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Neuroscience Evidence, Legal Culture, and Criminal Procedure

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ABSTRACT

Proposed lie-detection technology based on neuroscience poses significant challenges for the law. The law must respond to the science with an adequate understanding of such evidence, its significance, and its limitations. This paper makes three contributions toward those ends. First, it provides an account of the preliminary neuroscience research underlying this proposed evidence. Second, it discusses the nature and significance of such evidence, how such evidence would fit with legal practices and concepts, and its potential admissibility. Finally, it analyzes the constitutional protections that may limit the compelled production of such evidence.

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INTRODUCTION

We humans, at some point,[1] developed the biological complexity and linguistic skills necessary to lie and to deceive. The ability to detect such acts reliably would undoubtedly be powerful evidence in any legal system interested in resolving contested factual disputes about the past in a reliable manner. The typical way to detect such conduct is with the evidence generated once people are ensnared by or forced into the, as it were, tangled web they've chosen to weave. Some examples would include a suspect who utters statements that contradict reality, are internally inconsistent, or which reveal details known only to the culprit, or a suspect who confesses because of guilt, to cease interrogation, or out of (mis)perceived self-interest.[2] Another way, a way now proposed by the next wave of lie-detection technology, would attempt to look for evidence at the neurological source of such conduct. Current neuroscience is investigating the possible neurological correlates of deceptive behavior, and the success of this research carries with it the promise of powerful legal evidence in the form of reliable lie detection.[3] Such a use, moreover, is one of the several proposed uses of such evidence discussed in the

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[1] One estimate is that deception emerged with primates about four million years ago. See R.W. Bryne, *Tracing the Evolutionary Path of Cognition*, in THE SOCIAL BRAIN (Brune et al., eds.) (2003).

[2] This may occurs in various other ways, for example, known deceptive behavior in similar circumstances or behavior perceived to indicate lying (no eye-contact, nervousness, etc.). For details on the interrogation techniques employed to bring about these and the above circumstances see GISLI H. GUDJONSSON, THE PSYCHOLOGY OF INTERROGATIONS AND CONFESSIONS: A HANDBOOK (2003).

[3] The scholarly research is discussed in detail infra at pp. 6-12. For journalistic discussions see Robin Marantz Henig, *Looking for the Lie*, N.Y. TIMES MAG. (Feb. 5, 2006); Malcolm Ritter, *Brain Scans as Lie Detectors? AP's Lying Thief Checks it out*, DAILY CHRONICLE (Jan. 28, 2006) (available at http://www.daily-chronicle.com/articles/2006/01/29/news/news04.txt) (last visited February 7, 2006). And for commercial marketing of such technology see www.noliemri.com (last visited Feb. 6, 2006); www.cephoscorp.com (last visited April 15, 2006) (claiming the technology is "90 % accurate.").

legal literature. Others include predicting criminality,[4] and determining intentions and states of mind generally,[5] the voluntariness of acts,[6] the possible biases of judges and jurors,[7] and whether a person is brain dead.[8]

Despite these often sanguine-toned proposals, new types of evidence raise serious concerns for the law. One type of concern involves several related questions about the evidence itself. What is the nature of such evidence? What are its empirical limitations? What are its conceptual limitations? What may or may not be legitimately inferred from it? Will it fit within existing legal concepts and practices, and, if so, how? Or will it alter, undermine, transform, or destroy such practices, thereby causing a radical shift in legal culture?

A separate type of concern involves how such evidence is gathered. All (perceived) valuable evidence involves the potential for overzealous, and sometimes barbarous, evidence-gathering practices.[9] The Constitution places limits on such conduct

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[4] NEUROSCIENCE AND THE LAW: BRAIN, MIND, AND THE SCALES OF SOCIAL JUSTICE 6 (Brent Garland ed.) (2004).

[5] Erin Ann O'Hara, *How Neuroscience Might Advance the Law*, 359 PHIL. TRANS. R. SOC. LOND. 1677, 1681-82 (Nov. 2004).

[6] Deborah W. Denno, *Crime and Consciousness: Science and Involuntary Acts*, 87 MINN. L. REV. 269 (2002).

[7] Garland, supra note 4.

[8] Id.

[9] The importance of confessions in early common-law courts, for example, led to the employment of torture as an epistemological device. See Eben Moglen, *The Privilege in British North America: The Colonial Period to the Fifth Amendment*, in THE PRIVILEGE AGAINST SELF-INCRIMINATION 120 (1997). Other concerns raised by such evidence include privacy concerns outside of the context of criminal litigation, for example, privacy interests regarding medical or similar information the tests might reveal. Cf. Harold J. Krent, *Of Diaries and Databanks: Use Restrictions Under the Fourth Amendment*, 74 TEX. L. REV. 49 (1995) (arguing that "reasonableness" should apply not only to the seizure of evidence but also to the uses of such evidence, particularly how it's used outside the prosecution context). Similar privacy issues arise regarding the information collected in DNA tests, both in and outside the criminal process. See generally PHILIP KITCHER, SCIENCE, TRUTH, AND DEMOCRACY (2001).

generally, but it's not clear how the compelled gathering of the proposed neuroscientific evidence would fit with extant constitutional limitations.[10] More bluntly—when can the government force defendants (or suspects or anyone for that matter) against their will to submit to a test that measures the workings of their brains for evidence of lies or deception?

This article addresses these two types of concerns and makes three contributions to the existing literature. First, it provides an account of the preliminary neuroscience research that may provide the legal system with important evidence. Second, it provides understanding of the nature and significance of the proposed evidence, an understanding the law needs in order to conceptualize and to evaluate if, and how, such evidence would fit with current legal concepts and practices. Finally, it offers a constitutional analysis of a potential practice that raises potentially serious constitutional problems. This last contribution provides theoretical, not only practical, value. The examples discussed help to understand the nature of the criminal-procedure protections offered by the Constitution, most importantly, the privilege against self-incrimination. In helping to theorize the scope of these provisions, the examples also raise important methodological and substantive questions about how to interpret the rules relating to the provisions and to the Constitution more generally. Thus, the analysis is valuable even if the promised

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[10] See Charles N.W. Keckler, *Cross-Examining the Brain: A Legal Analysis of Neural Imaging for Credibility Impeachment*, 57 Hastings L. J. 509, 555 (2006) ("Could [a defendant's] brain be scanned simultaneously, in the way he is now compelled to surrender a DNA sample? I admit this to be a difficult question, but one I think society will inevitably confront, and one well worth exploring in advance of this confrontation.")

evidence never comes to fruition, if only for the use the proposed evidence provides as a "thought experiment"[11] for testing the limits of various constitutional theories.

My thesis is that, when properly understood (an important qualification): (1) this evidence would fit smoothly within existing legal concepts—despite claims that it may radically transform or destroy extant practices; and (2) the compelled production of this evidence would fall within the core concepts and practices of, and hence would be regulated by, the Fourth Amendment and the Self-Incrimination Clause.

The next section describes the current neuroscience research on this issue. The research involves two different kinds of technology: experiments using fMRI tests to scan and create images of the brains of subjects during truthful and deceptive acts in order to look for differences in areas of brain activation; and second, research using a technique referred to as "brain fingerprinting" [*sic*][12] that uses EEG tests of brainwave responses when subjects are shown scenic images to measure whether prior familiarity with the image will elicit a different brain response than unfamiliarity.

Next, Section II attempts to make sense of such evidence and to evaluate if, and how, it would fit with legal settings. This task is primarily conceptual, not empirical. The research discussed in Section I involves empirical, inductive evidence of possible correlations between behavior and brain states. However, a proper understanding of the nature of this evidence, and what it shows, requires an examination of the various concepts presupposed by it. Such a conceptual understanding is necessary in order to analyze the evidence in light of current legal doctrine and practices.

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[11] The irony is unavoidable.

[12] It's not clear why it's referred to as "brain fingerprinting" rather than, say, "brain printing."

This understanding is also necessary to analyze and evaluate how the gathering of such evidence accords with constitutional criminal-procedure concepts and rules. Section III turns to this task. This section examines when the compelled gathering of such evidence would be prohibited by the Constitution—primarily the Fourth and Fifth Amendments. This analysis employs a theory and framework developed previously for evaluating claims that implicate the Fourth and Fifth Amendments.[13] Rather than diverging to protect different conduct or types of evidence, the Fourth Amendment and the Self-Incrimination should be seen as overlapping to subject government evidence-gathering to a two-part inquiry: first, is it unreasonable (Fourth Amendment)? And second, if not unreasonable, does it seek to compel the incriminating content of a subject's mental states, such as their beliefs or knowledge, to use against them in a criminal investigation or prosecution (Self-Incrimination Clause).[14] This evidence provides informative examples to test and extend that analysis.

I. NEUROSCIENCE RESEARCH

Although in its nascent stages, neuroscience research has made some progress in attempting to understand the brain processes that may be necessary for deceptive behavior.[15] Section A discusses this research. Section B discusses in a more cursory fashion a second type of neuroscience-based lie detection: a process known as "brain

[13] Michael S. Pardo, *Disentangling the Fourth Amendment and the Self-Incrimination Clause*, 90 IOWA L. REV. 1857 (2005).

[14] See id. at 1879-81. The above inquires, and alternative theories, are discussed infra at pp. 28-31.

[15] See sources cited in supra note 3.

fingerprinting" that purports to reveal whether a suspect has prior knowledge of a particular scene or image.

A. *Deception*

Recent experiments have used fMRI technology[16] to attempt to separate the neural correlates of truthful from deceptive behavior. The studies have revealed a general increase of activity in the prefrontal cortex and anterior cingulated gyrus of subjects during lies and deception.[17] These brain areas are thought to control "executive brain functions" such as "problem solving, planning, the initiation and inhibition of behaviors, and the manipulation of useful data in conscious working memory."[18] By contrast, "truthful responding has not been shown to be associated with any areas of increased activation."[19] In order to provide some background on the preliminary research underlying the proposed neuroscience-based evidence, this section discusses four

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[16] Functional Magnetic Resonance Imaging "is based on the increase in blood flow to the local vasculature that accompanies neural activity in the brain." About Functional MRI, Functional MRI Research Center, Columbia University (http://www.fmri.org/fmri.htm) (2005). The test provides the following benefits over PET scans:

> The main advantages to fMRI as a technique to image brain activity related to a specific task or sensory process include 1) the signal does not require injections of radioactive isotopes, 2) the total scan time required can be very short, i.e., on the order of 1.5 to 2.0 min per run (depending on the paradigm), and 3) the in-plane resolution of the functional image is generally about 1.5 x 1.5 mm although resolutions less than 1 mm are possible. To put these advantages in perspective, functional images obtained by the earlier method of positron emission tomography, PET, require injections of radioactive isotopes, multiple acquisitions, and, therefore, extended imaging times. Further, the expected resolution of PET images is much larger than the usual fMRI pixel size. Additionally, PET usually requires that multiple individual brain images are combined in order to obtain a reliable signal.

Id.

[17] Sean A. Spence, Mike D. Hunter, Tom F.D. Farrow, Russell D. Green, David H. Leung, Catherine J. Hughes & Venkatasubramanian Ganesan, *A Cognitive Neurobiological Account of Deception: Evidence from Functional Neuroimaging*, 359 PHIL. TRANS. R. SOC. LOND. 1755, 1760 (Nov. 2004).

[18] Id. at 1756.

[19] Id. 1756; see also id. at 1760 ("So far, to our knowledge, no published fMRI study has revealed increased activation in any brain region during truthful responding").

published studies.[20] Three experiments attempted to measure in general truthful behavior versus lies or deception. The fourth attempted to further breakdown deceptive behavior according to variables such as whether they fit into a coherent story and whether they were previously memorized.

