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Neuroscience in the Courtroom: An International Concern

Dominique J. Church

NEUROSCIENCE IN THE COURTROOM: AN INTERNATIONAL CONCERN

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> A human being ... is a part of the whole, called by us "Universe," a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest—a kind of optical delusion of his consciousness.[1]

INTRODUCTION

Before it is seen as a legitimate right, cognitive liberty will cease to exist.[2] In June 2008, India became the first country in the world to convict a criminal defendant of murder on the basis of a brain scan indicating that the defendant, Aditi Sharma, had "experiential knowledge," or memory, of the murder in question.[3] The brain scan convinced the court that Sharma possessed a specific memory of murdering her fiancé, "as opposed to ... [merely] hearing the details of his murder from another person."[4] Sharma, who consented to the

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1. Walter Sullivan, *The Einstein Papers: A Man of Many Parts Was Long Involved in the Cause of Peace*, N.Y. TIMES, Mar. 29, 1972, at 1.

2. Jeffrey Rosen, *The Brain on the Stand: How Neuroscience Is Transforming the Legal System*, N.Y. TIMES, Mar. 11, 2007, http://www.nytimes.com/2007/03/11/magazine/11 Neurolaw.t.html. Skeptics of neuroscience's entry into the courtroom claim that "the use of brain-scanning technology as a kind of super mind-reading device will threaten our privacy and mental freedom, leading some to call for the legal system to respond with a new concept of 'cognitive liberty.'" *Id.*

3. *See* Anand Giridharadas, *India's Novel Use of Brain Scans in Courts Is Debated*, N.Y. TIMES, Sep. 14, 2008, http://www.nytimes.com/2008/09/15/world/asia/15brainscan.html. The machine used, an electroencephalogram (EEG), measures the brain's electrical waves. *Id.* ("The suspect sits in silence, eyes shut. An investigator reads aloud details of the crime—as prosecutors see it—and the resulting brain images are processed."). The brain "lights up in specific regions" in response to the reading if the individual is reliving the experiences. *Id.* (noting that Champadi Raman Mukundan developed India's version of this test, called the Brain Electrical Oscillations Signature test (BEOS), based upon American neuroscientist Lawrence Farwell's work on brain fingerprinting). The Indian court used the BEOS as the basis upon which to convict Sharma of murder. *Id.* A few months after Sharma's conviction, India's National Institute of Mental Health and Neurosciences released a statement declaring brain scans too unscientific for use against criminal defendants in court. Angela Saini, *The Brain Police: Judging Murder with an MRI*, WIRED.CO.UK (May 27, 2009), http://www.wired.co.uk/magazine/archive/2009/06/features/guilty. Sharma appealed on this basis, and in 2009 the court released her on bail pending her appeal, which might take between five and ten years to occur due to "India's slow judicial process." *Id.*

4. Brian Farrell, *Can't Get You Out of My Head: The Human Rights Implications of Using Brain Scans as Criminal Evidence*, 4 INTERDISC. J. HUM. RTS. L. 89, 89 (2009-2010) (citing Saini, *supra* note 3).

test, sat in a room wearing a "skullcap" with thirty wires hooked to it that measured her brain activity in response to the following tape-recorded statements pertaining to her relationship with her fiancé: "I had an affair with Udit .... I got arsenic from the shop. I called Udit. I gave him the sweets mixed with arsenic. The sweets killed Udit."[5] The test—an EEG—showed Sharma's brain lighting up in various colors during the reading of these statements, allegedly proving her culpability by indicating specific knowledge of her fiancé's murder.[6]

Within six months of Sharma's conviction, an Indian court used the same testing to find two more criminal defendants guilty of murder based on "conclusive" findings of experiential knowledge.[7] The Indian court's decision not only to use neuroscientific evidence in the courtroom but also to employ it as a basis upon which to convict criminal defendants of murder sent shock waves throughout the scientific and legal communities.[8] The court's decision prompted substantial debate as to whether reliance on this evidence was appropriate, with an overwhelming majority of commentators believing that without more proof of the technology's reliability, the court's willingness to rely on it was unsoundly premature.[9]

Although the United States has yet to admit evidence of brain scans in either civil or criminal proceedings for lie-detection purposes, scholars suggest that a courtroom display, in which a defendant is connected to electrodes and has his brain scan projected onto a screen for the jury to assess his truth-telling capacity and

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5. Saini, *supra* note 3 (internal quotation marks omitted).

6. *Id.*

7. *See id.* (declaring that, in the wake of this string of convictions, "[n]euroimaging as truth teller had come of age").

8. *See* Giridharadas, *supra* note 3.

9. *Id.* (noting that Henry Greely, a bioethicist at Stanford Law School, found the court's decision to be "both interesting and disturbing"). Greely described this technology as "a magic ... solution to lie detection." *Id.* (internal quotation marks omitted) ("Maybe we'll have it someday, but we need to demand the highest standards of proof before we ruin people's lives based on its application."). Dr. Rosenfeld, a psychologist and neuroscientist at Northwestern University, expressed a similar sentiment, noting that "[t]echnologies which are neither seriously peer-reviewed nor independently replicated are not ... credible .... The fact that an advanced and sophisticated democratic society such as India would actually convict persons based on an unproven technology is even more incredible." *Id.* (internal quotation marks omitted).

experiential knowledge of an event, is not far from occurring.[10] American neuroscientist Michael Gazzinga has gone so far as to predict that this new technology will eventually "dominate the entire legal system."[11]

Although Gazzinga's theorized domination has yet to occur domestically, other countries have shown interest in experimenting with neuroscience.[12] Both Israel and Singapore, for instance, have commenced research on the possible uses of neuroscientific evidence.[13] Moreover, in May 2009, an Italian court of appeals became the first European court to use genetic information and brain-imaging scans to reduce a criminal defendant's murder sentence, finding that the evidence indicated an unavoidable propensity toward violence.[14]

The ever-widening international scope of neuroscientific research is unsurprising. The prospect of using science to analyze the "criminal mind," including the histories and motivations of criminals, has obvious allure.[15] Individuals have "looked to inheritance (genetics), anatomical features (phrenology), a history of emotional trauma or unresolved psychic conflict (psychoanalysis), or socioeconomic deprivation (sociology and economics) to explain why some

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10. *See generally* Michael Haederle, *A Mind of Crime*, MILLER-MCCUNE (Feb. 23, 2010), http://www.miller-mccune.com/legal-affairs/a-mind-of-crime-8440/ (noting that in one case, counsel used an alleged murderer's projected brain scans, marked with "X's" to indicate problems in brain functioning, to assist the jury in its determination of guilt); Ed Yong, *Controversy of Brain Scan Use in Courtrooms*, CBS NEWS (May 10, 2010, 4:53 PM), http://www.cbsnews.com/stories/2010/05/10/tech/main6471186.shtml (commenting on the irony of this courtroom display, as it facilitates a betrayal of oneself through one's own memories).

11. Michael Cook, *Liar, Liar, Brain on Fire!*, MERCATORNET (June 17, 2010), http://www.mercatornet.com/articles/view/liar_liar_brain_on_fire/ (internal quotation marks omitted). Similarly, some scholars postulate that the usefulness of neuroscientific evidence to the legal community is analogous to that of DNA. *See, e.g.*, Giridharadas, *supra* note 3.

12. *See* Giridharadas, *supra* note 3.

13. *See id.*

14. *See* Emiliano Feresin, *Lighter Sentence for Murderer with 'Bad Genes,'* NATURE NEWS (Oct. 30, 2009), http://www.nature.com/news/2009/091030/full/news.2009.1050.html?s=news_rss ("On the basis of the genetic tests, Judge Reinotti docked a further year off the defendant's sentence, arguing that the defendant's genes 'would make him particularly aggressive in stressful situations.'").

