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Seeing Voices: Potential Neuroscience Contributions to a Reconstruction of Legal Insanity

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SEEING VOICES: POTENTIAL NEUROSCIENCE CONTRIBUTIONS TO A RECONSTRUCTION OF LEGAL INSANITY

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Nurses working at a community hospital ward in a poor section of the city were both frustrated and irritated with their middle-aged female patient and were ready to put her in physical restraints.[1] The patient had been admitted for attempting to harm herself. She refused to comply with the nurses' requests, behaving belligerently and repeatedly throwing herself on the floor. In a hospital that serves many homeless, drug-addicted, mentally ill, and violent patients, this troublesome woman was a particular challenge in a day filled with difficult patients. And, after several hours, the nurses' empathy for their patient was waning.

The psychiatrist on staff that day was new to the job, although not new to psychiatric work. He had given up his long-standing and very successful private and forensic practice to return to practicing psychiatry in a city hospital that often received the most difficult and treatment-resistant mentally ill patients. This job was similar to the work he did when first out of his residency with an ivy-league degree and no fear of spending eighteen-hour days in a hospital psych ward. But now, of course, he was returning with decades of experience and access to new forms of neuroimaging and psychotropic drugs that did not exist when he first began practice. As he returned to hospital work, he was finding the work fascinating, exhausting, intense, and, most critically, valuable.

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* Carol Los Mansmann Chair in Faculty Scholarship and Professor of Law, Duquesne University School of Law. Special thanks to Professor Deborah W. Denno and Fordham University School of Law for the terrific symposium in February 2016, *Criminal Behavior and the Brain: When Law and Neuroscience Collide*, for which this article was written. Versions of this article were presented at Stetson Law School, University of Akron School of Law, and at the Mon River Faculty Colloquium, composed of faculty from Duquesne University School of Law, University of Pittsburgh School of Law, and West Virginia School of Law. Thanks to all for helpful comments. Thanks to Daniel Langleben, Michael Perlin, Bruce Ledewitz, and Lee Gutkind for helpful comments on drafts. Many thanks to Duquesne University School of Law for supporting this research and to Marcus Lipinski (J.D., 2016) and Rachel Matson (J.D., 2017) for research assistance and the *Fordham Law Review* for their excellent work on this project. For an overview of the symposium, see Deborah W. Denno, *Foreword: Criminal Behavior and the Brain: When Law and Neuroscience Collide*, 85 FORDHAM L. REV. 399 (2016). For Gary~rest in peace, my love.

1. The following account comes from two interviews with a neuropsychiatrist who requested anonymity. The first was an in-person interview in Pittsburgh, Pennsylvania on February 13, 2016 and the second was a telephone interview on July 12, 2016.

After listening to the nurses' concerns about this particular patient and observing her behavior, however, he had a suspicion and ordered a CT scan of the patient's brain. He reviewed the scans and immediately saw the damage and tissue loss in the patient's prefrontal cortex, likely from a prior stroke. When he discussed the scan results with the nurses, he saw their faces soften and realized they now saw her not as a rotten person but as a very ill patient.[2] This state of mind and emotion, where we shift from blaming a person for behavior to potentially excusing her, is where the historical origins of the insanity defense reside within us. At root, opinions about blameworthiness and mental illness are guided by an internal moral compass and are critical to our shared notions of justice.[3]

The change in how the nurses thought about the patient was not due to a physician's clinical diagnosis or opinion based on the patient's behavior. It was the information from the image of an injured brain that affected how the nurses thought about her blameworthiness. We cannot discount the effect on a decision that a reliable, science-based image can provide—whether an x-ray of a broken leg, a photograph of a severe injury, or a structural or functional image of the brain—or even the effect of being informed about that image. Accurate, relevant neuroimaging data (coupled with explanations) that relate to legal insanity might be helpful and lead to

2. Whether brain damage or trauma is causally related to behavior, of course, is a serious question in any given case and for neuroscience and criminal law generally. While there are reasons to believe that brain trauma and injury might be implicated in aberrant behavior, as explained later in this Article, simply blaming the brain for behavior is both overly simplistic and potentially misleading. The prefrontal lobe damage in this case may have been causally related to the behavior of the patient or not; she may just have been a very difficult person. Correlation is not causation, and current imaging does not prove the relationship between a given brain abnormality and behavior. *See* Walter Glannon, *The Limitations and Potential of Neuroimaging in the Criminal Law*, 18 J. ETHICS 153, 155 (2014). The relationship between neuroimaging and aberrant behavior is the subject of much commentary. *See, e.g.*, C.C. Meltzer et al., *Guidelines for the Ethical Use of Neuroimages in Medical Testimony: Report of a Multidisciplinary Consensus Conference*, 35 AM. J. NEURORADIOLOGY 632, 632 (2013) (noting the difficulty of making inferences about human behavior from functional neuroimaging); Jane C. Moriarty, Daniel D. Langleben & James M. Provenzale, *Brain Trauma, PET Scans and Forensic Complexity*, 31 BEHAV. SCI. & L. 702, 707 (2013) (discussing the complicated relationship between brain and behavior, and arguing that the weight of commentary does not support the neuroimaging as a direct link to behavior). For an excellent discussion on the historical and contemporary problems of linking violent behavior to physiognomy and brain structure, see Amanda Pustilnik, *Violence on the Brain: A Critique of Neuroscience in Criminal Law*, 44 WAKE FOREST L. REV. 183 (2009).

3. "These shared intuitions of justice can reveal much about the way people conceptualize behavior, blame, and punishment. . . . [T]hese intuitions tell us what it means to hold someone blameworthy and not just responsible." Steven K. Erickson, *Blaming the Brain*, 11 MINN. J.L. SCI. & TECH. 27, 59–60 (2010). For more on the concept of blameworthiness in criminal law, see generally, Peter Arenella, *Convicting the Morally Blameless: Reassessing the Relationship Between Legal and Moral Accountability*, 39 UCLA L. REV. 1511 (1992) (providing an in-depth analysis of the foundations of legal and moral blame and the complexities of that relationship). For more on blameworthiness and legal insanity, see generally Laura Reider, *Toward a New Test for the Insanity Defense: Incorporating the Discoveries of Neuroscience into Moral and Legal Theories*, 46 UCLA L. REV. 289 (1998); Christopher Slobogin, *An End to Insanity: Recasting the Role of Mental Disability in Criminal Cases*, 86 VA. L. REV. 1199 (2000).

more rationally premised decision making.[4] For example, if functional neuroimaging could accurately visualize an auditory verbal hallucination (AVH) that a person with schizophrenia endures, legal insanity might be a more understandable and, indeed, a more palatable concept. Perhaps "seeing voices" could improve the rationality of decision making about legal insanity.[5] Moving away from purely behavioral-science based expert opinions to opinions more firmly grounded in neurological or biological evidence may be a critical step.

Radiographic images of brain anatomy ("structural images") are widely used in medicine where behaviors may be correlated with conditions such as strokes and neurodegenerative disorders.[6] Additionally, some forms of functional neuroimaging are also useful in medicine. For example, one type of positron emission tomography, 18 FDG PET, a functional technique that captures glucose metabolism, is routinely used in diagnosing brain tumors and Alzheimer's disease.[7]

The legal system embraces these structural and functional imaging methods for many diagnostic purposes, given their long-recognized role in medicine for these purposes.[8] Using structural and functional imaging to explain criminal behavior, however, raises more complicated questions, including whether behavior can be reduced to brain states and whether complex decisions involving cognition and behaviors can be accurately imaged.

Given the largely negative and stereotyped beliefs that have long fueled legislative, judicial, and jury decisions about the insanity defense,[9] accurate

4. Studies looking at neuroimaging, neuroscience, and decision making by mock jurors suggest it is not the images themselves that are terribly persuasive, but the "entire package of neuroevidence," including the science-based testimony. N.J. Schweitzer & M.J. Saks, *Neuroimaging Evidence and the Insanity Defense*, 29 BEHAV. SCI. L. 592, 604 (2011).

