NEUROTECHNOLOGIES AT THE INTERSECTION OF CRIMINAL PROCEDURE AND CONSTITUTIONAL LAW

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Introduction

"The last realm of privacy is your mind. This will invade that."

- CEO of Veritas Scientific Corporation, describing his company's mindreading helmet.¹

The rapid development of neurotechnologies poses novel constitutional issues for criminal procedure, among other areas of law.² These technologies can identify directly from brain waves whether a person is familiar with a stimulus like a face or a weapon, can model blood flow in the brain to indicate whether a person is lying, and can even interfere with brain processes themselves via high-powered magnets to cause a person to be less likely to lie to an investigator. By obtaining information directly from a subject's involuntary physiological responses, investigators could use such "neuroassay" technologies to make an end run around the Fifth Amendment privilege against compelled, self-incriminating speech. Neuroassays complicate, as well, the question of what constitutes a Fourth Amendment "search" and "seizure." Yet, jurisprudence under both amendments stumbles on a conceptually limited distinction between body and mind, physical and informational. Such a distinction can no longer stand, as brain processes and emanations sit at the juncture of these categories.

This chapter first explains why neurotechnologies may be useful in criminal investigations and describes key neurotechnologies actually in use or under development. It then analyzes the implications of these technologies under the Fourth and Fifth Amendments. Building on work by other law and neuroscience scholars, it offers a framework for Fourth and Fifth Amendment analysis that aims to avoid current doctrine's false dualism.

[http://spectrum.ieee.org/biomedical/diagnostics/the-mindreading-machine] (quoting CEO of corporation developing mind-reading helmet).

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² Numerous scholars have written on the potential implications of neuroscience on various branches of law and on basic legal concepts. See, e.g., Joshua Greene and Jonathan Cohen, "For the Law, Neuroscience Changes Nothing and Everything," *Philosophical Transactions of the Royal Society of Biological Science* 359 (2004): 1775–85, Print; Robert M. Sapolsky, "The Frontal Cortex and the Criminal Justice System," *Philosophical Transactions of the Royal Society of Biological Science* 359 (2004): 1787–96, Print; Henry T. Greely, "Prediction, Litigation, Privacy and Property: Some Possible Legal and Social Implications of Advances in Neuroscience," *Neuroscience and the Law*, ed. Brent Garland (New York: Dana, 2004), 114–56, Print. But see Stephen J. Morse, Neuroscience and the Future of Personhood and Responsibility, in Constitution 3.0: Freedom and Technological Change 113 (Jeffrey Rosen and Benjamin Wittes, eds. 2011), Print (arguing that traditional legal conceptions of personhood and responsibility will not fundamentally be changed by any developments in neuroscience).

In its existing Fifth Amendment jurisprudence, the Supreme Court has emphasized distinctions between bodily samples and communicative acts or statements, privileging only the latter as "testimonial." This dichotomy between bodily facts and communicative acts is collapsed by direct access to neural processes, the physical substrate of thought and speech. This chapter suggests that Fifth Amendment jurisprudence ought to dispense with tests predicated on this problematic dichotomy. Instead, drawing on other strands of Supreme Court reasoning, it proposes that the Fifth Amendment inquiry should focus on whether law enforcement elicited or "evoked" the self-incriminating information. This allows for a principled distinction between two sets of physical products: those the information content of which is independent of law enforcement inquiry, like blood alcohol level or hair color, which are presumptively not privileged, and those that communicate mental contents evoked by law enforcement, which presumptively would be privileged.

Fourth Amendment jurisprudence, too, trips on distinctions between searches of bodily and non-bodily private spaces. The Court has correlated the degree of protection against compelled bodily searches with the degree of the search's physical invasiveness. Yet, brain searches via neuroassay show invasiveness to be a poor benchmark. Brain waves can be detected from outside of the skull; yet, information from a brain search may be equivalent to the content of private conversations or documents, which receive high Fourth Amendment protection. Normatively and culturally, the mind is an archetypal space of privacy, making searches of the brain more like searches of the home than like the noninvasive taking of other physical samples, such as fingernail clippings. This chapter suggests that brain searches should be conceived of not as noninvasive physical searches but as searches of private information within a space of presumed privacy.

The speed with which neurotechnologies are developing makes it perilous to predict how they may shape future legal practices. Some concerns of today might be obviated tomorrow by the failure of current technologies or the invention of new ones. But this uncertainty also makes the predictive enterprise important: Exploring potential influences of neuroscience on criminal law now allows us to set a course thoughtfully toward the law's possible futures.

