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Neuroscience and the Criminal Legal System: A Humanitarian Application Framework

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NEUROSCIENCE AND THE CRIMINAL LEGAL SYSTEM: A HUMANITARIAN APPLICATION FRAMEWORK

*Dorothy Hayes**

Advancements in neuroscience call our intuitive notion of free will into question—and by implication, invite a reassessment of the United States criminal legal system and its reliance on radical personal agency. In the backdrop of the evolving landscape of neuroscience and neurolaw is an inquiry: how do we appropriately and ethically incorporate advancements of these fields into law and policy? This paper pulls that question to the forefront, advocating for a humanitarian-forward framework to guide the process. The framework emphasizes the Daubert standard, addresses the "G2i" problem, and includes a balancing test to ensure the protection of neurorights. The paper also provides an overview of the influence of belief in free will, personal agency, and neurolaw on the U.S. criminal legal system.

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"*Man is a masterpiece of creation if for no other reason than that, all the weight of evidence for determinism notwithstanding, he believes he has free will.*"

- Georg C. Lichtenberg

"*When a man cannot choose, he ceases to be a man.*"

- Anthony Burgess, *A Clockwork Orange*

Introduction

It's only human to believe that people who commit heinous crimes deserve to be punished—we begin to seek justice as toddlers.[1] But what if advances in science upend our intuitive ideas of what makes a person morally blameworthy? This paper explores the emerging field of neurolaw—specifically its application to criminal law in informing sentencing and discouraging retribution.[2] Neurolaw is the interdisciplinary study that explores neuroscientific discoveries about human behavior and their influence on the law.[3] Increasingly, neurolaw confronts the focus on personal agency and personal responsibility in criminal law.[4] This paper establishes and advocates for a humanitarian framework for adopting neurolaw findings into criminal law and policy.

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[1] Katrin Riedl et al., *Restorative Justice in Children*, 25 CURRENT BIOLOGY 1731, 1731 (2015); *see also* Fiery Cushman, *The Role of Learning in Punishment, Prosociality, and Human Uniqueness*, *in* COOPERATION AND ITS EVOLUTION, 333, 346–48 (Kim Sterelny et al. eds., 2013) (discussing individual preference for retributive punishment over deterrence or incapacitation motivations).

[2] *See* Nathaniel E. Anderson & Kent A. Kiehl, *Re-wiring Guilt: How Advancing Neuroscience Encourages Strategic Interventions Over Retributive Justice*, FRONTIERS PSYCH., Mar. 2020, at 1, 7–10 (framing advancements in neuroscience as means to promote pragmatic incarceration strategies over retribution), Farah Focquaert, *Neurobiology and Crime: A Neuro-ethical Perspective*, J. CRIM. JUST., Nov.–Dec. 2019, at 1, 7–8 (identifying ethical implications of incorporating neuroscience findings into criminal law), *and* Andrea L. Glenn & Adrian Raine, *Neurocriminology: Implications for the Punishment, Prediction and Prevention of Criminal Behaviour*, 15 NATURE REVS. NEUROSCIENCE 54, 58–61 (2014) (describing future impact that neuroscience may have on punishment, recidivism, and crime prevention).

[3] Francis X. Shen, *The Overlooked History of Neurolaw*, 85 FORDHAM L.R. 667 (2016) [hereinafter *The Overlooked History of Neurolaw*].

[4] *E.g*, Adam J. Kolber, *Free Will as a Matter of Law*, *in* PHILOSOPHICAL FOUNDATIONS OF LAW AND NEUROSCIENCE 9 (Michael Pardo & Dennis Patterson eds., 2016); Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON 1775, 1775 (2004).

Neuroscience has and will continue to influence criminal law.[5] There is evidence that certain neurobiological characteristics are predictors of violent behavior and reoffending.[6] Neuroscientific evidence is used to inform competency assessments and support admitting evidence during trial to determine guilt, as well as during sentencing as a mitigating factor.[7] Neuroscience likewise provides scientific support for favoring incarceration strategies like rehabilitation and individualized treatment over retribution.[8] For example, neuroscience research continues to support the case against placing incarcerated individuals in prolonged solitary confinement.[9]

The legal prevalence of neuroscience in law has led to the rise and evolution of neurolaw over the past three decades.[10] New

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[5] *See, e.g.*, Greene & Cohen, *supra* note 4, at 1779 (arguing that findings in neuroscience will impact law by challenging personal notions of criminal and moral responsibility), Darby Aono et al., *Neuroscientific Evidence in the Courtroom*, COGNITIVE RSCH., Dec. 2019, at 1 (studying the effects of neuroscientific evidence on criminal case verdicts, sentencing, and juror beliefs), *and* Nita A. Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis*, 2 J.L. & BIOSCIENCES 485 (2016) (providing overview of neurological and behavioral genetics evidence usage in judicial options from criminal cases between 2005 and 2012).

[6] *See* Focquaert, *supra* note 2, at 1.

[7] Focquaert, *supra* note 2, at 4. ("Specific brain imaging tests and techniques such as diffusion tensor imaging (DTI), structural magnetic resonance imaging (sMRI) and functional magnetic resonance imaging (fMRI) may provide additional information to support or question behavioral diagnoses. For example, whereas dementia used to be diagnosed solely at the behavioral level, brain scans are increasingly used to support clinical characterization and differential diagnosis."). For a summary of the use of neuroimaging evidence in trial, sentencing, and competency assessments, see Lyn M. Gaudet & Gary E. Marchant, *Under the Radar: Neuroimaging Evidence in the Criminal Courtroom*, 64 DRAKE L.R. 596 (2016).

[8] *See* Anderson & Kiehl, *supra* note 2, at 7–10 (framing advancements in neuroscience as means to promote pragmatic incarceration strategies over retribution).

[9] *See* Federica Coppola, *The Brain in Solitude: An (other) Eighth Amendment Challenge to Solitary Confinement*, 6 J.L. & BIOSCIENCES 184, 206 (2019) (identifying neuroscientific research on negative impact of social deprivation on the brain).

[10] See *infra* notes 136–137 and accompanying text for a discussion on the origination and development of neurolaw.

courses are taught about the intersection of law and neuroscience, "law and neuroscience" textbooks have been published, and training courses and judicial seminars are available.[11] This trend shows no signs of slowing down, with fifteen million dollars invested in the MacArthur Foundation to establish the Law and Neuroscience Project and the MacArthur Foundation Research Network on Law and Neuroscience.[12]

The push towards science-based and data-based approaches must be checked with ethical standards. There is a long history of weaponizing the sciences to justify human rights violations.[13] For example, homosexuality was considered a mental illness until 1973, subjecting the LGBTQ community to lobotomies, electroshock, and chemical castration in the name of "treatment".[14] Today, one instance of discrimination in our criminal legal system is the use of risk assessment recidivism algorithms used for sentencing and

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[11] *E.g.,* OWEN D. JONES, JEFFREY D. SCHALL & FRANCIS X. SHEN, LAW AND NEUROSCIENCE (2d ed. 2020); MICHAEL FREEMAN ET AL., LAW AND NEUROSCIENCE: CURRENT LEGAL ISSUES VOLUME 13, (Michael Freeman ed. 2011); *and* DENNIS PATTERSON ET AL., PHILOSOPHICAL FOUNDATIONS OF LAW AND NEUROSCIENCE (Dennis Patterson & Michael S. Pardo eds. 2016).

[12] *Landmark Law and Neuroscience Network Expands at Vanderbilt*, VAND. UNIV. (Aug. 24, 2011), https://news.vanderbilt.edu/2011/08/24/grant-will-expand-law-neuroscience-network/ (identifying ten million dollar grant from MacArthur foundation to launch The Law and Neuroscience Project and additional $4.85 million to manage the MacArthur Foundation Research Network on Law and Neuroscience); *see generally*, *The MacArthur Foundation Research Network on Law and Neuroscience*, VANDERBILT UNIV., https://www.lawneuro.org/ (last visited Apr. 4, 2023) (providing overview of projects investigating the intersection of neuroscience and criminal justice).

[13] *E.g.*, Emily Bergeron, *The Historical Roots of Mistrust in Science*, HUM. RTS. MAG. (June 14, 2021), https://www.americanbar.org/groups/crsj/publications/human_rights_magazine_home/the-truth-about-science/the-historical-roots-of-mistrust-in-science/ (discussing the weaponization of science to perpetuate racism by justifying racist policies, disregarding systemic racism, and maintaining inequitable health outcomes); Erin Blakemore, *Gay Conversion Therapy's Disturbing 19th-Century Origins*, HIST. (June 18, 2019) https://www.history.com/news/gay-conversion-therapy-origins-19th-century (discussing the widely practiced abuse of LGBTQ people based on pseudoscientific techniques and the classification of homosexuality as a psychiatric disorder).

[14] Blakemore, *supra* note 13.

parole decisions.[15] Although data-based, these algorithms have critical flaws that result in racial discrimination and violation of constitutional rights.[16]

In response to the rise of neurolaw and concerns for abuse, there has been a parallel emergence of neuroethics and neurorights analysis and guidance from academics, nonprofits, and international organizations. Prominent players include: the Organisation for Economic Co-operation and Development,[17] the International Neuroethics Society,[18] and the International Bioethics Committee of the United Nations Educational, Scientific and Cultural Organization.[19]

Section I of the paper outlines the current neurolaw landscape and the criminal legal system's reliance on rational actors to justify mass incarceration. Section II examines how the insights of neurolaw reject the practice of retributive justice in favor of rehabilitation. Repeat sentencing has been ineffective in preventing crime and recidivism risk prediction instruments used in sentencing

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[15] Sonja B. Starr, *Evidence-Based Sentencing and the Scientific Rationalization of Discrimination*, 66 STAN. L.R. 803, 821–41 (critiquing the use of socioeconomic and demographic factors in sentencing and parole decisions as discriminatory and unconstitutional).

