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Erin Murphy
New York University School of Law

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NEUROSCIENCE AND THE CIVIL/CRIMINAL *DAUBERT* DIVIDE

*Erin Murphy**

INTRODUCTION

Advances in neuroscience have dramatically expanded our knowledge of the brain and how it operates. Although many mysteries remain, the early architectures of our understanding have already left impressions on the legal system. Neuroscientific evidence has been offered to support claims by litigants in both civil and criminal cases, ranging from broad-based generalities (such as "juvenile brains are generally immature in these ways") to individualized opinions (such as "this defendant lacked the cognitive capacity to control this behavior").

As such evidence trickles into the courts, scholars have debated the scientific foundation of such claims, the scope of their applicability, and whether such evidence has met some threshold of reliability imposed before courts and fact-finders ought to accept them.[1] But most scholarly treatments of neuroscientific proof overlook a more fundamental question regarding evidentiary admissibility: What impact will the standard applied to determine admission—both de jure and de facto—have on the rate of acceptance of this new evidence? History suggests that, when it comes to proffers of scientific evidence, civil and criminal proceedings are not in fact created equal. Moreover, the application of evidentiary standards varies widely, and constitutional oversight of evidentiary rules is, for litigants other than a criminal defendant, somewhere between threadbare and nonexistent.

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1. *See* 5 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY §§ 20:3–:17 (2015); Deborah W. Denno, *The Myth of the Double-Edged Sword: An Empirical Study of Neuroscience Evidence in Criminal Cases*, 56 B.C. L. REV. 493, 499 (2015); *see also* Nita A. Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis*, 2 J.L. & BIOSCIENCES 485, 491 (2016) (disputing that neuroscientific evidence is used exclusively and largely unsuccessfully in capital mitigation hearings, but reporting one study that shows that it is largely used, with success, in that context).

This Article thus speculates on the course of neuroscience-as-proof with an eye toward the actual admissibility standards that will govern the acceptance of such evidence by courts, not just as a matter of formal law but also as a function of historical custom. Given the legal system's spotty record with scientific evidence—which is to say, both the demonstrated willingness of the system to admit unproven "science" or to exclude evidence despite a seemingly adequate scientific foundation—the trajectory of neuroscience in the courts cannot be predicted simply by asking about its scientific legitimacy in the abstract. Rather, an observer must ponder whether patterns of admissibility long evident in criminal and civil courts will persevere with respect to neuroscientific proof.

One clarification is warranted. Throughout this Article, I use the phrases "novel neuroscience" and "novel neuroscientific evidence." Capturing precisely what is meant by "neuroscience," much less "novel neuroscience," can often prove more elusive than seems at first glance.

I generally follow Professor Nita Farahany's approach, which prefers the word "neurobiological" to capture "evidence about the study of the brain and the nervous system," which includes "claims about the 'normal' brain, abnormal brain, effects on neurotransmitters, brain structure, function, and genetic contributions to neurological functioning and structure."[2] Professor Farahany's definition also broadly encompasses evidence based on imaging techniques (such as CT or MRI), as well as findings drawn from interviews (intended to elicit, for instance, whether a person had a brain injury) or psychological assessments.[3]

I further circumscribe this category to "novel neuroscience." By this, I mean to exclude relatively noncontroversial uses of neuroscience, such as those that show an undisputed physical insult or injury to the brain, or its fairly noncontroversial consequence, like a car accident that results in visible damage to a portion of the brain affecting speech, where the injured person developed precisely that expected speech impairment. I also intend to exclude assessments that have only remote connection to the physical condition of the brain, such as psychological assessments that have no connection to any observed physiological conditions. In short, I mainly intend to speak to precisely what the phrase suggests: novel or cutting-edge methods—whether scan-based or assessment-based—that purport to link a finding about the structure or physiological function of the brain to a manifested behavior, cognitive power, or psychology. Moreover, this Article considers the likely treatment of novel neuroscientific evidence when offered in courts at this moment in scientific understanding; in other words, it does not assume any game-changing breakthroughs on what may reliably be proven.

Part I begins by recounting the historical divide between civil and criminal courts with respect to the treatment of novel scientific evidence. Part II then explores, both by examining current trends and predicting future trajectories,

2. Farahany, *supra* note 1, at 2 n.3.
3. *Id.* at 10.

whether this pattern of differential treatment is likely to endure as courts begin to confront the admissibility of novel neuroscience.

I. *DAUBERT*'S TWO FACES: CIVIL V. CRIMINAL

The formal standard for admission of expert evidence may, as a matter of formal law, be the same in civil and criminal cases. But in practice, both scholars and litigants have observed that the application of that standard varies markedly. The conventional wisdom holds, and empirical studies support, that evidence proffered by plaintiffs in civil cases receives harsh scrutiny for reliability, whereas evidence proffered by prosecutors in criminal cases typically gets a free pass. But, as explained in this part, this disparity is rarely observed directly because apart from a couple of exceptions—most notably fire science and handwriting analysis—the type of evidence offered by civil litigants has little overlap with that offered by criminal prosecutors.

A. Background

When announced by the U.S. Supreme Court in 1993, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[4] was heralded as a watershed moment in the treatment of scientific evidence.[5] In its opinion, the Court displaced the longstanding *Frye v. United States*[6] "general acceptance" test ("the *Frye* test") as the standard for evidentiary admissibility. With the Court's opinions in *General Electric Co. v. Joiner*[7] and *Kumho Tire Co. v. Carmichael*[8] that quickly followed, the Supreme Court seemed to erect an entirely new and more rigorous test for admissibility intended to stem the perceived epidemic of "junk science" that had overtaken the courts.[9]

But even in the midst of this celebration, suspicions began circulating that *Daubert*'s professed commitment to rigorous examination of evidence offered in civil cases—like the one in which the ruling was announced—would not extend to its criminal brethren. For instance, the opinion itself, which talked breathlessly about the scientific ideal of "reliability" in ways later criticized by philosophers of science,[10] conspicuously omitted any reference to the forensic sciences that routinely arose in criminal courts.

4. 509 U.S. 579 (1993).

5. *See, e.g.*, Leslie Morsek, Comment, *Get on Board for the Ride of Your Life! The Ups, the Downs, the Twists, and the Turns of the Applicability of the "Gatekeeper" Function to Scientific and Non-Scientific Expert Evidence:* Kumho*'s Expansion of* Daubert, 34 AKRON L. REV. 689, 704 (2001).

6. 293 F. 1013 (D.C. Cir. 1923).

7. 522 U.S. 136 (1997).

8. 526 U.S. 137 (1999).

9. The iconic text that influenced this view was written by Peter W. Huber. *See* PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 3 (1991) (warning that "any self-styled scientist, no matter how strange or iconoclastic his views, will be welcome to testify in court").

10. *See, e.g.*, David S. Caudill & Richard E. Redding, *Junk* Philosophy *of Science?: The Paradox of Expertise and Interdisciplinarity in Federal Courts*, 57 WASH. & LEE L. REV. 685, 690, 703–09 (2000) (critiquing the opinion's "limited framework" for understanding the scientific enterprise).