15. *See* Laura S. Khoshbin & Shahram Khoshbin, *Imaging the Mind, Minding the Image: An Historical Introduction to Brain Imaging and the Law*, 33 AM. J.L. & MED. 171, 183 (2007) (noting that principles of deterrence, rehabilitation, and retribution have largely driven this quest for knowledge).

commit crimes and others do not."[16] In future years, however, people will likely turn to neuroscience to provide these answers.[17]

Legal scholars fall on opposite ends of the continuum regarding the ultimate utility of this evidence in the courtroom.[18] Some argue that its accuracy and reliability are intact and pose few problems to admittance.[19] Others, such as John G. New, Professor of Biology at Loyola University of Chicago, contend that, even assuming its eventual scientific reliability, significant evidentiary and constitutional issues are at stake in using this evidence in either civil or criminal proceedings.[20] Still others believe that a greater understanding of potential legal uses of neuroscientific evidence, in conjunction with a sound regulatory scheme, would prove beneficial to the legal arena.[21]

Regardless of one's position in this burgeoning debate, however, the ethical and human rights considerations at stake are difficult to ignore. Technology that is able to detect what a person is thinking could signal the end of mental privacy, particularly if such testing were to become mandatory. In essence, subconscious thoughts would no longer be our own.[22] As Joshua Greene noted,

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16. *Id.*

17. *See id*. at 183-84.

18. *See* Joelle A. Moreno, *The Future of Neuroimaged Lie Detection and the Law*, 42 AKRON L. REV. 717, 725-26 (2009).

19. *See* Rosen, *supra* note 2.

20. *See* John G. New, *If You Could Read My Mind: Implications of Neurological Evidence for Twenty-First Century Criminal Jurisprudence*, 29 J. LEGAL MED. 179, 188, 191-98 (2008); *see also* Rosen, *supra* note 2. Stephen Morse, Professor of Psychology at the University of Pennsylvania, believes that neuroscientific evidence should not be used to determine criminal responsibility or punishment. Stephanie J. Bird & Judy Illes, *Neuroethics: A Modern Context for Ethics in Neuroscience*, 29 TRENDS NEUROSCIENCE 511, 514 (2006). According to Morse, the "colorful images of the brain such as those produced by functional magnetic resonance imaging (fMRI) might blind people to the fundamental legal assumption that 'people are conscious, intentional and potentially rational agents' and therefore responsible for their actions." *Id.*

21. Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide to the Perplexed*, 2009 STAN. TECH. L. REV. 5, 6 ("We are concerned that brain imaging can be misused by lawyers ... and misunderstood by judges and jurors. Consequently, our aim ... is to provide information about ... brain imaging techniques, in hopes that it will increase the extent to which imaging is properly interpreted, and ... decrease the extent to which it is misunderstood or misused.").

22. *See* Sullivan, *supra* note 1, at 1. This technology has the ability to thrust Albert Einstein's "optical delusion" of consciousness into a nonillusory, nondelusional reality—a reality that would seek to expose that which is most private and most sacred: one's thoughts, feelings, and memories. Assuming that science, and neuroscience in particular, might seek

> to a neuroscientist, you are your brain; nothing causes your behavior other than the operations of your brain .... If that's right, it radically changes the way we think about the law. The official line in the law is all that matters is whether you're rational, but you can have someone who is totally rational but whose strings are being pulled by something beyond his control.[23]

Implications of this technology extend beyond evidentiary and constitutional concerns and delve into a new field that scholars have branded "neuroethics."[24]

In analyzing the current forms of neuroscientific technology that researchers suggest will soon impact the legal community, this Note addresses the history of neuroscience use in the courtroom—in the United States as well as internationally—and the future consequences of its admissibility in court. Part I provides a brief history of neuroscience in the courtroom, including an examination of the two forms of neuroscientific technology currently employed as lie detectors; an overview of courts that have admitted various forms of neuroscience evidence; and a brief synopsis of current attempts to admit this new evidence in court—both nationally and internationally.

Part II explores ways in which scholars have analogized neuroscience to other forms of scientific inquiry, such as DNA and fingerprinting evidence, while noting the inherent differences between past technology and neuroscience and the dangers of drawing too close an analogy. Part II also addresses the growing international attention paid to neuroscience and its application to the law abroad.

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to achieve this exposure, the law, as the ultimate arbiter, would be forced to intervene.

23. Rosen, *supra* note 2. Greene, an Assistant Psychology Professor at Harvard University, provides an example of someone choosing between soup and salad. *Id.* According to Greene, although it may appear to be a rational choice, neuroscientific evidence indicates that such a simple decision may be "ultimately predestined by forces hard-wired in his brain," making the notion of rational choice merely illusory. *Id.*

24. *See* Bird & Illes, *supra* note 20, at 511. In 2002, the Dana Foundation held a meeting entitled "Neuroethics: Mapping the Field," during which scholars solidified the concept of neuroethics and analyzed, among several factors, "the implications of neuroscience for notions of the self, agency and responsibility." *Id*. at 512, 514; Tamami Fukushi et al., *Ethical Considerations of Neuroscience Research: The Perspectives on Neuroethics in Japan*, 57 NEUROSCIENCE RES. 10, 10 (2007).

Part III addresses the field of neuroethics, arguing that neuroethics, as an extension of bioethics, should fall under the auspices of the United Nations Educational, Scientific and Cultural Organization's (UNESCO) Universal Declaration of Bioethics and Human Rights, as well as the fair trial and privacy provisions in both the Universal Declaration of Human Rights and the European Human Rights Convention. Ultimately, this Note maintains that although this technology, if proven reliable, would provide beneficial information to court proceedings, the cost to an individual's right to cognitive liberty is too great not to heavily scrutinize this technology through the lens of human rights protections.

I. A BRIEF HISTORY OF NEUROSCIENCE IN THE COURTROOM

As George Orwell postulated in his dystopian novel, *Nineteen Eighty-Four*, "[t]houghtcrime was not a thing that could be concealed forever. You might dodge successfully for a while, even for years, but sooner or later they were bound to get you."[25] Although the Orwellian concept has yet to become a full-fledged reality, neuroscientific evidence and its rapid growth has seemingly limitless possibilities, leaving many to propound that this technology has the ability to become the ultimate lie detector.[26]

Both legal and scientific scholars scrutinize the use of this new technology in the context of the burgeoning field of neurolaw—a field that examines the interdisciplinary link between neuroscience and the law.[27] Scholars argue that the legal community is reluctant

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25. GEORGE ORWELL, NINETEEN EIGHTY-FOUR 20 (Harcourt, Brace & World, Inc. 1949).

26. *See* Bird & Illes, *supra* note 20, at 515 (noting that the pursuit of "a method for detecting deception has been an enduring focus of scientific endeavor in the neurobehavioral sciences ... [and] is likely to be rapid"); Sean K. Thompson, *The Legality of the Use of Psychiatric Neuroimaging in Intelligence Interrogation*, 90 CORNELL L. REV. 1601, 1602 (2005) ("FMRI could function as a hyper-accurate lie detector.").

27. *See* George J. Annas, *Imagining a New Era of Neuroimaging, Neuroethics, and Neurolaw*, 33 AM. J.L. & MED. 163, 163 (2007) ("As with contemporary medicolegal and bioethical literature on the implications of genetic engineering and nanotechnology, there is much imagination, hype, and even science fiction in this new arena, dubbed 'neurolaw.'"). Others, however, are avid proponents of this new field. *See* Rosen, *supra* note 2. One such supporter is Owen Jones, Professor of Law and Biology at Vanderbilt University and one of the leading proponents for Vanderbilt's $27 million MacArthur Foundation grant to help fund a neuroimaging center and the "nation's first program in law and neuroscience." *Id.* Jones has referred to neurolaw as

to expand its focus past the social sciences, and as a result, "legal thinkers have generally ignored an array of interdisciplinary approaches that are rapidly changing the way we understand how the mind works and what it means to be human."[28] This reluctance thus impedes what some hold to be the law's basic function: the consumption and application of knowledge from other disciplines.[29] When the process of scientific consumption and application does occur, however, it is fraught with misunderstandings and improper uses of science by "judges, legislators, agency personnel, and other policymakers," a reality that underscores the necessity of proper communication between the disciplines.[30] Even a proper understanding of the science, however, does not mean that the science should be permitted to function in the legal arena without a proper regulatory scheme in place.