I. Cognitive Neuroscience and Neurotechnologies

Cognitive neuroscience is a subfield of neuroscience that studies how the brain operationalizes thinking, feeling, and behaving.³ To measure or infer the activity of neurons in the brain, researchers most commonly use direct and indirect electrophysiological measurement, like electroencephalography (EEG),⁴ and neuroimaging, like magnetic resonance imaging (MRI).⁵ Researchers also increasingly use a third, more recent mode of investigation, transcranial magnetic stimulation (TMS).⁶

³ See generally Michael Gazzaniga, Richard B. Ivry, and George R. Mangun, *Cognitive Neuroscience: The Biology of the Mind*, 3rd ed. (New York: Norton, 2008), Print.

⁴ O. Carter Snead, "Neuroimaging and the 'Complexity' of Capital Punishment," *New York University Law Review* 82 (2007): 1265–1339, 1280–90, Print.

⁵ Snead 1280–90.

⁶ Rather than measuring or imaging activity within the brain, TMS useselectromagnets totemporarily and selectively disable targeted brain regions. Researchers then can make inferences about the function of the temporarily disabled region by seeing how subjects are affected by the stimulation. See, e.g., Tracy

In the specialized cognitive neuroscience subfield of "mind-reading" and "lie detection," investigators make use of all three modes, EEG, MRI, and TMS. These technologies aim to reduce uncertainty around whether an individual possesses any relevant knowledge, what that knowledge might be, and whether the individual is being honest in his or her representations to investigators. This section briefly describes the most promising current neuroassay ⁷ technologies.

A. Assaying Knowledge: Concealed Information Tests

Several neurotechnologies assay the subject's mind for particular experiences, items of knowledge, and emotions. These assay techniques aim to detect experiential traces encoded in the subject's brain. The longest-studied and most well-validated brain-based information-seeking technique is the concealed information test, or CIT.⁸ The CIT presents subjects with familiar and unfamiliar stimuli and uses EEG to measure the subject's brain's responses to the stimuli. The test is based on the "well established . . . principle" that the brain produces a brain wave known as the P300 in response to familiar stimuli only.⁹ An investigator presents the subject with a series of related words or images, and within that set will be one word or image that ought to stand out to the subject because of what he or she knows or has experienced – the so-called oddball or probe stimulus.¹¹ The P300 response is not perfect, but in controlled laboratory tests it is very good: it correctly detects "lies" between seventy-four and eighty percent of the time. These are strong results, but false negatives and false positives occur in a meaningful number of tests.¹² Researchers are working to combine the P300 with other physiological measures.¹³

An example illustrates how the test works. Suppose a victim was bludgeoned to death with the *Bluebook*. An investigator might expose a suspect to a class of words

Hampton, "Magnetism on the Brain: Researchers Probe Transcranial Magnetic Stimulation," *Journal of the American Medical Association* 293 (2005): 1713–14, Print.

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⁷ I use the term "neuroassay" to encompass technologies that assay the brain for its information content and to distinguish such technologies from the many other neurotechnologies that provide different kinds of information about the brain. For example, CT scans and MRIs provide information about a brain (its size, shape, and physical integrity) but do not reveal anything about the information content encoded within that brain.

⁸ Gershon Ben-Shakhar and Eitan Elaad, "The Guilty Knowledge Test (GKT) as an Application of Psychophysiology: Future Prospects and Obstacles," *Handbook of Polygraph Testing*, ed. Murray Klein (London: Academic Press, 2002) 87–102, Print.

⁶ See Samuel Sutton et al., "Information Delivery and the Sensory Evoked Potential," *Science* 155 (1967): 1436–39, Print (a foundational article describing the P300 response). For an overview, see Bruno Verschuere et al., *Memory Detection: Theory and Application of the Concealed Information Test* (New York, Cambridge UP, 2011), Print.

¹⁰ Editorial, "Forensic Neuroscience on Trial," Nature Neuroscience 4.1 (2001): 1, Print.

¹¹ J. Peter Rosenfeld, "Event-Related Potentials in the Detection of Deception, Malingering, and False Memories," *Handbook of Polygraphy Testing* 265–86.

¹² Vahid Abootalebi, Mohammed Hassan Moradi, and Mohammad Ali Khalizadeh, "A Comparison of Methods for ERP Assessment in a P300-based GKT," *International Journal of Psychophysiology* 62 (2006): 309–20, Print; David Carmel et al., "Estimating the Validity of the Guilty Knowledge Test from Simulated Experiments: The External Validity of Mock Crime Studies," *Journal of Experimental Psychology: Applied* 9 (2003): 261–9, Print.