Then, on remand, Judge Alex Kozinski of the Ninth Circuit, palpably bristling at the "daunting" task of acting as an arbiter of scientific reliability,[11] took pains to exempt "[f]ingerprint analysis, voice recognition, DNA fingerprinting and a variety of other scientific endeavors closely tied to law enforcement" from *Daubert*'s strictures, setting up a de facto divide between civil and criminal *Daubert*.[12]

In the years since the *Daubert* trilogy—which also witnessed amendments to Rule 702 of the Federal Rules of Evidence that either codified or enhanced its standards, depending on whom you ask[13]—the debate over *Daubert*'s impact has continued. Such findings have political and not just legal significance because in both civil and criminal cases, the methods and techniques most vulnerable to *Daubert* scrutiny, as judged by scientific standards, tend to be offered by only one side in the litigation. And in fact, those parties even sit on the same side of the courtroom: prosecutors in criminal cases and plaintiffs' attorneys in civil cases. That is, plaintiffs' attorneys, such as in toxic tort or personal injury cases, often rest their proof on medical or scientific findings that are readily challenged as unreliable by defendants.[14] Similarly, prosecutors in criminal cases routinely offer evidence based on methods like fingerprinting, hair and fiber analysis, or pattern matching (like ballistics or bite marks), notwithstanding reliable indicators that such evidence is in fact wholly lacking in scientific support.[15]

Even though "*Daubert* ostensibly applies in the same way in criminal and civil cases, social scientists have increasingly raised the issue whether courts, in fact, apply *Daubert* more lackadaisically in criminal trials—especially in regard to prosecution evidence."[16] Given that the proponents of vulnerable scientific evidence tend to hew to one side, the degree to which *Daubert* works to exclude such science carries important repercussions for measurements of plaintiff and prosecutorial success. Thus, multiple empirical studies have endeavored to answer precisely whether *Daubert* has, in fact, served its role of precluding junk science while admitting reliable, even if cutting-edge or novel, techniques.[17]

Generally speaking, these studies themselves divide between civil and criminal cases. And they seem to reaffirm, albeit imperfectly, the intuition of litigants and those familiar with the justice system: "civil defendants win

11. Daubert v. Merrell Dow Pharm., Inc., 43 F.3d 1311, 1315 (9th Cir. 1995).

12. *Id.* at 1317 n.5.

13. Note, *Admitting Doubt: A New Standard for Scientific Evidence*, 123 HARV. L. REV. 2021, 2024 & nn.24–25 (2010) (collecting sources on opposing sides of the debate).

14. *See, e.g.*, Andrew W. Jurs & Scott DeVito, *Et Tu, Plaintiffs?: An Empirical Analysis on* Daubert*'s Effect on Plaintiffs, and Why Gatekeeping Standards Matter (a Lot)*, 66 ARK. L. REV. 975, 984–85 & n.47 (2013) (canvassing studies estimating high rates of expert evidence, in reporting on findings about plaintiff and defendant filing and removal behavior in light of the evidentiary standard).

15. NAT'L RESEARCH COUNCIL, NAT'L ACADS., STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 11 (2009).

16. David L. Faigman, *Admissibility Regimes: The "Opinion Rule" and Other Oddities and Exceptions to Scientific Evidence, the Scientific Revolution, and Common Sense*, 36 SW. U. L. REV. 699, 716 (2008).

17. *See, e.g.*, *supra* note 9; *infra* notes 24–25.

their *Daubert* reliability challenges to plaintiffs' proffers most of the time, and . . . criminal defendants virtually always lose their reliability challenges to government proffers."[18] In short, "civil defendants have benefited greatly from *Daubert* but . . . criminal defendants have not."[19]

One iconic comparison was conducted by Professor Michael Risinger in 2000. He looked at over 1,600 citations to *Daubert* by American state and federal courts, in a period from 1993 to 1999, and compared that to a reference set of opinions citing *Frye* in the six years prior to *Daubert*.[20] He found that post-*Daubert*, courts excluded plaintiffs' proffered evidence at high rates, even while granting plaintiffs' requests to exclude defense evidence at much lower rates.[21] On the criminal side, he found that defense challenges to prosecution evidence infrequently succeeded, even while prosecution challenges to defense evidence had roughly the same success rate as that of civil defendants.[22]

Professor Risinger's findings have been replicated by others using an array of approaches.[23] Those findings show that in the civil context, generally speaking, "studies show that after *Daubert*, parties challenged the admissibility of evidence more frequently, and judges scrutinized evidence more carefully, excluding a greater proportion of it."[24] In contrast, in the criminal context, one major review found that questioned experts tended to testify for the prosecution, and "the *Daubert* decision did not impact on the admission rates of expert testimony at either the trial or the appellate court levels."[25]

Some observers might wonder whether these findings simply reflect the relative substantive merit of evidence offered by civil plaintiffs versus criminal prosecutors. Indeed, if it simply is the case that prosecutors offer robust, reliable techniques, whereas civil plaintiffs tend to offer novel, untested methods, then these findings simply show that the standard is performing as expected. But regardless of the merits of plaintiffs'

18. D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?*, 64 ALB. L. REV. 99, 99 (2000).

19. *Id.* at 143.

20. *Id.* at 102–04.

21. *Id.* at 143–49, app.

22. *Id.* at 143–49.

23. *See generally* NAT'L RESEARCH COUNCIL, *supra* note 15, at 11; Paul C. Giannelli, Daubert *and Criminal Prosecutions*, 26 CRIM. JUST. 3 (2011).

24. A. Leah Vickers, Daubert, *Critique and Interpretation: What Empirical Studies Tell Us About the Application of* Daubert, 40 U.S.F. L. REV. 109, 109–10, 126–37 & nn.3–4 (2000) (reviewing and citing studies); *see also* Margaret A. Berger, *What Has a Decade of* Daubert *Wrought?*, 95 AM. J. PUB. HEALTH S59, S64 (2005) (citing studies that show that "judges are much more likely since *Daubert* to scrutinize expert testimony before trial and then to limit or exclude expert testimony" in civil cases, although "courts are not applying *Daubert* stringently in the criminal context"); Peter J. Neufeld, *The (Near) Irrelevance of* Daubert *to Criminal Justice and Some Suggestions for Reform*, 95 AM. J. PUB. HEALTH S107, S109 (2005). *But see* Andrew Jurs, *Gatekeeper with a Gavel: A Survey Evaluating Judicial Management of Challenges to Expert Reliability and Their Relationship to Summary Judgment*, 83 MISS. L.J. 325, 335–38 (2014) (reviewing prior studies and noting greater degrees of uncertainty).