A. The Two-Fold Science of Lie Detection

There are two primary forms of neuroscientific evidence that operate, in some capacity, as lie-detection devices: (1) functional Magnetic Resonance Imaging, or fMRI, which Daniel Langleben of the University of Pennsylvania applied to his "Guilty Knowledge" test in 2001,[31] finding that particular areas of the brain light up

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> the new frontier in law and science—we're peering into the black box to see how the brain is actually working, that hidden place in the dark quiet, where we have our private thoughts and private reactions—and the law will inevitably have to decide how to deal with this new technology.

Id. (internal quotation marks omitted).

28. Owen D. Jones & Timothy H. Goldsmith, *Law and Behavioral Biology*, 105 COLUM. L. REV. 405, 408 (2005).

29. *Id.* at 411.

30. *See id.* at 419-20.

31. Rosen, *supra* note 2. fMRI provides images of the brain in action, displaying what the person is thinking by providing "near-real time, ultra-high resolution, computer-generated models of brain activity." Thompson, *supra* note 26, at 1602. Researchers have further noted that

> [t]he development of fMRI as a cognitive, as opposed to simply diagnostic, tool promises to bring fresh controversy and challenges to the use of scientific evidence in the courtroom. Several studies employing fMRI to detect the truthfulness or deceit of a subject have recently been conducted and suggest that it may be possible to discern by MRI whether an individual is being truthful. If such studies prove reliable, they may be the next generation of "lie detector" employed to establish the truthfulness of a defendant or the credibility of a witness.

when people lie;[32] and (2) brain fingerprinting, developed by Lawrence Farwell, which measures frequency changes of brain waves upon recognition of "images, pictures, sights, and smells."[33]

Studies of fMRI brain scans reveal potentially high success rates for truth-telling detection,[34] as well as for determining specific memories of events and people.[35] When a person sees a familiar face or hears a recapitulation of an event in which he took part, the hippocampus—the part of the brain that regulates "memory and parts of the visual cortex"—experiences heightened activity.[36] This evidence, therefore, can make it difficult or even impossible for a person to conceal or refute knowledge of a particular individual or event.[37] Scientists postulate that this evidence might make it possible to ascertain how people feel about one another[38] and to "essentially read minds" within fifty years.[39]

Researchers conducting these brain scans operate under the assumption that "deception involves multiple cognitive processes that are superimposed upon a truth-telling baseline."[40] When someone is lying, he simultaneously "withhold[s] the truth (*suppression veri*) while constructing a consistent new item of information (*suggestio falsi*)."[41] The baseline, therefore, is either the truth or a lie that

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New, *supra* note 20, at 181 (citations omitted).

32. Rosen, *supra* note 2 (noting that certain areas of subjects' brains lit up when they were instructed to lie in response to questions that researchers asked them about playing cards).

33. *Id.*

34. *See* Thompson, *supra* note 26, at 1608-09. fMRI evidence has also been used in counterterrorism efforts, and certain proponents, particularly those at the University of Pennsylvania's Institute for Strategic Analysis and Response (ISTAR), believe that this evidence will significantly decrease the torture involved in obtaining information from terrorists. *Id.* at 1602, 1609-11. For example, an interrogator using this evidence against a detainee could show the detainee "pictures of suspected terrorists, or of potential terrorist targets, which would generate certain neural responses if the detainee were familiar with the subjects pictured." *Id.* at 1602.

35. *See id.* at 1610.

36. *Id.*

37. *See id.*

38. *See id.* (noting that some researchers think they have isolated "brain regions associated with love").

39. *Id.* (citations omitted) ("In a recent study, scientists using a new, higher-resolution form of fMRI were able to determine what subjects were looking at, even when the subjects themselves were not consciously aware of what they were seeing.").

40. New, *supra* note 20, at 181.

41. *Id.*

requires a minimal amount of cognitive energy.[42] Deception requires a greater degree of cognition, and often more complex cognition, than does telling the truth.[43] The fMRI then detects this heightened degree of deceptive activity.[44]

The tantalizing nature of this "mind-reading" fMRI technology has created both widespread fascination and contentious commentary from legal scholars and lay individuals alike.[45] In fact, despite the relative novelty of this technology, two competing American companies are already working to solidify their place in the nascent fMRI market.[46] No Lie fMRI and Cephos are attempting to perfect fMRI technology for use in the government sector and the courtroom.[47] According to Steven Laken, Cephos's president, "two to three people ... call every single week ... [who are] in legal proceedings throughout the world, and [are] ... looking to bolster their credibility."[48]

Brain fingerprinting, the second form of lie detection, searches for specific information in a person's memory based on electrical brain activity.[49] Although this methodology is currently unable to decode specific memories relating to a person or an event, there is a high probability that, in time, "lie detectors in the courtroom will become much more accurate, and correspondingly more intrusive."[50] Lawrence Farwell, the creator of brain fingerprinting, insists that the technology "does not prove guilt or innocence .... [Rather,] [t]hat is the role of a judge and jury."[51] According to Farwell, however, brain fingerprinting is capable of providing information on whether

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42. *See id.*

43. *See id.* (noting that lying activates several "executive functions such as problem solving, planning, and the conscious manipulation of information in working memory").

44. *Id.* at 180-81. When telling the truth, the executive brain functions and centers —including the anterior cingulate and prefrontal cortices—should display a lesser degree of activity than when telling a lie. *Id.* at 181-82.

45. *See* Moreno, *supra* note 18, at 734-37. Studies on people's reactions to the field of neuroscience indicate that "brain scan images are incredibly appealing, even to sophisticated audiences." *Id.* at 737.

46. *See* Rosen, *supra* note 2.

47. *See id.* Cephos charges $4000 per test. Moreno, *supra* note 18, at 724 n.30.

48. *See* Rosen, *supra* note 2 (internal quotation marks omitted).

49. *Id.* (noting that brain fingerprinting can measure a brain wave, which "changes its frequency when people recognize images, pictures, sights and smells").

50. *Id.*

51. *A New Paradigm in Criminal Justice*, BRAIN FINGERPRINTING LABORATORIES, http://www.brainwavescience.com/criminal-justice.php (last visited Mar. 7, 2012).

a defendant has a stored memory of the crime in question within his brain.[52]

Brain fingerprinting is made possible by the P300 wave—a brain wave that becomes activated when an individual recognizes someone or something that is part of his specific memory.[53] For example, when presented with a crime scene photograph or piece of evidence, a guilty person's P300 wave should become activated, whereas an innocent person would fail to recognize the item and thus produce no P300 wave.[54] This technology, however, is not currently capable of providing information as to the specific content of an individual's memory.[55] As such, it would be possible to wrongly incriminate an innocent person with knowledge of a victim or an event unconnected to the crime at issue—a possibility that poses serious legal concerns about this technology's use.[56]

The rise of and fascination with neuroscientific technology is pronounced and ever-expanding, with approximately 8,700 published articles on fMRI and related topics between 1991 and 2007.[57] Neuroscience has had an equally significant impact on the general public through mainstream media.[58] Some scholars believe that what neuroscience promises—a glimpse into what and how we think—combined with the misguided perception that this is "legitimate 'hard' science because researchers rely on technologically sophisticated neuroimaging tools of demonstrated accuracy," will lead courts to subject this field to less intense scrutiny and skepticism than courts have afforded other "soft sciences" in the past.[59]

B. Past Uses of Neuroscience in the Law

Although neurolaw is a relatively new field, courts have relied on neuroscience to assess behavior in civil and criminal trials for decades, using the commonly known forms of EEGs, PET scans, and

52. *Id.*
53. New, *supra* note 20, at 185-86.
54. *Id.* at 186.
55. *Id.*
56. *See id.* at 187, 192.
57. Henry T. Greely & Judy Illes, *Neuroscience-Based Lie Detection: The Urgent Need for Regulation*, 33 AM. J.L. & MED. 377, 379-80 (2007).
58. Moreno, *supra* note 18, at 720-21.
59. *Id.* at 721 (internal quotation marks omitted).