5. Researchers are developing neuroimaging to visualize auditory verbal hallucinations. *See generally* Renaud Jardri et al., *Cortical Activations During Auditory Verbal Hallucinations in Schizophrenia: A Coordinate-Based Meta-Analysis*, 168 AM. J. PSYCHIATRY 73 (2011) (analyzing multiple PET and fMRI studies and discussing the findings of increased activation in clusters of the brain that occur when patients with schizophrenia spectrum disorders experience AVH); *see also* Schweitzer & Saks, *supra* note 4, at 604 (suggesting from their study data that "framing mental illness in biological or neurological terms works to remove some skepticism on the part of jurors by making the underlying mechanism of the mental illness more concrete").

6. Melissa Lamar et al., *Dementia*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM 67, 69–71 (Joseph R. Simpson ed., 2012) (discussing the use of structural neuroimaging in diagnosing various forms of dementia); *see also* Erin D. Bigler et al., *MRI and Functional MRI*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM, *supra*, at 27, 27 (noting that CT is "is the most powerful method of showing the mechanism and acuteness" of acute-onset brain injuries such as stroke).

7. Susan E. Rushing, Daniel A. Pryma & Daniel D. Langleben, *PET and SPECT*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM, *supra* note 6, at 3, 20.

8. Jane Campbell Moriarty, *Flickering Admissibility: Neuroimaging Evidence in the U.S. Courts*, 26 BEHAV. SCI. & L. 29, 40 (2008) (collecting cases and concluding that "MRI and CT . . . are well-accepted as reliable forms of scientific evidence to show that a party has brain damage, injury, or illness.").

9. *See generally* MICHAEL J. PERLIN, JURISPRUDENCE OF THE INSANITY DEFENSE 229–30 (1993) (discussing the largely mythic beliefs that animate insanity defense jurisprudence,

structural and functional images might become an effective way in the future to provide a more realistic understanding of both mental illness and the effects of traumatic brain injury. If such images are to be based upon robust scientific knowledge that supplements and confirms current psychiatric and psychological diagnoses, it may be possible to respond successfully to the damaging and inaccurate mythic beliefs that plague the insanity defense.

By most accounts, the science is not yet there,[10] but identifying genetic and brain-based biomarkers of serious mental illness is a robust area of research in multiple scientific disciplines.[11] Moreover, neuroscience may help illuminate the relationship between cognition and behaviors, relevant both to defendants with mental illness and those with traumatic brain injuries caused by accidents, assaults, wars, and sports.[12]

This Article focuses only on the conception of legal insanity in light of developing neuroscience; it does not make recommendations about courtroom evidence. Much of the emerging functional neuroscience is not sufficiently reliable for the courtroom,[13] a point I have made elsewhere.[14]

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including that the defense is "an abused, overpleaded and over-accepted 'loophole' . . . that most successful pleaders are not truly mentally ill; that most acquittals follow sharply-contested 'battle of the experts;' [and] that most successful pleaders are sent for short stays to civil hospitals").

10. *See e.g.*, Stefan Borgwardt & Paolo Fusar-Poli, *Third-Generation Neuroimaging in Early Schizophrenia: Translating Research Evidence into Clinical Utility*, 200 BRIT. J. PSYCHIATRY 270, 270 (2012) (discussing some of the findings of schizophrenia neuroscience research in first and second generation studies but noting that "no consistent or reliable anatomical or functional alterations have been unequivocally associated with psychosis or schizophrenia and no clinical applications have been developed in psychiatric neuroimaging"); MICHAEL FIRST ET AL.,AM. PSYCHIATRIC ASS'N, CONSENSUS REPORT OF THE APA WORK GROUP ON NEUROIMAGING MARKERS OF PSYCHIATRIC DISORDERS 2 (2012) (explaining that neuroimaging studies have presented promising results, but "[c]urrently neuroimaging is not recommended within either the U.S. or European practice guidelines for positively defining diagnosis of any primary psychiatric disorder"); Meltzer et al., *supra* note 2.

11. *See generally* Kerstin Bendfeldt et al., *Classifying Individuals at High-Risk for Psychosis Based on Functional Brain Activity During Working Memory Processing*, 9 NEUROIMAGE 555 (2015); Nikolaos Koutsouleris et al., *Individualized Differential Diagnosis of Schizophrenia and Mood Disorders Using Neuroanatomical Biomarkers*, 138 BRAIN 2059 (2015); Aswin Sekar et al., *Schizophrenia Risk from Complex Variation of Complement Component 4*, 530 NATURE 177 (2016); Kenneth Hugdahl et al. *Auditory Hallucinations in Schizophrenia: The Role of Cognitive, Brain Structural and Genetic Disturbances in the Left Temporal Lobe*, FRONTIER HUM. NEUROSCIENCE (Mar. 28, 2008), http://journal.frontiersin.org/article/10.3389/neuro.09.006.2007/full [https://perma.cc/3LDG-SJ2S].

12. *See also* Joshua W. Buckholtz and David L. Faigman, *Promises, Promises for Neuroscience and Law*, 24 CURRENT BIOLOGY (SPECIAL ISSUE) R861, R861–63 (2014) (discussing the potential "engagement between law and neuroscience" on the issue of self-control and to illuminate mental states, including blameworthiness).

13. Despite the concerns many have about the admissibility of structural and functional neuroimaging, data suggest such evidence is admitted in a variety of ways. *See* 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, 505 (2015) (analyzing 800 cases addressing neuroscience over the course of two decades and concluding that "[i]n sum, the Neuroscience Study reveals a modern criminal justice system that is open to employing a wide range of neuroscience evidence"). For more empirical data and analysis on the use of

Indeed, as other scholars explain in a recent article, law and neuroscience are not yet even speaking a common language that would permit them to meaningfully communicate in the area of self-control and criminal responsibility.[15] With time, however, the law should be receptive to well-developed science informing our conception of legal insanity.

I suggest three ways that neuroscience might inform and possibly improve the concept of legal insanity. First, it could ground existing psychiatric and psychological views of legal insanity in brain science that complements and possibly refines the traditional diagnoses based upon observations, physical examinations, and patient history.[16] For example, scientists from multiple disciplines are working to understand the cause, development, and appropriate treatment of schizophrenia.[17] These insights may provide what has been missing from the psychiatric diagnostic toolkit: reproducible, biological information about individuals with either mental or neurological illness or injury. Such information may well provide a better way to distinguish between the responsible and mentally nonresponsible.

Second, neuroscience may better illuminate the relationship between disordered thinking and aberrant behavior. Statutes defining legal insanity often distinguish between cognition and volition, with few jurisdictions allowing the latter to serve as a defense.[18] The debate about the proper role of cognition and volition in legal insanity has been reignited in the last decade in part due to legal cases involving (1) veterans returning from Iraq and Afghanistan who have been injured by explosions ("blast damage") or have suffered other forms of traumatic brain injuries and (2) athletes suffering from chronic traumatic encephalopathy (CTE) due to sport-related

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neuroscience evidence, see Nita A. Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis*, 2 J.L. BIOSCIENCES 485 (2016) (evaluating the use of neurological and behavioral genetic evidence by criminal defendants in U.S. criminal cases and concluding that the use of such evidence is widespread on the increase), and Francis X. Shen, *Neuroscience Evidence as Instant Replay*, 3 J.L. BIOSCIENCES 1 (2016) (synthesizing empirical studies from four countries and concluding that the admission of neuroscience evidence appears to be on an upward trajectory).

14. *See* Daniel D. Langleben & Jane C. Moriarty, *Using Brain Imaging for Lie Detection: Where Science, Law, and Policy Collide*, 19 PSYCHOL. PUB. POL'Y & L. 222 (2013); Jane Campbell Moriarty, *supra* note 8; Jane Campbell Moriarty, *Visions of Deception: Neuroimages and the Search for Evidential Truth*, 42 AKRON L. REV. 739 (2009); Moriarty, Langleben & Provenzale, *supra* note 2.