25. Jennifer L. Groscup et al., *The Effects of* Daubert *on the Admissibility of Expert Testimony in State and Federal Criminal Cases*, 8 PSYCHOL. PUB. POL'Y & L. 339, 364 (2002).

evidence—which is a subject of some debate—that conjecture does not bear out with respect to prosecutorial evidence. Consider that nearly all of the common forensic techniques offered by prosecutors, and routinely admitted by courts, have been repeatedly denounced as lacking in any scientific basis.[26] Most prominently, a 2009 National Academy of Sciences report observed that

> [w]ith the exception of nuclear DNA analysis, . . . no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source. . . . The simple reality is that the interpretation of forensic evidence is not always based on scientific studies to determine its validity.[27]

Indeed, some criminal courts admitting forensic evidence despite defense challenges to reliability have expressly conceded that the proposed conclusions lack any scientific basis in data, methods, or statistical significance—and yet nonetheless embraced them citing nothing more than their longstanding pedigree.[28]

In sum, commentators, scholars, and courts themselves seem to acknowledge that there exists a *Daubert* double standard. Professor Jane Moriarty has further intimated that this double standard is not just the product of incompetence or lack of understanding.[29] She notes that

> [i]n civil cases, courts seem quite up to the task of evaluating microbiology, teratology, and toxicology evidence, discussing both science and statistics with plenty of acumen. Yet when it comes to evaluating the shortcomings of lip prints and handwriting, courts are unable to muster the most minimal grasp of why a standardless form of comparison might lack evidentiary reliability or trustworthiness.[30]

This intuition is perhaps bolstered by efforts to expressly enshrine the distinction. In the wake of *Daubert*, federal lawmakers circulated a bill to exempt criminal evidence from the proposed codification of the *Daubert* test, but their efforts failed.[31] That suggests that political actors, or at least some legislators, would expressly aim to lower the bar of reliability for evidence admitted in criminal cases. But whether de facto or de jure, the bottom line seems that, whatever *Daubert*'s bark, it tends to bite only in civil cases.

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26. *See generally* Paul C. Giannelli, *Forensic Science: Under the Microscope*, 34 OHIO N.U. L. REV. 315 (2008) (surveying disciplines like bite marks, handwriting, and ballistics).

27. NAT'L RESEARCH COUNCIL, *supra* note 15, at 7–8.

28. *See, e.g.*, Julie A. Seaman, *A Tale of Two* Dauberts, 47 GA. L. REV. 889, 892 n.12 (2013).

29. Jane Campbell Moriarty, *Will History Be Servitude?: The NAS Report on Forensic Science and the Role of the Judiciary*, 2010 UTAH L. REV. 299.

30. *Id.* at 315 (footnote omitted).

31. *See* H.R. 988, 104th Cong. (1995). Georgia, however, still maintains some distinction. *See* Seaman, *supra* note 28, at 891 & n.9 (citing a provision that reads: "In criminal proceedings, the opinions of experts on any question of science, skill, trade, or like questions shall always be admissible; and such opinions may be given on the facts as proved by other witnesses" (quoting GA. CODE ANN. § 24-7-707 (2011))).

B. Exceptions

The disparate treatment of proffered scientific evidence in the civil and criminal context is easily masked in part because the disciplines relied upon in each context diverge so sharply. In the civil context, experts tend to offer opinions about causal factors of injury or illness.[32] In the criminal context, by contrast, experts tend to be less concerned with causation and more focused on identification.[33] The civil cases are littered with examples of doctors, epidemiologists, and social scientists offering medical and mechanical explanations,[34] whereas the criminal cases consist largely of devoted forensic analysts—often police department employees—discussing methods like fingerprinting, trace evidence identification, handwriting analysis, and the like.[35]

Even scientific disciplines that may, on the surface, appear to apply in both civil and criminal contexts do not upon closer examination. For instance, DNA typing is a scientific technique that obviously carries great import for criminal cases as an identification method, and it is also easy to imagine that it might be relevant in a civil case involving genetic testing of some kind. But, for reasons that are too complex to detail in this Article, the methods, instrumentation, and interpretive difficulties of DNA testing in each context are in fact quite different.[36] Even DNA testing in civil parentage cases—the closest analogue to the criminal context—diverges significantly from the kinds of reliability challenges that arise in criminal forensic testing. To give just one example, parentage testing always involves controlled quality and quantity samples taken from known individuals (the putative parents or the child), whereas forensic testing focuses on crime scene samples from unknown persons collected in uncontrolled conditions that may be of low quality or quantity.[37]

There are, however, two disciplines that form an area of overlap between civil and criminal cases and thus might directly surface the conflict between civil and criminal admissibility standards. Specifically, fire investigation is relevant for both criminal arson and civil insurance cases, and handwriting analysis is pertinent for both criminal cases and civil cases. These two areas thus provide good source material against which to test the thesis that courts apply admissibility standards more strictly in civil cases (to evidence offered by plaintiffs) than in criminal cases (to evidence offered by prosecutors).

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32. Samuel R. Gross, *Expert Evidence*, 1991 WISC. L. REV. 1113, 1119 (reporting on findings from a study of California courts).

33. *See, e.g.*, NAT'L RESEARCH COUNCIL, *supra* note 15, at 36 (noting that forensic analysis typically aims for identification, individualization, association and reconstruction).

34. Gross, *supra* note 32, at 1119.

35. Jennifer Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725, 759–60, 774 (2011) (discussing the lack of training of analysts and institutional relationship between forensic laboratories and police departments).

36. *See* ERIN E. MURPHY, INSIDE THE CELL: THE DARK SIDE OF FORENSIC DNA 4–5 (2015) (listing differences between medical and forensic DNA testing).

37. *See id.* at 4.

A 2013 article by Professor Julie Seaman probed a version of this question.[38] Professor Seaman sought to answer whether the same discipline (fire science or handwriting analysis) received different treatment depending on the kind of case (civil versus criminal).[39] In a review that she conceded faced some methodological challenges,[40] she made some interesting findings. In short:

> Comparing the admission and exclusion percentages in criminal and civil cases, then, it is apparent that the disparity seen in the handwriting cases is not evident in the fire cause and origin cases. In the handwriting cases, prosecution evidence was admitted in nearly 90% of the criminal cases, whereas on the civil side it was admitted (or at least not excluded) in fewer than 40% of cases. In contrast, the admission rates for expert testimony in the fire cases hovered close to 75% for both criminal and civil cases.[41]

On its face, these findings present a conflicting image.[42] But examined more closely, they reaffirm and deepen the initial underlying premise: it depends as much on the offering party as it does on the type of case. In criminal cases involving fire science, the prosecution (the favored party) tends to offer the evidence, and so we would expect high rates of admission. In civil cases, however, it is not only plaintiffs that offer this evidence but rather civil defendants as well; fire science experts tend to be used by defendant-insurers who seek to defend against claims lodged by plaintiff-insureds.[43] Thus, if the evidence is admitted in civil cases at high rates, it may very well be because it is offered by the favored party in those cases—the defendant.

By contrast, the cases involving handwriting analysis fit the more typical picture. Handwriting analysis tends to be offered by the prosecution in the criminal context and by plaintiffs in the civil context.[44] And again, Seaman found that in criminal cases, the admission rate was around 90 percent, whereas the exclusion rate in civil cases was roughly 64 percent.[45] Importantly, in looking at the qualitative language used in these cases to discuss the admission or exclusion determination, Seaman found marked variation in the perspective of judges:

> Whereas in criminal cases, for the most part, the global field of questioned document analysis is one with a long history, tested in the crucible of the

38. *See* Seaman, *supra* note 28.
39. *Id.* at 898.
40. *Id.* at 897–99.
41. *Id.* at 907–08.
42. Of course, there is also the question of whether fire science is more rigorous than handwriting analysis and thus deserving of admission. Certainly some aspects of fire investigation can lay substantially more claim to scientific legitimacy than handwriting analysis. However, fire science unfortunately has been marked by a longstanding history of experts whose conclusions rest more on myth and folklore than on scientific truth. *See generally* Caitlin M. Plummer & Imran J. Syed, *"Shifted Science" Revisited: Percolation Delays and the Persistence of Wrongful Convictions Based on Outdated Science*, 64 CLEV. ST. L. REV. 483, 485–95 (2016).
43. Seaman, *supra* note 28, at 904, 907.
44. In Professor Seaman's sample, in all but one of the criminal cases the evidence was offered by the prosecution, and in civil cases nearly all were offered by the plaintiff. *Id.* at 899.
45. *See id.* at 901, 908.