MRIs.[60] For example, in 1981, during John Hinckley's trial for the attempted assassination of President Ronald Reagan, the court admitted CT scans intended to show evidence of Hinckley's schizophrenia.[61] The expert witness testified that the scans, although abnormal, did not conclusively prove that Hinckley's actions were the result of his brain abnormalities.[62] Regardless of the psychiatrist's testimony, the jury rendered a verdict of not guilty by reason of insanity, leading to the natural inference that the CT evidence was a primary, if not the primary, determining factor in the jury's verdict.[63]

More recently, in 2007, a court sentenced Peter Braunstein, a New York journalist, to prison for eighteen years to life for kidnapping, sexual abuse, and robbery.[64] The defense's principal argument was that Braunstein's schizophrenia prevented him from controlling his violent impulses, a theory that the defense attempted to prove through MRI evidence.[65] Furthermore, in both *People v. Weinstein* and *McNamara v. Borg*, the defense introduced evidence of PET scans during the murder trials to provide behavioral explanations for the defendants' actions.[66] The defense in *Weinstein* credited a brain cyst as the underlying reason the defendant murdered his

60. *See id.* at 719-20 (discussing the three common forms of measuring brain activity); *see also* Khoshbin & Khoshbin, *supra* note 15, at 184-86 (discussing the past uses and continued evolution of neuroimaging devices).

61. *See* Khoshbin & Khoshbin, *supra* note 15, at 184.

62. *Id.*

63. *Id.*

64. Anemona Hartocollis, *Writer Sentenced for Sexually Tormenting Former Colleague*, N.Y. TIMES, June 19, 2007, http://www.nytimes.com/2007/06/19/nyregion/19fake.html.

65. Moreno, *supra* note 18, at 723. ("The jury viewed Braustein's MRI scans and heard defense arguments linking Braustein's schizophrenia to his inability to control his violent impulses. This jury presumably considered the possibility that brain scans might provide reasonable doubt that Braustein had formulated the requisite intent to harm this victim. However, they were not convinced and the defendant was convicted on all counts. The Braustein case, because it involved MRI evidence to explain the defendant's actions, is representative of the type of behavior-related neuroscience evidence that is increasingly likely to be proffered and admitted in both criminal and civil trials.").

66. McNamara v. Borg, 923 F.2d 862, 862 (9th Cir. 1991); People v. Weinstein, 591 N.Y.S.2d 715, 722-24 (Sup. Ct. 1992); Khoshbin & Khoshbin, *supra* note 15, at 184-85 & nn.99, 106 & 111 (citing An Overview of the Impact of Neuroscience Evidence in Criminal Law (Sept. 2004) (staff working paper discussed at the 2004 meeting of the President's Council on Bioethics) [hereinafter Neuroscience Evidence], *available at* http://bioethics.georgetown.edu/pcbe/background/neuroscience_evidence.html).

wife.[67] Although the defense did not ultimately admit the evidence because the defendant accepted a plea bargain, some speculated that the plea bargain was the result of the prosecution's belief that "the jury would be unduly persuaded by the scans."[68] In *McNamara*, however, the court admitted evidence of PET scans, which the defense used to show that the defendant suffered from schizophrenia.[69] After the jury rendered its verdict of life in prison, a few jurors admitted that the scans "persuaded them to grant leniency" in the form of life in prison as opposed to the death penalty.[70] All of these cases demonstrate that the use of neurological evidence in court tends to impact the outcomes of criminal cases.

C. Recent Attempts to Admit Brain Scan Evidence in Court

Whereas the aforementioned uses of neuroscience have been largely accepted as reliable methods of behavioral analysis,[71] the projected uses of neuroscience in the courtroom discussed in this Note, such as brain fingerprinting, go beyond behavioral analysis in the commonly and historically recognized sense. Largely due to the belief that this science will pose significant evidentiary and constitutional problems to admissibility,[72] U.S. courts have been reluctant to admit cognitive neuroscience evidence for the purposes of lie detection and memory exploration.[73] Instances in which U.S. courts have excluded newer variants of neuroscientific evidence are discussed below.

To date, U.S. courts have considered only two attempts to admit fMRI evidence for truth-telling purposes.[74] Both courts ultimately excluded the evidence during the pretrial hearing, but they did so

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67. Khoshbin & Khoshbin, *supra* note 15, at 184-85 (citations omitted).
68. Neuroscience Evidence, *supra* note 66.
69. *McNamara*, 923 F.2d at 862.
70. Neuroscience Evidence, *supra* note 66.
71. *See supra* text accompanying note 60.
72. New, *supra* note 20, at 191-92, 194-95, 197-98.
73. Moreno, *supra* note 18, at 723.
74. *See* Alexis Madrigal, *Brain Scan Lie-Detection Deemed Far from Ready for Courtroom*, WIRED (June 1, 2010, 3:20 PM), http://www.wired.com/wiredscience/2010/06/fmri-lie-detection-in-court/ [hereinafter Madrigal, *Brain Scan*]; Alexis Madrigal, *Judge Issues Legal Opinion in Brooklyn fMRI Case*, WIRED (May 17, 2010, 8:36 PM), http://www.wired.com/wiredscience/2010/05/brooklyn-fmri-case/ [hereinafter Madrigal, *Brooklyn fMRI Case*].

on different grounds.[75] In *United States v. Semrau*, which a federal court in Tennessee decided in May 2010, the judge excluded fMRI evidence that the defendant attempted to admit to prove that he had not defrauded the government.[76] After watching a fifty-three slide presentation and listening to numerous reports submitted by Steven Laken, Cephos's president, on peer-reviewed articles and on the reliability of the technology, the judge ruled that this evidence did not satisfy the *Daubert v. Merrell Dow Pharmaceuticals, Inc.* standard, as it lacked verifiable proof of its scientific reliability.[77] The judge further noted that error rates "in the 'real-world' or 'real-life' setting" are currently unknown, enhancing the evidence's unreliability.[78] However, the judge noted in his conclusion that he could foresee a time in the future when this evidence could, in fact, be admissible, "even if the error rate is not able to be quantified in a real world setting."[79] The judge based this opinion on an assumption that "fMRI-based lie detection [will eventually] undergo further testing, development, and peer review, improve upon standards controlling the technique's operation, and gain acceptance by the scientific community for use in the real world."[80]

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75. *See* Madrigal, *Brain Scan, supra* note 74; Madrigal, *Brooklyn fMRI Case*, *supra* note 74.

76. Report and Recommendation on Motion to Exclude, United States v. Semrau, No. 07-10074 Ml/p, 2010 WL 6845092, at *1, *7 (W.D. Tenn. June 1, 2010).

77. *Id.* at *1, *10-13 (finding that despite several peer-reviewed publications and success in the lab, the scientific community had yet to widely accept this evidence—a condition that must be satisfied prior to courtroom admittance). Judge Pham excluded the evidence on the basis of the following federal evidentiary standard for reliability prescribed in *Daubert*:

> (1) whether the theory or technique can be tested and has been tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) the known or potential rate of error of the method used and the existence and maintenance of standards controlling the technique's operation; and (4) whether the theory or method has been generally accepted by the scientific community.

Id. at *9 (citing Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 593-94 (1993)).

78. *Id.* at *11. An additional reason for the judge's decision to exclude the evidence was that Laken allowed the defendant to take the test three times, due to the defendant's claim that he was fatigued the first two times Laken administered the test. *Id.* at *6-7, *13. Judge Pham noted that Laken "violated his own protocols" by retesting the defendant. *Id.* at *13. Interestingly, the defendant failed the exam the first two times he took it, yet passed the third time. *Id.*

79. *Id.* at *12 n.18.

80. *Id.*

The second attempt to admit fMRI evidence in court occurred in May 2010, in a Brooklyn trial court.[81] In that case, the court ultimately decided to exclude the fMRI evidence that the plaintiff attempted to admit to establish the veracity of a witness, because it failed to meet the standard articulated in *Frye v. United States*,[82] finding that "credibility is a matter solely for the jury and is clearly within the ken of the jury."[83] The court held that this evidence failed the *Frye* test because the evidence, submitted for lie-detection purposes, removed the jury's duty of assessing witness credibility.[84]

Brain fingerprinting evidence, like fMRI scans, has not been allowed in U.S. courts, with the exception of *Harrington v. State*.[85] In *Harrington*, the judge admitted the evidence "only for his use in considering a postconviction motion for relief, which was not held in front of a jury. Hence, this ruling carries little precedential weight."[86] Moreover, in *Slaughter v. Oklahoma*,[87] Farwell, the creator of brain fingerprinting, stated in an affidavit that he would submit a report detailing the results of the test that he conducted, but he ultimately failed to submit the report.[88] The court found this "strange, particularly in light of his willingness to testify in *Harrington*."[89]

In addition to basic evidentiary and reliability concerns, scholars contend that the use of neuroscience in court also implicates constitutional provisions—namely, the Fourth and Fifth Amendments of the U.S. Constitution.[90] This science "poses new and untested ... issues"[91] to the Fifth Amendment's assurance that "[n]o person shall

81. *See* Wilson v. Corestaff Servs. L.P., 900 N.Y.S.2d 639 (Sup. Ct. 2010).