[16] *See id*. at 819 (citing Bernard E. Harcourt, *Risk As a Proxy for Race*, Pub. L. & Legal Theory Working Paper No. 323, 2010 in acknowledgement that recidivism tools heavily considering criminal history aggravate racially disparate impacts in prison populations); *see also* Jeff Larson et al., *How We Analyzed the COMPAS Recidivism Algorithm*, PROPUBLICA (May 23, 2016), https://www.propublica.org/article/how-we-analyzed-the-compas-recidivism-algorithm ("f[inding] that black defendants who did not recidivate over a two-year period were nearly twice as likely to be misclassified as higher risk compared to their white counterparts"). For an analysis of the Correctional Offender Management Profiling for Alternative Sanctions (COMPAS) tool's failure to predict recidivism more accurately or fairly than surveyed participants, see Julia Dressel and Hany Farid, *The Accuracy, Fairness, and Limits of Predicting Recidivism*, SCI. ADVANCES, Jan. 2018, at 1.

[17] *OECD Recommendation on Responsible Innovation in Neurotechnology*, OECD, https://www.oecd.org/science/recommendation-on-responsible-innovation-in-neurotechnology.htm\ (last visited Apr. 4, 2023).

[18] *Mission*, INT'L NEUROETHICS SOC'Y, https://www.neuroethicssociety.org/about#mission (last visited Apr. 4, 2023).

[19] *International Bioethics Committee (IBC)*, UNESCO, https://en.unesco.org/themes/ethics-science-and-technology/ibc (last visited Apr. 4, 2023).

decisions are discriminatory. Section III proposes a humanitarian incorporation of neurolaw findings into criminal sentencing, treatment, and rehabilitation. A framework is provided for determining which neuroscientific discoveries are good candidates for policy change, as well as the balancing test required to ensure the protection of "neurorights".

I. Neuroscience and the Criminal Legal System Today

A. The Criminal Legal System: Radical Personal Agency and Mass Incarceration

The United States is a highly individualistic society.[20] The upshot is a focus on individual autonomy, personal responsibility, individual creativity, and economic growth.[21] When taken to an extreme, the glorification of the individual reveals a dark underbelly: alienation and lack of empathy for the oppressed.[22] A legal corollary of foregrounding personal agency and accountability is found in the U.S. criminal legal system. Personal agency in committing criminal acts creates moral blameworthiness; blameworthiness calls for punishment.[23] The criminal legal system in the United States incorporates "a mixture of deterrence,

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[20] *See generally*, STEPHANIE M. WALLS, INDIVIDUALISM IN THE UNITED STATES: A TRANSFORMATION IN AMERICAN POLITICAL THOUGHT (2015) (exploring the foundations of individualism in the United States and individualism's political, economic, and social implications).

[21] *Id. See also* Yuriy Gorodnichenko & Gerard Roland, *Individualism, Innovation, and Long-run Growth*, 108 PROC. NAT'L ACAD. SCIS. 21316, 21319 (2011) (finding that individualistic countries show higher long-run growth than collectivistic countries); Jack A. Goncalo & Barry M. Staw, *Individualism–Collectivism and Group Creativity*, 100 ORG. BEHAV. & HUM. DECISION PROCESSES 96, 96–109 (2006) (finding that individualistic groups are more creative in problem solving tasks than collectivistic groups).

[22] *See* HARRY C. TRIANDIS, INDIVIDUALISM & COLLECTIVISM, (1995) at 107–08 (noting that individualists are less likely to ask for community support and more likely to attribute others' poverty to personal choices over systemic issues).

[23] *See* IAN MARSH, JOHN COCHRANE & GAYNOR MELVILLE, CRIMINAL JUSTICE 13 (2004) (discussing retributivism or "just deserts" theory of punishment and its assertion that the offender's guilt, rather than the injury caused, sufficiently justifies punishment).

incapacitation, and retribution."[24] This spirit of retribution is reliant on ideals of personal agency and is in part responsible for high incarceration rates.[25] Societal views on punishment are legally relevant to the criminal legal system—the U.S. Supreme Court has considered public desire for retribution as a worthy justification for harsh punishment, including capital punishment.[26]

But what if we are not fully accountable for our actions? The question of whether we have free will has been debated for centuries[27] and will not be resolved in this paper. However, the emergence of neuroscience provides a new language for this debate. Rather than the gods manipulating our fates, we can ask whether our neurobiology predetermines our actions. And there is reason to believe that this is true.[28] That a brain tumor may cause neurological changes that impair speech, generate delusions, or even cause extreme aggression is not incompatible with general subjective conceptions of justice and free will.[29] But does this concept hold true for a neurotypical brain—are traditional justice and free will beliefs compatible with the idea that brain structure and neurochemistry dictate all human action?

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[24] Darryl K. Brown, *Cost-Benefit Analysis in Criminal Law*, 92 CAL. L. REV. 323, 329 (2004).

[25] *See generally*, Mark R. Fondacaro & Megan J. O'Toole, *American Punitiveness and Mass Incarceration: Psychological Perspectives on Retributive and Consequentialist Responses to Crime*, 18 NEW CRIM. L.R. 447, 490–91 (2015) (discussing psychological basis for retribution and its reliance on individual agency to dole out unduly harsh punishment).

[26] "The instinct for retribution is part of the nature of man, and channeling that instinct in the administration of criminal justice serves an important purpose in promoting the stability of a society governed by law." Gregg v. Georgia, 428 U.S. 153, 183 (1976) (quoting Furman v. Georgia, 408 U.S. 238, 308 (1972) (Stewart, J., concurring)).

[27] *See generally* MICHAEL FREDE, A FREE WILL: ORIGINS OF THE NOTION IN ANCIENT THOUGHT, 175–78 (A. A. Long ed., 2011).

[28] See *infra* notes 31–43 and accompanying text for a discussion of neuroscientific findings regarding free will.

[29] For a summary of the use of neuroimaging evidence in trial, sentencing, and competency assessments, see Lyn M. Gaudet & Gary E. Marchant, *Under the Radar: Neuroimaging Evidence in the Criminal Courtroom*, 64 DRAKE L.R. 596 (2016).

B. Neuroscience and the Question of Free Will

Although free will does not have a universally accepted definition,[30] this paper discusses free will as the ability to exercise personal agency and autonomy as it relates to blameworthiness and criminal liability.

Free will has been debated from a philosophical perspective for centuries.[31] Neuroscience offers an appealing dimension to the debate: one separate from subjective human experience.[32] A commonly referenced study in the discussion of free will is from Benjamin Libet in the 1980s.[33] By studying when a participant decided to move their wrist, Libet discovered that the neural activity for wrist movement was available 350ms before the participant's subjective experience of choosing to move their wrist.[34] An interpretation of this study is that prior to taking a course of action (moving one's wrist), a "deterministic process" had begun in the subconscious of the actor, calling our traditional idea of free will into question.[35] Later studies using fMRI patterns of neural activity enabled reliable prediction of which button a participant would choose up to seven seconds before the participant's conscious decision.[36]

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[30] Robert Kane, *1 Introduction: The Contours of Contemporary Free will Debates (Part 2), in* The OXFORD HANDBOOK OF FREE WILL 2, 3–4 (Robert Kane ed., 2nd ed. 2011).

[31] *See generally* Frede, *supra* note 27.

[32] Kelly Burns & Antoine Bechara, *Decision Making and Free Will: A Neuroscience Perspective*, 25 BEHAV. SCIS. L. 263, 267 (2007).

[33] Anderson & Kiehl *supra* note 2, at 4–5. For critiques of Libet's experiment and its interpretation, see Bahar Gholipour, *A Famous Argument Against Free Will Has Been Debunked*, THE ATLANTIC (Sept. 10, 2019), https://www.theatlantic.com/health/archive/2019/09/free-will-bereitschaftspotential/597736/ and Steve Taylor, *How a Flawed Experiment "Proved" That Free Will Doesn't Exist*, SCI. AM. (Dec. 6, 2019), https://blogs.scientificamerican.com/observations/how-a-flawed-experiment-proved-that-free-will-doesnt-exist/.

[34] Anderson & Kiehl, *supra* note 2, at 4–5.

[35] *Id.*

[36] *See id.* at 5 (citing study where participants could stop the predicted movement if given a "stop" signal at least 200 ms before the movement).

Beyond decisions to make purely physical movements, studies have also considered thought processes and decision making in economic and moral contexts.[37] Our genes, childhood, and social systems have predictable impact on our choices over which we have no control.[38] Up to 40-60% of variance in criminal behavior can be attributed to genetic influences.[39] Along with environmental factors, certain neurobiological characteristics are associated with criminal behavior.[40] There is mounting research that those who engage in violent behavior, on average, have differences in brain structure, brain functioning, hormone levels, and neurotransmitter levels.[41] Environmental and neurobiological factors are not easily separated: our neurobiology influences how we react to our environment and our environment can likewise influence our brain structure and functioning.[42] For this reason, we can consider all human behavior as a function of the dynamic system of neurobiology, psychology, and our environment.[43]

Science reveals hidden realities about the world but remains silent on the philosophical and legal significance of those revelations. Science tells us that humans will die without oxygen, but it has no moral stance on intentionally drowning someone. Instead, what neuroscience offers is the jumping-off point for a paradigm shift: instead of chasing down the elusive culprit of "evil", how can society and the criminal legal system leverage scientific

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[37] Anderson & Kiehl, *supra* note 2, at 5.
[38] *Id.*
[39] Focquaert, *supra* note 2, at 1.
[40] *Id.*; *see also* Henrik Walter, *Neurophilosophy of Moral Responsibility*, 32 PHIL. TOPICS 477, 488–91 (2004) (applying studies about structural and functional brain abnormalities' effects on behavior to hypothetical scenario about juror determining blameworthiness).
[41] *See* Focquaert, *supra* note 2, at 1.
[42] *Id.*
[43] *Id. See also* CHRIS WILLMOTT, BIOLOGICAL DETERMINISM, FREE WILL AND MORAL RESPONSIBILITY 25, 29, 35–37 (2016) (describing experiments demonstrating influence of genetics, environmental factors, and brain structure on human behavior); Greene & Cohen, *supra* note 4, at 1781 ("your brain serves as a bottleneck for all the forces spread throughout the universe of your past that affect who you are and what you do").

discoveries to positively influence behavior?[44] Releasing our grip on radical personal agency has the added benefit of acknowledging that culpable behavior is largely a normative judgment that has shifted across time, cultures, and religions.[45] Neuroscience provides scientific support for separating the concepts of what is undesirable for a healthy society from what is considered deviant or immoral.[46]

Reducing human behavior to its neurobiological influences has the potential to dismantle retribution as a worthy justification for punishment.[47] Even if free will is an illusion, this does not mean that accountability or repercussions for crime must be abandoned.[48] Punishment may be necessary to prevent undesirable behavior and promote public safety, but a spirit of retribution is inconsistent with a deterministic world.[49] The question is not whether neuroscience necessitates a criminal law revolution, but whether—in light of our humanitarian ideals—we become discontent enough with our retributive system to enact change that reflects neuroscientific discoveries.[50]

C. Neuroscience Application to Criminal Law Today

There is debate on the admission of neuroscientific data into evidence.[51] Opponents assert methodological or application

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[44] *See* Greene & Cohen *supra* note 4, at 1783 (arguing that neuroscience's support of determinism rejects retribution in favor of consequentialism to influence human behavior through criminal punishment).