> adversarial process and relied upon by law enforcement and overwhelmingly approved by courts, in civil cases the field is peopled by unqualified charlatans who use untested methodologies to offer unreliable opinions that are not helpful to juries, which are perfectly capable of comparing handwriting samples on their own.[46]

In short, although handwriting analysis or fire science evidence arises in both the criminal and civil contexts, when it comes to judging the admissibility of the proffered evidence, each discipline's rate of success follows the same pattern of admission and exclusion apparent from studies about the rigor of *Daubert* when it comes to nonoverlapping fields. When faced with evidence offered by prosecutors or civil defendants, courts tend to take a generous approach, whereas even the same kind of evidence offered by civil plaintiffs is met with great skepticism.

II. THE NEW KID ON THE BLOCK: NEUROSCIENTIFIC EVIDENCE

Given the conventional wisdom, borne out by empirical study, that *Daubert* bites in civil cases but merely barks in criminal ones, how might we expect courts to treat the impending onslaught of neuroscientific evidence? Like handwriting analysis and fire investigation, novel neuroscience creates a point of tension because it can arise in both categories of cases and be introduced by either side in a dispute. Specifically, novel neuroscientific methods, such as those used to detect closed brain injuries or subtle cognitive, emotional, or psychological conditions, have cross-applications that make them more like handwriting analysis than like side-specific methods such as idiopathic mesothelioma or bite marks. If novel neuroscience extends beyond its present reach—most commonly to capital criminal defendants and to a lesser extent to civil plaintiffs—and becomes part of the prosecutorial and perhaps even civil defendants' arsenal,[47] what will happen? Novel neuroscientific evidence may present the law with the direct point of conflict that it has henceforth averted: the context and side-specific treatment of scientific evidence, whether civil versus criminal cases or plaintiffs and prosecutors versus defendants. And from that conflict, observers may gain a clearer sense of the successes and failures of our evidentiary admissibility standard.

What will be the result of this point of conflict? Will admissibility standards operate to preclude novel neuroscientific evidence, and, if so, in what kinds of cases and by which parties? Will neuroscience admissibility patterns reflect the same political story recounted above, or will they cleave between prosecutorial evidence and plaintiffs' evidence as hinted at by the findings in the handwriting example? Will pressure to reconcile these admissibility decisions result in the forging of some new equilibrium? It is

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46. *Id.* at 900.

47. *See, e.g.*, Owen D. Jones et al., *Neuroscientists in Court*, 14 NATURE 730, 730 (2013) ("In . . . a steadily increasing number of similar cases in both criminal and civil courts, neuroscientific evidence has been introduced to support a party's legal claim as well as to argue its irrelevance or invalidity (by the opposing party).").

too early to know, but the remainder of this Article will consider current trends and explore several possibilities.

A. Current Trends

In both civil and criminal cases, neuroscientific evidence commonly has been introduced to support noncontroversial findings such as structural damage or major brain injury, easily readable on a standard CT or MRI scan.[48] Although such findings are not without challenge, they tend to be relatively noncontroversial. The novel neuroscientific proof of interest to this Article, however, is that which relies on contested questions such as the degree to which conclusions can be drawn about a single individual from aggregated group data,[49] the relationship between cause and effect, the absence of baseline data about a subject's brain prior to trauma,[50] or the ascertainment of disputable injuries or abnormalities.[51] These developments raise some degree of alarm on the part of scientists when applied in a context of categorical decision making—such as the recent Supreme Court decision citing neuroscience about juveniles as a basis for a wholesale prohibition on the death penalty or mandatory life without parole for that group[52]—but the most contested use continues to be to support findings individualized to a specific person.

In civil cases, plaintiffs most commonly offer novel neuroscientific evidence for one of three different purposes: (1) to show brain injury, in particular closed head injuries; (2) to prove the existence of toxic encephalopathy or other chemical sensitivities; and (3) for lie detection.[53] In criminal cases, novel neuroscientific evidence is typically admitted at the request of the defendant in support of arguments to mitigate punishment, most often in serious sentencing hearings like capital cases.[54]

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48. Stephen J. Morse, *Introduction*, *in* A PRIMER ON CRIMINAL LAW AND NEUROSCIENCE, at xv (Stephen J. Morse & Adina L. Roskies eds., 2013).

49. *See, e.g.*, David L. Faigman, John Monahan & Christopher Slobogin, *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L. REV. 417 (2014).

50. *See, e.g.*, OWEN JONES, JEFFREY SCHALL & FRANCIS SHEN, LAW AND NEUROSCIENCE 28 (2014); A. Philip Dawid, David L. Faigman & Stephen E. Fienberg, *Fitting Science into Legal Contexts: Assessing Effects of Causes or Causes of Effects?*, 43 SOC. METHODS & RES. 359 (2014).

51. JONES, SCHALL & SHEN, *supra* note 50, at 269–302.

52. *See generally* Graham v. Florida, 560 U.S. 48 (2010); Roper v. Simmons, 543 U.S. 551 (2005).

53. *See generally* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, §§ 20:1–:63.

54. Two major surveys both reached the same conclusion. *See* Denno, *supra* note 1, at 493 ("My analysis reveals that neuroscience evidence is usually offered to mitigate punishments in the way that traditional criminal law has always allowed, especially in the penalty phase of death penalty trials."); Farahany, *supra* note 1, at 7 (conceding that neurobiological evidence is used most often in criminal cases for mitigation purposes, but claiming that it also is gaining ground in other areas, such as competency determinations or capacity defenses). Professor Farahany's findings of usage beyond just mitigation hinge in large part on a more capacious definition of "what 'counts' . . . as neurobiological evidence," because her study includes any reference to medical history of brain trauma or interviews aimed at determining such history and not just scans or physical evidence of brain injury. *Id.* at 10.

Thus far, courts' response to neuroscientific evidence when offered for these purposes has been tentative and inconsistent. Courts have shown the greatest enthusiasm for admitting evidence offered by capital defendants seeking to fight a sentence of death by showing brain conditions that mitigate their criminal responsibility. In this context, courts have admitted neuroscientific evidence to bolster claims of behavioral or emotional disorders,[55] the absence of a culpable mental state or evidence of insanity,[56] and diminished cognitive capacity.[57] But it is only the use of neuroscientific evidence in the mitigation phase that has become genuinely common—so common, in fact, that appellate judges have even found that failure to investigate neuroscientific explanations for behavior constitutes ineffective assistance of counsel.[58]

In civil cases, judges have shown greater recalcitrance about admitting novel neuroscientific proof, although there are occasional exceptions. For instance, although courts routinely admit established technologies like CT, PET, and MRI scans as proof of major structural damage to a brain, they have not always welcomed such evidence when offered to prove the existence or cause of minor closed-head brain trauma (often abbreviated "TBI" for "traumatic brain injury").[59] There are a handful of examples to the contrary, but courts still typically exhibit significant reservation about allowing in such evidence. When it comes to cutting-edge methods like QEEG or SPECT,[60] as well as novel findings such as toxic encephalopathy[61] or lack of truthfulness (lie detection),[62] courts have overwhelmingly rejected such proffered evidence as unreliable.