82. 293 F. 1013, 1014 (D.C. Cir. 1923).

83. *See Wilson*, 900 N.Y.S.2d at 642.

84. *See id.*; *see also* Madingal, *Brooklyn fMRI Case*, *supra* note 74 (citing *Wilson,* 900 N.Y.S.2d at 642) (noting that Judge Miller's determination of the case was based on both the lack of witness assessment of credibility as well as the plaintiff's inability "to establish that the use of the fMRI test to determine truthfulness or deceit is accepted as reliable within the relevant scientific community").

85. 659 N.W.2d 509 (Iowa 2003).

86. New, *supra* note 20, at 189 (citing *Harrington*, 659 N.W.2d at 516). The Iowa Supreme Court chose to ignore this evidence on appeal. *Harrington,* 659 N.W.2d at 516.

87. 105 P.3d 832 (Okla. Crim. App. 2005).

88. *See* New, *supra* note 20, at 190 (citing *Slaughter*, 105 P.3d at 834).

89. *Id.*

90. *See id.* at 193-98.

91. *Id.* at 193.

... be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law."[92] Whether a violation exists under the Fifth Amendment in a given case will hinge on whether courts find the science to be "physical evidence or actual testimony by the individual."[93]

Moreover, the Fourth Amendment's right "of the people to be secure in their persons"[94] and the guarantee of "privacy, dignity, and security of persons against certain arbitrary and invasive acts by officers of the government or those acting at their direction,"[95] raise important search and seizure questions regarding the legality of obtaining this "mental information."[96] If courts find mental information to be searchable and seizeable based upon the existence of probable cause to suspect wrongdoing, some scholars argue that the government could eventually mandate defendants to undergo fMRI or brain fingerprinting testing.[97]

Although the evidentiary and constitutional concerns that this evidence implicates are worthy of consideration, this Note's analysis is broader in its scope. Assuming neuroscience gains general acceptance in the scientific community, that acceptance will likely translate into legal approval and evidentiary admissibility.[98] Moreover, once the threshold evidentiary issues are satisfied, constitutional issues are not likely to pose a significant threat to admissibility, particularly if courts find the "mental information" to be physical evidence, along the lines of DNA or fingerprinting.[99] Thus, an analysis limited to U.S. evidentiary and constitutional protections, although beneficial, is too narrow a vantage point from which to view such an expansive and looming scientific reality—a reality that has the ability to impact the entire international community.

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92. *Id.* (citing U.S. CONST. amend. V).

93. *Id.*

94. U.S. CONST. amend. IV.

95. New, *supra* note 20, at 195 (quoting Skinner v. Ry. Labor Execs.' Ass'n, 489 U.S. 602, 613-14 (1989)).

96. *See id.*

97. *Id.* at 193-98.

98. *See supra* text accompanying notes 79-80.

99. *See* New, *supra* note 20, at 193-94.

II. GROWING INTERNATIONAL CONCERN

As one scholar has aptly noted, "[t]he ethical issues that would arise from a reliable (or thought-to-be-reliable) brain-imaging deception technology are complex."[100] As such, although too myopic in scope to serve as the sole basis of discussion in this Note, a historical analysis of surface-level considerations that this science implicates is helpful to contextualize some of the more prominent issues at stake. Although an analysis of these complexities should naturally begin with an overview of the superficial problems related to admissibility, such considerations will differ dramatically among countries depending upon their standards of admissibility.[101] Additionally, surface-level considerations leave open some of the deeper and more pressing questions of admissibility. For instance, what, if any, rights are implicated by the admissibility of this evidence, and what are the possible limits that courts should impose on the breadth of this evidence?

A. Predecessors of fMRI and Brain Fingerprinting

Albeit new and still developing, neurotechnology is a throwback to a familiar predecessor—the polygraph—and its inherent problems.[102] Though the majority of U.S. courts now hold the polygraph to be inadmissible in criminal cases, largely due to its scientific unreliability,[103] proponents' promises of more advanced neuro-lie-

100. Paul Root Wolpe et al., *Emerging Neurotechnologies for Lie-Detection: Promises and Perils*, AM. J. BIOETHICS, Mar.-Apr. 2005, at 39, 39.

101. India's use of this evidence exemplifies this contention. *See* Giridharadas, *supra* note 3.

102. Wolpe et al., *supra* note 100, at 39 ("Using these technologies in courtrooms and for security screening purposes ... raises many of the same difficult ethical and legal issues already present in the debate over conventional polygraphy."). Both polygraphy and neurotechnology exhibit problems with accurate measurements and questionable reliability. *Id.* at 41.

103. *See* New, *supra* note 20, at 179-80 (citing Charles M. Sevilla, *Reliability of Polygraph Examination*, 14 AM. JUR. 2D *Proof of Facts* §§ 1, 7-8 (1977)); *see also* Wolpe et al., *supra* note 100, at 41, 46. Polygraphy remains a popular tool despite issues with its scientific reliability, evidencing people's desire to have access to lie-detection devices. *Id.* at 45 ("Alternatives [to the polygraph] are welcomed and implemented even though they suffer from the same, or new, limitations.").

detection devices have attracted a steady stream of national and international attention.[104] Coupled with this increase in attention are questions related to the breadth and scope of this technology's invasion into privacy, which many scholars contend is far greater than the invasiveness of polygraphy.[105]

Neurotechnology may ultimately mimic the polygraph's eventual devolution into inadmissibility. Or, as many legal scholars believe, the more likely fate of fMRI and brain fingerprinting is to follow in the footsteps of their more successful technological predecessors, such as fingerprinting and DNA.[106] These scholars contend that neurotechnology and its potential uses will continue to expand with more sophisticated knowledge, similar to the way in which "[g]enetic information[,] ... inconsequential when originally stored in tissue samples[,] [became] increasingly revealing" with greater knowledge of genetics.[107]

Analyzing this issue from a human rights perspective should, therefore, begin with a glance backwards. Neuroscientific evidence "evokes obvious, recognizable parallels to other sorts of physical evidence that may be compelled from a suspect, such as fingerprints, hair and blood samples, or genetic evidence in the form of DNA."[108] Scholars have yet to determine whether information derived from neuroscientific testing is actual physical evidence or is a more amorphous, intangible type of evidence.[109] But, as with obtaining DNA or fingerprint evidence, the question of compelling

104. *See* Wolpe et al., *supra* note 100, at 44 (describing the aggressive promotional techniques on Farwell's website, http://www.brainwavescience.com, on which Farwell is shown standing "in a white lab coat, surrounded by testimonials from a U.S. Senator, media clips, and praise of the technique for applications including forensic investigation, counterterrorism efforts, early detection of Alzheimer's disease, studies of efficiency of advertising campaigns, and security testing"). The effectiveness of Farwell's promotional tools is evidenced by the fact that several countries and various U.S. organizations have bought brain fingerprinting equipment, including the DaVinci Institute, "a Colorado 'futurist think tank' [that purchased the technology in 2004] ... to train 1000 'brain fingerprinting' technicians." *Id.*

105. *Id.* at 39-40, 45-47 (commenting that although neurotechnology and the polygraph share similar problematic elements, this new technology poses its own set of unique complexities, including the invasion of one's cognitive liberty).

106. New, *supra* note 20, at 193.

107. Wolpe et al., *supra* note 100, at 46.

108. New, *supra* note 20, at 193.

109. *Id.* at 193-95.

neuroscientific evidence strikes to the heart of privacy issues and other related human rights concerns.