[45] Focquaert *supra* note 2, at 5.

[46] *Id*.

[47] *E.g*., Greene & Cohen, *supra* note 4, at 1783; Robert M. Sapolsky, *The Frontal Cortex and the Criminal Justice System*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON 1794 (2004); Richard Dawkins, *Let's All Stop Beating Basil's Car*, EDGE: 2006: WHAT IS YOUR DANGEROUS IDEA?, https://www.edge.org/response-detail/11416 (last visited May 1, 2023); Anderson & Kiehl, *supra* note 2, at 7.

[48] *See* Greene & Cohen, *supra* note 4, at 1783 (acknowledging that consequentialist approaches to punishment do not require belief in free will).

[49] *Id*.

[50] Focquaert, *supra* note 2, at 3.

[51] *See* Ruben C. Gur et al., *A Perspective on the Potential Role of Neuroscience in the Court*, 85 FORDHAM L.R. 547, 566–71 (2016) (addressing common objections to neuroscientific evidence and providing guidance for such expert testimony).

problems with the evidence generally or believe that it may unduly impact the jury.[52] The level of certainty required within the courtroom differs from that within the psychiatrist's office—in part because of the distinct incentives at play in each environment.[53] The U.S. Supreme Court has held that psychiatric evaluations should be met with skepticism in the courtroom because diagnosis is an inexact science that may be disputed by professionals.[54] However, neuroscientific evidence is becoming increasingly common, with experts testifying about neuropsychological testing and structural and functional neuroimaging.[55]

The rules of evidence typically require any expert testimony—in this case neuroscientific testimony—to be (1) relevant to the disputed legal issue, (2) helpful for the factfinder, and (3) sufficiently reliable and valid.[56] For testimony to be relevant, the *Daubert* standard refers to the concept of "fit",[57] which includes two components for expert testimony of a scientific nature.[58] First, there must be legal fit, which means that the information provided is relevant to a disputed legal issue.[59] Second, empirical fit is a

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[52] *Id.* at 548. For the case against the admissibility of neuroscientific evidence (fMRI imaging) under Federal Rule of Evidence 403 due to the danger of unfair prejudice, misleading the jury, and wasting the court's time and resources, see Teneille Brown & Emily Murphy, *Through a Scanner Darkly: Functional Neuroimaging as Evidence of a Criminal Defendant's Past Mental States*, 62 STAN. L.R. 1119 (2010).

[53] *See* Carl E. Fisher, David L. Faigman & Paul S. Appelbaum, *Toward a Jurisprudence of Psychiatric Evidence*, 69 U. MIAMI L.R. 685, 695–96 (2015) (distinguishing psychiatric diagnosis in the clinical setting where the objective is treatment from the courtroom setting, where the objective of diagnosis is sentencing mitigation).

[54] *Id.* at 690.

[55] See *supra* note 29 and accompanying text for a discussion on the use of neuroscientific evidence at trial.

[56] *See generally*, Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 588–91 (1993) (holding that the standard for admitting expert scientific testimony in federal court is Federal Rules of Evidence 702—that expert testimony is admissible if it will help the jury understand the evidence and determine issues of fact—rather than Frye).

[57] *Id.* at 591.

[58] Fisher, Faigman & Appelbaum, *supra* note 53, at 697.

[59] *Id.*; *Daubert*, 509 U.S. at 591 (requiring that expert testimony be relevant to the legal issues of the case).

question of whether the information provided is sufficient to resolve the given dispute.[60] In contrast to the *Frye* standard, where the acceptance of the relevant scientific community is the critical question, the judges act as the gatekeeper in a *Daubert* court.[61]

Brain imaging techniques that have been used in court can either provide information about the brain's structure or the brain's function.[62] Structural imaging techniques include magnetic resonance imaging (MRI, most common) and computed axial tomography (CAT).[63] Functional imaging techniques include electroencephalography (EEG), magnetoencephalography (MEG), positron emission tomography (PET), single photon emission computed tomography (SPECT), and functional magnetic resonance imaging (fMRI).[64]

Where neurobiological evidence conflicts with circumstantial evidence that suggests planning and premeditation, juries tend to give greater weight to the circumstantial evidence.[65] As informative as it may be, neurobiological evidence cannot place us in the mind of the defendant at the time of the crime; it can only inform us about general tendencies of the defendant due to their brain structure or functioning.[66] This may explain why juries are more willing to consider circumstantial evidence from the time the crime was committed rather than neurobiological data collected post hoc.[67]

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[60] Fisher, Faigman & Appelbaum, *supra* note 53, at 697; *Daubert*, 509 U.S. at 591–92 (requiring that expert testimony be not only scientifically valid—but assist the trier of fact).

[61] Fisher, Faigman & Appelbaum, *supra* note 53, at 698; *see* Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (holding that the basis for scientific expert testimony must have general acceptance in that particular field).

[62] *See* Gaudet & Marchant, *supra* note 7, at 583–87 (listing and providing simple explanations for available neuroimaging technologies); *see also* Jason P. Kerkmans & Lyn M. Gaudet, *Daubert on the Brain: How New Mexico's Daubert Standard Should Inform its Handling of Neuroimaging Evidence*, 46 N.M.L.R. 383, 400–03 (2016) (summarizing available neuroimaging techniques).

[63] Gaudet & Marchant, *supra* note 7, at 583–84.

[64] *Id.* at 584–87.

[65] Farahany, *supra* note 5, at 503.

[66] *Id.; see also* Brown & Murphy, *supra* note 52, at 1167 (noting inability of fMRI to provide evidence of defendant's mental state at the time of the crime).

[67] Farahany, *supra* note 5, at 503.

Neuroscience evidence has been offered as support in cases regarding constitutional rights. In *Roper v. Simmons*, the U.S. Supreme Court held that capital punishment for minors is cruel and unusual punishment prohibited by the Eighth Amendment.[68] The Court cited scientific studies and briefs from *amici curiae*, including the American Psychological Association, support for the "comparative immaturity and irresponsibility of juveniles."[69] Referenced studies offered psychological and neurobiological evidence showing that brain systems used in impulse control and judgment are not fully developed until adulthood.[70] The Court's decision centered around the "diminished culpability" of minors considering their development, which provided sufficient reasoning against the ultimate retributive punishment: the death penalty.[71] Similarly, *Graham v. Florida* referenced *amici curiae* briefs presenting developmental neuroscience evidence in holding that sentencing juveniles to life without parole for non-homicide crimes violated the Eighth Amendment.[72] The Court reasoned that the diminished culpability of juvenile offenders weakened the case for severe retributive punishment.[73]

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[68] 543 U.S. 551 (2005).

[69] *Id.* at 569; *see also* Brief for the Am. Psych. Ass'n et al. as Amici Curiae Supporting Respondents, Roper v. Simmons, 543 U.S. 551 (2005) (No. 03-633), at 9–10 (asserting that neurodevelopmental MRI studies reveal that the frontal lobe—the impairment of which is associated with diminished decision-making capacity—is one of the last regions of the brain to reach maturity).

[70] One study referenced by the Court identified that neurobiological evidence indicates the most significant cognitive developments during adolescence occur in the brain regions associated with "long-term planning, the regulation of emotion, impulse control, and the evaluation of risk and reward." Laurence Steinberg & Elizabeth S. Scott, *Less Guilty by Reason of Adolescence: Developmental Immaturity, Diminished Responsibility, and the Juvenile Death Penalty*, 58 AM. PSYCH. 1009, 1013 (2003).

[71] *Roper*, 543 U.S. at 571.

[72] 560 U.S. 48, 68 (2010); *see also* Brief for the Am. Med. Ass'n et al. as Amici Curiae in Support of Neither Party, Graham v. Florida, 560 U.S. 48 (2010) (Nos. 08-7412, 08-7621), at 16–24 (discussing role of MRI technology in confirming that the prefrontal cortex, associated with voluntary behavior control, is immature into late adolescence).

[73] *Graham*, 560 U.S. at 71–72.

Neuroscience evidence is particularly relevant for Sixth Amendment ineffective assistance of counsel claims.[74] In cases where the defendant's mental health is sufficiently relevant, failing to introduce neuroscience evidence may constitute ineffective assistance of counsel.[75] One study analyzed the use of neuroscience evidence in capital offense cases where the defense argued that the defendant did not have the requisite mens rea.[76] Defendants who filed ineffective assistance of counsel claims due to nonuse or misuse of neuroscience evidence were successful in approximately twenty-six percent of cases—as compared to five percent for the same type of claim for all capital cases.[77]

Defense attorneys may choose not to present relevant neuroscience evidence for fear of the "double-edged sword".[78] The same facts that produce an argument for a lesser sentence because someone has diminished capacity can also be flipped by the prosecution to support harsher sentences due to future dangerousness.[79] However, a systematic review of criminal cases that involve neuroscience evidence does not support this position.[80]

Experimental studies evaluating the impact of neuroscientific evidence on sentencing show contradictory results: from mitigating to aggravating to no impact.[81] These mixed results

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[74] *See infra* notes 75–77.