Of course, broader applications of neuroscientific evidence are easily imaginable. As succinctly laid out by one group of authors, neuroscientific evidence could answer questions as wide ranging as:

> [I]s this person responsible for his behaviour? What was this person's mental state at the time of the act? How much capacity did this person have to act differently? What are the effects of addiction, adolescence or advanced age on one's capacity to control behaviour? How competent is this person? What does this person remember? How accurate is this person's memory? What are the effects of emotion on memory, behaviour and motivation? Is this person telling the truth? In how much pain is this person? How badly injured is this person's brain?[63]

Although there are occasional examples of courts admitting novel neuroscientific evidence in support of some of these outlier propositions, in

55. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, § 20:11.
56. *See id.* §§ 20:12–:13; *see also* Farahany, *supra* note 1, at 19.
57. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, § 20:10.
58. *See* Farahany, *supra* note 1, at 21.
59. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, § 20:4.
60. *See id.* §§ 20:5–:6. QEEG and SPECT, short for quantitative electroencephalogram and single-photon emission computerized tomography, respectively, are neuroimaging methods. *Id.*
61. *See id.* § 20:7.
62. *See id.* §§ 20:8, :16.
63. Jones et al., *supra* note 47, at 730.

general courts find such evidence unreliable under a *Daubert*, *Frye*, or other pertinent standard.[64]

In sum, courts in civil cases tend to reject novel neuroscientific evidence unless it supports fairly solid-seeming claims of traumatic brain injury, and in criminal cases, courts express similar reluctance to admit evidence unless it is offered as mitigation evidence. But when so offered, and in particular as capital mitigation, courts tend to take a more permissive view of admissibility.

B. Future Directions

What do these early patterns of neuroscientific admissibility patterns predict for the future? This part, of necessity, constitutes pure speculation. But for the sake of argument, let us presume two things. First, assume that in the near term, claimants will continue to proffer neuroscientific evidence, and courts will continue to face challenges on the basis of scientific validity. In other words, do not expect that these early defeats will dissuade litigants from continued efforts to utilize neuroscientific evidence. Second, assume that the state of the science continues to improve. Methods become more robust and technologies advance. Thus, while still fraught, such findings refine incrementally in terms of specificity and sensitivity. What might we expect the arc of admissibility to look like, knowing what we do about the courts' track record when it comes to novel or unproven scientific techniques?

1. A Ban: Novel Neuroscience Goes the Way of the Polygraph

One possibility is that neuroscientific evidence will continue to meet broad resistance by courts, which will remain skeptical of its reliability and mindful of the numerous cautions sounded by scientists who aim to curb efforts of overclaiming.[65] Under this view, the current trends of excluding novel neuroscientific evidence in the vast majority of civil and criminal cases will continue, with perhaps a small pocket of admission when offered by defense in mitigation proceedings (more on that later). The enthusiasm of proponents of neuroscience will thus ultimately be checked by courts, which will strictly apply the standards of evidentiary admissibility and deem most methods insufficiently reliable.

Evidence of this kind of skepticism is already apparent in existing civil cases, where plaintiffs, generally speaking, have failed when proffering in evidence a wide array of uses of novel neuroscience.[66] It is also to some degree evident in the criminal cases, where defendants outside of the mitigation context tend to meet similar skepticism. Indeed, fears about prosecutorial overreaching, the usurpation of the jury function, and "trial by

64. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, §§ 20:5–:8.

65. *See, e.g.*, JONES ET AL., *supra* note 50, at 731 (describing worries about judicial misuse of neuroscientific evidence).

66. *See supra* Part II.A.

machine" might further work to stem the tide in criminal cases. Thus, going against the conventional practice of imposing stricter admissibility tests on plaintiffs than on prosecutors, courts might simply reject novel neuroscience altogether.

Such a result would not be unprecedented. For instance, when ordinary lie detector tests first came to market, there existed a similar fervor that such tests offered a scientifically certain means of resolving law's recurring problem of assessing human credibility.[67] But the tool proved quite useful to defendants because it offered "scientific" validation of their honesty.[68] In fact, it was offered for just that purpose in *Frye*, the landmark case that announced the reliability standard that dominated American law for decades, and the court ruled it insufficiently reliable on the grounds that it had not yet gained general acceptance.[69]

But lie detection methods did not fade. Defense lawyers continued to argue their applicability for purposes other than formal admission as evidence.[70] Nevertheless, in the wake of *Frye*, "[t]he vast majority of courts maintained a per se inadmissibility rule."[71] Then, as polygraph technology improved, and the Supreme Court laid down the *Daubert* standard, there was a resurgence in hope that the polygraph might return to court.[72] By this point, law enforcement had routinely relied on polygraphs for making charging and other decisions, so it seemed that the method might gain greater favor. Indeed, polygraph machines arguably have a stronger scientific foundation than numerous other forensic methods—such as bite mark or tool mark matching—that have earned widespread acceptance in criminal courts.[73] Yet even when revisited in the wake of *Daubert*, polygraphs still could not make it into court.[74] To be fair, some of those judgments turned on concerns other

67. NAT'L RESEARCH COUNCIL, NAT'L ACADS., THE POLYGRAPH AND LIE DETECTION 18 (2003) ("In popular culture and media, the polygraph device is often represented as a magic mind-reading machine. These facts reflect the widespread mystique or belief that the polygraph test is a highly valid technique for detecting deception . . . .").

68. The sense that polygraphs seem to favor criminal defendants is evident in the U.S. Attorneys' Manual, which instructs prosecutors to seek to exclude polygraph evidence. 5 DEP'T OF JUSTICE MANUAL tit. 9, no. 262 (3d ed. 2015) (outlining arguments for attorneys on exclusion).

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

70. *See, e.g.*, Charles W. Daniels, *Using Polygraph Evidence After Scheffer* (pt. 2), CHAMPION, June 2003, at 36.

71. Timothy B. Henseler, Comment, *A Critical Look at the Admissibility of Polygraph Evidence in the Wake of* Daubert*: The Lie Detector Fails the Test*, 46 CATH. U. L. REV. 1247, 1248 (1997).

72. *See id.* at 1250 ("[T]he potential for admissibility of polygraph evidence appears to be greater than ever before.").

73. *See* NAT'L RESEARCH COUNCIL, *supra* note 67, at 203 ("In fact, topics such as bite mark and hair identification, fingerprinting, arson investigation, and tool mark analysis have a less extensive record of research on accuracy than does polygraph testing.").

74. *See* Henseler, *supra* note 71, at 1278–79; *see also* United States v. Scheffer, 523 U.S. 303 (1998) (holding that the bar on polygraph evidence did not violate defendant's constitutional rights); Robin D. Barovick, Comment, *Between* Rock *and a Hard Place: Polygraph Prejudice Persists After* Scheffer, 47 BUFF. L. REV. 1533 (1999).

than reliability, such as undue prejudice to the jury.[75] But courts seemed to have gained familiarity with the idea that polygraphs had no place in evidence and did not miss them. Whatever the reason, continued exclusion was the path of least resistance.