15. *See* Joshua W. Bukholtz, Valerie Reyna & Christopher Slobogin, *A Neuro-Legal Lingua Franca: Bridging Law and Neuroscience on the Issue of Self-Control* (Mental Health Law & Policy Journal, Working Paper No. 16-32, 2016) (explaining the dual languages of law and science and the need for a common language—a "lingua franca"—about mental states relevant to criminal justice). "[I]f the law's normative preferences can be framed in a common language, scientists' ability to operationalize legal concepts and produce legally relevant findings will be enhanced." *Id.* at 4.

16. *See* Glannon, *supra* note 2, at 154 (noting that advanced imaging may "clarify whether an individual had or lacked control of her actions when behavioral criteria alone cannot answer this question").

17. *See generally supra* note 11; *infra* notes 87–89.

18. *See infra* Parts I, III.

head injuries.[19] The relationship between thought and behavior is the subject of much research, and neuroscience insights may eventually improve the understanding of this relationship.

Third, neuroscience and research from other disciplines may converge to better inform our moral sense of blameworthiness. As with the example of the nurses at the beginning of this Article, a deeper, more science-based understanding of mental illness and impairment may affect our moral decisions about blameworthiness—a helpful antidote to the last forty years of legislation aimed primarily at stopping defendants from "getting away with murder."[20]

Part I of this Article explains the insanity defense in the United States. Next, Part II discusses some of the brain-based research about mental illness, focusing on schizophrenia research. Then, Part III looks at traumatic brain injury and the relationship among injury, cognition, and behavior. Finally, Part IV explains how a new neuroscience-informed standard might better inform our moral decision making about legal insanity.

I. THE INSANITY DEFENSE

Intuitively, we understand and accept that not all actors are equally blameworthy for their acts. We believe toddlers are not blameworthy, as they have not yet developed moral reasoning or behavioral control. We often hold adolescents to a lesser standard of responsibility than adults, understanding their less developed brains may lead them to make more impulsive and foolish decisions than adults.[21] But in the legal evaluation of criminal defendants with mental illness, the distinction between blameworthy and excusable conduct is far more complex and fraught, as the last few hundred years prove. Ideally, the insanity defense excuses defendants who, due to serious mental illness or injury, are not morally blameworthy. While a verdict of legal insanity is informed by medical or psychological evidence, it is also a moral and humane judgment.[22]

The insanity defense, although a part of Anglo-American jurisprudence for hundreds of years,[23] has been much maligned.[24] Its claimed

19. *See, e.g.*, Symposium, *Brain Science in the 21st Century: Clinical Controversies and Ethical Implications*, 42 J.L. MED. & ETHICS 124 (2014); Symposium, *Criminal Behavior and the Brain: When Law and Neuroscience Collide*, 85 FORDHAM L. REV. 399 (2016); Symposium, *Neuroscience, Cognitive Psychology, and the Criminal Justice System*, 8 OHIO ST. J. CRIM. L. 1 (2010).

20. For more on the importance of neuroscience to inform our moral sense of blameworthiness, see generally Theodore Y. Blumoff, *Foreword: The Brain Sciences and Criminal Law Norms*, 62 MERCER L. REV. 705 (2011).

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

22. *See* Richard J. Bonnie, *The Moral Basis of the Insanity Defense*, 69 A.B.A. J. 194, 194 (1983) (discussing the role of the insanity defense as an integral aspect of the moral foundation of criminal law).

23. *See* 1 THE ROLE OF MENTAL ILLNESS IN CRIMINAL TRIALS: THE HISTORY OF MENTAL ILLNESS IN CRIMINAL CASES, at xi (Jane Campbell Moriarty ed., 2001) (discussing the

shortcomings are multifold: the defense is based on antiquated and inaccurate concepts of mental illness,[25] behavioral science diagnoses are claimed to be overly subjective,[26] mental health professionals frequently disagree about whether a given individual is sufficiently mentally ill to be considered legally insane,[27] politicians and prosecutors argue strenuously that the insanity defense allows defendants to "get away with murder,"[28] and many fear a legally insane defendant will be able to walk free after the verdict.[29] In studies involving mock juries and public views of legal insanity, many participants did not believe that mental illness reduces an individual's capacity for understanding the wrongfulness of his conduct. These jurors also believed that the mentally ill were equally blameworthy as others who committed crimes.[30]

Leading insanity defense scholars have long argued that insanity defense jurisprudence has been in a "state of chaos"[31] or that it is "incoherent."[32] More recently, one scholar, noting multiple problems with the current state of the insanity defense argues that it may be "unraveling"—a position that certainly rings true.[33] If the defense, infrequently invoked and rarely

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contributions of Sir Edward Coke and Sir Mathew Hale in the 1600s to the legal construction of the insanity defense).

24. *See generally* PERLIN, *supra* note 9.

25. Lisa Claydon, *Are There Lessons to be Learned from a More Scientific Approach to Mental Condition Defences?*, 35 INT'L J.L. & PSYCHIATRY 88, 88 (2012) ("[T]he law lags behind psychiatric understanding, and this partly explains why in practice medical professionals do not apply the correct legal test."). This concern animates much of the reasoning for Judge David Bazelon's well-known opinion in *Durham v. United States*, 214 F.2d 862 (D.C. Cir. 1954), where he noted that the law of insanity was far behind developments in science, and he created a new test that defined insanity as "the product of mental disease or mental defect." *Id.* at 874–75. The *Durham* test, however, was abandoned in 1972 by *United States v. Brawner*, 471 F.2d 969 (D.C. Cir. 1972). *Brawner* was effectively overruled by the Insanity Defense Reform Act, 18 U.S.C. § 17 (2012).

26. Nicole A. Vincent, *A Compatibilist Theory of Legal Responsibility*, 9 CRIM. L. & PHIL. 477, 479 (2015).

27. In a recent study conducted in Hawaii, where three independent experts (psychiatrists and psychologists) conducted independent evaluations of defendants in 165 cases, the authors conclude that the rate of agreement about legal sanity among forensic evaluators was roughly 55 percent. *See* W. Neil Gowensmith, Daniel C. Murrie & Marcus T. Boccaccini, *How Reliable Are Forensic Evaluations of Legal Sanity*, 37 LAW & HUM. BEHAV. 98, 103 (2012). In that study, evaluators disagreed clearly in at least 35 percent of cases. *See id.* This study's conclusion differs sharply from previous studies cited therein but may be based on the fact that these cases required independent evaluations, which was not likely in prior studies.

28. PERLIN, *supra* note 9, at 24 n.53 (1993) (quoting Rudolph Guiliani,who claimed that getting away with murder occurs "in many, many insanity cases").

29. *See id.* at 230.

30. *See* COREY J. VITELLO & ERIC W. HICKEY, THE MYTH OF A PSYCHIATRIC CRIME WAVE: PUBLIC PERCEPTION, JUROR RESEARCH, AND MENTAL ILLNESS 97 (2006) (citing Caton F. Roberts, Stephen L. Golding & Frank D. Fincham, *Implicit Theories of Criminal Responsibility: Decision Making and the Insanity Defense*, 11 LAW & HUM. BEHAV. 207 (1987)).

31. *See* Slobogin, *supra* note 3, at 1199.

32. PERLIN, *supra* note 9, at 1.

33. R. George Wright, *Pulling on the Thread of the Insanity Defense*, 59 VILL. L. REV. 221, 241 (2014) (arguing that the defense is in danger of unraveling due to legal, scientific, and jurisprudential reasons).

successful,[34] is unraveling, the reasons are clear: legislation either seriously restricts the defense[35] or eliminates it entirely,[36] the U.S. Supreme Court and state court decisions permit such legislation to stand,[37] the public has a distaste for the defense,[38] and there has been a national shift toward incarcerating those with mental illness.[39] Additionally, the ongoing debates about free will and determinism may also be contributing to this unraveling.[40]

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34. *See* Schweitzer & Saks, *supra* note 4, at 594 (noting the infrequent use and even more infrequent success of the insanity defense). The most memorable description of its poor success rate claims it is "rarer than poisonous snake bites in Manhattan." Julian Eule, *The Presumption of Sanity: Bursting the Bubble*, 25 UCLA L. REV. 637, 655 (1978).