[75] Deborah W. Denno, *How Prosecutors and Defense Attorneys Differ in Their Use of Neuroscience Evidence*, 85 FORDHAM L.R. 453, 458 (2016) [hereinafter *Prosecutors and Defense Attorneys*].

[76] *See id.* at 462 (analyzing thirty-nine capital offense cases where the defense argued that the defendant did not have the requisite mens rea).

[77] *Id.* (finding that 25.81% of thirty-nine capital cases analyzed were successful in their ineffective assistance of counsel claims).

[78] Richard J. Bonnie, *Mental Illness, Diminished Responsibility, and the Death Penalty*, 42 HUM. RTS. 21, 21 (2017).

[79] *Id.*; *see also* Farahany, *supra* note 5, at 506.

[80] *See* Deborah W. Denno, *The Myth of the Double-Edged Sword*, 56 B.C.L.R. 493, 544 (2015) [hereinafter *Double-Edged Sword*] (analyzing 553 criminal cases involving neuroscience evidence, finding prosecution used neuroscience evidence in relation to defendant's future dangerousness in 7% of cases).

[81] *Compare* Edith Greene & Brian S. Cahill, *Effects of Neuroimaging Evidence on Mock Juror Decision Making*, 30 BEHAV. SCI & L. 280, 292-93 (2012) (finding mock jurors provided with neuropsychological and neuroimaging evidence were less likely to recommend death sentences); David P. McCabe, Alan D. Castel & Matthew

may be caused by variation in participants' beliefs about the purpose of incarceration.[82] One experiment presented participants with neuroscientific testimony describing the hypothetical defendant's neuroanatomical risk factors for violent behavior.[83] When the objective of incarceration was primarily retribution, participants suggested shorter sentences.[84] Conversely, an objective prioritizing public safety or rehabilitation resulted in increased sentences—perhaps because jurors' view biological characteristics as fixed.[85]

A material risk with focusing on diminished mental capacity as a legal defense or mitigating factor is public backlash.[86] In the case of Dan White for the murder of San Francisco Mayor George Moscone and Harvey Milk, a diminished capacity defense was raised given White's depression, which included a minor detail about his poor dietary habits.[87] There was resultant public backlash for what was criticized as the "The Twinkie Defense", which contributed to the diminished capacity defense being abolished in California.[88] Similar public outrage characterized the case of John Hinckley Jr., in which he was found not guilty by reason of insanity

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G. Rhodes, *The Influence of fMRI Lie Detection Evidence on Juror Decision-Making*, 29 BEHAV. SCI. & L. 566 (2011) (finding fMRI lie detection evidence led to more guilty verdicts than polygraph evidence); *and* Casey LaDuke, Benjamin Locklair & Kirk Heilbrun, *Neuroscientific, Neuropsychological, and Psychological Evidence Comparably Impact Legal Decision Making*, 18 J. FORENSIC PSYCH. R. & PRAC. 114 (2018) (finding neuroscientific or neuropsychological evidence had no impact on mock juror's sentencing decisions).

[82] Annalise Perricone, Arielle Baskin-Sommers & Woo-kyoung Ahn, *The Effect of Neuroscientific Evidence on Sentencing Depends on How One Conceives of Reasons for Incarceration*, 17 PLOS ONE, Nov. 2, 2022, at 1, https://doi.org/10.1371/journal.pone.0276237.

[83] *Id.* at 7 (describing experimental conditions for participants).

[84] *Id.* at 8.

[85] *Id.* at 10.

[86] See *infra* notes 87–90 and accompanying text for a discussion of such cases.

[87] Anderson & Kiehl *supra* note 2, at 9.

[88] *See* Robert Weinstock, Gregory B. Leong & J. Arturo Silva, *California's Diminished Capacity Defense*, AM. ACAD. PSYCHIATRY & L. 347, 348 (1996) (attributing California's abolishment of the diminished capacity defense to public outrage over to the trial outcomes of Dan White and John Hinckley Jr.).

following his attempted assassination of President Ronald Reagan.[89] The verdict prompted the Insanity Defense Reform Act of 1984 (IDRA), which narrowed the insanity defense in federal courts to where the defendant is "unable to appreciate the nature and quality or the wrongfulness of his acts."[90] This is similar to the M'Naughten standard used in about half of states, which limits the insanity defense to instances where the offender did not "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."[91]The IDRA shifted the burden of proof from the prosecution, who previously needed to prove the defendant's sanity beyond a reasonable doubt, to the defendant, who must present "clear and convincing evidence" of insanity.[92] Many legal scholars have criticized the IDRA and M'Naughten rule for their disregard for mental conditions that substantially impair personal agency.[93]

II. Retribution and the Weaponization of Neuroscience: Reasons for Change

A. Ineffectiveness of current system - Mass incarceration and recidivism

That the United States has a serious problem with mass incarceration is nothing new. Incarceration has increased by 500% in the last forty years,[94] with up to 1.9 million incarcerated persons

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[89] Natalie Jacewicz, *After Hinckley, States Tightened Use of the Insanity Plea,* NPR (July 28, 2016, 10:20 AM), https://www.npr.org/sections/health-shots/2016/07/28/486607183/after-hinckley-states-tightened-use-of-the-insanity-plea; *see also* United States v. Hinckley, 672 F.2d 115 (D.C. Cir. 1982); *see also* Valerie P. Hans & Dan Slater, *John Hinckley, Jr. and the Insanity Defense*, 47 PUB. OP. Q. 202, 206 (1983) (finding majority of 434 surveyed participants believed that Hinckley was guilty (73%) and not legally insane (66%).

[90] 18 U.S.C.A. § 17 (1984).

[91] Jacewicz, *supra* note 89

[92] United States v. Freeman, 804 F.2d 1574 (11th Cir. 1986) (finding the IDRA constitutional).

[93] Sapolsky, *supra* note 47, at 1790.

[94] THE SENTENCING PROJECT, FACT SHEET: TRENDS IN U.S. CORRECTION 2 (2021), https://www.sentencingproject.org/app/uploads/2022/08/Trends-in-US-Corrections.pdf.

in 2022, or 573 per 100,000 U.S. residents.[95] Beyond mass incarceration, there is a major inability to prevent recidivism: "68% of released felony-level prisoners are rearrested within 3 years, 79% within 6 years, and 83% within 9 years."[96] The majority of incarcerated persons with a current or past violent offense suffers from mental health and substance abuse disorders.[97]

Some jurisdictions use algorithms that collect and analyze certain offender characteristics to predict recidivism.[98] This software is used to inform sentencing decisions and probation protocol.[99] Legal scholars have condemned this method of preventing recidivism due to its racial bias, questionable effectiveness, and potentially unconstitutional methods.[100] Partially in response to this criticism, the Center for Science and Law in Houston[101] developed and tested a similar risk assessment tool using neurocognitive tests instead of self-reported questions or

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[95] *See* Wendy Sawyer & Peter Wagner, *Mass Incarceration: The Whole Pie 2023*, PRISON POL'Y INITIATIVE (March 14, 2023), https://www.prisonpolicy.org/reports/pie2023.html#datasection (including incarcerations for convicted and not convicted persons in local, state, and federal prisons; juvenile justice; civil detention and commitment; immigration detention; and commitment to psychiatric hospitals for criminal justice involvement).

[96] Mariel Alper, Matthew R. Durose & Joshua Markman, *Bureau of Justice Statistics 2018 Update on Prisoner Recidivism: A 9-Year Follow-up Period (2005-2014)*, BUREAU OF JUST. STATS., (May 23, 2018), https://bjs.ojp.gov/library/publications/2018-update-prisoner-recidivism-9-year-follow-period-2005-2014.

[97] *See* DORIS J. JAMES & LAUREN E. GLAZE, BUREAU OF JUST. STAT., MENTAL HEALTH PROBLEMS OF PRISON AND JAIL INMATES 1 (2006) (finding 61% of State inmates with a current or past violent offense had a clinical diagnosis, treatment, or recent symptoms of a mental health problem, 74% of inmates with mental heath problems also met criteria for substance dependence).

[98] John Monahan & Jennifer L. Skeem, *Risk Assessment in Criminal Sentencing*, 12 ANN. R. CLINICAL PSYCH. 489, 494 (2016).

[99] *Id.* at 493–94.

[100] *See generally*, Starr, *supra* note 15.

[101] Along with the Texas Southern University Administration of Justice Department and the Stanford University School of Medicine Department of Psychiatry and Behavioral Sciences.

demographic characteristics.[102] The neurocognitive test shows similar accuracy to other risk assessment tools and provides a metric for monitoring behavioral therapy and other treatments.[103] The use of neurocognitive tests as an indicator for recidivism and metric for treatment efficacy is analyzed using this Article's humanitarian application framework in Section III.B.5.