The same kind of story easily could play out with regard to novel neuroscience. Like those initial polygraphs, the successful proponents of this evidence tend, at this time, to be criminal defendants.[76] And like polygraphs, novel neuroscience raises concerns about displacing the function of juries and confusing the fact-finder; indeed, proposed uses of novel neuroscience include lie detection, superseding the polygraph.[77] If courts deem such evidence insufficiently reliable, perhaps even bolstered by the findings of courts in civil cases where such evidence is offered by plaintiffs, then exclusion may become the default in much the same way it has with lie detection testing, notwithstanding improvements to the technology or error rate over time. In such a scenario, novel neuroscience may go the way of the polygraph machine—perhaps operating in the background to inform the choices of actors in the system, but never taking its place as full-bodied evidence in court, regardless of any gains in the reliability of specific uses.

2. The Same Old Story: Prosecutors' Evidence in, Plaintiffs' Evidence Out

Of course, the current practice in civil and criminal cases both supports and undermines the claim that novel neuroscience may go the way of the polygraph. On the supporting side, courts already seem to show intense skepticism toward cutting-edge neuroscientific techniques and have generally excluded such evidence.[78] Moreover, because such evidence is offered almost always by plaintiffs in support of recovery for claims against defendants, exclusion is consistent with courts' historical skepticism of plaintiff-proffered novel scientific proof.[79] Thus, the general and specific patterns point in consistent directions: toward exclusion of the evidence.

But undermining the probability of an enduring ban are the cases from the criminal context that already dispute that prediction. Although courts have generally excluded novel neuroscience, recall that careful inspection reveals one significant exception: neuroscientific proof offered by defendants in sentencing proceedings.[80] That suggests both a willingness to embrace some role in service of the criminal defendants and not the prosecution.

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75. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, § 38:5 (discussing "evaluations of polygraph evidence").

76. *See supra* Part II.A.

77. *See* 5 DAVID L. FAIGMAN ET AL., *supra* note 1, § 38:1 n.2 ("[T]here are a multitude of other techniques and technologies heralded as the next generation of lie detector. Principal among these competitors might be the use of functional magnetic resonance imaging (fMRI) for this purpose.").

78. *See supra* Part II.A.

79. *See supra* notes 16–18, 24 and accompanying text.

80. *See supra* note 54.

Current observations thus only partly conform to the general pattern of novel scientific evidence—plaintiffs still remain largely rebuffed, but defendants can find some favor with courts. But the story is not yet fully told, because courts, for the most part, have yet to confront the question of admitting novel neuroscience when offered by prosecutors.[81] It thus may still unfold that the customary patterns prove enduring; courts generally exclude plaintiffs' novel neuroscience applying strict admissibility tests, while admitting prosecutors' evidence under a more relaxed standard. In this case, the only surprise would be that defendants will also benefit from such evidence when proffered for mitigation purposes.

This kind of modified status quo is not that unimaginable, as described in greater depth below.[82] In fact, it is this familiar story that causes many to fear that neuroscience represents a "double-edged sword"—what appears on its face a boon for criminal defendants, who can claim "my brain did it," will in fact be a weapon for prosecutors, who will use neuroscientific findings to argue for the incorrigibility, remorselessness, antisocial tendencies, or deviance of defendants.

3. The Status Quo, Revised

A third possibility, however, is that the current trend holds even as prosecutors seek to marshal neuroscientific evidence in support of their claims. Courts would extend the general skepticism shown to plaintiffs who offer novel techniques to prosecutors, even while continuing to carve out a role for the criminal defendant. It is not quite a ban because criminal defendants are permitted limited use. And again, because prosecutors have yet to offer such evidence with regularity, this scenario constitutes pure conjecture. But it may be that the heyday of admission of thinly supported

81. Professor Denno's study concludes that prosecutors presently use such evidence "only rarely." Denno, *supra* note 1, at 499. Professor Farahany is more equivocal, noting that "[p]rosecutors, too, have seized on cognitive neuroscience to argue that defendants are incorrigible and should be given longer sentences" and "to denigrate defendants' characters and to demonstrate defendants' likely future dangerousness." Farahany, *supra* note 1, at 4–5. But it is unclear whether this refers to arguments made by prosecutors in response to evidence offered by the defense and intended as mitigating (e.g., the touted "double-edged sword" of neuroscience, in which the defense argues "my brain is defective, spare me" while the prosecution counters that "defendant's brain is defective, incarcerate him"), as opposed to those marshaled to support neuroscientific evidence offered ab initio by the prosecutor. *See, e.g.*, *id.* at 21 (recounting prosecutors' argument to this effect in response to defense evidence). In Professor Farahany's article surveying existing cases, she expounds the facts of cases that seem to consist exclusively of defense-offered evidence. *See id.* at 12, 14–19 (discussing competency challenges raised by defense regarding standing trial, tendering a plea, and confessing; support for mental illness or mens rea defenses; involuntariness; and sentencing). Notably, Professor Denno found that when "prosecutors did utilize neuroscience evidence to suggest a defendant's propensity to commit crimes, they typically did so only by building upon the evidence first introduced by a defense expert." Denno, *supra* note 1, at 526. She further found that only eighty cases contained future dangerousness discussions grounded in neuroscience, and only in ten of those was that "neuroscience evidence introduced by the defense . . . leveraged by the prosecution in an effort to prove the defendant's future dangerousness." *Id.* at 528.

82. *See infra* Part II.B.4.

scientific evidence is over, and the kind of rigorous attention given to plaintiffs' evidence will now be given to prosecutors' evidence as well. The raised awareness of the problem of wrongful conviction, and the prominent role that faulty science has played in those injustices,[83] could contribute to a sense that courts ought to shore up their admissibility standards when it comes to novel scientific evidence offered by the government in a criminal case. Recent admonitions against admitting flawed forensics may also cause courts to examine such evidence with greater intensity.[84]

But if that is the case, and courts roundly reject novel neuroscience, then how could current trends permitting defense introduction of such evidence hold and not collapse into the total ban scenario? There is little specific law on the operation of scientific admissibility standards as applied to criminal defendants as opposed to the prosecution, but what little exists suggests that there is no meaningful difference. While there is some legal support for the notion that a defendant's constitutional rights to confrontation and due process may override even rules intended to safeguard evidentiary reliability,[85] that line of reasoning has long lain fallow. If so, then *Daubert* should demand as much from criminal defendants as it does from prosecutors, and much novel neuroscience would be excluded.

But why might courts not back away from admission when it comes to defense mitigation? Three reasons.

First, the mantra that "death is different" is now so familiar that it practically needs no citation.[86] The Supreme Court consistently has distinguished capital cases in its review of the constitutionality of sentences, applying a much more robust concept of Eighth Amendment proportionality and even the Sixth Amendment right to counsel than evident in noncapital cases. Thus, it would be consistent with this disparity to also admit defense neuroscientific evidence that would not have passed muster if offered by the prosecution or civil parties.

Second, this tacit recognition that the Constitution applies differently to death cases finds explicit expression in the law of evidentiary admissibility for capital mitigation hearings. The Constitution requires that juries be allowed to consider "any relevant mitigating factor"[87] offered in a capital sentencing hearing, and "virtually no limits are placed on the relevant mitigating evidence a capital defendant may introduce concerning his own

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83. *See generally* BRANDON L. GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG 84–117 (2012).

84. *See, e.g.*, NAT'L RESEARCH COUNCIL, *supra* note 15, at 96–110.