35. *See e.g.*, Insanity Defense Reform Act, 18 U.S.C. § 17 (2012).

36. *See, e.g.*, KAN. STAT. ANN. § 21-5209 (2012). The Kansas statute eliminates the insanity defense and provides for an acquittal only if the defendant, "as a result of a mental disease or defect, lacked the culpable mental state required as an element of the crime charged."

37. *See, e.g.*, State v. Cowan, 861 P.2d 884, 888 (Mont. 1993), *cert. denied sub nom.* Cowan v. Montana, 511 U.S. 1005 (1994).

38. PERLIN, *supra* note 9, at 229.

39. *See, e.g.*, Jonathan Simon & Stephen A. Rosenbaum, *Dignifying Madness: Rethinking Commitment Law in an Age of Mass Incarceration*, 70 U. MIAMI L. REV. 1, 11 (2014) ("In the [past] forty years, a revolution in criminal justice policies led to an enormous expansion of the prison population. As prison sentences became less individualized through a variety of mechanisms—including determinate sentences, mandatory minimums, and prosecutorial discretion—unprecedented numbers of people with serious mental illness found themselves confined in prisons and jails."); *see also* Steven Raphael & Michael A. Stoll, *Assessing the Contribution of the Deinstitutionalization of the Mentally Ill to Growth in the U.S. Incarceration Rate*, 42 J. LEGAL STUD. 187, 188 (2013) (discussing the precipitous rate of mental hospital inpatients after the 1960s and the fivefold increase in incarceration rates during the 1980s and 1990s and analyzing the relationship between those two dramatic changes). While finding that the deinstitutionalization played a "relatively minor role" in incarceration increases, the authors conclude that "a sizable portion of the mentally ill behind bars would not have been incarcerated in years past." *Id.* at 190; *see also* Michael L. Perlin, *"Wisdom Is Thrown Into Jail": Using Therapeutic Jurisprudence to Remediate the Criminalization of Persons with Mental Illness*, 17 MICH. ST. U. J. MED. & L. 343 (2013).

40. Professor R. George Wright argues that debates about free will and determinism also contribute to the more philosophically premised concerns about moral agency. Wright, *supra* note 33, at 231–41. While the debate about free will and determinism is robust in neuroscience and law, it is beyond the scope of this Article, although certainly relevant to the issue. *See e.g.*, Martha J. Farah, *Neuroethics: The Ethical, Legal, and Societal Impact of Neuroscience*, 63 ANN. REV. PSYCHOL. 571, 586 (2012) (questioning whether neuroscience knowledge claiming that our behavior is caused by brain processes will affect our views of ourselves as moral agents); Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON B 1775, 1778 (2004); Adam J. Kolber, *Will There Be a Neurolaw Revolution?*, 89 IND. L.J. 807 (2014); John B. Meixner, Jr., *Applications of Neuroscience in Criminal Law: Legal and Methodological Issues*, 15 CURRENT NEUROLOGY & NEUROSCIENCE REP. 513, 520 (2014) (referencing the vigorous debate among scholars in science, law, and philosophy about whether neuroscience might change the way we think about culpability, mens rea, and behavioral control); Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397 (2006); Stephen J. Morse, *Determinism and the Death of Folk Psychology: Two Challenges to Responsibility from Neuroscience*, 9 MINN. J.L. SCI. & TECH. 1 (2008); Slobogin, *supra* note 3, at 1222–27 (discussing determinism and insanity); Vincent, *supra* note 26, at 481–82.

During this same period, however, neuroscience research (among other scientific disciplines) appears to be ascendant in the understanding, prediction, diagnosis, and treatment of mental illnesses, such as schizophrenia.[41] Researchers are also trying to understand the cognitive and behavioral effects of traumatic brain injury caused by blast damage, sports, and accidents.[42] It is thus an appropriate time, perhaps, to consider developing neuroscience research and whether it could inform a reconstruction of legal insanity going forward.[43]

Given the fragmented and fraying state of the insanity defense, it may be overly optimistic to assume a reconstruction will follow. Yet, moral blameworthiness is a deeply human concept we collectively and intuitively understand; we are unlikely to willingly jettison the concept of legal insanity entirely.[44] Neuroscience, however, may help create a sturdier foundation for a reconstruction of legal insanity—in whatever form it takes.[45] If developments in neuroscience provide information that substantively changes the way we think of serious mental illness—for example, as a disease process akin to type I diabetes that strikes in childhood and adolescence—we might radically restructure the concept of legal insanity in the criminal law field.[46] It is possible that legal insanity could change from an affirmative defense to something more akin to a pretrial determination that results in confinement and treatment but not punishment.[47]

Currently, the federal system and a majority of states use some variant of the mid-1800 "*M'Naghten* test," a cognitively focused standard that

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41. *See infra* Part II.

42. *See infra* Part III.

43. Professor Theodore Blumoff suggests that "[n]euroscience, behavioral genetics, and the brain sciences generally ought to be among the sources that routinely inform our jurisprudence far more than they do now." Blumoff, *supra* note 20, at 725. I agree with Professor Blumoff in theory but believe it may still be too early for such a hearty embrace.

44. Stephen J. Morse, *Mental Disorders and Criminal Law*, 101 J. CRIM. L. & CRIMINOLOGY 885, 933 (2011) (arguing that "[t]here is no suitable alternative to legal insanity"). Professor Michael Perlin agrees, noting that "we recognize that in some narrow and carefully circumscribed circumstances, exculpation is—and historically has been—proper and necessary." Michael J. Perlin, *"The Borderline Which Separated You from Me": The Insanity Defense, the Authoritarian Spirit, the Fear of Faking, and the Culture of Punishment*, 82 IOWA L. REV. 1375, 1379 (1997); *accord*, Bonnie, *supra* note 22, at 194.

45. How a reconstruction of legal insanity would develop is interesting but beyond this Article. In Montana, for instance, when the insanity defense was abolished there was a marked increase in the number of defendants that courts found incompetent to be tried. *See, e.g.*, Lisa A. Callahan, Pamela Clark Robbins, Henry J. Steadman & Joseph P. Morrissey, *The Hidden Effects of Montana's "Abolition" of the Insanity Defense*, 66 PSYCHIATRY Q. 103, 116 (1995) (discussing the increase in finding defendants incompetent to stand trial and the increase in charges being dismissed after that finding).

46. Scholars suggest that as neuroscience offers more precise accounts of the "physical processes that can lead to irresponsible or criminal behaviour, the public perception of responsibility" may change much the way viewpoints about addiction have shifted from a failure of character to a medical disease model. Andrea L. Glenn & Adrian Raine, *Neurocriminology: Implications for the Punishment, Prediction and Prevention of Criminal Behaviour*, 15 NATURE REVIEWS NEUROSCIENCE 54, 59 (2014); *see also* Farah, *supra* note 40 at 586.

47. *See* Blumoff, *supra* note 20, at 746.

considers whether an individual knows or appreciates the wrongfulness of his conduct due to serious mental illness or injury.[48] Before 1980, however, "well over half the states" in the United States had adopted the American Law Institute's (ALI) Model Penal Code test, which embraced a broader definition of legal insanity, including a volitional, as well as a cognitive prong.[49] The test did not require the mental illness or defect to be "severe," and permitted the defense to be used where the defendant could not "conform his conduct to the requirements of law."[50]

However, when John Hinckley Jr. shot both President Reagan and James Brady in March 1981 and was found not guilty by reason of insanity under the ALI test, insanity defense standards began changing rapidly.[51] In response to the Hinckley's acquittal, Congress enacted a much more limited test for insanity, as part of the Insanity Defense Reform Act[52] (IDRA). IDRA restricted the insanity defense to those cases where the defendant, because of a severe mental illness or injury, was unable to distinguish right from wrong or to appreciate the wrongfulness of his conduct. In addition to diminishing the scope of the defense, IDRA required the defendant to prove

48. The *M'Naghten* test dates back to the trial of Daniel M'Naghten in 1843. M'Naghten's Case (1843) 8 Eng. Rep. 718. The original test was a cognitive-based test considering whether the defendant "was labouring under such a defect of reason, from disease of the mind, as not to know the nature and quality of the act he was doing; or, if he did know it, that he did not know he was doing what was wrong." *Id.* at 722. For more on this case, see generally, RICHARD MORAN, KNOWING RIGHT FROM WRONG: THE INSANITY DEFENSE OF DANIEL MCNAUGHTAN (1981); PERLIN, *supra* note 9, at 78–84. Moran notes, incidentally, that the accepted spelling of "M'Naghten" in U.S. courts is likely inaccurate; thus explaining the alternative spelling of the name in his book. MORAN, *supra*, at xiii.