B. Ineffectiveness: G2I Problem for Neuroscience

There is a tension between the methodology used for scientific studies and legal decision making. With scientific studies, conclusions are a result of large-scale statistical analysis.[104] As a general matter, vaccines, medications, and medical treatments are valuable because they provide desired outcomes for patients. However, these medical marvels rarely, if ever, guarantee success; chemotherapy may work for one cancer patient, but not another. In the same way, neuroscience research regarding brain structure is generally applicable but the effects of an individual's brain structure may vary from the majority.[105] For example, certain brain abnormalities may be associated with a mental health diagnosis, however, those abnormalities may be absent in some diagnosed persons and present in neurotypical persons.[106]

The potential inconsistency between generalized research and an individual's experience conflicts with legal decision making in a criminal court of law, where the individual defendant and case-specific details reign supreme.[107] Just because general neuroscientific findings are valid does not imply that an expert can accurately diagnose the defendant. This tension between generalized

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[102] Gabe Haarsma et al., *Assessing Risk Among Correctional Community Probation Populations*, 10 FRONTIERS PSYCH., Jan. 2020, at 1, 1, 3, https://doi.org/10.3389/fpsyg.2019.02926.
[103] *Id.* at 3, 11.
[104] Fisher et al., *supra* note 53, at 687.
[105] MACARTHUR FOUND. RSCH. NETWORK ON L. & NEUROSCIENCE, G2I KNOWLEDGE BRIEF 1 (June 2017), https://www.lawneuro.org/LawNeuro_G2i.pdf.
[106] *Id.* at 2. (NOTE: The second to last sentence of the first paragraph on page 17 is not supported by the cited source).
[107] Fisher et al., *supra* note 53, at 685, 693.

findings and how they apply to the individual is known as the "G2i" problem (General to individual).[108] This is not just a problem in neuroscience, but any application of general science to the individual level.[109]

Another issue arises because scientific terms are not necessarily equivalent to legal terms; there is always an issue of translation.[110] For example, many jurisdictions may allow testimony regarding whether a defendant has schizophrenia (applied science of psychiatry) but prevent testimony as to whether the defendant is insane (a legally relevant question).[111] Additionally, there are different objectives for each field. Whereas clinical diagnosis in a medical context provides information needed for treatment options, legal classification of a diagnosis is relevant to inform guilt and sentencing decisions.[112]

Neuroscience can provide objective measures of psychiatric diagnoses unaffected by subjective interpretation. Certain brain imaging techniques—diffusion tensor imaging (DTI), structural magnetic resonance imaging (sMRI) and functional magnetic resonance imaging (fMRI)—can support psychological diagnoses of dementia beyond behavioral symptoms.[113] Beyond dementia, neuroimaging can potentially inform diagnoses of depression, schizophrenia, and bipolar disorder.[114]

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[108] *Id.* at 685, 688. For a general overview of the G2i problem, see MACARTHUR FOUND. RSCH. NETWORK ON L. & NEUROSCIENCE, *supra* note 104, at 1–4.

[109] Fisher et al., *supra* note 53, at 687–88.

[110] David L. Faigman et al., *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L.R. 417, 417–19 (2014).

[111] Fisher et al., *supra* note 53, at 694–95; *see also* 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").

[112] Fisher et al., *supra* note 53, at 695–96.

[113] Focquaert, *supra* note 2, at 4. *See generally* Guendalina Bonifacio & Giovanna Zamboni, *Brain Imaging in Dementia*, 92 POSTGRADUATE MED. J. 333, 333–37 (2016) (describing the use of MRI, PET fMRI, DTI, and amyloid PET in detecting dementia).

[114] Graziella Orrù et al., *Using Support Vector Machine to Identify Imaging Biomarkers of Neurological and Psychiatric Disease*, 36 NEUROSCIENCE & BEHAV. REVS. 1140, 1140–41 (2012).

C. The Inevitability of Neurolaw and the Need for a Humanitarian Approach

Courts have not consistently dealt with the G2i problem[115] despite the present role of neuroscientific evidence in the courtroom.[116] A framework on how to consider neuroscience evidence in trial and incorporate neuroscientific discoveries into criminal legal policy while prioritizing neurorights does not exist.[117] Proactively weighing neurorights while implementing policies supported by research is crucial to prevent the weaponization of neuroscience, infringement on neurorights, and stigmatization.

As mentioned, defense attorneys may not present neuroscientific evidence if they judge it to be more aggravating than mitigating.[118] Although not empirically substantiated,[119] this fear highlights a key concern around neurobiological influences on behavior: neurodeterminism. Neurodeterminism is the idea that because brain chemistry dictates behavior, neurological traits are immutable.[120] Less formally, the idea is: a zebra never changes its stripes. Unfortunately, neurobiological explanations for mental disorders can alienate individuals with mental disorders by aggravating public perceptions of dangerousness.[121] However, education regarding the biological component of mental illness seems to generate public support for treatment.[122]

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[115] Fisher et al., *supra* note 53, at 701.

[116] For a summary of the use of neuroimaging evidence in trial, sentencing, and competency assessments, see Lyn M. Gaudet & Gary E. Marchant, *Under the Radar: Neuroimaging Evidence in the Criminal Courtroom*, 64 DRAKE L.R. 596, 578–79 (2016).

[117] See *infra* notes 133–137 and accompanying text for a description of neurorights.

[118] Bonnie, *supra* note 78. See *Prosecutors and Defense Attorneys*, *supra* note 75, for a discussion on the use of neuroscientific evidence by prosecutors and defense attorneys.

[119] *Double-Edged Sword*, *supra* note 80, at 544.

[120] *See* Bernard Baertschi & Alexandre Mauron, *Genetic Determinism, Neuronal Determinism, and Determinism Tout Court*, *in* THE OXFORD HANDBOOK OF NEUROETHICS 300–301 (Judy Illes & Barbara J. Sahakian eds.) (2011) (describing neurodeterminism as "brain determinism").

[121] Focquaert, *supra* note 2, at 6.

[122] *Id.*

Prioritizing neurological or biological indicators for violent behavior subjugates environmental factors like access to a living wage, education, housing, as well as psychological skills like practicing self-control or cognitive behavioral therapy.[123] This minimizes the need for structural change around an individual's environment to reduce crime.[124] Relying on neuroscientific findings also ignores that individual brains compensate differently for neurological pathology.[125]

Another troubling effect of neurodeterminism is the self-stigmatization of those with mental health problems.[126] When people experiencing mental health problem self-stigmatize, they are less likely to seek mental health treatment.[127] Offering people their neurobiological profile may in fact prevent treatment and behavioral change due to stigmatization and self-blame—potentially increasing the risk of future criminal behavior.[128]

Too much focus on personal responsibility neglects the biological and environmental origins of crime (e.g., poverty, unemployment, health care inequities and childhood maltreatment).[129] Too much focus on the neurobiological factors may discourage effective rehabilitation.[130] For this reason, some experts argue that individual notions of free will are necessary for successful behavioral treatment.[131] Having both the patient and provider believe that the patient is a free agent who is capable of change and responsible for their actions promotes effective treatment and rehabilitation.[132] We must clarify how to apply these findings in various systems and develop an informed standard in the

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[123] *Id.* at 3.
[124] *Id.*
[125] *Id.* at 5.
[126] *Id.* at 6.
[127] *Id.*
[128] *Id.* at 3; *see also* Thomas Fuchs, *Ethical Issues in Neuroscience*, 19 CURRENT OP. PSYCHIATRY 600, 601 (2006) ("The possible benefit of predictive imaging would have to be carefully weighed not only against possible harm but also against the burden of knowledge and the possible discriminations caused by being an at-risk patient").
[129] Focquaert, *supra* note 2, at 6.
[130] *See supra* notes 123–125 and accompanying text.
[131] *See supra* notes 126–128 and accompanying text.
[132] Focquaert, *supra* note 2, at 6.

realms of the criminal legal system: in trial, sentencing, and general policy.

III. Humanitarian Application Framework Proposal

This paper provides a framework for incorporating neuroscience findings into the criminal legal system. A key component in this framework is the consideration and protection of neurorights, which this paper describes in detail. The framework is relevant for trial, sentencing, probation decisions, as well as larger policy considerations like incarceration strategy and rehabilitative efforts. Following the description of the framework, this paper applies the considerations to a relevant legal scenario to demonstrate how this framework can look when implemented.

A. Defining Neurorights

The term "neuroright" was introduced in 2017 by Ienca and Andorno in an "ethical-legal analysis of human rights in the age of neuroscience and neurotechnology."[133] Ienca and Andorno analyzed brain protections included in various international human rights documents alongside emerging trends in neurotechnology.[134] Neurorights can also be defined as, "the ethical, legal, social, or natural principles of freedom or entitlement related to a person's cerebral and mental domain; that is, the fundamental normative rules for the protection and preservation of the human brain and mind."[135] "Neurolaw" was first coined by Sherrod Taylor in 1991 as a description of the developing collaboration within criminal law between neuropsychologists and lawyers in the criminal justice

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[133] Marcello Ienca, *On Neurorights*, FRONTIERS HUM. NEUROSCIENCE, Sept. 2021, at 1, 2, https://doi.org/10.3389/fnhum.2021.701258.
[134] *See id.* (considering the United Nation's Universal Declaration of Human Rights (UDHR) (1948), the European Union's Charter of Fundamental Rights (2000) and the UNESCO's Universal Declaration on Bioethics and Human Rights (2005) in their analysis).
[135] *Id.*

system.[136] Now, neurolaw more generally encompasses the overlap between neuroscience and law.[137]

Various international organizations have begun to define and provide recommendations for the protection of neurorights. The Organisation for Economic Co-operation and Development (OECD) has developed the "OECD Recommendation on Responsible Innovation in Neurotechnology", which is the first international standard to "anticipate and address the ethical, legal and social challenges raised by novel neurotechnologies while promoting innovation in the field".[138] One of the Recommendation's nine principles includes "[s]afeguarding personal brain data."[139] Another group, the International Neuroethics Society, includes scholars, scientists, clinicians, and other professions with the goal to "inspire research and dialogue on the responsible use of advances in brain science."[140] The Society has 300 members across 28 countries.[141]

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has likewise addressed the issue of neurorights via its International Bioethics Committee (IBC).[142] Created in 1993, IBC is "the only global forum for reflection in bioethics."[143] It is comprised of independent experts that aim to protect human dignity and freedom amid progress in science and technology.[144] The "Report of the International Bioethics

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[136] *Id.; See also* J. Sherrod Taylor, J. Anderson Harp & Tyron Elliott, *Neuropsychologists and Neurolawyers*, 5 NEUROPSYCHOLOGY 293; *The Overlooked History of Neurolaw*, *supra* note 3.

[137] *See* Ienca, *supra* note 133, at 2; *see generally*, *The Overlooked History of Neurolaw*, *supra* note 3.