As previously mentioned, skeptics of this new technology have coined the term "cognitive liberty" to denote the right that neuroscience seems poised to invade.[110] As a somewhat abstract principle, cognitive liberty pertains to the privacy of one's mental freedom and consciousness of thought.[111] Thus, from a privacy standpoint, analogizing brain activity to fingerprinting and DNA evidence creates a significant problem. If brain activity becomes synonymous with genetic information, or physical evidence, few barriers or protections against eventual mandatory testing will remain.[112]

The Supreme Court in *Terry v. Ohio* enunciated the principle of governmental invasion of a person's privacy under the Fourth Amendment's Search and Seizure Clause.[113] According to *Terry*, courts should analyze "the reasonableness in all the circumstances of the particular governmental invasion of a citizen's personal security."[114] Moreover, in *United States v. Knights*, the Supreme Court found that the reasonableness of a search—the degree of intrusion into an individual's privacy compared to the need "for the promotion of legitimate governmental interests"—depends on the totality of the circumstances.[115] In compliance with this standard, the Ninth Circuit in *United States v. Kincade* held that "[t]he compulsory extraction of blood for DNA profiling unquestionably implicates the right to personal security embodied in the Fourth Amendment, and thus constitutes a 'search' within the meaning of the Constitution."[116]

Finding DNA testing to be constitutionally permissible in most instances, Congress has subjected more and more individuals to mandatory testing.[117] The DNA Analysis Backlog Elimination Act

110. *See* Rosen, *supra* note 2; *see also* Wolpe et al., *supra* note 100, at 39.

111. *See* Wolpe et al., *supra* note 100, at 39-40; Rosen, *supra* note 2.

112. *See* New, *supra* note 20, at 193-95.

113. 392 U.S. 1, 19 (1968).

114. *Id.*

115. 534 U.S. 112, 118-19 (2001) (quoting Wyoming v. Houghton, 562 U.S. 295, 300 (1999)).

116. 379 F.3d 813, 821 n.15 (9th Cir. 2004); *see also* Jones v. Murray, 962 F.2d 302, 306 (4th Cir. 1992) (noting that the act of taking a blood sample to obtain DNA is tantamount to "a search within the scope of the Fourth Amendment" (citing Skinner v. Ry. Labor Execs.' Ass'n, 489 U.S. 602, 616 (1989))).

117. *See* LISA M. SEGHETTI & NATHAN JAMES, CONG. RESEARCH SERV., RL 32247, DNA TESTING FOR LAW ENFORCEMENT: LEGISLATIVE ISSUES FOR CONGRESS 8 (2006).

of 2000 mandated that DNA samples be obtained "from individuals in custody and those on probation, parole, or supervised release after being convicted of 'qualifying Federal offenses.'"[118] Shortly thereafter, in 2004, the Justice for All Act extended DNA testing to any felony, as opposed to "qualifying" felonies in the 2000 Act.[119] Finally, the DNA Fingerprinting Act of 2005 applied to all "who are arrested and detained."[120] Today, the U.S. Code provides that the Attorney General may "collect DNA samples from individuals who are arrested, facing charges, or convicted or from non-United States persons who are detained under the authority of the United States."[121]

Genetic identifiers have become normative and commonplace.[122] Courts typically view procedures such as obtaining a blood sample or a fingerprint as minimally physically invasive[123] and pursuant to the purpose of establishing identity.[124] It remains to be seen, however, whether courts will adopt a similar interpretation of neurotechnology.

The hype surrounding neurotechnology and its promises evokes the long-standing allure of DNA evidence. DNA's ability to assist in crimesolving has led some to conclude that it is "the most significant weapon in crime detection since the introduction of fingerprinting in the early 1900s."[125] Whether neurotechnology is poised to become this century's new "weapon in crime"[126] or merely unreliable junk science is yet to be seen. Much will depend on how courts choose to analyze the totality of the circumstances as they relate to the

118. United States v. Kriesel, 508 F.3d 941, 943 (9th Cir. 2007) (citing 42 U.S.C. § 14135a (2006)).

119. *Id.*

120. *See* SEGHETTI & JAMES, *supra* note 117, at 8.

121. 42 U.S.C. § 14135a(a)(1)(A).

122. *See generally* SEGHETTI & JAMES, *supra* note 117, at 1 ("By analyzing selected DNA sequences ... a forensic laboratory can develop a profile to be used in identifying a person from a DNA sample.").

123. Jones v. Murray, 962 F.2d 302, 307 (4th Cir. 1992) (citing Skinner v. Ry. Labor Execs.' Ass'n, 489 U.S. 602, 625 (1989)).

124. *Id.* at 306 ("[W]hen a suspect is arrested upon probable cause, his identification becomes a matter of legitimate state interest and he can hardly claim privacy in it."); *see also* 42 U.S.C. § 14135e (noting that DNA is used for identification purposes and not to obtain additional information about a person's particular disposition or traits).

125. *See* SEGHETTI & JAMES, supra note 117, at 2.

126. *Id.*

technology's physical and mental invasiveness as compared to the government's interest in the sought-after mental information.[127]

Unlike actual physical evidence such as DNA and fingerprints, however, neural activity–and anything in the cognitive realm for that matter–deals with layers of conscious and subconscious complexities.[128] Moreover, if the legal system were to mandate this testing, it would cast doubt on the common understanding of what it means to communicate: "without the mental intent to communicate, there can be no communicative behavior."[129] But as scholars have recognized, the choice and intent to communicate are neurological decisions, and would be entirely eradicated if a person were forced to subject himself to neurological assessment, essentially rendering it the equivalent of a compelled testimony.[130]

B. Neuroscience Conferences Galore

Lurking in the background of questions related to the reliability and eventual admissibility of neuroscience in the courtroom are moral and ethical concerns about the scope of what this evidence will be used to prove. Equally pressing is the extent to which cognitive liberty will be invaded to ascertain intangibles like a guilty mind and possibly criminal thoughts.

In the wake of the Indian court's 2008 decision to admit neuroscientific evidence in the now infamous murder trial of Aditi Sharma,[131] the international community began to take note of both the possibilities and limitations of this new technology. Groups recently gathered in Milan, Italy, to discuss the impact of neuroscience on both American and European law during a conference

127. *See* United States v. Knights, 534 U.S. 112, 118-19 (2001) (noting that the reasonableness of a search under the Fourth Amendment depends upon weighing the degree of intrusion on a person's privacy against the need to promote "legitimate governmental interests" (quoting Wyoming v. Houghton, 526 U.S. 295, 300 (1999))).

128. New, *supra* note 20, at 194 ("Fingerprints, blood alcohol levels, genetic information, and other forms of physical evidence are not under conscious control; they exist independent of nervous system activity and can even be preserved after death, when all neural activity ceases. Not so with memories or other manifestations of neural activity (such as emotions or intents), the expression of which is under nervous system control and is of the same neurological nature.").

129. *Id.*

130. *See id.*

131. *See supra* notes 3-6 and accompanying text.

entitled "Neuroscience in European and North-American Case-Law and Judicial Practice."[132] The conference's call for abstracts recognized that

> [t]he greatest enthusiasm [for neuroscience] has been in the United States, where a worldwide debated case law has developed. Throughout Europe there is now the necessity, on one side, to understand whether there is a unknown use of such neuroscientific techniques and, on the other side, to train judges and legal practitioners to properly understand and use these new methods.[133]

The Milan conference is one of many that have taken place throughout the world over the past few years, indicating that this issue is one of international scope and concern.[134] The growing international attention to neurotechnology underscores the extent to which human rights are implicated in the expansion of this science.

III. INTERNATIONAL HUMAN RIGHTS

After Sharma's conviction, her attorney, Revati Dere, disparaged the use of brain scans employed to convict her client, noting that "[s]omewhere, someone down the line should understand it's the human mind that you're talking about. It can't be tested with that much accuracy. It's an easy solution, a very easy solution. A short cut."[135] Dere's opinion, although not scientifically based, expresses a very real concern: the human mind and its contents might be too complex to lead to predictive and certain scientific results that courts of law should rely upon. In contrast, Champadi Raman Mukundan, the creator of India's version of the brain fingerprinting scan, believes that "[m]an is not destined to be controlled by nature.