49. Christopher Slobogin, *The Integrationist Alternative to the Insanity Defense: Reflections on the Exculpatory Scope of Mental Illness in the Wake of the Andrea Yates Trial*, 30 AM. J. CRIM. L. 315, 318 (2003).

50. MODEL PENAL CODE § 4.01 (AM. LAW INST., Official Draft and Explanatory Notes 1985). The "Mental Disease or Defect Excluding Responsibility," provision reads:

> (1) A person is not responsible for criminal conduct if at the time of such conduct as a result of mental disease or defect he lacks substantial capacity either to appreciate the criminality [wrongfulness] of his conduct or to conform his conduct to the requirements of law.
>
> (2) As used in this Article, the terms "mental disease or defect" do not include an abnormality manifested only by repeated criminal or otherwise antisocial conduct.

Id.

51. Hinckley was released from confinement after thirty-five years. *See generally* Spencer S. Hsu & Ann E. Marimow, *Would-Be Reagan Assassin John Hinckley Jr. to Be Freed After 35 Years*, WASH. POST (July 27, 2016), https://www.washingtonpost.com/local/public-safety/would-be-reagan-assassin-john-w-hinckley-jr-to-be-freed-after-35-years/2016/07/27/04142084-5015-11e6-a422-83ab49ed5e6a_story.html [https://perma.cc/9SPJ-D6ZL].

52. The federal insanity defense provides:

> It is an affirmative defense to a prosecution under any Federal statute that, at the time of the commission of the acts constituting the offense, the defendant, as a result of a severe mental disease or defect, was unable to appreciate the nature and quality or the wrongfulness of his acts. Mental disease or defect does not otherwise constitute a defense.

18 U.S.C. § 17(a) (2012).

insanity by clear and convincing evidence.[53] The Federal Rules of Evidence were also amended to cabin the testimony of experts in these cases, prohibiting them from opining on whether a defendant did or did not have the requisite mental state.[54] The purpose of these changes was to limit the availability and success of the defense.[55]

Since IDRA was enacted, a majority of states have followed its lead.[56] Some states have gone further in their restrictions, permitting a defendant to raise the defense only when he could not tell whether an act charged was right or wrong.[57] Finally, a handful of states have eliminated the affirmative insanity defense altogether.[58] Further encroaching on the insanity defense are the "guilty but mentally ill" verdicts,[59] which sound like a helpful alternative for juries but in reality simply mean the defendant goes to prison, where he is unlikely to get very much mental health treatment.[60]

In the 2006 *Clark v. Arizona*[61] decision, the Supreme Court upheld the constitutionality of Arizona's insanity defense statute, which limited the defense to the right-or-wrong test and did not permit evidence of insanity to rebut the element of mens rea.[62] Noting the great diversity among states in

53. *See id.* § 17(b) ("The defendant has the burden of proving the defense of insanity by clear and convincing evidence.").

54. FED. R. EVID. 704(b) ("In a criminal case, an expert witness must not state an opinion about whether the defendant did or did not have a mental state or condition that constitutes an element of the crime charged or of a defense. Those matters are for the trier of fact alone.").

55. *See* Michael L. Perlin, *"Wisdom Is Thrown Into Jail": Using Therapeutic Jurisprudence to Remediate the Criminalization of Persons with Mental Illness*, 17 MICH. ST. U. J. MED. & L. 343, 354 (2013) ("There is no question that the Hinckley acquittal 'helped legitimize long-standing efforts at both the state and federal levels to abolish or reform the defense,' and that those efforts were, by and large, successful." (quoting Peter Arenella, *Reflections on Current Proposals to Abolish or Reform the Insanity Defense*, 9 AM. J.L. & MED 271, 272 (1982))). While Professor Wright argues the insanity defense is "unraveling," Professor Perlin describes an intentional "shrinking" of the insanity defense. *Id.* at 353–56.

56. *See* Clark v. Arizona, 548 U.S. 735, 750 n.12 (2006) (listing state statutes); *see also* 2 THE ROLE OF MENTAL ILLNESS IN CRIMINAL TRIALS: THE INSANITY DEFENSE, at xi–xvi (Jane Campbell Moriarty ed., 2001) (discussing the history of the insanity defense in the United States).

57. *See, e.g.*, TEX. PENAL CODE ANN. § 8.01(a) (West 2015) (stating that "[i]t is an affirmative defense to prosecution that, at the time of the conduct charged, the actor, as a result of severe mental disease or defect, did not know that his conduct was wrong").

58. *See Clark*, 548 U.S. at 752 n.20 (listing the statutes from Idaho, Kansas, Montana, and Utah). For further explanation of the current national standards governing the insanity defense, see Stephen J. Morse, *Mental Disorder and Criminal Law*, 101 J. CRIM. L. & CRIMINOLOGY 885, 925 (2011).

59. *Clark*, 548 U.S. at 752 n.19 (focusing on states' statutes). For a thorough analysis of "guilty by mentally ill" (GBMI), see Christopher Slobogin, *The Guilty but Mentally Ill Verdict: An Idea Whose Time Should Not Have Come*, 53 GEO. WASH. L. REV. 494 (1985).

60. *See* Mark A. Woodmansee, Note, *The Guilty but Mentally Ill Verdict: Political Expediency at the Expense of Moral Principle*, 10 NOTRE DAME J.L. ETHICS & PUB. POL'Y 341, 344–45 (1996) ("In reality, however, GBMI offenders seldom receive mental health treatment during the course of their prison sentences.").

61. 548 U.S. 735 (2006).

62. *Id.* at 747.

crafting the insanity defense, the Court held that the elimination of the full *M'Naghten* standard as a required minimum did not offend a "principle of justice so rooted in the traditions and conscience of our people as to be ranked as fundamental."[63] In a footnote, the Court suggested it might go further, citing the four states that had eliminated the affirmative defense entirely and remarking that although they were not deciding the matter, "[w]e have never held that the Constitution mandates an insanity defense, nor have we held that the Constitution does not so require."[64] The decision, like much contemporary Supreme Court jurisprudence, is fractured. The majority opinion, authored by Justice David Souter and joined in full by Justices Roberts, Scalia, Thomas, and Alito, was the subject of a strong dissent from Justice Kennedy, joined by Justices Stevens and Ginsburg.[65] Justice Breyer concurred in part and dissented in part.[66] Time has not illuminated the Justices' view of whether the insanity defense is constitutionally mandated.