85. *See, e.g.*, Rock v. Arkansas, 483 U.S. 44 (1987); Chambers v. Mississippi, 410 U.S. 284 (1973).

86. Nonetheless, Rachel Barkow's excellent review of the "two tracks" of sentencing law provides a helpful primer. Rachel E. Barkow, *The Court of Life and Death: The Two Tracks of Constitutional Sentencing Law and the Case for Uniformity*, 107 MICH. L. REV. 1145, 1147 (2009) (noting courts' insistence that "death is different" and arguing that it is both legally unsupported and theoretically unwise).

87. Eddings v. Oklahoma, 455 U.S. 104, 112 (1982) (citing Lockett v. Ohio, 438 U.S. 586 (1978)).

circumstances."[88] It is also clear that ordinary rules of evidence—which typically do not apply in full form during sentencing proceedings in any event[89]—must yield in capital mitigation hearings.[90] At the same time, there remains debate as to whether and to what extent *Daubert*, or a similar reliability-based standard for expert evidence, applies in the sentencing context.[91]

Finally, to the extent that the debate centers on introduction of such evidence in capital mitigation hearings—as opposed to the sentencing phase for noncapital offenses as well—then in practicality it will be an issue in only the handful of states that continue to impose the widely rejected sentence of capital punishment.[92]

In short, it is possible to imagine, and compatible with a commitment to the consistent application of legal standards, that novel neuroscientific evidence becomes a regular feature of capital mitigation hearings, even if rejected for every other proffered use. Plaintiffs, prosecutors, and other litigants (including defendants seeking to use novel neuroscience as proof in the liability phase) may continue to meet resistance from courts skeptical that

88. Payne v. Tennessee, 501 U.S. 808, 822 (1991). Note, however, that the Court has expressly stated that "relevant" has no special meaning in the capital context. Tennard v. Dretke, 542 U.S. 274, 284 (2004) (noting that the evidence must be that which "tends logically to prove or disprove some fact or circumstance").

89. *See, e.g.*, 18 U.S.C. § 3593(c) (2012) (stating that "[i]nformation is admissible regardless of its admissibility under the rules governing admission of evidence at criminal trials except that information may be excluded if its probative value is outweighed by the danger of creating unfair prejudice, confusing the issues, or misleading the jury"); FED. R. EVID. 1101(d)(3). Interestingly, there have been constitutional challenges to this rule that reveal how it operates both to the benefit and detriment of each side. For instance, it may help criminal defendants by permitting less robustly reliable evidence in mitigation, but most defense advocates deem the standard as harming defendants because it lessens the bar for the reliability of aggravation evidence offered by the prosecution in support of aggravation. Challenges along both lines have largely failed. *See, e.g.*, United States v. Snarr, 704 F.3d 368, 399 (5th Cir. 2013) (reviewing the Federal Death Penalty Act's "relaxed evidentiary standard" and reaffirming its constitutionality); *see also* Michael D. Pepson & John N. Sharifi, *Two Wrongs Don't Make a Right: Federal Death Eligibility Determinations and Judicial Trifurcations*, 43 AKRON L. REV. 1, 13 (2010). At the same time, defendants have mounted *Daubert* and *Frye* challenges to evidence introduced at sentencing, such as to "scientific findings" claiming future dangerousness, most often without much success. *See infra* note 90.

90. *See* Green v. Georgia, 442 U.S. 95, 97 (1979) (holding that the hearsay rule could not serve to exclude testimony during the capital penalty phase); *cf.* Oregon v. Guzek, 546 U.S. 517, 525 (2006) (holding that the Constitution did not grant the right to the defendant to introduce innocence-related alibi evidence that undermined conviction during the penalty phase).

91. Some courts have expressly held that *Daubert* does not apply, *see, e.g.*, United States v. Fields, 483 F.3d 313, 342 (5th Cir. 2007), while others have simply skirted the issue, *see, e.g.*, United States v. Barnette, 211 F.3d 803, 815 (4th Cir. 2000) (rejecting the defense's *Daubert*-based challenge to "[p]sychopathy checklist" evidence at sentencing without resolving the applicability of *Daubert*); Smithers v. State, 826 So.2d 916 (Fla. 2002) (noting conflicting evidence on PET scan without referencing admissibility standards).

92. Although nineteen states formally retain the death penalty, only seven states have executed an individual in the past two years. *See* DEATH PENALTY INFO. CTR., FACTS ABOUT THE DEATH PENALTY, http://www.deathpenaltyinfo.org/documents/FactSheet.pdf (last updated Aug. 30, 2016) [https://perma.cc/UFQ4-C4YS].

such evidence can meet the threshold showing of reliability, even as criminal defendants in mitigation hearings make full use of such evidence.

4. Final Thoughts About Spillover Effects

One final scenario requires elaboration. Although there are good reasons, founded both in law and legal practice, to expect that novel neuroscience will initially remain largely cabined to capital mitigation and other serious sentencing hearings, it is easy to imagine that mounting pressure would result in its adoption in other contexts. If, in fact, the routine use of novel neuroscientific evidence in mitigation hearings were to result in such pressure to apply elsewhere, what might that expansion look like? To what other proceedings might it most naturally reach?

Already, novel neuroscience has had an impact outside of the capital sentencing context: namely, in the noncapital sentencing context, albeit in a categorical and nonindividualized way. In *Graham v. Florida*[93] and *Miller v. Alabama*,[94] the Supreme Court relied heavily on neuroscientific studies to limit the reach of life without parole sentences for juvenile offenders, based on studies showing the immaturity of their brains. But apart from continuing to rely on neuroscience in this categorical fashion—isolating categories for addicted persons or the mentally ill, for instance—the real breakthrough would be to apply neuroscientific findings to noncapital, individual sentencing determinations. Indeed, *Miller* opened the door precisely to that kind of evidence. By holding that courts cannot impose mandatory life without parole, but must make individualized determinations in the case of juveniles,[95] the Court opened the door to the consideration of individual neuroscientific findings in support of a particular defendant's claim. And if a juvenile can use brain development as a mitigating factor, why not a twenty-something-year-old?

Also, there are already slight signs of prosecutors' interest in using neuroscientific evidence,[96] and it is easy to imagine, as many have, the myriad ways in which prosecutors might make further use of it in the future. It is easiest to imagine such uses in contexts that, like capital sentencing, do not suffer from the constraint of strict (or clear) evidentiary rules, such as bail hearings, competency determinations, and noncapital sentencing. Still, other proceedings, such as civil commitment hearings predicated on mental illness or future dangerousness, may require adherence to *Daubert* and *Frye* but not require the stringent burden of proof that must be met for criminal proceedings.

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93. 560 U.S. 48 (2010). As noted earlier, the Court also held it unconstitutional to execute juveniles in *Roper v. Simmons*, 543 U.S. 551 (2005). *See supra* note 52 and accompanying text.

94. 132 S. Ct. 2455 (2012).

95. *Id.* at 2475.

96. *See, e.g.*, Denno, *supra* note 1, at 526 (arguing that the concern is overblown that prosecutors will use neuroscientific evidence to bolster arguments of future dangerousness); Farahany, *supra* note 1, at 12–17 (discussing competency).