[138] *Recommendation of the Council on OECD Legal Instruments Responsible Innovation in Neurotechnology*, OECD, (2019), https://legalinstruments.oecd.org/api/print?ids=658&Lang=en. [hereinafter *Recommendation of the Council on OECD*]

[139] *Id.*

[140] *See generally Mission*, INT'L NEUROETHICS SOC'Y, https://www.neuroethicssociety.org/about#mission (last visited Apr. 19, 2023).

[141] *Id.*

[142] *International Bioethics Committee*, UNESCO (Jan. 19, 2023), https://www.unesco.org/en/ethics-science-technology/ibc.

[143] *Id.*

[144] *Id.*

Committee of UNESCO (IBC) on the ethical issues of neurotechnology" addresses the issues raised by emerging neurotechnologies in the context of ethics, law, and governance.[145]

The IBC Report defines neurorights as "human rights-based 'ethical, legal, social, or natural principles of freedom or entitlement related to a person's cerebral and mental domain; that is, the fundamental normative rules for the protection and preservation of the human brain and mind.'"[146] Autonomy and informed consent are central principles of bioethics that extend to the field of neurorights.[147] Some neurological augmentation technology can be classified as mental health treatment, but doing so presumes that atypical neurocognitive characteristics are illnesses to be cured.[148] In this way, certain augmentation technologies rely on normative beliefs of what constitutes ideal neurological functioning.[149] The IBC Report warns of the ethical problems in promoting certain neurocognitive characteristics—namely, threatening the dignity of the individual.[150]

The Neurorights Initiative of Columbia University established the Neurorights Foundation.[151] The Neurorights Foundation focuses on six neurorights including mental privacy, personal identity, free will, fair access to mental augmentation, and protection from bias.[152] The second goal of the Foundation is "to pre-empt and reduce the risk of the misuse or abuse of neurotechnology", in part by developing a "Technocratic Oath".[153] Like the Hippocratic oath, the "Technocratic Oath" aims to provide

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[145] Int'l Bioethics Comm., *Report of the International Bioethics Committee of UNESCO (IBC) on the Ethical Issues of Neurotechnology* 1, at 1-2 (Dec. 15, 2021), https://unesdoc.unesco.org/ark:/48223/pf0000378724, [hereinafter *IBC Report*].

[146] *Id. See also* Ienca, *supra* note 133, at 15.

[147] *IBC Report*, *supra* note 145, at para. 62, 68.

[148] *Id.* at para 88.

[149] *Id.*

[150] *Id.* at para. 90.

[151] *Mission*, NEURORIGHTS FOUND., https://plum-conch-dwsc.squarespace.com/mission, (last visited Apr. 19, 2023).

[152] *Id.*

[153] *Id.*

"an ethical framework for entrepreneurs, scientists, companies, and investors, and others developing neurotechnology."[154]

Various institutions and groups have identified common neurorights. This paper will focus on these principles as they highlight the similarities between different organizations, showcase the evolution of neurorights over time, and have groundings in commonly acknowledged human rights both nationally and internationally. These neurorights include:

1. *Mental Privacy*: Provides individuals the "right against the unconsented intrusion by third parties into their brain data as well as against the unauthorized collection of those data."[155]
2. *Mental Integrity*: "[T]he right of individuals to be protected from illicit and harmful manipulations of their mental activity."[156]
3. *Mental autonomy and Informed Consent*: "Individuals should have ultimate control over their own decision making"[157] and "must receive understandable, relevant, structured and individually tailored information that makes it possible for that individual to make a decision on whether or not to accept medical intervention or to participate in scientific research."[158]
4. *Protection from Bias and Stigma*: Requires that "[c]ountermeasures to combat bias should be the norm for algorithms in neurotechnology."[159]

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[154] *Id*.

[155] Ienca, *supra* note 133, at 7; *see generally*, Francis X. Shen, *Neuroscience, Mental Privacy, and the Law*, 36 HARV. J.L. & PUB. POL'Y 653 (2013) [hereinafter *Neuroscience, Mental Privacy, and the Law*] (discussing mental privacy and the emerging concern of non-consensual "brain reading" via neurotechnologies).

[156] Ienca, *supra* note 133, at 8; *see also* Andrea Lavazza, *Freedom of Thought and Mental Integrity*, 12 FRONTIERS NEUROSCIENCE, Feb. 2018, at 1 (advocating for technical principles in developing neurotechnologies that prevents unauthorized detection of brain data to preserve mental integrity).

[157] *Mission*, *supra* note 151.

[158] *IBC Report*, *supra* note 145, at para. 68.

[159] *Mission*, *supra* note 151.

In the United States, there is disagreement among legal scholars whether Fourth and Fifth Amendment protections extend to neurorights and mental privacy.[160] For the Fifth Amendment right against forced self-incrimination, the question hinges on whether brain activity is categorized as testimonial evidence, which is protected, or as physical evidence, which is not.[161] Regardless of whether these protections exist, currents practices threaten individuals' mental privacy—especially in competency and parole decisions.[162] In Delaware, for example, a mental health evaluation is required prior to being eligible for parole. [163]

The question of whether neurorights are already protected under existing legal frameworks is present on a global scale as well. The Council of Europe is in the middle of a five-year "Strategic Action Plan" concerning Human Rights and Technologies in Biomedicine.[164] In part, the Plan is assessing whether the neurorights issues raised by the emergence of neurotechnologies require a new human rights framework or are adequately covered by existing structures.[165] Can the principles of neurorights be derived

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[160] *Neuroscience, Mental Privacy, and the Law*, *supra* note 155, at 694-97.

[161] *Id.* at 702; *see also* John G. New, *If You Could Read My Mind: Implications of Neurological Evidence for Twenty-First Century Criminal Jurisprudence*, 29 J. LEGAL MED. 179, 190, 197–98 (2008) ("if evidence of mental activity is considered testimonial, the strictures of the Fourth Amendment are inapplicable because searches, even of bodily evidence such as hair or blood, are searches for physical evidence. Thus, the Fifth Amendment protections against self-incrimination discussed above, rather than the Fourth Amendment's strictures preventing unreasonable search and seizure, would be the appropriate frame of analytical reference.").

[162] *Neuroscience, Mental Privacy, and the Law*, *supra* note 154, at 707–09.

[163] *See id.* at 709 ("Turning from the start of proceedings to the end, a mental health evaluation may be required as a precondition for parole." In Delaware, for instance, "No person who has been convicted of and imprisoned for any class A felony, felony sex offense or any felony wherein death or assault to a victim occurred shall be released from incarceration by the Parole Board until the Parole Board has considered a mental health evaluation of such person. The Parole Board, in its discretion, may request mental health evaluations on persons convicted and imprisoned for any offense not enumerated [in the code]")

[164] COUNCIL OF EUROPE, STRATEGIC ACTION PLAN ON HUMAN RIGHTS AND TECHNOLOGIES IN BIOMEDICINE: 2020–2025, at 5-7 (2019) https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2.

[165] *Id.* at 9.

from Article 18 of the Universal Declaration of Human Rights, which states that "[e]veryone has the right to freedom of thought, conscience and religion"?[166] Given the significance of neural data in personal identity, the principles of neurorights may require explicit protection.[167]

The legal analysis of neuroscientific advancement is ongoing, but there has been a push toward neurorights as a focus for policy advocacy concerning, "privacy and consent, agency and identity, augmentation, and bias."[168] Pivoting toward a proactive protective approach can encourage legislative action to specifically codify neurorights. For example, Chile began the process of amending their constitution in 2021 to protect neurorights by "safeguard[ing] brain activity".[169] The Senate and Chamber of Deputies approved the bill, and the president is now expected to sign the bill into law.[170] The enacted law would make Chile the first country with legislation that explicitly protects neurorights by providing, "personal brain data the same status as an organ, so that it cannot be bought or sold, trafficked or manipulated."[171]

B. Proposal for Humanitarian Application Framework

The framework that follows attempts to provide structure to the conversation of neuroscience and its bearing on criminal law and policy. The objective is to tip the scale from analyzing neuroscientific advancements and neurorights from a theoretical perspective to a policy-forward humanitarian approach.

The first question addresses the scope of the neuroscience-backed proposal: is this a change to existing law that would apply equally to all individuals—for example, reduction in sentences for a given crime? Or would the proposal require individual assessment as a precondition for implementation—for example, using

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[166] G.A. Res. 217 (III) A, Universal Declaration of Human Rights, at 74 (Dec. 10, 1948).
[167] *IBC Report*, *supra* note 145, at para 77.
[168] Ienca, *supra* note 3, at 3.
[169] Lorena Guzmán H., *Chile: Pioneering the Protection of Neurorights*, UNESCO COURIER, Jan.–Mar. 2022, at 13, 13.
[170] *Id*.
[171] *Id*.

neurological indicators to determine sentence severity? Second, the science supporting the proposal is assessed via a variation of the *Daubert* standard as described by Faigman, Monahan, and Slobogin.[172] This second step includes two subcomponents which are applied based on the classification performed in step one (i.e. generally applicable or individual-dependent). The third step requires a balancing test of the benefits of the proposal versus the potential for infringement on neurorights. And finally, the final step is a pragmatic one: given the above analysis and the current state of criminal law and policy, should this proposal be applied? In the interest of legal continuity, step four is primarily an assessment of whether current law is already compatible with the neuroscientific findings underlying the proposal.

1. What is the proposal based on neuroscientific research? Does it concern a broad-stroke policy, or does it depend on individual assessment?

The first question in the framework considers how the neuroscientific findings would be implemented in law and policy. Would the reform be at a structural level and apply uniformly to everyone? An example of this can be seen in *Roper v. Simmons* where the death penalty for minors was held to be cruel and unusual punishment in violation of the Eighth Amendment.[173] This would also include legal reform that reduces sentences for a given crime. Or alternatively, is the legal reform conditioned on a neurological assessment of an individual? This would include topics like the admission of neuroscientific data as evidence during trial, sentence mitigation, parole decisions, and treatment eligibility. For broad-stroke policies, satisfying the "G" requirements is sufficient. In other words, neuroscience research must meet the *Daubert* standard regarding both its methodology and the specific application of its methodology. Neuroscientific findings that apply to individuals have an additional requirement of satisfying the "i" portion of the

[172] See *infra* Section III.B.2 for G2i framework from Faigman, Monahan, and Slobogin.