1. Spence, et al. (2001)[21]

This study found evidence of "greater activity in the bilateral ventrolateral prefrontal cortices" during lying.[22] Ten subjects were asked 36 yes-no questions about their day (for example, whether they had made their bed).[23] They were then asked the same questions while in an fMRI scanner, holding a device with buttons corresponding to "yes" and "no." A screen in front of the subjects displayed a color, and the subjects were told to answer truthfully when one color appeared and to lie when another color appeared. The authors then compared brain activity during truthful and lying responses. Lying responses exhibited increased activity in the prefrontal cortex, whereas truthful responses did not indicate any areas of increased activity. The authors, however, note two important limitations to their initial findings: the details of the questions involved trivial matters and the stakes were low; emotional subjects and higher stakes may trigger different responses.

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[20] For further discussion of these and other studies see Keckler, supra note 10 at 524-36.

[21] Sean A. Spence, Tom F.D. Darrow, Amy Herford, Iain D. Wilkinson, Ying Zheng & Peter W.R. Woodruff, *Behavioral and Functional Anatomical Correlates of Deception in Humans*, 12 NEUROREPORT 2849 (2001).

[22] Id.

[23] The details of the study are in id. at 2849-50.

2. Lee, et al. (2002)[24]

This study attempted to measure "malingering"—"intentionally false and fraudulent simulation or exaggeration of physical or mental disease."[25] Six subjects underwent an fMRI test and were asked to feign a memory problem.[26] In particular, the subjects were told:

> You are to feign a memory problem and deliberately do badly on the test. Imagine a scenario, which envisages that a bad result will lead to an attractive sum of money as compensation for your memory problem. You should fake skillfully to avoid detection. So, your goal is to fake well, do it with skill, and avoid detection.[27]

The authors conducted two tests. First, subjects were presented with a three-digit number, followed by a second three-digit number a few seconds later, and then asked if the numbers matched. Second, subjects were asked biographic details about themselves (for example, where they were born) followed by an answer (London). In both tests the subjects held a device to indicate "yes" or "no" responses. The tests indicated "four principle regions of brain activation during deception: prefrontal and frontal, parietal, temporal, and sub-cortical."[28] The authors conclude that their results "provide some initial evidence for the existence and involvement of a prefrontal-parietal-sub-cortical circuit in feigned memory impairment when tested with a forced-choice format."[29]

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[24] Tatia M.C. Lee, Ho-Ling Liu, Li-Hai Tan, Chetwyn C.H. Chan, Srikanth Mahankai, Ching-Mei Feng, Jinwen Hou, Peter T. Fox & Jia-Hong Gao, *Lie Detection by Functional Magnetic Resonance Imaging*, 15 HUMAN BRAIN MAPPING 157 (2002).

[25] Id. at 157.

[26] Id at 158.

[27] Id. at 159.

[28] Id. at 161.

[29] Id. at 163.

3. Langleben, et al. (2002)[30]

This experiment tested 18 subjects using playing cards.[31] Subjects were told to select one of three sealed envelopes that contained a card and $20. They were then given additional cards. They were next asked if they had a particular card, and told that they could keep the money if they succeeded in concealing the identity of the card from the sealed envelope from a "computer" that would "analyze their brain activity during the MRI session."[32] They were finally told that they would forfeit the money if they lied about any card other than the one from the sealed envelope. The authors found "[i]ncreased activation of the right [anterior cingulate gyrus] but not the [dorsolateral prefrontal cortex] during the Lie response," and "no regions more active during Truth than Lie, suggesting that Truth is the baseline cognitive state."[33] The authors thus conclude that "[t]his finding indicates that there is a neurophysiological difference between deception and truth at the brain activation level that can be detected with fMRI."[34]

4. Ganis, et al. (2003)[35]

This study investigated two types of deception: memorized lies that fit into a coherent story, on one hand, and spontaneous, isolated lies, on the other.[36] 10 subjects

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[30] D.D. Langleben, L. Schroeder, J.A. Maldjian, R.C. Gur, S. McDonald, J.D. Ragland, C.P. O'Brien & A.R. Childress, *Brain Activity during Simulated Deception: An Event-Related Functional Magnetic Resonance Study*, 15 NEUROIMAGE 727 (2002).

[31] See id. at 729 for the details of the experiment.

[32] Id. at 729.

[33] Id. at 730-31.

[34] Id. at 731.

[35] G. Ganis, S.M. Kosslyn, S. Stone, W.L. Thompson & D.A. Yurgelun-Green , *Neural Correlates of Different Types of Deception: an fMRI Investigation*, 13 CEREBRAL CORTEX 830 (2003).

were asked about a memorable work experience or vacation.[37] The subjects were then asked, and assisted, in generating an alternative, false scenario that was coherent and internally consistent. The subjects were then asked questions and told to give three kinds of answers: (1) false answers based on the alternative scenario previously memorized; (2) spontaneous lies without regard to whether the answers were consistent or formed a coherent story; and (3) truthful ones. The authors found that during the spontaneous lies "a number of brain regions were activated more strongly than when they produced [memorized] lies: anterior cingulate, the right precentral/ postcentral gyrus, and the right cuneus."[38] And with regard to the memorized lies, "only the right anterior middle frontal gyrus activated more strongly."[39] The authors thus conclude that "[t]he findings support the idea that lying and telling the truth rely on systematically different neural processes," and "that 'lying' is not a single process or function, but instead is a heterogeneous category."[40]

B. *Prior Knowledge*

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[36] Id. The authors speculate that the differences may matter because: "Spontaneous lies that are isolated are easier to generate than coherent lies because one does not have to cross check details to ensure that they fit into a larger scheme"; "working memory's being more engaged when one generates a coherent lie than an isolated lie because more information has to be held in mind and evaluated"; and "for memorized lies, those that fit into a coherent scenario may be easier to generate because it is easier to recall a lie when more retrieval cues are present." Id. at 831.

[37] For the details of the experiment see id. at 831.

[38] Id. at 833.

[39] Id.

[40] Id.

A technique known as "brain fingerprinting" uses an EEG test[41] to measure whether a subject has prior knowledge of details of an event.[42] The technique purports to establish whether suspects have information "stored" in their brains based on the electrical signals their brains give off when the suspects are shown various words, phrases, or images. The test works by showing subject three types of stimuli regarding an event: details the suspect has been told or is known to know ("targets"); details that are false or unrelated to the event ("irrelevants"); and details known only by someone at the event ("probes"). According to the authors, if the suspect has prior knowledge of details a certain charge will be emitted by the brain automatically as it is processing the information.[43] In this particular test (which involved six subjects) the authors report an accuracy rate of 100 percent, with no false negatives, false positives, or indeterminate cases.[44] But, while the science underlying the technique is generally well established, the technique's accuracy has not been independently corroborated: "the amount of peer-

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[41] Electroencephelography records electrical signals from the brain to electrodes attached to a subject's scalp.

[42] Lawrence A. Farwell & Sharon S. Smith, *Using Brain MERMER Testing to Detect Knowledge Despite Efforts to Conceal*, 46 J. FORENSIC SCI. 1-9 (2001) (available at http://www.brainwavescience.com/JourForensicScience.php) (last visited Feb. 20, 2006). A scientist named Lawrence Farwell is the leading developer and proponent of this technique. See generally www.brainwavescience.com. For a general discussion see Sara Solovitch, *Mind Reader*, LEGAL AFFAIRS (Dec. 2004); see also O'Hara, supra note 5; Denno, supra note 6; Andre A. Moenssens, *Brain Fingerprinting – Can it be used to detect the innocence of a person charged with a crime?* 70 UMKC L. Rev. 891 (2002).

[43] The authors refer to the charge under the acronym MERMER:

> MERMERs (memory and encoding related multifaceted electroencephalographic responses), of which the P300 is a sub-component, were used to determine whether the subject had the relevant information stored in his brain (information present) or not (information absent), thus indicating whether or not each subject had participated in the real-life event in question.

Farwell & Smith, supra note 42.

[44] The authors report similar results in four previous tests. Id.

reviewed material available to study the efficacy of this method is almost non-existent."[45] This has been due, in part, to the refusal of the technique's developer to disclose important details regarding how the test works, including, most significantly, the algorithm used to measure the EEG results.[46]

II. UNDERSTANDING AND EVALUATING THE NEUROSCIENCE EVIDENCE

Any new type of evidence based on technological advancement creates problems for the law. Questions immediately arise regarding its nature, what may or may not be inferred from it, the strength of such inferences, its limitations, and the possible dangers and confusions it could engender. Consider, for example, the invention and widespread use of photography.[47] Photographs were thought by some to be evidence of previously unknown reliability—drawn with "the pencil of God" or a "mirror with a memory."[48] Others, however, noticed the possibility for manipulation and abuse with regard to this evidence, and hence deplored its use in court.[49] Photography, it was thought, potentially could usurp the power of courts to determine facts[50] by shifting power to photography experts, and away from courts, to determine the true nature of reality.[51] None of this

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[45] Keckler, supra note 10 at 521.

[46] Id.

[47] See Jennifer L. Mnookin, *The Image of Truth: Photographic Evidence and the Power of Analogy*, 10 YALE J. LAW & HUMAN. 1 (1998).

[48] Id. at 16, 38. The latter phrase was that of Oliver Wendell Holmes. Id. at 38.

[49] Id. at 20-27 (quoting one source who referred to photographs as a "most dangerous perjurer").

[50] Or possibly it would purport to undermine the legitimacy of judicial verdicts to the extent they contradicted photographic evidence. This would perhaps have occurred much the way DNA evidence is now used as a benchmark for determining whether previous convictions were wrong.

[51] Id. at 54.

happened, of course, because the evidence was eventually assimilated within legal practices. So long as a lay witness can authenticate a photograph (or a video or audio recording) as an accurate representation, the powerful yet fallible evidence may be properly evaluated by legal factfinders.[52] This is now commonplace in evidence-law doctrine and evidence courses.

The proposed neuroscience evidence shares some striking similarities with the story of photographic evidence. The neuroscience purports to offer powerful, as-yet-unforeseen evidence—probing a suspect's brain directly for evidence of a crime.[53] Therefore, "[t]he invention by neuroscientists of perfectly or extremely reliable lie-detecting or truth-compelling methods might have substantial effects on almost every trial and on the entire judicial system."[54] One possible effect might be that neuroscience experts would usurp the jury's power to determine credibility and guilt, a concern Justice Thomas relied on in a recent case in which the Court upheld a categorical ban on polygraph results (over a defendant's challenge that the rule deprived him a constitutional right to present a defense): "By its very nature, polygraph evidence may diminish the jury's role in making credibility determinations."[55] If properly understood, however, the

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[52] See Fed. R. Evid. 901.

[53] See, e.g., Farwell & Smith, supra note 42 ("Physical evidence may or may not be present, but the brain of the criminal is always there, recording the events"); Ganis, et al, supra note 35 at 830 ("we examine directly the organ that produces lies.")

[54] Henry T. Greely, *Prediction, Litigation, Privacy, and Property*, in NEUROSCIENCE AND THE LAW, supra note 4 at 137.

[55] United States v. Scheffer, 523 U.S. 303, 313-14 (1998). Justice Thomas wrote the opinion for the Court in upholding the rule, but the section discussing the above concern was joined by three other Justices only. The case involved a military rule that applied in military trials, but the Court's conclusions were general and would have applied if the rule been a state or federal one. Given the lack of a consensus regarding the reliability of polygraphs, courts have taken a variety of approaches. See, e.g., United States v. Lea, 249 F.3d 632 (7th Cir. 2001) (excludable under Rule 403 based on jury confusion); Cervantes v. Jones, 188

neuroscience evidence, like photography (and reliable DNA evidence), may be properly assimilated into legal practices without undermining those practices or usurping powers of judges and juries.

This section first explicates the conceptions employed by scientists and legal scholars regarding the neuroscience evidence. It then discusses the psychological concepts necessarily presupposed by such conceptions, which help to clarify the nature and significance of the evidence. This understanding is then used to place the neuroscience evidence within existing legal concepts and practices. Finally, this section discusses the empirical limitations of the current research and the admissibility of such evidence. The clarifications in this section are employed in the next section to evaluate the constitutional significance of the evidence.