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132. *US and Europe on the Stand — Are Legal Systems Neuroscience Friendly?,* ITALIAN SCIENTIST & SCHOLARS IN N. AM. FOUND., http://www.issnaf.org/events/us-and-europe-on-the-stand-are-legal-systems-neuroscience-friendly.html (last visited Mar. 7, 2012).

133. Call for Abstracts, European Centre for Life Scis., Health, and the Courts, Univ. of Pavia, *available at* http://kolber.typepad.com/files/callforabstracts_italy.pdf.

134. Fukushi et al., *supra* note 24, at 11 (recognizing that Canada and several European nations have begun to fund neuroscience research, hold conferences to discuss the implications for society, and take note of potential ethical and legal concerns).

135. Saini, *supra* note 3.

Man is destined to control nature .... Human beings are destined to create a nature and then live in that nature."[136] The inherent tension between these diverging viewpoints is at the core of the dispute.

Although the legal community will eventually validate either Dere's or Mukundan's view to the exclusion of the other, prior to this ultimate validation, it is important to analyze the potential human rights issues implicated by this evidence—particularly if its use is mandated.

A. Bioethics and Neuroethics on the Same Continuum

Neuroethics, a recently modernized field at the intersection of bioethics and neuroscience, "is founded on centuries of discussion of the ethical issues associated with mind and behavior."[137] As a separate field of inquiry apart from bioethics, neuroethics relates to the "ethical, legal and social policy implications of neuroscience, and with aspects of neuroscience research itself," including advances in neuroscientific technology.[138] In contrast, bioethics pertains to the ethical considerations inherent in the expansion of biological sciences, with a particular focus on respecting individuals' privacies.[139]

To ensure proper protection of individuals in light of rapid scientific expansion, the International Brain Research Organization (IBRO) was created in 1960 and is currently overseen by UNESCO.[140] Additionally, in 2001, President George W. Bush created the President's Council on Bioethics, whose purpose was "to discuss emerging ethical issues related to recent developments in biomedical science and technology, such as human cloning, aging, and stem cell research."[141] Out of these efforts came the Universal

136. *Id.*

137. *See* Bird & Illes, *supra* note 20, at 511.

138. *Id.* ("With more and more studies touching upon personal and societal phenomena, neuroethics and the terrain it covers are continuously expanding.").

139. *Id.*

140. *Id.* at 512.

141. Fukushi et al., *supra* note 24, at 10. The purpose of the Executive Order establishing the Commission was to continuously advise the President on "bioethical issues" resulting from technological, scientific advances. Executive Order Establishing the Presidential Commission for the Study of Bioethical Issues, Exec. Order No. 13,521, 74 Fed. Reg. 62,671, 62,671 (Nov. 24, 2009).

Declaration of Bioethics and Human Rights, adopted by UNESCO in 2005.[142] The Bioethics Declaration aims to "provide a universal framework of principles and procedures to guide States in the formulation of their legislation, policies or other instruments in the field of bioethics,"[143] all while "promot[ing] respect for human dignity and protect[ing] human rights, by ensuring respect for the life of human beings, and fundamental freedoms, consistent with international human rights law."[144] In sum, the Bioethics Declaration encourages freedom in scientific research and development while simultaneously ensuring that the expansion of bioethics remains within ethical bounds.[145]

As a subsidiary of bioethics, neuroscience and its nascent lie- and memory-detection technology should fall under the auspices of the Bioethics Declaration and conform to its aims and guidelines. Although the Society for Neuroscience (SfN) oversees some of the social and policy implications of neuroscience research,[146] it is not as overarching or extensive as that of the IBRO under UNESCO.[147] Moreover, unlike bioethical considerations, no declaration of human rights pertaining specifically to neuroscience currently exists.[148] UNESCO, however, created the Bioethics Declaration as a means to attempt to preserve basic human rights in light of general scientific advances.[149]

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142. UNESCO General Conference Res. 15, Universal Declaration on Bioethics and Human Rights 33d Sess., Oct. 3-21, 2005 [hereinafter Bioethics Declaration], *available at* http://unesdoc.unesco.org/images/0014/001428/142825e.pdf.

143. *Id.* art. 2(a).

144. *Id.* art. 2(c).

145. *Id.* art. 2(d).

146. Bird & Illes, *supra* note 20, at 512 (noting that the Society came into existence in 1969). The SfN has grown from 500 members in its early years to an impressive 40,000, serving as the "world's largest organization of scientists and physicians devoted to advancing understanding of the brain and nervous system." *About Membership,* SOC'Y FOR NEUROSCIENCE, http://www.sfn.org/index.aspx?pagename=membership_AboutMembership (last visited Mar. 7, 2012).

147. In 1972, the SfN created a separate Social Issues Committee to monitor some of these concerns, but the Committee has since disbanded and the aims of the Committee have become subsumed into the general principles of awareness that the SfN seeks to achieve. *See* Bird & Illes, *supra* note 20, at 512. And, although the SfN works to coordinate with other organizations such as the IBRO, its primary focus is the advancement of scientific development and education, not human rights. *See* sources cited *supra* note 146.

148. Farrell, *supra* note 4, at 93 ("There are no express provisions in the major international human rights instruments regarding the admissibility of scientific evidence.").

149. *See* Bioethics Declaration, *supra* note 142.

Although the Bioethics Declaration alone might not provide much in the way of substantive guidance on how to oversee and potentially limit the use of neuroscience in the courtroom, the Declaration clearly provides a starting point and guidelines for how countries should react to new scientific advances in this field. And when read in conjunction with other human rights instruments, a clearer picture of the protectable rights and interests begins to emerge.

B. Right to a Fair Trial

The right to a fair trial is an enumerated right within both the Universal Declaration of Human Rights (UDHR)[150] and the European Convention on Human Rights (ECHR).[151] According to the UDHR, "Everyone is entitled in full equality to a fair and public hearing by an independent and impartial tribunal, in the determination of his rights and obligations and of any criminal charge against him."[152] The ECHR similarly states that in a criminal trial, "everyone is entitled to a fair and public hearing within a reasonable time by an independent and impartial tribunal established by law."[153]

Lack of scientific validity is one basis upon which to claim the need for international human rights protection. If courts choose to admit neuroscientific evidence prior to establishing its reliability, they will violate a person's right to an independent and impartial

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150. *See* Universal Declaration of Human Rights, G.A. Res. 217A (III), U.N. Doc A/810 at 71, art. 10 (Dec. 10, 1948) [hereinafter UDHR]. Although not a treaty itself, the UDHR seeks to maintain

> a common standard of achievement for all peoples and all nations, to the end that every individual and every organ of society, keeping this Declaration constantly in mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.

Id. at pmbl. As of early 2012, the United Nations had a total of 193 Member States. *UN at a Glance,* UNITED NATIONS, http://www.un.org/en/aboutun/index.shtml (last visited Mar. 7, 2012).

151. European Convention on Human Rights, art. 6(1), Nov. 4, 1950, 213 U.N.T.S. 221 [hereinafter ECHR].

152. UDHR, *supra* note 150, art. 10.

153. ECHR, *supra* note 151, art. 6(1).

trial.[154] Admitting inadequately reliable evidence contravenes the express human rights provision of a right to a fair trial.[155] As Brian Farrell has noted, however, "as advances in neurotechnology, supported by peer-reviewed research, enhance the reliability of the brain scan as a method of showing experiential knowledge," this argument will likely become moot and courts will admit this evidence without further contestation.[156]

A secondary argument, and one that persists notwithstanding issues of scientific reliability, is that neuroscientific evidence will have such a dramatic effect on juries and judges that it will impair a defendant's right to a fair trial. Even if proven to be scientifically reliable, images—and neuroimages in particular—can have a more profound effect on jury determinations than verbal testimony.[157] The President's Council on Bioethics referenced this phenomenon in a staff working paper, wherein it noted that "[j]urors can be dazzled by the display."[158] The implications of showing a jury a live brain scan, with illuminated regions of the brain indicating memory, emotion, or truth-telling, are vast. Such images would far exceed the impact that crime scene photographs or victim impact videos have on juries as these images promise a new and ambitious understanding of the human mind. Therefore, the right to a fair and impartial trial included in the provisions of both the UDHR and the ECHR faces a dual threat from the lack of scientific reliability and the impact that neuroscientific evidence is likely to have on juries regardless of its accuracy.

