) or statistical probability."[343] DNA did not "dispute a theory or demonstrate a rift or a contention in the scientific community. It didn't provide for alternative hypotheses."[344] In contrast to defense evidence substantiating the existence of lucid intervals, DNA samples "exclude[d] the defendant from the world of possible perpetrators."[345] And unlike testimony regarding possible alternative causes of death in *Edmunds*, DNA provided definitive answers.[346]

As the *Edmunds* arguments show, DNA has implicitly been positioned as the paradigm of newly discovered evidence. Although the appeals court ultimately rejected the prosecutor's arguments, DNA's reign as the "poster child of newly discovered evidence" motions[347] must be reckoned with. The level of certitude DNA provides has become a *de facto* "benchmark,"[348] and the actual innocence it establishes is a touchstone for post-conviction relief.[349] As a consequence, legal standards may be formulated and applied in ways that tend to disadvantage other types of proof. As a matter of law, DNA is not the benchmark[350] and actual

342. Attorney for the Defense in Transcript of Oral Argument, *supra* note 115, at 58.

343. Attorney for the Prosecution in Transcript of Oral Argument, *supra* note 321, at 65.

344. *Id.*

345. *Id.* at 105.

346. The prosecutor in *Edmunds* argued this point as follows: "Is there an enzyme that still exists in the bones of this deceased child that will tell us if she was the subject of rotational acceleration-deceleration injury that killed her? No." Attorney for the Defense in Transcript of Oral Argument, *supra* note 115, at 88.

347. Attorney for the Prosecution in Transcript of Oral Argument, *supra* note 321, at 64–65.

348. *Id.* at 88.

349. An emerging scholarly literature explores the post-DNA meanings of "actual innocence" and "wrongful conviction" and considers the conceptual, strategic, and practical implications that follow. *See generally* Gross, *supra* note 139; Susan A. Bandes, *Framing Wrongful Convictions*, 2008 UTAH L. REV. 5 (2008); Richard A. Rosen, *Reflections on Innocence*, 2006 WIS. L. REV. 237 (2006); Carol S. Steiker & Jordan M. Steiker, *The Seduction of Innocence: The Attraction and Limitations of the Focus on Innocence in Capital Punishment Law and Advocacy*, 95 J. CRIM. L. & CRIMINOLOGY 587 (2005); Andrew M. Siegel, *Moving Down the Wedge of Injustice: A Proposal for a Third Generation of Wrongful Convictions Scholarship and Advocacy*, 42 AM. CRIM. L. REV. 1219 (2005); Margaret Raymond, *The Problem With Innocence*, 49 CLEV. ST. L. REV. 449 (2001).

350. Edmunds's attorney emphasized this:

> Yes, the DNA evidence can absolutely prove that somebody did not commit a crime and can absolutely prove somebody else did commit the crime, but that is not to say that that's what you

innocence is not the *sine qua non* of a new trial. But the subjectivity inherent in predicting the effect of new evidence on a jury's deliberations[351] means that the litigation of post-conviction relief motions will continue to take place in the shadow of DNA.

Given these formidable obstacles, the trial court's denial of Edmunds's motion[352] was to be expected. In the decision, we may rightly discern that similarly situated defendants will have difficulty prevailing in the future.[353] Perhaps more surprising is that the trial court's decision was overturned on appeal.[354] This development portends hope for those seeking new trials in SBS cases.

Even so, the promise of *Edmunds* is closely circumscribed by its limited precedential effect.[355] Beyond onerous post-conviction relief standards,[356] defendants seeking collateral relief in SBS cases confront the likelihood that, in coming years, the current scientific controversy will be suspended in a kind of equilibrium. At some point, unless a revolutionary breakthrough fatally undermines SBS, defendants convicted in this era of uncertainty will be hard-pressed to claim that evidence of the diagnosis's

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> have to have in order to create a reasonable probability of a different outcome. That's a real red herring here. That's a much higher standard than the clearly established legal standard under the case law.

Attorney for the Defense in Transcript of Oral Argument, *supra* note 115, at 135.

351. Daniel Medwed has observed generally that

> non-DNA cases are difficult for defendants to overturn . . . given the subjectivity involved in assessing most forms of new evidence and the absence of a method to prove innocence to a scientific certainty. This inherent difficulty in litigating innocence claims predicated on newly discovered non-DNA evidence is exacerbated by the structural design of most state post-conviction regimes . . . .