The fMRI research discussed above found increased brain activity in certain areas during "deceptive" responses, and no increases during "truthful" activity. To account for the differences, the researchers posit that deception requires more cognitive effort than truthful responses. To lie, a subject

> must construct a new item of information (the lie) while also withholding a factual item (the truth), assuming that he knows and understands what constitutes the 'correct' information. Within such a theoretical framework it is apparent that the truthful response comprises a form of baseline.[56]

F.3d 805 (7th Cir. 1999) (may not be relied on to determine probable cause); United States v. Posado, 57 F.3d 428 (5th Cir. 1995) (rejecting rule that makes polygraph results per se inadmissible); United States v. Piccinonna, 885 F.2d 1529 (11th Cir. 1989) (admissible for impeachment purposes).

[56] Spence, supra note 17 at 1757. They predict that a truthful response will thus "be made by an honest subject answering the same question or by the liar were he to become distracted of fatigued. (indeed, from this perspective it is understandable why inebriation or sedation might 'release' the truth via disinhibation: in vino veritas.)" Id. On the last point, however, empirical research confirms that alcohol intoxication *decreases* suggestibility during interrogation. See GUDJONSSON, supra note 2 at 428-30.

Interestingly, part of this posited extra mental work requires what the researchers refer to as "theory of mind."[57] That is, subjects must form beliefs and draw inferences about the mental states (thoughts and ongoing beliefs) of those they are attempting to lie to or deceive.[58] How much extra mental work is required will depend on the nature of the lie because "'lying' is not a single process or function, but instead is a heterogeneous category."[59] For example, spontaneous-isolated lies may require different cognitive processes than memorized lies forming a coherent scenario.[60] Finally, this extra cognitive work detected by the fMRI test is involuntary.[61] Because subjects have no control over this activity, it makes the test superior to traditional lie detectors such as polygraphs, which rely on measures of anxiety that a subject may learn to control.[62]

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[57] Spence, supra note 17 at 1757; Lee, supra note 23 at 163.

[58] Spence, supra note 17 at 1757 ("Deceiving another human subject is likely to involve multiple cognitive processes, including theory of mind concerning the victim's thoughts (their ongoing beliefs)"); Lee, supra note 23 at 163 ("An essence of lying is the recognition of, and attempt to manipulate, the mental states of others.").

[59] Ganis, supra note 34 at 833. ("The generation of various types of lies engages different combinations of general-purpose cognitive processes which, as an ensemble, may provide reliable neural signatures of various types of lies.").

[60] See id. at 833 for details.

[61] See Lee, supra note 23 at 163 ("It is also clearly evident that controlling one's cerebral activity to avoid detection is unfeasible.")

[62] In a typical polygraph test,

> The examiner interprets various physiological responses of the examinee, including blood pressure, perspiration, and respiration, while asking a series of questions, commonly in three categories: direct accusatory questions concerning the matter under investigation, irrelevant or neutral questions, and more general "control" questions concerning wrongdoing by the subject in general. The examiner forms an opinion of the subject's truthfulness by comparing the physiological reactions to each set of questions.

See United States v. Scheffer, 523 US 303, 314 n.9 (1998) (citations omitted) (concluding that a rule categorically excluding polygraph evidence did not violate a constitutional right to present a defense because of the technique's questionable reliability).

Similar to the fMRI test, the "brain fingerprinting" technique also relies on a measure of involuntary cognitive activity.[63] Rather than relying on increased activity consistent with deception, however, it purports to measure whether information or details are "encoded" or "stored" or "housed" in the subject's brain.[64] According to this conception, the brain of a subject records and encodes the details of a perceived event while it is taking place, and when later presented with details about the event, the brain's response during the test "reveals" whether the information is present there. Consider this metaphor provided by Farwell & Smith:

> Investigators' need for other accurate, scientific means of linking perpetrators with crime scene evidence has inspired some scientists to ask, "What does the criminal always take with him from the crime scene that records his involvement in the crime?" The answer to this question, of course, is the brain. Physical evidence may or may not be present, but the brain of the criminal is always there, recording the events, in some ways like a video camera.[65]

The above conceptions, however, may benefit clarification. This task is conceptual in the sense that it requires clarifying the relevant concepts involved and their articulations, not determining which empirical facts obtain—which presupposes the concepts and their sense.[66] A clear understanding of this research requires a clear

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[63] Farwell & Smith, supra note 42 ("the evidence reported here, and in several other studies, suggests that recent advances in neuroscience allow scientists to detect information stored in the brain—information that potentially could scientifically, objectively, non-invasively, and accurately connect a criminal with a specific criminal act.").

[64] Id. See also Moennens, supra note 42 at 5 ("Brain fingerprinting, at its best, can only detect whether certain knowledge exits in the subject's brain."); Denno, supra note 6 at 333 ("Brain fingerprinting is based on the principle that the human brain houses information.").

[65] Farwell & Smith, supra note 42.

[66] See M.R. BENNETT & P.M.S. HACKER, PHILOSOPHICAL FOUNDATIONS OF NEUROSCIENCE 402-07 (2003). The authors explain:

> Neuroscience research . . . abuts the psychological and clarity regarding the achievements of brain research presupposes clarity regarding the categories of ordinary psychological description—that

articulation of the psychological concepts presupposed by it and the psychological capacities about which the research seeks to provide empirical evidence.[67] Based on the above conceptions, the neuroscience evidence presupposes several relevant psychological capacities—not just "to lie," "to deceive," and "to know," but also to "think," "believe," "perceive," "recognize," "infer," and so on. And the fMRI situation presupposes not only such concepts and capacities on the part of subjects, but also presupposes that subjects themselves ascribe such states to their listeners.

These presuppositions are significant for two reasons. First (and less important), they make unlikely the success of an "eliminative materialist" proposal in this particular context; such a proposal would seek to eliminate talk of such mental concepts and predicates and instead focus solely on the supposed correlated brain states.[68] In this context, such a project likely could not get off the ground because the presupposed

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> is, the categories of sensation and perception, cognition and recollection, cogitation and imagination, emotion and volition.

Id. at 115. See also Dennis M. Patterson, *review of* PHILOSOPHICAL FOUNDATIONS OF NEUROSCIENCE, NOTRE DAME PHILOSOPHICAL REVIEWS (2003) (available at http://ndpr.nd.edu/review.cfm?id=1335) (last visited Feb. 15, 2006); P.F. STRAWSON, ANALYSIS AND METAPHYSICS 17-28 (1992).

[67] Two analogies help to illustrate this point. A bounty hunter searching for a fugitive is targeting the fugitive not his picture on the "wanted" poster, but the failure to attend to the details of the poster will make it less likely the hunter will find his target. See FRANK JACKSON, FROM METAPHYSICS TO ETHICS: A DEFENCE OF CONCEPTUAL ANALYSIS 30 (1998). Similarly, eyeglass wearers know that even though they care more about the world they see through the glasses than the glass itself, they should care about flaws in the glass nonetheless. To dismiss flaws in the glass because they care about the world would be absurd. See BENNETT & HACKER, supra note 66 at 401. Likewise, it would be absurd to dismiss the focus on our psychological concepts, and the language we use to express them, because we are interested in the capacities themselves. See also Timothy Williamson, *Past the Linguistic Turn?*, in THE FUTURE FOR PHILOSOPHY 125-26 (Brian Leiter ed. 2004).

[68] See, e.g., Paul Churchland, *Eliminative Materialism and the Propositional Attitudes*, 78 J. PHIL. 67 (1981). For a general discussion of this position see William Ramsey, *Eliminative Materialism*, Stanford Encyclopedia of Philosophy (2003) (http://plato.stanford.edu/entries/materialism-eliminative/) (last visited Feb. 20, 2006) (Eliminative materialism is "the radical claim that our ordinary, common-sense understanding of the mind is deeply wrong and that some or all of the mental states posited by common-sense do not actually exist.") This is not to deny that such programs make be more likely in other contexts.

concepts are necessary to make sense of and explain the human actions.[69] The second (and more important) reason is that the above considerations show that the concepts and capacities presupposed cannot simply be identified with the brain states. The brain state is not the lie or the knowledge. Unlike the neuroscience evidence, which provides inductive evidence of lying or knowing, other evidence provides criterial (conceptually or logically good) evidence of such conduct.[70] For example, asserting a known false statement, or manifesting knowledge of a fact by asserting the fact and what justifies believing it. In the case of conflict between these two kinds of evidence—a sincere assertion with an fMRI indication of "lie," or a sincere denial of knowledge of a crime scene with a "brain fingerprinting" result of "knowledge"—the criterial evidence trumps the neuroscience evidence.[71] The problem would be with the neuroscience evidence; its presupposition of uniformity of brain states among individuals would be wrong. The best the neuroscience evidence can accomplish is to make more reliable predictions. But the

[69] Donald Davidson has made this general point in several essays. To interpret human behavior as *intentional* and as an *action* requires a description of it employing these presupposed mental concepts. See, e.g., DONALD DAVIDSON, *Three Varieties of Knowledge*, SUBJECTIVE, INTERSUBJECTIVE, OBJECTIVE 217 (2001) ("it is part of the concept of an intentional action that it is caused and explained by beliefs and desires; it is part of the concept of a belief or a desire that it tends to cause, and so explain, actions of certain sorts."). And the law explains action in terms of mental states. See Stephen J. Morse, *New Neuroscience, Old Problems*, in NEUROSCIENCE AND THE LAW, supra note 4 at 157-98.

[70] BENNETT AND HACKER, supra note 66 at 83 ("If a person avows that he is not in pain, yet evidence from PET or fMRI suggests that he is, the latter is defeated by the agent's sincere utterance, and the inductive correlations of the data . . . need to be reexamined."). As the authors explain, "The brain does not satisfy the criteria for being a possible subject of psychological predicates." Id. In other words, a brain scan would not show the brain thinking, it would show what the brain is doing when the person is thinking. Id.

[71] This does not suggest that a psychological concept will necessarily be *reducible* to criterial evidence; one can conceal pain or manifest pain behavior when not in pain. Criterial evidence can be overridden in certain circumstances. The main point here: In the relevant case, we want to determine whether the assertion is sincere or not, but the neuroscience evidence cannot provide a *necessarily* true answer one way or the other.

possibility will remain for contrary criterial, logically good evidence to override the inductive evidence.[72]

The distinction between criterial and inductive evidence for proving mental states helps to clarify some confusion in the descriptions of the above-described neuroscience evidence. The brain does not "store" or "house" knowledge,[73] knowledge does not "exist" in the brain, nor do lies, and the brain is not like a video camera.[74] "To know" (facts or how to perform a task) is an achievement verb (or success word).[75] To illustrate this, suppose both A and B witnessed C commit a bank robbery. At a subsequent lineup, A successfully picks out C and states "that's the guy I saw commit the robbery," while B states sincerely in the same lineup that he can't identify anyone as the robber. A knows C did it[76]; B may not[77]—regardless of what any brain scan shows. This is not to deny, of

[72] Or, more likely, evidence of such evidence. This latter evidence will likely focus on whether there is any additional evidence to believe or disbelieve the subject. This will include all the typical ways we infer such conduct generally. See supra note 2. Moreover, both the reliability of the neuroscience evidence and the strength of possible criterial evidence (or whether it should be overridden) will involve a "reference class" issue. See Michael S. Pardo, *The Field of Evidence and the Field of Knowledge*, 24 LAW & PHIL. 321, 374-83 (2005). In particular, why or why not this subject, on this occasion, should be seen as a typical member of the sets underlying the generalizations regarding both kinds of evidence.

[73] See Moennens, supra note 42; Denno, supra note 6; Farwell & Smith, supra note 42.