In 2013, the Court declined to decide whether the Constitution requires an insanity defense when it denied certiorari in the case of *Delling v. Idaho*,[67] another case that addressed the constitutionality of a statute eliminating the affirmative defense of insanity. The Idaho Supreme Court upheld the statute, and the Supreme Court declined to hear the case.[68] Justice Breyer, joined by Justices Ginsburg and Sotomayor, dissented from the denial, arguing the Court should address the issue of whether Idaho's modification of the insanity defense is consistent with the Fourteenth Amendment's Due Process Clause.[69]

Thus, whether the insanity defense—in any form—is a constitutionally protected right is unclear and far from certain. The Supreme Court has refused to decide the matter since its rejection of certiorari in *Cowan v. Montana*[70] in 1994, and a shifting majority of the Court seems disinclined to protect it under the Due Process Clause. The defense is a fractured concept and of very little use, given the strictures of proof and the availability of alternative verdicts, such as guilty but mentally ill.[71]

The impact may be negligible if a jurisprudential nail is finally hammered into the coffin of the insanity defense, given its vanishingly small success rate.[72] But if the defense fully withers, the law has no

63. *Id.* at 748 (citing Patterson v. New York, 432 U.S. 197, 202 (1977)).
64. *Id.* at 752 n.20.
65. *Id.* at 741.
66. *Id.*
67. 133 S. Ct. 504 (2012).
68. *Id.*
69. *Id.* at 506 (Breyer, J., dissenting from the denial of certiorari).
70. 511 U.S. 1005 (1994).
71. "[T]he most fundamental distinction—that between persons who are legally classified as insane, and thus presumably as not bearing criminal moral responsibility, and persons not so classified, and thus who are presumably criminally responsible—is in crucial respects fraying and unraveling, for good or ill." Wright, *supra* note 33, at 241 (arguing that the defense is in danger of unraveling for myriad reasons: legal, scientific, and jurisprudential).
72. *See* Schweitzer & Saks, *supra* note 4, at 594.

mechanism to address defendants like Andrea Yates, who drowned her five children, understanding it was legally wrong but believing in the delusion that it was the only way to save their immortal souls.[73]

The critical inquiry is whether a jurisprudential commitment exists to distinguish between the mentally responsible and the mentally nonresponsible who commit criminal acts. Although existing legislation suggests there is little interest in protecting mentally ill defendants from being tried and convicted, there seems to be widespread agreement, at least in theory, that legal insanity fulfills an essential jurisprudential role with respect to certain individuals. As Professor Stephen Morse puts it:

> Abolition of the insanity defense is simply unfair and there is no adequate substitute for it. Some people are so lacking in rational capacity through no fault of their own that it would be as unjust to blame and punish them as it would be to blame and punish young children or people with dementia.[74]

If we remain jurisprudentially and morally committed to the concept of legal insanity, neuroscience research may assist in breathing new life into it.

II. NEUROSCIENCE AND SEVERE MENTAL ILLNESS: SCHIZOPHRENIA AS A TEMPLATE

Medicine relies on multiple forms of structural neuroimaging for diagnosis and treatment of illness and trauma. X-ray, computed tomography (CT) scans, and magnetic resonance imaging (MRI) depict brain structure and are widely accepted to diagnose skull fractures, traumatic injuries, and brain tumors, for example.[75] Functional imaging such as functional MRI (fMRI), by contrast, purports to show areas of activity and inactivity in the brain.[76] Certain types of positron emission tomography scans, such as 18 FDG PET, detect glucose metabolism in the brain and can diagnose malignancies and neurodegenerative diseases.[77] However, most functional neuroimaging (primarily fMRI) has been used essentially for foundational cognitive neuroscience research.[78]

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73. *See* Yates v. State, 171 S.W.3d 215 (Tex. App. 2005). For more, see Deborah W. Denno, *Who Is Andrea Yates?: A Short About Insanity*, 10 DUKE J. GENDER L. & POL'Y 1 (2003); Phillip J. Resnick, *The Andrea Yates Case: Insanity on Trial*, 55 CLEV. ST. L. REV. 147 (2007); Slobogin, *supra* note 49.

74. *See* Morse, *supra* note 58, at 932.

75. For more on structural and functional neuroimaging, see generally Bigler et al., *supra* note 6; Robert P. Granacher, Jr., *Traumatic Brain Injury*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM, *supra* note 6, at 43.

76. An fMRI is used to detect activity and function in the brain and is based upon the fact that blood flows to a brain region when neural activity increases. Bigler et al., *supra* note 6, at 32.

77. Rushing, Pryma & Langleben, *supra* note 7, at 19; M. Wintermark et al., *Traumatic Brain Injury Research Roadmap*, 36 AM. J. NEURORADIOLOGY E12 (2015).

78. *See, e.g.*, Wintermark et al., *supra* note 77.

Researchers employ functional neuroscience to study the prediction, diagnosis, and treatment of various mental illnesses,[79] and there is a concerted effort to develop "objective, biologically-based tests for psychiatric illnesses."[80] One such area of psychiatric research is schizophrenia, a severe mental illness characterized by psychosis, which manifests as delusional thinking and hallucinations. Neuroscientists, biologists, geneticists, research psychiatrists, and statisticians—sometimes working in concert[81]—have been contributing to this effort for decades. For quite some time, both functional and structural neuroimaging research has focused on developing diagnostic markers for predicting[82] and imaging schizophrenia.[83]

Yet, three decades after the original brain scans on schizophrenia, the science has not produced a reliable clinical or forensic tool for diagnosis. "[N]o consistent or reliable anatomical or functional alterations have been unequivocally associated with psychosis or schizophrenia and no clinical applications have been developed in psychiatric neuroimaging."[84] A working group of the American Psychiatric Association stated in their Consensus Report of 2012 that "[d]espite the invaluable leads that the neuroimaging studies have provided regarding the neurobiological bases for psychiatric disorders, they have yet to impact significantly the diagnosis or treatment of individual patients."[85] Although recognizing that neuroscience is not yet able to diagnose mental illness using functional imaging, there is "considerable effort" being invested to "utilize structural and functional MRI for diagnostic purposes in patients with schizophrenia and related disorders."[86]

Defendants with schizophrenia and other forms of psychosis often have illnesses that fit within the narrow definitions of mental illness required to establish a claim of legal insanity. Proof of a defendant's delusional state

79. *See generally* Jazmin Camchong & Angus W. MacDonald III, *Imaging Psychosis: Diagnosis and Predication of Violence*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM, *supra* note 6, at 113.

80. Jonathan B. Savitz, Joseph R. Simpson & Wayne C. Drevets, *Neuroimaging in Affective Disorders: Application in Clinical Research and Forensic Psychiatry*, *in* NEUROIMAGING IN FORENSIC PSYCHIATRY: FROM THE CLINIC TO THE COURTROOM, *supra* note 6, at 131.

81. *See* Sekar et al., *supra* note 11 (a multidisciplinary genetic study investigating schizophrenia risk).

82. *See* Philip McGuire et al., *Can Neuroimaging Be Used to Predict the Onset of Psychosis?*, 2 LANCET PSYCHIATRY 1117 (2015) (collecting and discussing the studies and need for translation of the findings into clinical care); *see also* Bendfeldt et al., *supra* note 11. For additional research studies, see, e.g., Dominic E. Job et al., *Grey Matter Changes over Time in High Risk Subjects Developing Schizophrenia*, 25 NEUROIMAGE 1023 (2005), and Christos Pantelis et al., *Neuroanatomical Abnormalities Before and After Onset of Psychosis: A Cross-Sectional and Longitudinal MRI Comparison*, 361 LANCET 281 (2003).

83. *See generally* Hugdahl et al., *supra* note 11; Koutsouleris et al., *supra* note 11; Sukhwinder S. Shergill et al., *Mapping Auditory Hallucinations in Schizophrenia Using Functional Magnetic Resonance Imaging*, 57 ARCHIVES GEN. PSYCHIATRY 1033 (2000).

84. Borgwardt & Fusar-Poli, *supra* note 10, at 270.

85. FIRST ET AL., *supra* note 10, at 1.

86. *Id.* at 9.

of mind, if present at the time of the act, helps to establish the cognitive prong of legal insanity.[87] Yet fact-finders are rarely persuaded to find a defendant not guilty by reason of insanity, even in cases involving ample proof of psychosis.