Medwed, *supra* note 318, at 658. Professor Medwed helpfully summarizes these collateral relief regimes. *Id.* at 681–86.

352. *See supra* notes 310–11 and accompanying text.

353. Edmunds was represented by Professor Keith Findley and the Wisconsin Innocence Project, a clinical program of the University of Wisconsin Law School whose mission is described at http://www.law.wisc.edu/fjr/clinicals/ip/index.html. It is worth noting that the Innocence Project, like others of its kind, has more resources, greater access to experts, and more extensive research capabilities than what is available to most defendants seeking post-conviction relief.

354. *See supra* notes 311–16 and accompanying text. Although he denied the defendant's motion, the trial judge's factual findings were particularly helpful to Edmunds on appeal. *Id.*

355. This is an inevitable feature of federalized system of justice. Where *Edmunds* is controlling, however, its impact may prove significant. *See Shaken-Baby Ruling Worries Prosecutor*, WIS. STATE J., Feb. 29, 2008, at C3 ("[A] prosecutor says it will be virtually impossible to convict anyone who shakes a baby to death in Wisconsin if a recent court ruling stands.").

356. One response to these realities is resort to a review commission, which may be the most efficient way of dealing with the systemic nature of triad-based SBS convictions and their potential failings. *See supra* notes 149–50 and accompanying text (describing approaches of United Kingdom and Canada).

invalidity is new. Newly discovered evidence motions will be effectively foreclosed without ever having become truly viable.[357]

This prospect would be somewhat less problematic if, throughout the criminal process, a systemic assimilation of the evolved science was underway. As we have seen, however, it is not.

V. CONCLUSION

SBS is a case study in the intersection of science and law, and the distorting influence that each may have on the other.

The construction and persistence of SBS raises the distinct possibility that our adversarial system of criminal justice may be corrupting science. It may do so by placing pressure on scientists to articulate opinions more extreme—and certainly with more confidence—than those they actually hold.[358] And it may do so by raising the stakes for those who have testified in court, under oath, to their version of scientific reality.

The natural course of scientific evolution has resolved many past medical conflicts. In the case of SBS, as well, ongoing research could ultimately answer the open questions.[359] New technological developments

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357. As the evolutionary trajectory of the science progresses and newly discovered evidence motions become obsolete, defendants whose trial lawyers failed to mount a substantial challenge to now-suspect medical orthodoxy will assert that their representation was ineffective. Keith Findley has articulated this point as follows:

> where the medical evidence is 'new' in the ordinary sense—that is, the jury at trial never heard the medical evidence—but not new in the legal sense—it existed and could have been presented at trial—the defendant's claim will likely shift to a claim of ineffective assistance of counsel based on counsel's failure to marshal the available scientific evidence.

E-mail from Keith Findley, Clinical Professor and Co-Director, Wisconsin Innocence Project, University of Wisconsin Law School to Deborah Tuerkheimer, Professor, University of Maine School of Law (Dec. 10, 2008, 17:52) (on file with author).

358. One pediatrician with whom I spoke elaborated on this point:

> the fact that we interact with lawyers and the court makes things worse. When you swear to tell the truth and nothing but the truth, are you swearing to speak only the truth, or to convey only the truth. Let's assume you believe you know the truth in the first place. You can only communicate in court through the artifices of the court by answering lawyers' questions that are purposely configured to structure and manipulate the truth. Within this venue, how do you deliver the "proper" concept into the minds of the jury, to whom you are trying to convey the truth. Some would assert that you should not reflect on uncertainties that you feel do not influence your ultimate opinion. You need to polarize your position, so that after cross and opposing witnesses, the jury lands in the middle where they belong.

This pediatrician, who asked not to be named, later added: "the urge to polarize your opinion significantly increase[s] when you are facing opposing 'expert' opinion, which you consider to be hyper-polarized, incompletely reflective of the clinical case, scientifically incorrect or outright disingenuous."

359. My conversations with advocates on both sides of this debate can be generalized as follows. Those who believe that SBS is an invalid diagnosis cite ongoing research into the previously

would facilitate this process. But SBS, from inception to current iteration, is fully embedded in the domain of law. This reality creates a special kind of urgency: around the country, murder convictions are resulting weekly from evidence that is a source of significant scientific controversy. Even if it were possible for research to progress on this front "naturally"—a dubious proposition given what has come before[360]—organic processes take time, which, here, is of the essence.