[74] Farwell & Smith, supra note 42. For a powerful critique of the notion that the brain "stores," "houses," "encodes, or "records" knowledge see BENNETT & HACKER, supra note 66 at 151-71.

[75] See BENNETT & HACKER, supra note 66 at 257. Of course, passive *reception* of knowledge may occur at a crime scene, which a defendant may later recognize when confronted with the details. In such a case, however, recognition is manifested in behavior. On "achievement" and "success" words generally see Dennis Patterson, *Fashionable Nonsense*, 81 TEX. L. REV. 841 885-92 (2003) (reviewing the following books: ANTHONY G. AMSTERDAM & JEROME BRUNER, MINDING THE LAW (2000); STEVEN L. WINTER, A CLEARING IN THE FOREST: LAW, LIFE, AND MIND (2001); VINCENT DESCOMBES, THE MIND'S PROVISIONS: A CRITIQUE OF COGNITIVISM (2001)); ALVIN I. GOLDMAN, KNOWLEDGE IN A SOCIAL WORLD 60 (1999) ("these terms imply that some sort of goal, undertaking, or function has been accomplished").

[76] I'm assuming that the testing procedures were not problematic such that A would have picked C even if A did not really see C do it. If this were the case, A would not know. In other words, I assume that A did not pick C by accident. For more on this issue and its relation to the concept of knowledge see Pardo, supra note 72.

course, that a brain and its parts aren't *necessary* for such conduct; rather they aren't *sufficient* for attributing knowledge in the example.[78] Moreover, to ascribe such predicates to the brain, as in the "brain lies" or "the brain knows," commits what Bennett and Hacker refer to as a "mereological" fallacy, that is, to ascribe to a part what only makes sense to ascribe to the whole.[79]

These conceptual clarifications help to further show why the proposed neuroscience evidence would not usurp court functions. This concern was most recently articulated by Justice Thomas in upholding a rule banning polygraph evidence; his discussion applies to lie-detection technology generally. A legitimate governmental interest, he explained, is preserving the "core function" of "credibility determinations in criminal trials"; a "fundamental premise" of that function is "that 'the *jury* is the lie detector.'"[80] The lie-detection technician, rather than the jury, would be the primary judge of credibility, with the jury deferring to the technician's opinion:

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[77] B may know but not be able to recall at that time. B's tacit knowledge would, therefore, be like having an ability B didn't know she had. Knowing does not entail knowing one knows. See Pardo, supra note 72. The knowledge would later be manifested when remembered.

[78] See WILFRED SELLARS, EMPIRICISM AND THE PHILOSOPHY OF MIND 76 (1997) ("The essential point is that in characterizing an episode or a state as that of *knowing*, we are not giving an empirical description of that episode or state; we are placing it in the logical space of reasons." [original emphasis]). This same point applies to other epistemic concepts as well such as evidence, justification, doubt, certainty, probability, reliability, and so. Brain states can't provide the *connections* between these concepts, either—for example, the relationships between knowledge and justification, evidence and knowledge, or evidence and probability. See TIMOTHY WILLIAMSON, KNOWLEDGE AND ITS LIMITS 184-237 (2000). Conceptual issues relating to knowledge and these other epistemic concepts are also important for evidence law. For a general account see Pardo, supra note 72.

[79] BENNETT & HACKER, supra note 66 at 29. Mereology is the branch of logic that concerns the relationship between parts and wholes. This critique may apply to attempts to explain other mental concepts—for example, intent or voluntariness—in terms of brain states. See, e.g., Denno, supra note 6 at 275-76 (voluntariness requires an "internal event or volition"); O'Hara, supra note 5 at 1681-82. Such reductive attempts eliminate the normative, social aspects of the human actions. See Patterson, supra note 75 and Patterson, supra note 66.

[80] 523 U.S. 303, 312-13 (1998) (quoting United States v. Barnard, 490 U.S. 907, 912 (9th Cir. 1973) (emphasis added)).

> Unlike other expert witnesses who testify about factual matters outside the jurors' knowledge, such as the analysis of fingerprints, ballistics, or DNA found at a crime scene, a [lie-detection] expert can supply the jury only with another opinion, in addition to its own, about whether the witness was telling the truth.[81]

Consequently, jurors may blindly defer to the technician and "abandon their duty to assess credibility and guilt."[82]

But, Justice Thomas's distinction notwithstanding, the problem of deference to expert opinion is a problem for all expert testimony.[83] There is no reason to believe that jurors will be less able to assess the neuroscience evidence than they are to assess DNA evidence or any other scientific evidence.[84] Highly reliable DNA results may be just as likely to cause deference, yet jurors are trusted to not abandon their duties to determine credibility and guilt. Nor does the fact that the neuroscience evidence would be tied more directly to the credibility of witness statements render the evidence problematic. Despite some initial resistance, courts have become more receptive to other kinds of expert testimony that may help jurors assess witness statements. Testimony regarding eyewitness identifications[85] and false confession[86] are two prominent examples. Like

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[81] Id. at 313.

[82] Id. at 314.

[83] See Ronald J. Allen & Joseph S. Miller, *The Common Law Theory of Experts: Deference or Education?* 87 NW. U. L. REV. 1131 (1993).

[84] Recent studies contend that jurors may undervalue DNA "random match" evidence. Dale A. Nance & Scott B. Morris, *Juror Understanding of DNA Evidence: An Empirical Assessment of Presentation Formats for Trace Evidence with a Relatively Small Random-Match Probability*, 34 J. LEGAL STUD. 395 (2005); Dale A. Nance & Scott B. Morris, *An Empirical Assessment of Presentation Formats for Trace Evidence with a Relatively Large and Quantifiable Random Match Probability*, 42 JURIMETRICS J. 403 (2002). These studies, however, rely on problematic and sometimes false assumptions regarding the probative value of evidence. See Ronald J. Allen & Michael S. Pardo, "The Problematic Value of Mathematical Models of Evidence," (manuscript in progress, on file with author).

[85] In a recent case upholding the admission of such testimony, for example, Judge Easterbrook explained:

these areas, the neuroscience evidence, when properly explained, may assist rather than hinder jurors in assessing statements—and such assistance is the whole point of expert testimony.[87]

Even a highly reliable neuroscience test, as explained above, would not establish knowledge or lies directly. Therefore, with regard to the neuroscience evidence, jurors would still need to play their traditional role in assessing it. These assessments should consider whether other (criterial) evidence regarding credibility should override the test results (rendering the test conclusion unlikely); the possibility of errors in conducting or analyzing the test (with known error rates for technique and "lab" errors told to the jury); and the possibility of perjury by the technician. These considerations, as well as other evidence in the case, would all affect the probative value of the evidence[88]—and nothing in the nature of the neuroscience evidence or its complexity would prevent jurors from adequately assessing its probative value in light of the above considerations. If properly instructed, there is no reason to think that the evidence would usurp jury powers any

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> it may be prudent to avoid complicating criminal trials with general scientific evidence about the psychology of identification--though scientific evidence that a given person deviates from the norm (for example, is exceptionally suggestible) may be invaluable.

Newsome v. McCabe, 319 F.3d 301, 306 (2003).

[86] In vacating a conviction because the district court excluded expert testimony regarding false confessions, Judge Diane Wood explained:

> It was precisely because juries are unlikely to know that social scientists and psychologists have identified a personality disorder that will cause individuals to make false confessions that the testimony would have assisted the jury in making its decision. It would have been up to the jury, of course, to decide how much weight to attach to Dr. Ofshe's theory, and to decide whether they believed his explanation of Hall's behavior or the more commonplace explanation that the confession was true.

United States v. Hall, 93 F.3d 1337, 1345 (1996).

[87] See Fed. R. Evid. 702.

[88] See Pardo, supra note 72 at 374-83; see also Allen & Pardo, supra note 84.

more than DNA evidence or testimony regarding eyewitness identifications and false confessions would.

Beyond these conceptual issues, the neuroscience evidence in its present state faces empirical limitations as well. The fMRI researchers note its nascent stage.[89] The studies have involved small samples, relatively low-stakes and less-emotional situations, and the findings involve generalizations from groups of individuals. The legal admissibility of such a test therefore awaits more individualized reliability:

> the studies . . . concern the average brain activities of groups of subjects and we are aware of no study to date that has provided convincing evidence of a physiology of deception at the level of a single subject. Hence, there may well be a range of individual differences and it would be premature to extrapolate from the sorts of data we have considered to the individual suspect in the courtroom or the cell.[90]

As the research develops, however, reliable individualized results may emerge.[91] Reliable individualized results would make the tests admissible under federal rules of admissibility, perhaps initially for limited purposes such impeachment.[92] The evidence would, by hypothesis, be based on sufficient data and reliable principles and methods.[93] More importantly, individualized results would better fit forensic settings and hence

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[89] See, e.g., Spence, supra note 17 at 1760-61.

[90] Spence, supra note 17 at 1761. See also Keckler, supra note 10 at 542 ("the estimated error rate for any particular pattern activation as indicative of lying, *without calibration on the individual*, would be unacceptably high for admissibility." [original emphasis]) At least one of the commercial providers of such tests, however, asserts that "services to litigators" will be available in 2006. See http://www.cephoscorp.com/ (last visited April 15, 2006)

[91] The research is currently attempting to make such individualized assessments. See Daniel D. Langelben et al, *Telling Truth from Lie in Individual Subjects with Fast Event-Related fMRI*, 26 HUM. BRAIN MAPPING 262 (2005).

[92] Keckler, supra note 10 at 537-53, provides a model for admitting such evidence for impeachment purposes in civil cases.

[93] The underlying science is not in dispute. See Fed. R. Evid. 702(1)-(2).

would be applied "reliably to the facts of the case."[94] In addition, the evidence would satisfy additional guiding factors the Supreme Court identified in *Daubert* for assessing the admissibility of scientific evidence: the techniques and underlying principle would be falsifiable, subject to peer review and publication, and have identifiable error rates.[95] Given the wide discretion to trial judges to determine admissibility in the area,[96] there may be an initial divergence in the willingness of courts to admit the evidence. But (perceived) reliable use for limited purposes in some initial cases may lead to an increased willingness of other courts to exercise their discretion and admit it.[97]

The "brain fingerprinting" technique has presented more immediate challenges, and difficulties.[98] In two cases, defendants have sought to prove their innocence by showing the test revealed that they did not have knowledge of the details of the crimes for which they were convicted. In one case, the court reversed on other grounds without

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[94] Fed. R. Evid. 702(3).

[95] Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 593-94 (1993). The last variable—known error rates—is a serious problem for certain kinds of expert testimony (such as handwriting, voice, bite-mark, ballistics, and even fingerprint identifications) because in some cases they may be quite high but not revealed to courts and juries. See Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (Aug. 2005). With regard to the neuroscience evidence, knowing the error rates may be just as important as that they be sufficiently low; the fact-finder needs this information to determine how much probative value to assign to the evidence.

[96] In General Electric Co. v. Joiner, 522 U.S. 136 (1997), the Court stated that district-court decisions regarding the admissibility of expert testimony should be reviewed for abuse of discretion. And then in Kuhmo Tire Co., Ltd. V. Carmichael, 526 U.S. 137 (1999), the Court clarified that *Daubert* applied to all expert testimony, and that the abuse-of-discretion standard applied to both conclusions about admissibility and decisions about which factors are important for assessing the reliability of such evidence.

[97] Therefore, states that still adhere to the pre-Fed. R. Evid. 702 standard of "general acceptance" articulated in Frye v. United States, 293 F. 1013 (D.C. Cir. 1923), will take longer to admit such evidence. A similar story will likely be told about the admissibility of "mitochondrial" DNA testing. See Edward K. Cheng, *Mitochondrial DNA: Emerging Legal Issues*, 13 J.L. & POL'Y 99 (2005).