In a Louisiana case, for example, multiple defense and court-appointed experts testified that Salvador Perez was seriously mentally ill and floridly delusional when he shot a police officer.[88] Perez, a sixty-one-year-old man who lived on a small farm in Texas with his wife and five children, told his wife he was going out to feed the cows.[89] Instead, he put his teenage son in the car and began driving furtively across the country, sleeping in fields, all under the delusional belief that he was being followed by assassins.[90] Perez and his son ended their trip in New Orleans with Perez hiding in a shed.[91] Delusionally believing that a police officer was an assassin, Perez tragically shot and killed the officer.[92]

The prosecutor, who had called no expert witnesses, simply argued in closing, "[d]octors, doctors, doctors" and urged the jury to send a message that New Orleans does not tolerate cop killers.[93] The jury convicted.[94] While this conviction was ultimately vacated several years later, the trial was paradigmatically representative of insanity defense cases where the jury is skeptical of psychiatric and psychological experts. Cases like this suggest a need for neurological or laboratory-based expert testimony that might be more persuasive and less affected by the skepticism that plagues behavioral-science testimony.[95]

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87. A major problem, of course, is neural plasticity: brain function can change, and a current scan does not always reflect the state of the brain at an earlier time. *See* Glannon, *supra* note 2, at 157 (remarking that scans "cannot provide a retrospective diagnosis of the defendant's neural and mental states at the earlier time"); *see also* Valerie Gray Hardcastle, *Traumatic Brain Injury, Neuroscience, and the Legal System*, 8 NEUROETHICS 55, 60 (2014) ("[B]rains naturally change over time . . . . A brain scan performed a year or more after a crime may provide no information at all regarding the state of the defendant's brain or mind at the time of the alleged crime . . . ."). Nonetheless, the facts of any given case may suggest a history of psychosis and a reasonable inference may be, in a given case, that the delusions were present at the time of the crime.

88. *See* Perez v. Cain, 529 F.3d 588 (5th Cir. 2008).

89. *See id.* at 590.

90. *See id.*

91. *See id.* at 591.

92. *See id.*

93. *See* Perez v. Cain, No. 04-1905, 2008 WL 108661, at *17 (E.D. La. Jan. 8, 2008).

94. This conviction was vacated by the district court in a habeas corpus proceeding, and that decision was upheld on appeal. *See Perez*, 529 F.3d 588.

95. *See* Farah, *supra*, note 40, at 586 (discussing studies showing that people judge individuals less harshly when there is a neuroscientific explanation for immoral and criminal behavior); Schweitzer & Saks, *supra* note 4, at 604. An early mock-jury study found neuroimaging evidence itself influential to jurors in an insanity case. *See* Jessica R. Gurley and David K. Marcus, *The Effects of Neuroimaging and Brain Injury on Insanity Defenses*, 26 BEHAV. SCI. & L. 85 (2008). My assumption may be too facile and hopeful: experts will likely testify on both sides of a case and the phrase "doctors, doctors, doctors" may be replaced by "brain scans, brain scans, brain scans." However, if there is better, more biologically premised science to support claims of legal insanity than some of the testimony that is currently admitted, the defense may meet with less resistance. Or, as mentioned

In a meta-analysis of four experiments, with nearly 1,500 jury-eligible participants, designed to test the persuasiveness of neuroimaging in a mens rea defense, the results suggested that neuroimages did not affect jurors' judgments, an outcome counterintuitive to many.[96] However, the study also revealed that expert evidence invoking neurological explanations for the defendant's mental state were "more persuasive than evidence that relied on clinical psychological explanation."[97] Fact-finders may well respond more favorably to a medical or biologically based explanation of mental illness than a psychological one. It may not be the image that is so persuasive but the science behind it that gives jurors comfort.

Few fact-finders understand severe mental illness involving schizophrenia or other forms of psychosis, but their skepticism about mental illness and mistrust of clinical psychology may well be tempered by neuroscientific evidence, given its close association with medicine. Most people now have great faith in x-rays, CT scans, and MRIs—it is thus likely that fact-finders could find neuroimaging explanations well grounded. If future neuroimaging were able to provide biological proof of the auditory hallucinations using functional imaging, for example, fact-finders might be less distrustful of the behavioral science experts who testify about the defendant's serious mental illness. Of course, such imaging would provide relevant evidence of mental illness and auditory hallucinations; it would not prove that the defendant thought the voices were real, that she heard them at the time of the incident, or whether she honestly believed she had to obey the voices. But it might be a helpful adjuvant to the behavioral science diagnosis.

III. THOUGHTS AND BEHAVIORS: ILLUMINATING THE DIVIDE?

In the United States, between 1.7 and 2.5 million traumatic brain injuries (TBI) occur every year, with 5 million of those affected individuals suffering permanent disability—nearly 2 percent of the U.S. population.[98] A study tracking data from 2002 to 2006 found 275,000 hospitalizations and 52,000 deaths from TBI related to falls, car accidents, assaults and sports-related injuries.[99] Government statistics indicate that more than 12

earlier, legal insanity might not continue as a defense but be evaluated as part of a pretrial diversion program.

96. N.J. Schweitzer et al., *Neuroimages as Evidence in a Mens Rea Defense: No Impact*, 17 PSYCHOL. PUB. POL'Y & L. 357, 387–88 (2011).

97. *Id.* at 388.

98. MARK FAUL ET AL., U.S. DEP'T OF HEALTH & HUMAN SERVS., TRAUMATIC BRAIN INJURY IN THE UNITED STATES: EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS AND DEATHS 2002–2006, at 13, (2010), http://www.cdc.gov/traumaticbraininjury/pdf/blue_book.pdf (estimating 1.7 million) [https://perma.cc/M5W5-5B69]. A more recent study puts the number at 2.5 million per year in the United States, with 5 million of those people living with long-term disability as a result of such injury. Jennifer Hay et al., *Chronic Traumatic Encephalopathy: The Neuropathological Legacy of Traumatic Brain Injury*, 11 ANN. REV. PATHOLOGY 21, 22 (2016).

99. Wintermark et al., *supra* note 77, at E13.

percent of veterans returning from Iraq and Afghanistan are diagnosed with TBI as a result of blast exposure. This figure, though, may significantly underestimate the prevalence of TBI among military members; the correct number may be three times greater than the official count.[100] TBI is often a signature injury of those returning from Iraq and Afghanistan.[101]

Ongoing research suggests that certain types of serious brain injury may cause disordered thinking, depression, and in some cases, violent behavior and even suicide.[102] Some data, although controversial, indicate that inmates of both sexes may have statistically meaningful higher rates of TBI compared to others in the general population.[103] Likewise, studies indicate that veterans with diagnosed TBI have problems with violent thoughts, behaviors, or both.[104]

Although multiple research studies examine the relationship between brain trauma and violence, the nexus between brain trauma and loss of control over behavior is still unclear.[105] While some data support the claim that "TBI . . . is statistically connected to violent or criminal behavior,"[106] it is impossible to tell "whether someone was unable to exercise control over her conduct at any particular point in time."[107] The relationship among impulsivity (often mentioned in the literature on TBI), control over behavior, and criminal responsibility is still not well understood, but it certainly is a major topic of academic discussion.[108]

Commentators note that disinhibition and impulsivity, along with the inability to consider future consequences of one's actions, are hallmarks of

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100. *See* Hardcastle, *supra* note 87, at 56.

101. *Id.*

102. *See, e.g.*, Amane Tateno, Ricardo E. Jorge & Robert G. Robinson, *Clinical Correlates of Aggressive Behavior After Traumatic Brain Injury*, 15 J. NEUROPSYCHIATRY & CLINICAL NEUROSCIENCES 155, 155 (2003) (concluding there was a significant increase in aggressive behavior in the first six months after injury and that it was "significantly associated with the presence of major depression, frontal lobe lesions, poor pre-morbid social functioning, and a history of alcohol and substance abuse"); *see also* Vani Rao et al., *Aggression After Traumatic Brain Injury: Prevalence and Correlates*, 21 J. NEUROPSYCHIATRY CLINICAL NEUROSCIENCES 420 (2009); Hal S. Wortzel & David B. Arciniegas, *A Forensic Neuropsychiatric Approach to Traumatic Brain Injury, Aggression, and Suicide*, 41 J. AM. ACAD. PSYCHIATRY & L. 274 (2013).

103. *See* Hardcastle, *supra* note 87, at 56–57 (discussing studies).

104. *Id.*

105. Claydon, *supra*, note 25, at 94 (noting that the "precise relationship between frontal lobe damage and disinhibition and the role of other areas of the brain is far from established").