Even more untenable is the suggestion that this scientific dispute be decided in the courts. As the cautionary tale of SBS demonstrates, our adversarial, atomized system of justice, with its need for finality, is a poor forum for this debate. The institutional norms of science and law often collide; in this case, with tragic results. Without proper differentiation of their respective functions, both scientific certainty and individualized justice suffer.

To the greatest extent possible, then, a comprehensive inquiry must take place apart from the fray.[361] Perhaps only the National Academy of Sciences (NAS)[362]—or, even more fittingly, a similar undertaking by a newly created National Institute of Forensic Sciences[363]—can provide this space.

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undetected prevalence of retinal hemorrhages (by Patrick Lantz, among others) and subdural hemorrhages (by Ronnie Rooks, among others) as critical to resolving the debate. Defenders of the diagnosis point to better modeling and the possibility of capturing a shaking episode on film as the impetus for resolution. *But see*, http://www.youtube.com/watch?v=jBsXA4H5Dzw (last visited July 23, 2009) (shaking of an infant recorded on a "nanny-cam;" baby was not injured). Of course if, in the future, shaking resulting in the classic SBS symptoms is recorded on video, this may tend to establish that shaking alone can cause the triad, but it will not prove a pathognomic relationship between shaking and the triad. Put differently, proof that A can cause B does not equate with proof that B is necessarily caused by A.

360. *See supra* Part III.A.

361. Others within the scientific community have been agitating for a neutral body to undertake a thorough study of the basis for SBS. *See, e.g.*, Bohan, *supra* note 76 (calling this "long past the time that persons capable of scientifically examining [the controversy surrounding the diagnosis] be called on to do so as part of an independent broad-based team under the auspices of the National Academies of Science;" Interview with Thomas Bohan, *supra* note 78. Even outside the SBS context, one commentator has recently argued that greater "institutionalized oversight of forensic sciences, by scientists, is needed to compensate for the inadequacies of adversary adjudication." Keith A. Findley, *Innocents at Risk: Adversary Imbalance, Forensic Science, and the Search for Truth*," 38 SETON HALL L. REV. 893, 955 (2008).

362. According to its own assessment, "[t]he reports of the National Academies are viewed as being valuable and credible because of the Institution's reputation for providing independent, objective, and non-partisan advice with high standards of scientific and technical quality." From National Academies: Our Study Process, http://www.nationalacademies.org/studycommitteprocess.pdf (last visited July 23, 2009). Within the scientific community, this seems to be a generally accepted characterization. A NAS study requires a federal agency as its primary financial sponsor, implicating the willingness of Congress to authorize funds for the endeavor. *Id.*

363. In February 2009, the National Research Council of the National Academies issued its much heralded report, *Strengthening Forensic Science in the United States: A Path Forward*, available at

In the meantime, until scientific consensus has been achieved, the criminal justice system must find its own solutions to the problem of a diagnosis already morphed and still in transition.

To date, our system has failed. In place of adaptation, we have seen massive institutional inertia. Once the SBS prosecution paradigm became entrenched, the crime became reified. Deferential review standards and a quest for finality perpetuated the system's course. How expeditiously, and how deliberately, this course is righted will inform the meaning of justice.[364]

Complicating the endeavor, SBS prosecutions raise discomfiting possibilities that diverge from those presented by the innocence archetype. Here, no other perpetrator can be held accountable; indeed, no crime at all may have occurred. The problem is not individual, but systemic, and its source is error, not corruption. Responsibility is diffuse: prosecutors and scientists may each legitimately point fingers. Most fundamentally, scientific developments have cast new doubt without yet creating certainty in its place. The story of SBS thus challenges current notions of wrongful convictions. Underlying conceptual frameworks must evolve accordingly.

For now, we find ourselves situated in an extraordinary moment; one which tests our commitment to innocence that is not proven, but presumed.

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http://www.nap.edu/catalog.php?record_id=12589 (last visited July 23, 2009). Although the NRC Report did not specifically address the problem of SBS, it did catalogue a wide range of ways in which "substantive information and testimony based on faulty forensic science analyses may have contributed to wrongful convictions of innocent people." *Id.* at S-3. Perhaps most importantly, the Report recommended creation of a new independent federal agency, the National Institute of Forensic Science (NIFS), whose mission would encompass "establishing and enforcing best practices for forensic science professionals;" "developing a strategy to improve forensic science research and educational programs, including forensic pathology;" and "promoting scholarly, competitive peer-reviewed research . . . in the forensic science disciplines and forensic medicine." *Id.* at S-14.

364. I pursue the question of reform in a future Article.