Moreover, as noted earlier, judges who become used to seeing neuroscientific proof in capital sentencing hearings may believe, as a matter of basic fairness, that the prosecution ought to be permitted to respond in kind with its own evidence. For example, in Professor Farahany's study of criminal cases, she noted that prosecutors do not always respond solely with argument to defense efforts to use neuroscientific testing—they sometimes use the neuroscientific proof itself to argue against the defendant.[97] In such cases, "[s]ome of the brain abnormality evidence introduced by a criminal defendant at trial can cut against him at a civil commitment hearing,"[98] as happened in the case of a man who had suffered a serious brain injury that purportedly explained his aggression but whose injury prosecutors used to also show his incapacity for reform.[99]

A kind of "good for the goose, good for the gander" reasoning also appears in existing sentencing law. In *Payne v. Tennessee*,[100] as noted earlier, the Supreme Court expressly stated that "virtually no limits are placed on the relevant mitigating evidence a capital defendant may introduce concerning his own circumstances."[101] But the Court also added that "[t]he State has a legitimate interest in counteracting the mitigating evidence which the defendant is entitled to put in."[102] Otherwise, there is "the potential for such unfairness."[103] Once the defendant introduces exculpatory neuroscientific proof, it seems only natural that courts would allow prosecutors to respond in kind. And when such evidence takes the form of novel neuroscience, courts may prove reluctant to reject prosecutorial evidence as insufficiently reliable having admitted the same kind of evidence when offered by the defense. In this way, evidence that now serves the interests of defendants, propelled to admission by a defendant's special constitutional rights,[104] may quickly become precedent relied upon by courts to admit the same kind of evidence more broadly, even when offered against the defense. If so, government use of neuroscientific proof could be grandfathered in through defense standards that were never that onerous, resulting in a new kind of *Daubert* equilibrium.

Of course, as courts grow accustomed to hearing neuroscientific evidence in bail proceedings, sentencing proceedings, competency determinations, and the like, will they remember that such evidence did not have to meet stringent hurdles of reliability when confronted with neuroscientific evidentiary proffers during the guilt phase of a trial? Current case reviews suggest that

97. *See* Farahany, *supra* note 1, at 22.
98. *Id.*
99. *See id.*
100. 501 U.S. 808 (1991).
101. *Id.* at 822.
102. *Id.* at 825 (quoting Booth v. Maryland, 482 U.S. 496, 517 (1987) (White, J., dissenting)).
103. *Id.*
104. *See, e.g.*, United States v. Sandoval-Mendoza, 472 F.3d 645, 656 (9th Cir. 2006) (reversing exclusion of brain tumor evidence that bolstered entrapment defense); State v. Ferrell, 277 S.W.3d 372, 381 (Tenn. 2009) (reversing exclusion of "toxic encephalopathy" evidence that supported the defendant's claim that he was too cognitively impaired to have plotted escape).

courts generally reject such evidence, even when offered by the defense, although instances of admission occur.[105] But will that pattern endure even if the science does not meaningfully evolve? Will it not seem odd to a judge to rule evidence unreliable that, in a hearing months earlier, the judge cited as part of a basis for a detention decision? Similarly, it is easy to imagine that opinions admitting such evidence at the request of defendants citing constitutional values will be successfully cited by prosecutors seeking to introduce the same kind of evidence on their own behalf.

If novel neuroscience gains a foothold in the parts of a criminal case that are not characterized by extensive discovery, robust adversarial hearing, or formal evidence rules (including *Daubert*- or *Frye*-type reliability screens), then it will no doubt have an advantage when it first starts cropping up in the more demanding phases of adjudication. Indeed, the lamentable state of public defense in the United States suggests that many unfounded neuroscientific claims may go altogether unchallenged even if there were legitimate legal and scientific bases to keep such evidence out.[106]

Finally, might this embrace of novel neuroscientific evidence, once a regular feature of criminal cases, eventually bleed over to the civil context as well? Will an opinion that admits evidence of "toxic encephalopathy"[107] in mitigation become a supportive citation for a motion to admit such evidence when offered by a civil plaintiff? Although the traditional narrative about the divide between civil and criminal *Daubert* suggests that distinctions between the two can be maintained, it is not inconceivable that the inroads made in the criminal context might ease the path for at least some civil plaintiffs going forward. The same judges that hear neuroscientific evidence in capital cases inevitably will preside over other kinds of proceedings, including civil matters.

As such evidence becomes increasingly familiar and judges acclimate to its particular vernacular, the novelty of using neuroscientific proof may start to wear off and earlier boundaries dissolve. After all, judges tend to expect a baseline of reliability from all evidence. Even in a capital hearing, most judges would not allow the defendant to present an astrologer who would testify that the defendant only acted because Mercury was in retrograde. Judges may feel a fundamental discomfort with the idea of a discrepancy—the notion that neuroscience is somehow reliable enough for a death sentence determination but not for less serious offenses or monetary claims.

Furthermore, empirical evidence shows that neuroscientific proof is susceptible to motivated reasoning, "the unconscious tendency to assimilate

105. *See, e.g.*, 5 DAVID L. FAIGMAN ET AL., *supra* note 1, §§ 20:9–:16.

106. *See, e.g.*, Risinger, *supra* note 18, at 135 ("When I first started looking at these post-*Daubert* cases, I expected to find records of multiple well-litigated attacks on the weakest kinds of common prosecution-proffered expertise, with any system bias coming from judicial decisions. What I found was an apparent systematic failure to seriously litigate these issues on the part of the criminal defense bar.").

107. *See Ferrell*, 277 S.W.3d at 375, 381.

information in a manner biased towards reaching a particular outcome."[108] Thus, judges may begin to deem such evidence reliable when it confirms other proof, or even their own intrinsic beliefs about a particular condition, and incline toward a more generous *Daubert* or *Frye* standard in noncapital or civil cases.

CONCLUSION

Novel neuroscientific evidence now stands at the precipice of the judicial system, seeking entry. But that system's history of safeguarding scientific proof suggests that even if neuroscience is ready, the courts may not be. On the civil side, courts have struggled to show evenhandedness and consistency in the degree to which they subject plaintiffs' evidence to scrutiny, often being accused of reserving their most intense oversight for plaintiffs' proffers. On the criminal side, courts have repeatedly shown themselves willing to allow the most spurious forms of "science" when offered by prosecutors—with catastrophic consequences.

The disconnect between these two realities—courts' leniency toward criminal prosecutors and harshness toward civil plaintiffs—has henceforth created little overt tension in our appraisal of the rule of law because the scientific methods proffered in each category varied markedly. Apart from fire science and handwriting analysis, which have their own unique pathologies, the scientific techniques rejected by civil courts had little bearing on the methods prosecutors sought to introduce.

Novel neuroscience, however, may stand alone at the crossroads of civil and criminal evidence. Like lie detection, its closest analogue, novel neuroscience offers something of value to both civil and criminal litigants and to plaintiffs, prosecutors, and defendants. As courts confront questions of its admissibility, then, they will have to squarely confront the demonstrated problem of inconsistent application of admissibility standards. What will be the result? Only time will tell. But whatever the outcome, observers may gain a clearer sense of the successes and failures of our evidentiary admissibility standard.

108. Nicholas Scurich & Adam Shniderman, *The Selective Allure of Neuroscientific Explanations*, PLOS ONE 2 (Sept. 2014), http://journals.plos.org/plosone/article/asset?id=10.1371/journal.pone.0107529.PDF [https://perma.cc/W8AX-T76P].