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154. *See* Farrell, *supra* note 4, at 93.

155. *See id.*

156. *Id.*

157. *See* Annas, *supra* note 27, at 168 (noting the "power of the neuroimages themselves to shape our perception of reality"); Michael L. Perlin, "*His Brain Has Been Mismanaged with Great Skill": How Will Jurors Respond to Neuroimaging Testimony in Insanity Defense Cases?*, 42 AKRON L. REV. 885, 891-92 (2009) (recognizing that neuroimages, like holograms, are so visually seductive they will likely become "inappropriately persuasive"). Some scholars believe that brain images should be admitted into evidence only for the purpose of linking a structural abnormality to a specific deficit and that functional brain images should not be admitted for the purpose of establishing responsibility for, motivation for, or propensity to commit a particular behavior, or to show an inability to control a particular behavior. Khoshbin & Khoshbin, *supra* note 15, at 171-72 ("Indeed, given the current state of medical and scientific knowledge about the brain, once admitted as evidence, the courtroom is an inadequate forum for determining the 'truth' of such evidence.").

158. Khoshbin & Khoshbin, *supra* note 15, at 185 (citing Neuroscience Evidence, *supra* note 66, at 12).

C. Cognitive Liberty: An Extension of a Privacy Right

Even more pertinent than a right to a fair trial are rights related to privacy and security in one's person—a bundle of rights, which, unfortunately, might be entirely eradicated by brain scan technology. At a minimum, if this technology gains widespread general acceptance in the scientific community, it will inevitably invade a right to privacy.[159] Although estimating the extent of any invasion is currently speculative, whatever cognitive liberties people do in fact possess will cease to exist—especially if the refined testing becomes mandatory.

The type of information that this technology can expose is equally problematic. Scientists believe, for example, that neurotechnology has the ability to reveal information about "personality traits, mental illness, sexual preferences or predisposition to drug addiction."[160] Searching for one piece of information could, therefore, lead to an improper discovery of other, irrelevant, and deeply private information. Failure to obtain consent prior to these various searches could lead to severe consequences for the individual.[161]

Also implicit within this argument are self-incrimination concerns.[162] Both the International Covenant on Civil and Political Rights (ICCPR) and the American Convention on Human Rights (ACHR) protect against coerced self-incrimination.[163] Additionally, the European Court of Human Rights draws a distinction between compelling "'real' evidence which has an 'existence independent of the will of the suspect'"—such as DNA, blood, and fingerprints—and evidence such as thought processes, which are "not truly independent of the will of the suspect."[164] The question, then, becomes whether thoughts and memories are "real" evidence that can be compelled or whether they require the "will of the suspect." If found

159. *See* Wolpe et al., *supra* note 100, at 39, 46.

160. *Id.* at 46.

161. *Id.* (noting that the discovery of this information "could lead to unanticipated insurance, employment, or legal problems for the individual being tested").

162. *See* Farrell, *supra* note 4, at 93.

163. *Id.* (citing International Covenant on Civil and Political Rights art. 14(2)(g), Mar. 23, 1976, G.A. Res. 2200A (XXI), 999 U.N.T.S. 171; American Convention on Human Rights art. 8(2)(7), Nov. 22, 1969, 1144 U.N.T.S. 143).

164. *Id.* at 94 (citing Jalloh v. Germany, 44 Eur. Ct. H.R. 667 (2006)).

to be real evidence, this evidence will pose a very serious threat to the right against self-incrimination.

The threat against violating one's right against self-incrimination is part-in-parcel of a larger concern—one that may or may not exist and is difficult to imagine because of the newness of the threat. The concern, simply put, is that "the successful development of brain scans as lie detection tools would invade 'a last inviolate area of self.'"[165]

The importance of maintaining areas of self is reflected in the fact that privacy is an internationally recognized, fundamental human right. Another, somewhat tenuously related fundamental right is freedom of thought.[166] Article 18 of the UDHR states the following: "Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief, and freedom, either alone or in community with others and in public or private, to manifest his religion or belief in teaching, practice, worship and observance."[167] This freedom is typically associated with the right to develop one's own opinions and beliefs independent of others. In a related provision, Article 19 protects the right to express one's freedom of opinion without interference.[168] Article 18, therefore, protects the right to have freedom of thought whereas Article 19 protects the right to express those thoughts. Nothing in the Declaration, however, provides any express protection for the gap that exists between having a thought and expressing it. The ultimate question thus becomes whether people own their thoughts, memories, and conscious realities, such that any compelled taking amounts to a violation of what is the ultimate right to privacy.

Moreover, Articles 3 and 12 of the UDHR speak to the issue of privacy as a human right.[169] Article 3 guarantees that "[e]veryone has the right to life, liberty and *security of person*."[170] Article 12 states that "[n]o one shall be subjected to arbitrary interference with

165. *Id.* at 95 (citing Henry T. Greely, *The Social Effects of Advances in Neuroscience: Legal Problems, Legal Perspectives*, *in* NEUROETHICS: DEFINING THE ISSUES IN THEORY, PRACTICE AND POLICY 245 (Judy Illes ed., 2005)).

166. *See* UDHR, *supra* note 150, art. 18.

167. *Id.*

168. *Id.* art. 19.

169. *Id.* arts. 3 & 12.

170. *Id.* art. 3 (emphasis added).

his privacy."[171] Though a court might interpret a mandatory, invasive test seeking to obtain and expose one's thoughts and memories as both a violation of security of person and interference with privacy, a court could plausibly reach just the opposite conclusion. If courts determine that the evidence sought is in fact physical evidence, they will likely not see neurotechnology as violating one's security of person, nor would they find an arbitrary interference if probable cause existed to necessitate the taking.[172]

Much, therefore, will depend upon how courts or lawmakers choose to characterize this evidence and frame the rights at issue. As the rights currently exist, a compelled neurological exam might arguably pose a threat to either security in one's person or constitute an arbitrary interference with one's privacy. Part of the difficulty in determining whether mandated testing would amount to a human rights violation is that the technology and what it seeks to expose do not squarely fit into any currently recognizable rights as courts and citizens have come to understand them. However, due to the rapidity of the advances in this field and the potential harm that is likely to result if courts allow neuroscientific evidence into the courtroom, it is at least necessary to analyze the potential human rights at stake and ways to achieve a balance.

CONCLUSION

Arthur C. Clarke, a physicist and science fiction author, once wrote that "any sufficiently advanced technology is indistinguishable from magic."[173] This intriguing statement embodies the concern that this Note explores. There is an obvious appeal in and fascination with technology that has the ability to expose the substance and workings of someone's thoughts—particularly those thoughts that have the potential to establish a guilty mind. The resulting evidence, however, should not be sought at all costs.

Acknowledging that the ultimate questions regarding how this evidence might come to invade one's right to privacy remain unanswered, it is nonetheless crucial to tread carefully prior to

171. *Id.* art. 12.

172. *See supra* notes 90-97 and accompanying text.

173. ARTHUR C. CLARKE, PROFILES OF THE FUTURE: AN INQUIRY INTO THE LIMITS OF THE POSSIBLE 36 (Holt, Rinehart & Winston 1984) (1962).

admitting this evidence, with an understanding that its scope will likely have to be limited either by fitting the right into an existing framework or by creating a new right that delineates its scope.

This Note, therefore, suggests that although the legality of neuroscientific evidence should be viewed with an eye toward a country's specific laws, such an analysis does not, nor should it, preclude a more all-inclusive analysis from a human rights perspective. Assuming that proponents of this technology are correct in believing that it has the ability to revolutionize the legal field, a limited analysis commits a disservice to the rights at stake. Ultimately, although intriguing and possibly even beneficial to improving the ways in which individuals understand the human mind, neuroscience should be viewed as just that—science, not magic.

Dominique J. Church[*]

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