[98] Solovitch, supra note 42, discusses a similar study of the technique that found only a 50% accuracy rate. Moreover, it's not clear why previously having observed similar events or people might not be enough to (incorrectly) trigger a "knowledge" result. For example, suppose a subject undergoing the test is shown a picture of a victim who just happens to look like his Aunt Sally, or a scene that shares similarities with his friend's home.

relying on the evidence[99]; in the second, a state appellate court refused to grant post-conviction relief on the basis of such evidence.[100] This second court based its decision on the failure to provide corroboration of the claims that: the technique is reliable; has been extensively tested; analyzed in "numerous" peer-reviewed journals; has a low error rate; or is generally accepted in the "relevant scientific community."[101] Like the fMRI evidence, however, this evidence will likely become admissible under federal standards if it is shown to be based on sufficient data and applied reliably to the facts in the case. The technique already appears to be based on reliable principles and methods[102]; therefore, independent testing[103] and corroboration of Farwell's technique will make the admissibility more likely, with more acceptance perhaps to follow.

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[99] Harrington v. State, 659 N.W.2d 509, 516 (Iowa 2003) ("Because the scientific testing evidence is not necessary to a resolution of this appeal, we give it no further consideration."). The court explained the evidence as follows:

> This testing evidence was introduced through the testimony of Dr. Lawrence Farwell, who specializes in cognitive psychophysiology. Dr. Farwell measures certain patterns of brain activity (the P300 wave) to determine whether the person being tested recognizes or does not recognize offered information. This analysis basically "provide[s] information about what the person has stored in his brain." According to Dr. Farwell, his testing of Harrington established that Harrington's brain did not contain information about Schweer's murder. On the other hand, Dr. Farwell testified, testing did confirm that Harrington's brain contained information consistent with his alibi.

Id. at 516 n.6.

[100] Slaughter v. State, 105 P. 3d 832 (Okla. Crim. App. 2005).

[101] Id. at 835-36.

[102] Moenssens, supra note 42 at 916-20, reaches a similar conclusion.

[103] Judge Lumpkin's opinion in *Slaughter*—focusing on the lack of independent corroboration—appears to be an excellent example of a court's ability to take flexible, gate-keeping functions seriously with regard to expert testimony (as *Daubert* and *Kuhmo* suggested they could and should). 105 P.3d at 835 ("beyond Dr. Farwell's affidavit, we have no real evidence that Brain Fingerprinting has been extensively tested.") Despite the powerful results reported by Farwell, see http://www.brainwavescience.com/ (last visited February 8, 2006), independent testing of the technique would provide a much greater assurance of reliability, rather than relying on the say-so of one expert who is purporting to revolutionize the field of lie detection.

I next turn to how the Constitution will respond to the compelled production of such evidence. For the rest of this article, I will assume that whenever admissibility is an issue, both techniques will have evolved to a sufficient level of reliability to warrant admissibility. But even if not admissible, the tests may still be used as information-gathering devices, in which case the Constitution will still limit their use.

III. CONSTITUTIONAL CRIMINAL PROCEDURE

Advances in technology have posed difficult issues for criminal-procedure jurisprudence. On one hand, the advances allow the gathering of information that might otherwise be obtained only through typical violations of constitutional protections. On the other hand, however, the advances also sometimes remove the factual predicates normally thought necessary for such violations. For example, listening devices placed outside phone booths[104] and thermal-imaging devices aimed at houses[105] reveal information about conversations and the inside of homes, but without the need for the physical trespass once thought necessary for a violation of the Fourth Amendment.[106] Neuroscientific evidence raises similar tensions. On the one hand, an fMRI lie detector or the "brain fingerprinting" technique share similarities with other physical examinations such as blood tests, breathalyzers, and fingerprint tests, which may be compelled under certain circumstances. On the other hand, however, the neuroscience tests arguably are

[104] Katz v. United States, 389 U.S. 347 (1967).

[105] Kyllo v. United States, 533 U.S. 27 (2001).

[106] Silverman v. United States, 365 U.S. 505 (1961).

qualitatively different in that they compel inductive evidence of mental events, a subject's beliefs, thoughts, propositional knowledge.

How this tension is resolved will depend on how both the evidence and the constitutional protections are conceptualized. The former was the subject of the last section; the latter and how the two fit together is the subject of this section. Although the neuroscience research is still in a nascent stage, it continues apace.[107] As Henry Greely notes, exactly how the effects of this technology "would play out in light of our current criminal justice system, including the constitutional protections of the Bill of Rights, is not obvious."[108] How the legal system will or should respond to the compelled use of such evidence, given the significant constitutional issues at stake, needs to be answered before its use becomes widespread.[109]

The Fourth Amendment's ban on unreasonable searches or seizures and the Fifth Amendment's ban on compelled self-incrimination work together to regulate government evidence gathering.[110] In addition to these provisions, Due Process, both procedural and substantive, provides additional constraints on government evidence gathering not otherwise prohibited. The neuroscientific evidence is analyzed below in terms of such provisions. Before turning to that analysis directly, however, a few words on method are necessary.

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[107] See supra note 3; supra note 91.

[108] Henry T. Greely, *Prediction, Litigation, Privacy, and Property*, in NEUROSCIENCE AND THE LAW, supra note 4 at 137.

[109] And even if the science never becomes reliable enough to become admissible or used as an investigative tool, the example provides a good hypothetical for testing the limits of various constitutional theories. See infra at pp. 44-47.

[110] The relationship between the two amendments is explained in Pardo, supra note 13.

The analysis begins with the core, entrenched practices and principles for the relevant provisions. An alternative approach for analyzing the neuroscience tests would search for one normative justification or principle that underlies the particular provisions and from which doctrinal consequences regarding the tests may be deduced.[111] Such theories are legion, and problematic. They are problematic because they are both over- and under-inclusive in explaining not only current practices and rules, but intuitively desirable ones as well. Consider, for example, three examples of such theories regarding the privilege against self-incrimination.[112] Attempts have been made to justify the privilege in terms of the following rationales: it protects privacy[113]; it prevents torture and other abusive tactics[114]; and it protects dignity[115] by not subjecting people to the "cruel trilemma" of incrimination, perjury, or contempt.[116]

Although each of these theories sheds some light on the possible justifications underlying the privilege, and consequently on how the privilege may be implicated by the neuroscience tests, none of these justifications by themselves can explain the privilege's

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[111] See, e.g., Robert S. Gerstein, *Privacy and Self-Incrimination*, 80 ETHICS 87, 87-88 (1970):

> Any defense of the privilege must be founded on a clearly articulated justification for its existence. It must be a justification which will form a solid basis for the core of the privilege as we now know it, while offering criteria for a soundly rationalized redrawing of the boundaries for its applicability.

[112] For analysis of additional theories, see Pardo supra note 13 at 1862-66. Similar arguments could be made regarding normative theories of the Fourth Amendment. See Ronald J. Allen & Ross M. Rosenberg, *The Fourth Amendment and the Limits of Theory: Local Versus General Theoretical Knowledge*, 72 ST. JOHN'S L. REV. 1149 (1998).

[113] See, e.g., Peter Arnella, *Schmerber and the Privilege against Self-Incrimination: A Reappraisal*, 20 AM. CRIM. L. REV. 31 (1982).

[114] See Murphy v. Waterfront Comm'n, 378 U.S. 52, 55 (1964).

[115] For general dignity-based defenses see Gerstein, supra note 105; R. Kent Greenawalt, *Silence as a Moral and Constitutional Right*, WM. & MARY L. REV. 15, 39 (1981).

[116] See *Murphy*, 378 U.S. at 55.

presence or absence in core, intuitively clear examples. Privacy theories can't explain the privilege's absence when those granted immunity are forced to disclose private information about themselves, or why anyone can be forced to disclose private, incriminating information about friends and family members. On the flipside, a privacy rationale can't explain the privilege's applicability when the government already knows the information. Likewise, contra a torture rationale, the privilege applies in non-torturous situations, like in open court, and the privilege does nothing to prevent abusive practices when incriminating information is not used in a criminal prosecution.[117] Finally, the "cruel trilemma" rationale can't explain the privilege's absence when one faces a similar trilemma when compelled to provide a voice, handwriting, or urine sample.[118] Proponents of such theories may claim that the practices and rules should therefore be revised, but such required revisions may more plausibly provide *reductio ad absurdum* conditions for the theories.[119]

The failure of such theories has caused some to criticize the provisions as being unjustified or irrational.[120] Such criticism is misplaced for two reasons. First, the criticism assumes that each provision must have a single justification that provides necessary and sufficient conditions for the provision's application. But such conditions are themselves unnecessary. A rule may prevent various kinds of situations from

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[117] See Chavez v. Martinez, 538 U.S. 760 (2003).

[118] On the last example, see the fictional account at a tennis academy in DAVID FOSTER WALLACE, INFINITE JEST 151-56 (1996).

[119] For further meta-theoretic discussions of these theories see Pardo, supra note 13 at 1862-66.

[120] See David Dolinko, *Is there a Rationale for the Privilege against Self-Incrimination?*, 33 UCLA L. REV. 1063 (1986); Henry J. Friendly, *The Fifth Amendment Tomorrow: The Case for Constitutional Change*, 37 U. CIN. L. REV. 671 (1968).

occurring, each of which may share similarities with others in the group, without all of the situations being reducible to one characteristic. The privilege against self-incrimination appears to apply to such a "family resemblance"[121] of events—preventing some kinds of abusive conduct, eliminating some kinds of unreliable evidence, and protecting some kinds of privacy. Second, criticisms of the privilege for not having one essential normative justification collapse the difference between a rule and its justification(s).[122] Part of what constitutes a rule's existence is that it may operate independently of its justification(s). For example, the justification for a restaurant's rule not to allow pets inside may be to avoid noisy disruptions, but the rule would still apply to quiet pets and not apply to noisy children.[123] Indeed, where a rule has several justifications—such as a "no pets" rule to prevent noise, messes, health-code violations, upsetting allergic customers, and so on—an overarching rule eases administration and prevents deciding each problem on a case-by-case basis with regard to several different justifications.[124] A similar situation plausibly applies to the privilege against self-incrimination. In any event, in the below analysis, rather than look for one deep

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[121] The notion of a "family resemblance" concept is Wittgenstein's, who argued against the mistake that our uses of a concept must share an essential characteristic. Rather—like members of a family who share some physical characteristics with others, who in turn share different characteristics with other, and so on—some concepts have multifarious uses, which share different similarities with others. His famous example involved "games." LUDWIG WITTGENSTEIN, PHILOSOPHICAL INVESTIGATIONS 31-34 (G.E.M. Anscombe trans. 1953). Frederick Schauer has suggested that the "family resemblance" idea may apply to the justifications and practices covered by "freedom of speech." See FREDERICK SCHAUER, FREE SPEECH: A PHILOSOPHICAL ENQUIRY 14 (1992).

[122] See FREDERICK SCHAUER, PLAYING BY THE RULES: A PHILOSOPHICAL EXAMINATION OF RULE-BASED DECISION-MAKING IN LAW AND IN LIFE 53-76 (2002).

[123] See id. at 63.

[124] In Schauer's terminology this would constitute a "rule-generating justification," namely, a reason to formulate a rule rather than always appealing to the various underlying justifications whenever each new situation arises. See id. at 94.

justification for the constitutional provisions by which to analyze the neuroscientific evidence, I analyze the evidence in light of the provisions' entrenched rules and practices.

While accepting the entrenched practices for each provision, the analysis does not settle for indiscriminate description of every decision in the area.[125] Rather, the entrenched practices may be used to critique gaps or inconsistencies in other parts of the legal doctrine.[126] The next subsections apply a two-part framework developed previously for evaluating situations that implicate both the Fourth and Fifth Amendments.[127] First, does the Fourth Amendment render the attempt at evidence-gathering unreasonable? And even if reasonable, does the attempt seek to compel incriminating propositional content from a suspect's mind in order use it against that suspect in a criminal prosecution? If so, the privilege, if invoked, blocks the attempt.