[173] See *supra* notes 68–71 and accompanying text for a discussion of the Roper v. Simmons decision.

G2i problem. To do so, the research must meet the *Daubert* standard regarding its application to individual cases ("i").

2. Is the neuroscientific research worth considering?

The next step is determining whether the science that supports the proposal is sufficient to warrant reform. The stringency of analysis depends on the classification from the first step: is this an even-handed policy change, or is this something that requires an individual's brain data to make a determination? As discussed in step one, generally applicable changes must satisfy both "G" requirements regarding methodology and its application, whereas individual-focused changes must additionally satisfy "i" requirements in applying the methodology to the individual.

Just as expert testimony must pass a test of admissibility, neuroscientific discoveries must be assessed to determine whether they are valid and relevant enough to inform legal decision making. The *Frye* standard determines admissibility based on whether the subject of the expert testimony has "gained general acceptance in the particular field in which it belongs."[174] This leaves us first with questions of how to determine the appropriate relevant field and the threshold required to meet general acceptance.[175] For example, should a legal question regarding psychology be answered by psychiatrists or neuroscientists or a clinician?[176] What is the protocol when these experts disagree on what is "generally accepted"?[177]

Frye courts have also not clarified the ambiguity resulting from G2i phenomenon. In relation to G2i, *Frye* leaves a glaring application issue: must the acceptance be for the particular method on which the expert is testifying, for the expert's application of the method, or both?[178] If a given technology is generally accepted, can the same be said for derivative technologies (fMRI from MRI, for example)?[179] If the technology is considered generally accepted by

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[174] Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).
[175] Faigman, Monahan & Slobogin, *supra* note 110, at 427.
[176] Fisher, Faigman & Appelbaum, *supra* note 53, at 700.
[177] *Id*.
[178] Faigman, Monahan & Slobogin, *supra* note 110, at 427.
[179] *Id*.

the judge, there still needs to be a determination for whether diagnostic testimony using the technology is appropriate—a consideration omitted from *Frye* as provided.[180]

This framework adopts a variation of the *Daubert* standard catered to neuroscientific evidence as described by Faigman, Monahan, and Slobogin. In *Daubert*, judges have the authority and responsibility to assess whether an expert's testimony is more likely than not valid and reliable.[181] This approach is a departure from *Frye*, where the key question is one of acceptance.[182] *Daubert* alongside *General Electric Co. v. Joiner*[183] and *Kumho Tire Co. v. Carmichael*,[184] outlined the relevant criteria:

> (1) the theory or technique can be, and has been, tested; (2) the error rate is acceptable, and adequate standards exist to control the technique's operation; (3) the theory or technique has been peer reviewed and published; (4) there is "widespread acceptance" of the theory or technique; and (5) the expert "employ[ed] in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field.[185]

The *Daubert* Court noted that these factors are not the exclusive criteria and that the standard for admitting expert testimony is a "flexible one".[186] However, *Daubert*, as applied, does not adequately address the G2i issue and courts deal with the issue of G2i inconsistently.[187] In some contexts, courts may limit expert testimony to providing the empirical framework—as is the case for eyewitness testimony experts.[188] Courts typically allow eyewitness

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[180] *Id.*
[181] See *supra* notes 56–61 and accompanying text for a discussion of the *Daubert* standard.
[182] Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).
[183] 522 U.S. 136 (1997).
[184] 526 U.S. 137 (1999).
[185] Fisher, Faigman & Appelbaum, *supra* note 53, at 700–701.
[186] *Id.*
[187] *Id.* at 701.
[188] *Id.*

testimony experts to exclusively provide detail regarding the general science (the empirical framework or "G") but preclude testimony as to whether a given eyewitness should be believed (the diagnostic evidence or "i").[189] In other contexts like medical causation cases, courts may explicitly require both testimony regarding the empirical framework ("general causation") and corresponding diagnostic evidence ("specific causation").[190]

Faigman, Monahan, and Slobogin identify five criteria when considering the admission of scientific expert testimony: "(1) relevance, (2) qualifications, (3) scientific validity, (4) added value (or helpfulness), and (5) unfair prejudice."[191] Relevance, or "fit" has two interpretations: legal fit and empirical fit.[192] Legal fit concerns whether the testimony is relevant to a substantive legal question, and empirical fit concerns whether the testimony is based on research methods relevant to the case.[193] Qualifications consider whether the witness is considered an expert under Rule 702 of the Federal Rules of Evidence.[194] Scientific validity concerns whether the testimony is (a) able to be tested, (b) has permissible error rates, (c) is published and peer reviewed, (d) has widespread acceptance, and (e) has the "same level of intellectual rigor that characterizes the practice of an expert in the relevant field."[195] Helpfulness refers to whether the testimony would support the fact finder in making a decision.[196] Unfair prejudice concerns Rule 403 of the Federal Rules of Evidence and considers whether the prejudicial effect of the testimony would outweigh its probative value.[197] Each of these criteria must be considered on an empirical framework level *("G")* and on a diagnostic level ("i").

For proposals where neuroscientific data is being applied uniformly generally, both the methodology of the empirical framework and its application must be satisfied under this variation

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[189] *Id.*
[190] *Id.* at 702.
[191] Faigman, Monahan & Slobogin, *supra* note 110, at 440.
[192] *Id.* at 440–41.
[193] *Id.*
[194] *Id.* at 444; FED. R. EVID. 702.
[195] Faigman, Monahan & Slobogin, *supra* note 110, at 448
[196] *Id.* at 466.
[197] *Id.* at 469.

of the *Daubert* standard. For proposals involving individuals, there is an additional requirement: the application to the individual must satisfy diagnostic requirements. To do so, judges must consider the "error rate" of diagnosis to ensure only valid testimony is admitted.[198]

3. Balancing test: Impact of the proposal on individual neurorights

The next step in the application framework involves a balancing test of the change on individual and collective neurorights. The relevant neurorights to consider this exercise are not static and should reflect the current generally accepted neuroethical norms. For the purposes of this paper, the neurorights to weigh include (1) mental privacy, (2) mental integrity, (3) mental autonomy, and (4) protection from bias.

An inherent challenge in this analysis is weighing nonequivalent interests: the value of reducing recidivism and preventing crime versus the protection of individual neurorights. That the U.S. Government does not explicitly recognize neurorights jeopardizes their protection. For neurorights to gain adequate legal protection, the Government's must acknowledge their existence and value in some fashion. One option is codifying neurorights through a Constitutional amendment. Alternatively, some scholars anticipate that neurorights could be subsumed into existing rights guaranteed by the Constitution.[199] By classifying brain data collection as a search, for example, the Fourth Amendment could preserve mental privacy.[200] Additionally, if brain data is found to be testimonial

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[198] Fisher, Faigman & Appelbaum, *supra* note 53, at 705–06. The accuracy of diagnostic evidence can be broken down into two components: sensitivity and specificity. Sensitivity is a test's ability to *include* those *with* a condition. Poor sensitivity leads to "false negatives," or falsely excluding affected persons. Specificity is a test's ability to *exclude* those *without* a condition. Poor sensitivity leads to "false positives," or falsely diagnosing unaffected persons.

[199] *See Neuroscience, Mental Privacy, and the Law*, *supra* note 155, at 694–96 (summarizing legal scholars' view on Fourth and Fifth Amendment protections against the Government's involuntary neuroimaging collection).

[200] *Id.* at 699; *see also* Michael S. Pardo, *Neuroscience Evidence, Legal Culture, and Criminal Procedure*, 33 AM. J. CRIM. L. 301, 325 (2006) (comparing

evidence, the Fifth Amendment would protect defendants from being compelled to provide such data.[201] Mental integrity and mental autonomy could be integrated as liberty interests under the Due Process Clause of the Fourteenth Amendment, and protection from bias could likewise fall under the Equal Protection Clause.

Without legal recognition of neurorights, this balancing test remains a conceptual framework for assessing policies that arise out of or are supported by neuroscientific findings. The question is: how much weight should we give to neurorights?

4. Is the current system compatible with the finding or is change required?

After determining that the finding is applicable, the next question concerns whether it is necessary. Where neuroscientific findings bolster current law and policy, it is likely that no change is needed. For example, neuroscientific evidence is routinely admitted in trials where an insanity defense is raised to support the existing legal definition of insanity.[202] In instances where the findings may or may not be compatible, it is necessary to consider whether there is a negative impact on neurorights if change is not implemented. Where findings challenge or refute current law, the proposed change may be appropriate. For example, the study of the disastrous impact of solitary confinement on brain circuitry has not yet reached the tipping point of policy change.[203] Should the research reach this point, the neuroscientific case against solitary confinement would be incompatible with current practice.[204]

Government's collection of neuroscientific evidence to compelling physical evidence from suspect's body).

[201] New, *supra* note 161, at 197–98.

[202] Owen D. Jones, *Seven Ways Neuroscience Aids Law*, *in* NEUROSCIENCES AND THE HUMAN PERSON: NEW PERSPECTIVES ON HUMAN ACTIVITIES 18, 186 (Antonio M. Battro et al. eds., 2013).

[203] Francis X. Shen, *Neuroscience, Artificial Intelligence, and the Case Against Solitary Confinement*, 21 VAND. J. OF ENT. & TECH. L. 937, 941 (2020).

[204] *Id.* at 944–47.

5. The Humanitarian Application Framework Example: Neurological data in predicting recidivism and supplementing treatment.