106. Hardcastle, *supra* note 87, at 57 (summarizing studies); Steven Penney, *Impulse Control and Criminal Responsibility: Lessons from Neuroscience*, 35 INT'L J.L. & PSYCHIATRY 99, 100 (2012) (citing studies to suggest that "lesions can cause dramatic changes in behavior, including heightened propensities for impulsivity and violent, criminal, and other anti-social conduct").

107. *See* Steven K. Erickson, *The Limits of Neurolaw*, 11 HOUS. J. HEALTH L. & POL'Y 303, 314 (2012).

108. *See* Rebecca Hollander-Blumoff, *Crime, Punishment, and the Psychology of Self-Control*, 61 EMORY L.J. 501 (2012) (examining the social science research on self-control and noting its importance to neuroscience and law scholarship); Paul Litton, *Is Psychological Research on Self-Control Relevant to Criminal Law?*, 11 OHIO ST. J. CRIM. L. 725 (2014).

prefrontal damage.[109] "Frontal lobe damage is associated with an erosion of foresight and judgment, and people with such damage often fail to delay gratification or experience remorse for their acts."[110] Some scholars, citing studies, note that there are structural and functional anomalies in those with low impulse control.[111] While those with certain types of prefrontal cortex damage may show capacity for moral judgment, they may show deficiencies when it comes to acting morally.[112] Is that a cognitively based failure? A failure of control? Where and how does thought become impulse, and where does impulse become action?[113] As difficult as the questions are to answer, those relationships are likely to be helped by ongoing neuroscience research.

The research and commentary suggest three areas of ongoing inquiry: (1) the relationship between brain lesions and the potential for violent behavior; (2) the relationship between impulsivity and control over behavior; and (3) whether impaired volition, even if provable at some future time, should excuse behavior under some version of insanity defense.[114] Answering these inquiries could be exceptionally helpful for the concept of criminal responsibility, which has long adhered to a distinction between thought and action without a terribly nuanced understanding of the relationship between the concepts.

A frequently referenced example to showcase how trauma of the prefrontal cortex may be correlated with thought and behaviors is the mid-1800s case of Phineas Gage, a railway worker who suffered a grievous injury when a tamping iron (spike) was hurled through his cheek, eye socket, and brain due to an explosion at the work site.[115] His thinking and behavior before and after the injury appeared to vary dramatically.[116] Whereas prior to the injury he was a "responsible, intelligent, and socially well-adapted" railroad foreman worker, after the accident he became

109. *See* Katrina L. Sifferd, *Translating Scientific Evidence into the Language of the "Folk": Executive Function as Capacity-Responsibility*, *in* NEUROSCIENCE AND LEGAL RESPONSIBILITY 183, 191 (Nicole A. Vincent ed., 2013).

110. *Id.* at 191 (citing D. STUSS & R. KNIGHT, PRINCIPLES OF FRONTAL LOBE FUNCTION (2002)).

111. *See* Penney, *supra* note 106.

112. H.A. Berlin, E.T. Rolls & U. Kischka, *Impulsivity, Time Perception, Emotion and Reinforcement Sensitivity in Patients with Orbitofrontal Cortex Lesions*, 127 BRAIN 1108, 1108 (2004) ("Damage to the ventral prefrontal cortex (PFC) has been associated with disinhibited or socially inappropriate behaviour . . . ."); Anne Ruth Mackor, *What Can Neurosciences Say About Responsibility: Taking the Distinction Between Theoretical and Practical Reason Seriously*, *in* NEUROSCIENCE AND LEGAL RESPONSIBILITY, *supra* note 109, at 53, 72.

113. *See* Richard J. Bonnie, *Should a Personality Disorder Qualify as a Mental Disease in an Insanity Adjudication*, 38 J.L. MED. & ETHICS 760 (2010) (discussing the difficult distinction between thoughts and actions in insanity defense cases).

114. *See, e.g.*, Slobogin, *supra* note 3 (discussing his view and the various positions of scholars and commentators); *see also* Morse, *supra* note 58 (discussing his opposition to the control test).

115. *See* Hanna Damasio et al., *The Return of Phineas Gage: Clues About the Brain from the Skull of a Famous Patient*, 264 SCIENCE 1102, 1102 (1994).

116. *Id.*

"irreverent and capricious," used profanity profusely, and was unreliable and irresponsible.[117] As quoted by many, "Gage was no longer Gage."[118] The postincident stories about Gage suggest that his cognitive appreciation of right and wrong as well as his behaviors were both affected by the injury. Thus, again, the distinction is not always so clear between thoughts and actions.

Neuroscience may more accurately explain the relationship among brain lesions (or illnesses), cognition, impulsivity, and behavioral control. Historically, the law has embraced a sharp distinction between cognition and volition with respect to legal insanity. Science may help us understand whether the sharp demarcation between thoughts and actions is accurate or meaningful. If the relationship between thoughts and actions in the seriously mentally ill or injured is better understood, it is possible to redraw the map of legal insanity in a way that better comports with scientific knowledge, rather than simply following the long-standing separations of cognition and volition.

IV. NEUROSCIENCE, INSANITY, AND MORAL BLAMEWORTHINESS

To return to where we started in this Article, our opinions about blameworthiness and mental illness are guided by an internal moral compass and are critical to our shared notions of justice. Yet many have argued that legal insanity standards neither reflect an accurate understanding of mental illness nor provide a legitimate way to determine which defendants are morally blameless.

In 1954, Judge David Bazelon authored the opinion in *Durham v. United States*,[119] rejecting the *M'Naghten* test and the volitional test as both inadequate and too narrow, and replacing it with the so-called "product rule," which stated that "an accused is not criminally responsible if his unlawful act was the product of mental disease or mental defect."[120] In that remarkable opinion, Judge Bazelon wrote that the "legal and moral traditions . . . require that those who, of their own free will and with evil intent (sometimes called *mens rea*), commit acts which violate the law, shall be criminally responsible for those acts."[121] At the same time, he also noted that "where such acts stem from and are the product of a mental disease or defect . . . moral blame shall not attach, and hence there will not be criminal responsibility."[122] The lesson from this 1954 test still

117. *Id.*

118. *Id.* For further discussion about this case, see, Amanda C. Pustilnik, *Violence on the Brain: A Critique of Neuroscience in Criminal Law*, 44 WAKE FOREST L. REV. 183, 212–13 (2009), and Peter Ratiu et al., *The Tale of Phineas Gage, Digitally Remastered*, 21 J. NEUROTRAUMA 637 (2004).

119. 214 F.2d 862 (D.C. Cir. 1954), *overruled by* United States v. Brawner, 471 F.2d 969 (D.C. Cir. 1972).

120. *Id.* at 874–75.

121. *Id.* at 876.

122. *Id.*

resonates: to retain its legitimacy, moral blameworthiness in the law must keep pace with scientific knowledge.

Neuroscience may help improve opinions about blameworthiness by providing more science-based support for diagnoses, as happened with the nurses discussed at the beginning of this Article. And neuroscience may also encourage the judicial system to reject the stereotypes and myths that have shaped our current insanity defense doctrines and embrace a more humane way of dealing with the mentally ill and brain-injured criminal defendants. As Professor Theodore Blumoff urges, "[s]uch wrongdoers usually require incapacitation and always require rehabilitation, but they do not necessarily deserve punishment and blame in the hell-holes that constitute our prison system."[123]

CONCLUSION

The research on the effects of neuroscientific explanations for the mens rea defense and the insanity defense demonstrate the positive potential of neuroscience to improve decision making in response to such defenses.[124] In time, perhaps, the research can shed more light on serious mental illness, the relationship between thought and action, and concepts involving impulsivity and control of behavior. The amount of research on these issues is staggering and, with hope, will be illuminating and useful for a reconstruction of the doctrine of legal insanity that will more accurately define moral blameworthiness.

123. Blumoff, *supra* note 20, at 746.
124. *See* Schweitzer & Saks, *supra* note 4; Schweitzer et al., *supra* note 96.