A. *The Fourth Amendment*

Analysis under the Fourth Amendment of compelled neuroscience tests is fairly straightforward. The neuroscience tests fall within relatively clear and well-developed doctrinal rules that regulate the compelled production of evidence from suspects' bodies. Compelling such tests would be a "search" under the Court's "reasonable expectation of

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[125] For examples of such descriptive/ predictive theories see Allen & Rosenberg, supra note 110; Ronald J. Allen & M. Kristin Mace, *The Self-Incrimination Clause Explained and Its Future Predicted*, 94 J. CRIM. & CRIMINOLOGY 243, 248-49 (2004).

[126] The process resembles the reflective relationship between theory and particular cases discussed in NELSON GOODMAN, FACT, FICTION, AND FORECAST 64 (4th ed. 1983) and JOHN RAWLS, A THEORY OF JUSTICE 42-5 (rev. ed. 1999). Pardo, supra note 13 at 1881-02, for example, demonstrates how, based on entrenched practices, courts have transposed doctrinal considerations relevant to the Fourth and Fifth Amendments, respectively, in areas involving subpoenas, stop-and-identify statutes, and the use of pre-arrest silence as evidence of guilt.

[127] See Pardo, supra note 13 at 1879-81. According to this view, government evidence-gathering faces a general, first-level, reasonableness inquiry (Fourth Amendment); then, at a more specific, second level the self-incrimination privilege protects a subset of events not otherwise prohibited by the first-level inquiry. Courts and scholars run into doctrinal and conceptual difficulties when the falsely assume that the two provisions diverge to protect different events or situations. This is demonstrated in id. at 1875-1902.

privacy"[128] test. Like other information about inner bodily processes such as the contents of one's blood or urine, subjects have a "reasonable expectation of privacy" in information about their brain states.[129] Moreover, the fact that the neuroscience tests measure brain details from outside the scalp does not destroy the analogy. One has a reasonable expectation of privacy in the details of one's home (even when measured from outside with a thermal-imaging device)[130] and in the contents of one's telephone conversations (even when a gathered with an outside listening device).[131] Given these examples, one plainly also has a reasonable expectation of privacy in the details of what's in her head, even though the government doesn't have to invade the body to learn the information.[132] Because it's a "search" under the Fourth Amendment, such a test could be compelled if the government has probable cause and a warrant, or a recognized exception to these requirements.[133]

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[128] Katz v. United States, 389 U.S. 347, 360 (1967) (Harlan, J. concurring).

[129] Schmerber v. California, 348 U.S. 757 (1966) (blood test); Skinner v. Railway Labor Exec. Ass'n, 389 U.S. 602 (1989) (urine test). Compelling a neuroscience test also appears to be a "seizure" because it would involve a show of authority (requiring the subject to sit for the test) followed by submission by the subject. See California v. Hodari D., 499 U.S. 621, 625-29 (1991).

[130] Kyllo v. United States, 533 U.S. 27 (2001).

[131] Katz v. United States, 389 U.S. 347, 360 (1967).

[132] Indeed, one might intuitively presume that the details in one's head are qualitatively *more* private than those regarding blood, urine, homes, and conversations such that a showing *beyond* probable cause should be required to be reasonable. While I understand the intuitions that would suggest this reasonable-doubt-plus standard, I doubt the Court would take this step. Cf. Atwater v. Lago Vista, 532 U.S. 318 (2001), where the Court rejected a similar standard (suggested by Justice O'Connor, id. at 360-68) for full custodial arrests based on minor traffic violations. Moreover, I think the intuitions suggesting such a standard for the neuroscience tests are, to some extent, based upon misconceptions regarding the nature of the evidence, which is clarified supra at pp. 17-26.

[133] See Wong Sun v. United States, 371 U.S. 471 (1963); Warden v. Hayden, 387 U.S. 294 (1967) ("exigent circumstances" exception to the warrant requirement); Illinois v. Lidster, 540 U.S. 419 (2004) (applying "special needs" exception to the probable cause and warrant requirements to a roadblock); Bd. of Educ. v. Earls, 536 U.S. 822, 828-38 (2002) (applying "special needs" exception to school drug testing). Another newfangled kind of lie detector attempts to use thermal-imaging technology to measure heat coming off the eyes of suspects. For analysis of this technology under the Fourth Amendment see George

The Supreme Court's opinion in *Schmerber*, which involved a compelled blood test, is instructive.[134] There the defendant was hospitalized after an automobile accident.[135] An officer at the hospital ordered a blood test of the defendant, over the defendant's refusal.[136] The test was forcibly conducted, and the blood was analyzed for alcohol content.[137] The Court concluded that the compelled test was a search and seizure under the amendment, but that because the human body is not "inviolate" against all forms of government evidence-gathering, such a test would be acceptable if supported by probable cause.[138] Probable cause existed because the officer smelled alcohol on the defendant's breath and observed his bloodshot eyes, and the Court found a warrant was not required because the time needed to obtain one would allow the evidence to be destroyed.[139] The Court also noted that the test was reasonable because it was conducted in a safe manner with minimal risk, trauma, and pain.[140] Likewise, a compelled fMRI or "brain fingerprinting" test would measure information regarding internal bodily activity, in this case brain states. A suspect, therefore, could be compelled to take the test if probable cause exists to believe the test will reveal evidence, and the government obtains

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M. Dery, *Lying Eyes: Constitutional Implications of New Thermal Imaging Lie Detection Technology*, 31 AM. J. CRIM. L. 217, 242-44 (2004) (concluding that the use may not be a "search" when used on those in public because they voluntarily expose such heat to the public).

[134] Schmerber v. California, 348 U.S. 757 (1966).

[135] Id. at 758.

[136] Id. at 759.

[137] Id.

[138] Id. at 767-69.

[139] Id. at 768-69. This exigent-circumstances exception to the Fourth Amendment's warrant requirement was further established the next year in Warden v. Hayden, 387 U.S. 294, 298 (1967).

[140] 384 U.S. at 771.

a warrant or a warrant exception applies. Moreover, the neuroscience tests appear to be less intrusive than a blood test; they are safe, relatively painless, and don't involve piercing the skin.

A more difficult, and troubling, question concerns whether the government can compel such tests via a grand-jury subpoena, which would not first require a showing of probable cause. Consider a situation where the government obtains a grand-jury subpoena compelling 20 possible suspects to sit for a neuroscience test. Formally, the subpoenas may not be unreasonable, nor used to compel irrelevant evidence, nor to harass or burden a target.[141] Such protections, however, are feckless is practice. In practice, the burden would be on the targets, not the government, to show that

> there is *no reasonable possibility* that the *category* of materials the Government seeks will produce information relevant to the *general subject* of the grand jury's investigation.[142]

It would virtually impossible for a suspect to show that an fMRI or "brain fingerprinting" test would have no reasonable possibility of revealing relevant information about a general subject matter.

The Court's opinion in *Dionisio* provides an analogous situation.[143] There, 20 suspects were subpoenaed to provide a voice sample to the local U.S. Attorney's office.[144] The Court upheld the subpoena over a Fourth Amendment challenge brought by one of the targets, concluding that, despite any inconvenience or burden to the targets,

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[141] See Fed. R. Crim. P. 17; United States v. Dionisio, 410 U.S. 1 (1973); United States v. R Enterprises, Inc., 498 U.S. 292, 299 (1991) (noting the government cannot "engage in arbitrary fishing expeditions").

[142] R Enterprises, 292 U.S. at 301 [emphasis added].

[143] 410 U.S. 1 (1973).

[144] Id. at 3.

the government need not make a showing of relevance because the grand jury's powers are necessarily broad and that a probable-cause showing was not necessary because the subpoena involved less "social stigma" than an arrest.[145] Similarly, the government would need to make neither a relevance nor a probable-cause showing before rounding up the suspects for a neuroscience test, which would also involve less "social stigma" than an arrest. For these reasons, Stephen Morse's sanguine statement that "it is clear that the government will not be able to use neuroscience investigative techniques to go on 'mental fishing expeditions'"[146] may not necessarily be true—unless another provision in the Constitution picks up the slack.[147] The most likely candidate is the privilege against self-incrimination, which is discussed next.

Current doctrine aside, a better approach in these situations, and one that better accords with core Fourth Amendment practices and principles, would require the government to make some type of reasonableness showing. Because of a grand jury's need for broad investigatory powers[148] and the less "stigma" involved with a subpoena,[149] the showing need not be one of probable cause. The Fourth Amendment already

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[145] Id. at 3-7, 12-13.

[146] Morse, supra note 65 at 188. See also Keckler, supra note 10 at 555 n. note 142, ("the level of suspicion required for involuntary questioning by fMRI would presumably be at minimum that required for any form of custodial interrogation.")

[147] As explained in more detail in Pardo, supra note 13 at 1881-90, this gap in Fourth Amendment doctrine best explains the Court's mistaken transposition of a "government knowledge" inquiry into its analysis of whether the privilege against self-incrimination protects subpoena targets from compelled production. The Court's strange requirements in Fisher v. United States, 425 U.S. 391 (1976), and United States v. Hubbell, 530 U.S. 27 (2000), that the relevant information must not be a "foregone conclusion" (*Fisher*) or described with "reasonable particularity" (*Hubbell*) appear to work to prevent the "fishing expeditions" that should be protected by the Fourth Amendment. Nowhere else does the scope of the Fifth Amendment privilege turn on what the government knows.

[148] See Richard Uviller, *Foreword: Fisher Goes on Quintessential Fishing Expedition and Hubbell is off the Hook*, 91 J. CRIM. & CRIMINOLOGY 311, 321-22, 334-35 (2001).

[149] Dionisio, 410 U.S. at 3-7, 12-13.

accommodates such needs for lower standards, for example, by requiring only "reasonable suspicion" for brief, investigative stops.[150] A similar standard in this situation could prevent arbitrary "fishing expeditions" as well as prevent burdening or harassing innocent targets.[151]

B. *The Self-Incrimination Clause*

This part first analyzes the neuroscience evidence, and it then uses the analysis and examples discussed to test other proposed theories of the privilege against self-incrimination.

1. Neuroscience Evidence and Self-Incrimination

Whether the privilege against self-incrimination would prohibit forcing suspects to submit to the neuroscience tests presents a more difficult question. In practice, the privilege prohibits (1) compelled, (2) incriminating, (3) testimonial communications, and these three formal elements structure the analysis. With regard to the neuroscientific evidence, the first two elements are relatively straightforward, and the third presents a difficult question.

The first element—compulsion—refers to government conduct that causes a suspect to make statements. Whether conduct is "compulsion" or not turns on the permissibly of the kinds of conduct involved, not necessarily the pressure placed on

[150] Terry v. Ohio, 392 U.S. 1, 16-27 (1968).

[151] One district court has required a similar standard in response to a subpoena for blood and saliva. See Henry v. Ryan, 755 F. Supp. 247 (N.D. Ill. 1991) (requiring "subpoena for physical evidence must be based on individualized suspicion"). Most other district courts, however, have applied the basic "reasonableness" standard that applies to any other grand-jury subpoena. See, e.g., United States v. Garcia-Ortiz, 2005 WL 3533322, *8 (D. Puerto Rico 2005); United States v. Swanson, 155 F. Supp. 2d 992 (C.D. Ill. 2001); In Re Grand Jury Proceedings, 38 F. Supp. 2d 159 (D. N.H. 1998). One district court, by contrast, has required "probable cause" for a grand-jury subpoena for a blood sample. In re Grand Jury Proceedings, 816 F. Supp. 1196 (E.D. Ky. 1993). The Supreme Court has never required a higher standard under the Fourth Amendment for subpoenas for bodily fluids. See also Floralynn Einesman, *Vampires Among Us—Does A Grand Jury Subpoena for Blood Violate the Fourth Amendment?*, 22 AM. J. CRIM. L. 327 (1995).

suspects. Clear examples of compulsion include threats of contempt for not testifying or threats of violence for not confessing.[152] By contrast, offers of favorable plea agreements or trickery to induce statements are not compulsion. For purposes of my analysis, requiring the neuroscience tests would, by hypothesis, be compulsion. I'm assuming that subjects are being forced to submit to the tests, either by physically restraining them and conducting it (as in *Schmerber*) or by subpoenaing them to submit with a threat of contempt for noncompliance.