The use of risk assessment software as a consideration in determining criminal sentencing has already been discussed.[205] These assessment tools most typically include factors such as self-reporting, interviews, and personal data including past crimes, severity of crimes, education, age, and gender.[206] This technique has garnered both praise for its objectivity and outrage for its discriminatory effects and questionable efficacy.[207] Risk assessment tools may soon include neurological indicators in addition to other factors.[208] Certain neurological traits can provide indication of an offender's impulse control and predilection for aggression and violence.[209] One risk assessment tool in particular, the NeuroCognitive Risk Assessment (NCRA), uses "gamified" assessments administered on mobile devices to measure certain factors correlated with reoffending, including "attentiveness, aggression, risk seeking, empathy, future planning, emotional processing, and impulsivity."[210] Machine learning models are then used to provide an individualized risk assessment score.[211] NCRA shows similar accuracy to other risk assessment tools and claims that it provides a metric for monitoring behavioral therapy and other treatments.[212] Should NCRA be incorporated into sentencing decisions and treatment monitoring?

In applying the first step of the framework, this policy can be categorized as an individual-focused change, as the outcome of a defendant's or offender's case would be determined by their respective brain data.

Second, are neurological risk assessments "good" science? Under *Daubert* and confronting the G2i problem, the first point of

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[205] *See supra* notes 98–102.
[206] Starr, *supra* note 15, at 805.
[207] *Id.* at 814–19.
[208] Haarsma et al., *supra* note 102, at 3.
[209] *Id.*
[210] *Id.*
[211] *Id.*
[212] *Id.* at 10.

analysis is whether the "G" is scientifically sound. This is both a question of methodology and appropriate application. Concerning methodology, there are issues with correlating neurological factors with violence and recidivism.[213] For one, the studies have been small-scale and not adequately replicated.[214] Additionally, what constitutes violence is not strictly defined and is primarily a normative question.[215] Concerning the application of these studies to sentencing decisions and recidivism prediction, the data is even less clear.[216] Without a robust empirical framework, application to the individual is inappropriate and the analysis could end here.

For the sake of illustration, steps three and four will be analyzed as well. The balancing test portion of the framework is particularly crucial for individual-focused proposals because personalized data determines the outcome for a given defendant or offender. This is distinguishable from generally applicable proposals, where aggregate data dictates their application. Collecting individual brain data is an invasion of mental privacy, but this infringement can be avoided by ensuring that any usage of the tool is with the informed consent of the user. This includes an explanation of the data collected, its potential bearing on the individual's sentencing, as well as the data retention policy.

Because the study of the NCRA includes two potential usages of the data (recidivism risk assessments and treatment assessment and monitoring), these will be assessed separately. Using the NCRA as a risk assessment tool translates to using neurocognitive tests to inform legal decision makers in sentencing and parole decisions. A key tenet of criminal law is that one should not be punished for their thoughts or for crime they have not committed or attempted to commit. However, using neurological indicators to determine whether someone is an "at-risk" individual

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[213] *E.g.*, Philipp Kellmeyer, *Ethical and Legal Implications of the Methodological Crisis in Neuroimaging*, 26 CAMBRIDGE Q. HEALTH ETHICS 530, 537–47 (2017); Andrea L. Glenn & Adrian Raine, *Neurocriminology: Implications for the Punishment, Prediction and Prevention of Criminal Behaviour*, 15 NATURE REVS. NEUROSCIENCE 54, 57 (2014).

[214] Haarsma et al., *supra* note 102, at 11.

[215] Focquaert, *supra* note 2, at 2.

[216] *See supra* note 213 and accompanying text.

threatens these ideals by disadvantaging someone based entirely on their brain chemistry.

Concerning the use of NCRA for treatment, the analysis is more nuanced. How should we interpret situations where temporary infringement of a neuroright leads to greater freedom? Consider the situation where a temporary limit to autonomy leads to new freedom:

> Desires, cravings and habits that motivate criminal behavior can be experienced as impediments to making autonomous choices. Neurobiological treatments that reduce the internal coercion that such desires and cravings produce have the potential to increase an individual's autonomy and ability to lead a crime-free life."[217]

With this in mind, is it justifiable to limit autonomy in the short-term in order to provide an offender with greater freedom and autonomy in the long run?[218] In this case, the use of the NCRA tests may be permissible when weighing the benefit against the potential infringement of neurorights. Regardless, a prerequisite for methods that require brain data is informed consent as to the methods and usages of the collected information. Additionally, data privacy and security become key concerns in acknowledgment that although this information is collected for treatment purposes, it could be abused in sentencing and parole.

As the last step of analysis, should neurocognitive tests be used in risk assessment and treatment? Considering the insufficiencies of the methodology when applying the *Daubert* at both the general and individual levels in the second step of the analysis, the answer is no. However, should the research continue to support the findings in these studies, the question would then turn on the whether the NCRA's burden on neurorights would outweigh its benefit. In that case, this framework would turn on whether

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[217] Focquaert, *supra* note 2, at 7.

[218] *Id.* (citing Caplan's argument that long-term autonomy can be achieved in instances that temporarily limit individual autonomy during treatment; for example, using naltrexone for drug addiction).

neurorights can be adequately protected in the administration of the NCRA.

IV. The Future of Neurolaw: Promises and Limitations

There is great potential for neuroscience to inform our criminal legal system in the prevention of crime, throughout criminal trials and sentencing, and by informing our incarceration and rehabilitative policies.[219] By better understanding the connection between the brain and behavior, we can identify the neurological indicators that predict criminal behavior.[220] In the courtroom, this includes assessing competency to stand trial, determining guilt, and offering mitigating factors for sentencing.[221] On an individual level, neurological testing can supplement rehabilitation practices to both identify the most effective methods and track improvements. There is potential for neuro-interventions that could mitigate neural tendencies such as impulsivity, attention deficits, aggression, and addiction.[222] On an even greater scale, neuroscience findings can inform our larger incarceration practices– chipping away at the retributive motivations around solitary confinement, jailing for nonviolent offenses, etc.[223] Other promising neuroscience research concerns the minds of judges and legal

[219] *See* Focquaert, *supra* note 2, at 2 ("For example, such measures can reveal brain tumors (e.g., in case of acquired pedophilia), identify structural and functional brain abnormalities (e.g., in case of fronto-temporal dementia, traumatic brain injury, abnormalities linked to schizophrenia), and in the future potentially inform recidivism risk (e.g., as suggested by preliminary studies linking brain abnormalities to future crime.")).

[220] *Id.*; *see generally*, Haarsma et al., *supra* note 102.

[221] Focquaert, *supra* note 2, at 2.

[222] *Id.* ("[n]euro-interventions such as vitamin and omega 3 supplementation, cognitive-emotional training using computer tasks, EEG neurofeedback or real-time fMRI biofeedback, and transcranial direct current stimulation may be used to help prevent future deviant behavior in at-risk children, adolescents and adults").

[223] *See supra* note 47–49 and accompanying texts for neuroscience's role in the case against retribution.

decision makers in an effort to prevent arbitrary punishment and discriminatory practices.[224]

As neuroscience and its role in criminal law and policy evolves, it is necessary to address the limitations of the field. Many neuroscientific studies that hold promise in criminal law are small-scale studies that are not replicated. For this reason, there is a need for further neurocriminological research and forensic psychiatric treatment and prevention to support any changes in criminal law and policy.

The protection of neurorights is absent from United States law and policy. As of yet, there is no consensus on whether the Fourth and Fifth Amendments apply to brain data nor whether this would be sufficient for neurorights protection.[225] As a solution, the United States could codify neurorights, like Chile.[226] Beyond protecting neurorights, there is also a need for the translation of these rights into adequate regulation of neurotechnologies and the retention of neural data—mediums by which neurorights can be threatened.[227]

V. Conclusion

The question of whether we have free will has been debated for centuries. Are we the masters of our own fate? There is still no definitive answer, but some argue that the findings of neuroscience are shifting the weight toward determinism—the idea that all our actions are a result of the physical world around us and within us: both the cosmos and our neurobiology.[228] If this is the case, does it really matter what any of us do? How can anyone be blameworthy if they live in an entirely deterministic universe? When asked whether someone in a deterministic universe is morally accountable

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[224] *See generally* Joshua W. Buckholtz et al., *The Neural Correlates of Third-Party Punishment*, 60 NEURON 930 (2008) (using fMRI to analyze participants while assessing offenders' culpability and determining punishment).
[225] *See supra* notes 159–60, 198–200 and accompanying text.
[226] *See supra* notes 169–171 and accompanying text.
[227] *Recommendation of the Council on OECD*, *supra* note 138, at 6–9.
[228] See *supra* note 43 and accompanying text for arguments employing neuroscientific evidence in favor of determinism.

for their actions, most people say that they are not.[229] However, once given a concrete example of such a scenario (e.g., that someone in a deterministic universe murders their wife), most people believe that they should be held accountable. [230]

An incredible tension lies between approaching the scientific death of free will and the reality that believing that free will exists is critical for the individual. We are human animals, and the feelings that motivate us are not so easily rationalized, nor should they be. The individual's subjective experience of free will and choice is both inevitable and useful. Greene and Cohen offer an analogy: from our study of physics, we know that spacetime is curved.[231] This counter-intuitive fact is all but useless in our day-to-day life; we instead use a Euclidean perspective to navigate the world—to get us from point A to point B. But the deeper reality of curved spacetime cannot be neglected for other endeavors e.g., the launch of a spaceship.[232] In that scenario, the relativistic principles that buck our subjective ideas of physical space are the appropriate governing rules. The same can be said for our understanding of neuroscience and its implications on free will. Day-to-day, this perspective serves us well and we would do well not to cast it aside. But for greater structural questions regarding our criminal legal system, the nature of our brain chemistry and its dictation of behavior is a critical consideration—perhaps the neuroscientific equivalent to launching a spaceship. By going beyond our subjective experience of free will, we can adjust our criminal law and policies to consider diminished personal agency and neuroscientific discoveries.

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[229] Shaun Nichols & Joshua Knobe, *Moral Responsibility and Determinism: The Cognitive Science of Folk Intuitions*, 41 NOÛS 663, 670 (2007).
[230] *Id*.
[231] Greene & Cohen, *supra* note 4, at 1784.
[232] *Id*.