The second element—incrimination—refers to whether the compelled information will be used in a criminal prosecution against the subject, either directly or to derive other evidence. "Incrimination" is construed broadly to include any evidence that reasonably "could be used in a criminal prosecution or could lead to other evidence that might be used."[153] "Incrimination," and hence the privilege, does not apply when subjects are granted immunity[154]; when the information would lead to non-criminal sanctions only, such as loss of a job or a license or to disgrace or embarrassment; or when the information is sought to incriminate a third party, including friends and family.[155] Therefore, the compelled neuroscience tests would fall within these rules: the incrimination element would be met when the results could lead to evidence used in a criminal prosecution; subjects could not invoke the privilege when they are granted

[152] See also Griffin v. California, 380 U.S. 609 (1965) (prosecution may not refer to defendant's invocation of the privilege); see also Lefkowitz v. Turner, 414 U.S. 70 (1973) (striking down state statute that required state contracts to contain a clause that contractors waive their right to invoke the self-incrimination privilege with regard to subject matter relating to the contract).

[153] Kastigar v. United States, 406 U.S. 441, 445 (1972).

[154] Id.

[155] See Ullmann v. United States, 350 U.S. 422, 430-31 (1956).

immunity, face non-criminal sanctions only, or the test results are sought to incriminate a third party.

The third element—testimony—is less clear. Two principles help to delineate this variable. First, "testimonial" or "communicative" evidence is often contrasted with "real" or "physical" evidence. *Schmerber* drew this distinction explicitly in concluding that the compelled blood test did not implicate the privilege against self incrimination:

> The distinction which has emerged, often expressed in different ways, is that the privilege is a bar against compelling 'communications' or 'testimony', but that compulsion which makes a suspect or accused the source of 'real or physical evidence' does not violate it.[156]

To this end, in addition to blood tests, the privilege does not apply to other compelled evidence from a suspect's body such as hair, fingerprints, and breathalyzer tests[157]; to voice[158] and handwriting[159] exemplars (because physical characteristics are what is relevant); and to orders to appear in a lineup[160] or to try on clothing.[161]

The second principle for delineating this variable is that "testimonial communications" for purposes of the privilege are not limited to verbal or written acts by suspects. The Court's subpoena cases are illustrative. The act of responding to a subpoena by providing a requested object or document discloses one's (1) knowledge that the object exists, (2) possession of it, and (3) belief that the provided object is the one

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[156] 384 U.S. at 764.

[157] Id. at 760-65.

[158] Dionisio, 410 U.S. at 5-7.

[159] United States v. Mara, 410 U.S. 19, 21-22 (1973).

[160] United States v. Wade, 388 U.S. 218, 221-23 (1967).

[161] Holt v. United States, 218 U.S. 245, 252-53 (1910).

demanded.[162] In other words, the requested objects or documents are not protected, but the "testimonial" acts of production are protected. In *Fisher v. United States*, for example, the Court held that responding to a subpoena for tax documents did not implicate the privilege because the government already knew of the existence and location of the documents; therefore, the defendant did not use the defendant's testimonial communications.[163] By contrast, in *United States v. Hubbell*, the Court found that the privilege did apply to a request for thousands of documents that the government could not describe with particularity because the government made use of the "contents of [Hubbell's] mind" and thus his testimonial communications.[164]

From these two principles the scope of "testimonial communications" may be articulated in the following rule: The government may not compel for use as evidence the content of a suspect's propositional attitudes. Propositional attitudes are mental states such as beliefs, thoughts, doubts, hopes, wishes, desires, knowledge, and so on, toward propositions.[165] For example, a subject's belief *that so and so* (e.g., "that the victim was out of town during the robbery") or knowledge *that such and such* (e.g., "I robbed the

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[162] Fisher v. United States, 425 U.S. 391 (1976).

[163] 425 U.S. 391, 411 (1976). See also Doe v. United States, 487 U.S. 201 (1988), where a target of a grand-jury subpoena was directed to sign a form releasing details regarding any foreign bank accounts in his name, without admitting their existence. The Court concluded that the privilege did not apply because the act of signing the form did not invoke "testimonial aspects" of production: "By signing the form, Doe makes no statement, explicit or implicit, regarding the existence of a foreign bank account or his control over any such account." Id. at 215-16. The Court explained the policies beyond the privilege as follows: "to spare the accused from having to reveal, directly or indirectly, his knowledge of facts relating him to the offense or from having to share his thoughts and beliefs with the Government." Id. at 213.

[164] 530 U.S. 27 (2000). See also United States v. Doe, 465 U.S. 605, 612-17 (1984), where the Court concluded that a grand-jury target's acts of producing business records in response to a subpoena qualified as "testimonial" because they would reveal the existence and authenticity of the documents.

[165] See A COMPANION TO THE PHILOSOPHY OF LANGUAGE 679 (Bob Hale & Crispin Wright eds. 1999).

house"). When the government uses the informational content of those propositions (in other words, the '*so and so*' and '*such and such*'), the testimony variable is satisfied.[166]

Two additional examples help to further flesh out this rule and the related principles. First, consider a psychiatric examination used during a capital-sentencing proceeding in order to determine future dangerousness. In *Estelle v. Smith*, the Court held that a defendant's statements made during the examination were "testimonial" because "the State used as evidence against respondent the *substance* of his disclosures." [emphasis added].[167] Specifically, the testifying psychiatrist reached the conclusion that the defendant was a "severe sociopath" and "he will commit other similar or same acts" based on the defendant's account of his previous crime during the examination.[168] Second, consider a suspect asked whether he knows the date of his sixth birthday in order to determine the extent of his intoxication. In *Pennsylvania v. Muniz*, the Court had to determine whether an answer to this question (in this case, "I don't know") qualified as testimonial (along with other compelled evidence such as field-sobriety tests and biographical information elicited during "booking").[169] Although the Court ended up concluding the sixth-birthday question was covered by the privilege against self-

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[166] The above analysis follows Allen and Mace's descriptive account of the privilege, supra note 125 at 246-47, which explains the privilege as applying to "the substantive content of cognition" and "the propositions with truth-value that people hold." Under the rule articulated above, the privilege also would extend to a person's false beliefs (for example, a defendant's false belief that a victim named the defendant as the beneficiary of her will), and to those that are neither true nor false, for example, if the content were used to identify the person as the culprit of a crime. See also Uviller, supra note 148 at 325 n.50 (2001) (privilege protects a person's "sovereignty over the contents of his mind."). But the privilege does not protect a suspect's mental sovereignty when that person has been granted immunity or the content is being compelled to incriminate a third party.

[167] Estelle v. Smith, 451 U.S. 454, 459-60, 463-66 (1981). The substance of the defendant's disclosures is the content of what he said.

[168] Id. at 459-60, 464-65.

[169] Pennsylvania v. Muniz, 496 U.S. 582, 586 (1990).

incrimination, it did not decide whether it was "testimonial." Four justices concluded that it was testimonial[170]; four justices concluded it was not[171]; and Justice Marshall rejected the testimonial/ non-testimonial distinction and concluded that the privilege should apply to all the evidence regardless of its testimonial qualities (thus providing the fifth vote of the sixth-birthday question).[172] Under the above rule, however, the question and its answer would not be "testimonial" because the *content* of the answer would not be incriminating; the question would only test the defendant's mental acuity at the time, which may be incriminating for reasons other that content.[173] In sum, the psychiatric examination in *Estelle* and the sixth-birthday question in *Muniz* provide an example on each side of the "testimonial" line.

This rule and related principles now illuminate when the privilege would apply to the compelled use of the neuroscience tests. Namely, it would apply when the government compels the tests in order to obtain evidence of the incriminating informational content of subjects' propositional attitudes. Thus, even though the tests gather physical evidence from the subjects' bodies (like blood tests)—unlike other

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[170] Id. at 593-602.

[171] Id. at 607-08 (Rehnquist, C.J., concurring in part and dissenting in part).

[172] Id. (Marshall, J., concurring in part and dissenting in part) ("I believe [the] privilege extends to *any* evidence that a person is compelled to furnish against himself.") Although the "testimonial" requirement appears to be firmly entrenched in current doctrine, Justice Thomas (joined by Justice Scalia) recently has expressed a willingness to consider whether, based on historical grounds, the privilege should be extended to non-testimonial evidence as well. United States v. Hubbell, 530 U.S. 27, 49-56 (2000) (Thomas, J., concurring). Richard Nagareda has argued that this more expansive view of the privilege would better accord with the original understanding of the phrase "to be a witness" in the Fifth Amendment, which he argues meant "to give evidence" not just "testimonial communications." See Richard A. Nagareda, *Compulsion " to be a Witness" and the Resurrection of Boyd*, 74 N.Y.U. L. REV. 1575, 1587 (1999). Akhil Amar and Renee Lettow, by contrast, argue in favor of the "testimonial" limitation on historical, original-understanding grounds. See Akhil Reed Amar & Renee B. Lettow, *Fifth Amendment First Principles: The Self-Incrimination Clause*, 93 MICH. L. REV. 857, 919 (1995) ("Unlike some state constitutions, such as the Massachusetts Constitution of 1780, the Fifth Amendment does not prohibit the government from compelling a defendant to 'furnish evidence against himself.').

[173] Allen & Mace, supra note 125, reach a similar conclusion and provide further analysis of *Muniz*.

physical tests and like "testimonial acts of production"—the tests may provide inductive evidence of their beliefs, knowledge, and other mental states. When the government attempts to make evidential use of the propositional content of such states, the privilege applies; when not, not.

Four examples (two for each kind of test) help to elucidate this distinction.

Example 1: Winston is a suspect in a bank robbery. Winston denies involvement. The government (either with probable cause and a warrant or via subpoena) wants to compel Winston to sit for an fMRI test in order to ask him questions about his involvement in the crime. If the results of the test are consistent with deception, the government plans to uses the results at trial as evidence of guilt, or to gather further evidence against Winston.

Example 2: Alex is arrested for criminal fraud. Upon his arrest, his attorney claims that Alex lacked the mental capacities necessary to engage in such conduct. The government wants to compel Alex to sit for an fMRI test in order to use the results as evidence that, during Alex's answers, his brain triggered the neurological correlates consistent with deception, and thus that he can engage in such conduct.[174]

Example 3: Winston, still suspected of bank robbery, is now compelled to sit for the "brain fingerprinting" test. He is shown images of the bank vault (which only employees and the robbers have seen) and presented with details of the crime. The government

[174] This example is based on one suggested in O'Hara, supra note 5 at 1681-82.

wants to introduce the test results, which suggest prior knowledge when presented with the images and details, as evidence of Winston's guilt.

Example 4: Alex, still suspected of fraud, claims that he has a short-term memory problem, which explains his conduct, rather than an intent to commit fraud. The government compels Alex to sit for the "brain fingerprinting" test. They first present him with some details and, after a short period of time, test him to see if the results suggest "knowledge" when he's again presented with the details. The government wants to offer the results as evidence of guilt, arguing they show that Alex did recognize the details and thus does not have the memory problems he claims.

In these examples, Winston would be able to invoke the privilege while Alex would not.[175] In the Winston examples the tests are relevant in order to generate the incriminating content of Winston's beliefs or knowledge. The evidence of deception is relevant because it provides evidence of Winston's belief that he was involved in the crime; the "brain fingerprinting" evidence is relevant because it provides evidence of Winston's knowledge of the crime scene and details of the crime. By contrast, the Alex examples do not involve attempts to use the incriminating informational content of Alex's mental states. Both tests provide evidence, rather, of Alex's mental capacities; the fact that he has such brain states is evidence of cognitive capacities, not propositional content. This makes the tests more like other compelled tests where physical details are

[175] This is so even though Winston in example # 3 was not required to provide a verbal response. In either case, Fed. R. Evid. 704 would prevent an expert from offering an opinion in a criminal case on whether a defendant did or not "have the mental state or condition constituting an element of the crime charged or a defense thereto."

relevant such as blood tests and handwriting and voice exemplars, and not like testimony. These results appear to be consistent with the Court's dicta in *Schmerber* that a compelled polygraph, while measuring physical details, may still be testimonial:

> Some tests seemingly directed to obtain 'physical evidence,' for example, lie detector tests measuring changes in body function during interrogation, may actually be directed to eliciting responses which are essentially testimonial.[176]

To the extent the neuroscience tests are so directed, the privilege applies.[177]

2. Theoretical Accounts of the Privilege

The neuroscience-test examples provide powerful counter-examples to other theories that purport to explain the scope of the privilege against self-incrimination. Unlike my analysis—which extended the privilege to the neuroscience tests when used to compel the incriminating content of a suspect's propositional attitudes—other prominent theories of the privilege would allow its use. Therefore, the hypothetical use of the neuroscience tests serves an important analytical purpose in testing theoretical accounts of the privilege. If the reader is convinced that the privilege would apply to some uses of the neuroscience tests, then the following four theories fail to the extent that they cannot explain this result and would not extend the privilege to the compelled neuroscience tests. (In other words, the hypothetical Winston and Alex would *both* be unable to invoke the privilege under these theories.)

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[176] 384 U.S. at 764. See also Allen & Mace, supra note 125 at 249 ("the universal intuition is that involuntary polygraphs violate the Constitution.").

[177] When it does, the other corollaries to the privilege attach as well. See, e.g., Griffin v. California, 380 U.S. 609 (1965) (prosecution may not make evidentiary use of defendant's invocation of the privilege); Baxter v. Palmigiano, 425 U.S. 308 (1976) (concluding that adverse inferences may be drawn in non-criminal proceedings against parties who invoke the privilege); California v. Byers 402 U.S. 424 (1971) (privilege non-applicable to mandatory automobile-accident disclosures because required to facilitate non-criminal regulatory regime); Baltimore City Dep't of Soc. Servs. v. Bouknight, 493 U.S. 549 (1990) (privilege inapplicable to guardian requirements in order to facilitate non-criminal social-services administration).

First, Richard Nagareda argues that the privilege protects against a certain "means" of evidence gathering: namely, "the compelled giving of self-incriminatory evidence to the government (categorically impermissible under the Fifth Amendment)" as opposed to "the unilateral taking of such evidence by the government (permissible, when done in compliance with the Fourth)."[178] The distinction between "compelled giving" and "unilateral taking" cannot explain, and hence would appear to withhold the privilege from, at least one type of neuroscience test. This theory would authorize the government to use the "brain fingerprinting" test in every circumstance because the suspect is not required to give answers and the results can be "unilaterally taken" by the government, as could blood samples.[179]

Second, Akhil Amar and Renee Lettow argue that the privilege may be justified by a reliability principle.[180] Therefore, under this normative theory, they argue that current doctrine should be restructured to fit its reliability rationale.[181] Most notably, they suggest that suspects should be compelled to answer questions under oath in pre-trial proceedings, with possible contempt charges for refusing; their statements would be inadmissible, but any physical evidence or testimony their statements led to would be

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[178] Richard A. Nagareda, *Compulsion " to be a Witness" and the Resurrection of Boyd*, 74 N.Y.U. L. REV. 1575, 1587 (1999).

[179] Schmerber v. California, 348 U.S. 757 (1966).

[180] Amar & Lettow, supra note 172 at 928 ("Finders of fact in criminal cases should not be deprived of reliable, highly probative evidence.").

[181] Id. at 898-901.

admissible.[182] The rationale for excluding statements (but not the other evidence) is their unreliability:

> Compelled testimony may be partly or wholly misleading and unreliable; even an innocent person may say seemingly inculpatory things under pressure and suspicion and when flustered by trained inquisitors. But physical evidence is far more sturdy and reliable evidence, so it should be brought before the jury.[183]

Their theory would, therefore, allow use of both types of neuroscience tests under any circumstances once they reached a sufficient level of reliability. The test results would be physical evidence; and even when offered as evidence of the contents of mental states, the reliability of the tests would necessarily remove the unreliability rationale for excluding such evidence.[184]

Third, consider the recent "anti-pooling" theory of the privilege put forward by Daniel Seidmann and Alex Stein.[185] They argue that the privilege protects innocent defendants because, in the absence of a privilege, guilty defendants would offer lies, thus pooling with innocent defendants and lowering the credibility (and hence value) of the innocents' statements.[186] The privilege causes some defendants to invoke it and thus

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[182] Id. at 899-900. ("Physical evidence, on the other hand, can be introduced at trial whatever its source—even if that source is a compelled pretrial utterance.")

[183] Id. at 900-01. See also id. at 925-26 ("Reports of interior mental states are easily misunderstood, notoriously imprecise (depending on a person's mood when reporting), and hard to verify.")

[184] The authors may agree that the privilege should not apply to these compelled tests; the beauty of top-down, normative theories is that we can always revise any practices to fit the desired theory. Although to the extent one accepts the practices as sound (for example, extending the privilege to some compelled uses of the neuroscience tests), then the problem is with the theory that cannot explain those practices.

[185] Daniel J. Seidmann & Alex Stein, *The Right to Silence Helps the Innocent: A Game-Theoretic Analysis of the Fifth Amendment Privilege*, 114 HARV. L. REV. 430 (2000). This "anti-pooling" theory is discussed in further detail in ALEX STEIN, THE FOUNDATIONS OF EVIDENCE LAW 158-64, 200-04 (2005).

[186] Seidmann & Stein, supra note 185 at 451-74.

prevents their pooling with statements made by innocent defendants.[187] Seidmann and Stein argue that this rationale both justifies the privilege and can explain its doctrine.[188] But the "anti pooling" rationale would appear to authorize the neuroscience tests in all circumstances, again assuming sufficient reliability, because the results are involuntary and thus the game-theoretic choices that lead to the undesirable pooling could not be made.

Fourth, and finally, consider the oft-cited "cruel trilemma" rationale, which protects suspects from choosing between self-incrimination, perjury, or contempt.[189] In the context of lie detection, for example, George Dery has employed the "cruel trilemma" framework to conclude that the use of a thermal-imaging device to measure heat off of a subject's face would fall within the scope of the privilege.[190] He reaches this conclusion by analogizing to a similar three-prong choice a suspect would be forced to make: admitting incriminating information, lying and trying to bluff the machine, or refusing to answer and drawing suspicion on himself.[191] Such a "cruel choice," however, would not be available with regard to the neuroscience tests. Under the fMRI brain scan, the brain states are involuntary and not under a subject's control; hence suspects could not bluff the

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[187] Id. at 468-70.

[188] Id. at 474-502.

[189] The source of the phrase was Justice Goldberg in Murphy v. Waterfront Comm'n, 378 U.S. 52, 55 (1964). The Court recently cited this rationale again in Chavez v. Martinez, 538 U.S. 760, 767 (2003).

[190] Dery, supra note 133 at 248.

[191] Id. at 248. As explained infra at pp. 28-31, this cruel-choice rationale is also over-inclusive in that it would extend the privilege to compelled evidence outside of its current scope, for example, handwriting, voice, and urine samples.

machine.[192] And under the "brain fingerprinting" test, there would be even less choice because the tests would not even require the subject to provide answers. Thus, this rationale, like the above three theories, would authorize the use of reliable neuroscience tests under any circumstances.

My analysis of the privilege's scope explains when and why the privilege would protect the compelled neuroscience tests: the privilege protects the incriminating use of the content of one's propositional attitudes. Each of these alternative theories fails to the extent it would allow the compelled use of neuroscience tests in order to discover the incriminating propositional content of a suspect's mind.[193]

C. *Due Process*

In addition to the Fourth and Fifth Amendments, substantive and procedural due process also regulate government evidence gathering. But neither would prevent the compelled use of reliable neuroscientific evidence. The Court has recently clarified that government conduct that does not constitute a violation under the Fourth or Fifth Amendments may still constitute a violation of substantive due process if it is so outrageous that it "shocks the conscience."[194] For example, the Court explained that this standard might be met when a police officer allegedly denied medical treatment in an ambulance to a suspect, who had been shot, as an attempt to extract a confession.[195] The neuroscience tests, however, would not meet this standard because they are relatively safe

[192] See Lee, supra note 23 at 163. It might be argued that under this test, the suspect would still have a choice to answer or not, but this binary choice of compliance or not applies to all compelled evidence. Even those subject to a search warrant have to comply during the search.

[193] See supra note 119 and accompanying text.

[194] Chavez v. Martinez, 538 U.S. 760 (2003).

[195] Id. at 763-64, 779.

and painless—indeed more so than a compelled blood test, which does not violate this standard.[196] Procedural due process also provides some support for excluding involuntary confessions because of their unreliability.[197] But if the neuroscience tests reached a sufficient level of reliability, then this supplementary protection based of procedural due process would be unavailable as well.[198]

CONCLUSION

Neuroscience may soon provide the law with admissible, probative evidence of deception, and with powerful investigative tools. The law must anticipate and respond to the proposed neuroscientific evidence with a clearly articulated understanding of the nature of the evidence and a clearly articulated sense of its constitutional implications and limitations. This paper has attempted to further those ends.

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[196] Schmerber v. California, 348 U.S. 757 (1966). PET scans, which are significantly more invasive, are unlikely to be compelled. See supra note 14. The fMRI tests may also likely compelled in certain circumstances during civil discovery. See Fed. R. Civ. P. 35. Whether the Constitution would place any restrictions on the use of such tests for government purposes outside of criminal prosecutions, such as intelligence gathering or other military purposes, is outside the scope of this article. The use of reliable neuroscience tests, however, may have some beneficial effects in such information-gathering contexts: their reliability would lead to better information; they may lead to quicker determinations of who does and does not have information (hence perhaps shortening the detention of innocent suspects who have answered honestly); and the fact that the tests are safe and painless may lessen the need to employ more cruel (possibly abusive, not to mention, less reliable) interrogation techniques. A recent student article concludes that the compelled use of similar fMRI tests on detainees may violate international human-rights laws. Sean Kevin Thompson, Note, *The Legality of the Use of Psychiatric Neuroimaging in Intelligence Gathering*, 90 CORNELL L. REV. 1601 (2005). Also outside the scope of this article is whether a general First Amendment right to "freedom of thought" would be implicated by these tests. In general, the Supreme Court has refused to provide extra protection in the criminal-procedure context for evidence gathering that implicates First Amendment concerns. See Zurcher v. Stanford Daily, 436 U.S. 547 (1978) (typical Fourth Amendment standards apply to search of newspaper office); Branzburg v. Hayes, 408 U.S. 665 (1972) ("The issue in these cases is whether requiring newsmen to appear and testify before state or federal grand juries abridges the freedom of speech and press guaranteed by the First Amendment. We hold that it does not."); but see Tattered Cover, Inc. v. City of Thorton, 44 P.3d 1044 (Colo. 2002).

[197] See Mark A. Godsey, *Rethinking the Involuntary Confession Rule: Toward a Workable Test For Identifying Compelled Self-Incrimination*, 93 CAL. L. REV. 465, 485-99 (2005).

[198] Indeed, if the tests reached a sufficient level of reliability, defendants would likely have a constitutional right to be able to present such evidence suggesting their innocence. See United States v. Scheffer, 523 US 303, 314 n.9 (1998) (concluding that a rule categorically excluding polygraph evidence did not violate a constitutional right to present a defense because of the technique's questionable reliability).