¹³ See Xiaoqing Hu and J. Peter Rosenfeld, "Combining the P300-complex Trial-Based Concealed Information Test and the Reaction Time-Based Autobiographical Implicit Association Test in Concealed Memory Detection," *Psychophysiology* 49 (2012): 1090–1100, Print.

related to legal research, including the probe "Bluebook." If our suspect bludgeoned the victim, he ought to find the probe term more familiar and salient than, say, "pin cite," eliciting a P300 wave. Yet, if he emits a P300, that does not prove he is the killer. He might be in the midst of Bluebooking an article or Bluebook-phobic from a journal competition. The test proves familiarity plus salience, not guilt *per se*. Although the P300 is outside of conscious control, it still turns on the person's mental life – what is important to him and how that may vary in different contexts. ¹⁴

A corporation called VERITAS is developing a CIT helmet for mass memory screening. The company is producing helmets for use by the US military in field investigations, so that large groups of people can be screened quickly to determine if they recognize the faces of individuals of interest. The helmet shows images of interest, like the face of a terrorism suspect, to the subject within the helmet. A P300 response indicates that the subject likely is familiar with the person he has just seen. While the current planned use for these helmets is in field investigations in conflict areas, the technology could be deployed domestically.

B. Assaying Veracity: fMRI Lie Detection

Brain-based lie detection techniques primarily rely upon functional magnetic resonance imaging (fMRI).¹⁵ The general theory behind fMRI-based lie-detection is that it is more cognitively demanding for a subject to utter an intentionally false statement than a statement he believes to be true.¹⁶ The dominant model of how lies come about posits that when a subject is asked a question, the subject's brain automatically produces what it has stored as the correct response.¹⁷ To utter a false response, the subject must override the initial response and fabricate the falsehood in its place.¹⁸ Since lying takes more mental activity than truth-telling, a lie should be slower to produce and require the brain to work harder. The time factor can be measured as response latency,¹⁹ while the additional cognitive work should result in heightened blood to the working areas in order to satisfy their metabolic demand.

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¹⁴ Galit Nahari and Gershon Ben-Shakhar, "Psychophysiological and Behavioral Measures for Detecting Concealed Information: The Role of Memory for Crime Details," *Psychophysiology* 48 (2011): 733–44, Print (showing "informed innocents," aware of the same crime details as "guilty" subjects but for different reasons, showed P300 responses equivalent to "guilty" participants in a mock-crime study).

¹⁵ For an excellent overview of fMRI-based lie detection technologies, and their protocols and limits, see Francis X. Shen and Owen D. Jones, "Brain Scans as Evidence: Truths, Proofs, Lies, and Lessons," *Mercer Law Review* 62 (2011): 861–83, Print.

¹⁶ D.D. Langleben et al., "Brain Activity During Simulated Deception: An Event-Related Functional Magnetic Resonance Study," *NeuroImage* 15 (2002): 727–32, 731, Print ("We speculate that this increase in activation reflects additional effort needed to 'overcome' the inhibited true response.").

¹⁷ Langleben et al. 731; see also, e.g., Sean A. Spence et al., "A Cognitive Neurobiological Account of Deception: Evidence from Functional Neuroimaging," *Philosophical Transactions of the Royal Society of Biological Sciences* 359 (2004): 1755–62, 1757, Print ("We may posit that in the normal situation the liar is called upon to do at least two things simultaneously. He must construct a new item of information (the lie) while also withholding a factual item (the truth).").

¹⁸ Spence et al. 1757.

¹⁹ See, e.g., Martin R. Sheridan et al., "Reaction Times and Deception – The Lying Constant," *International Journal of Psychological Studies* 2 (2010): 41–51, 46, Print (asserting that "lying adds a constant delay to true responses, and can be reliably distinguished from true responses in terms of average RT [response time]").

The heightened blood flow to involved regions should produce a distinct color map on an fMRI. The areas that most commonly become active in deception tasks include the anterior cingulate cortex, orbitofrontal cortex, inferior frontal cortex, and parts of the temporal lobe.²⁰ Researchers thus must look at fMRIs for patterns involving numerous brain regions to infer indicators of deception. There is no universal "tell" within the brain for all kinds of lying and deception – or if there is, researchers have not discovered it. For this reason, scientists²¹ and members of the legal community²² have questioned whether fMRI lie detection is reliable enough to merit being admissible or available in courtroom and commercial contexts.²³

fMRI lie-detection has advantages and drawbacks relative to CITs. fMRI protocols discern more generally whether the subject is uttering truthful statements, without requiring precise, advance knowledge on the part of the investigator about the details of the target event. Conversely, unlike CIT, an fMRI examination "requires a high level of subject compliance," as the subject must lie still in the scanner and willingly respond to questions.²⁴

C. Shifting Preferences: TMS Changes Subject's Responses

Before a person has had a chance to answer a question, the neurotechnology known as transcranial magnetic stimulation (TMS)²⁵ could shift his or her preferences about whether to tell the truth – and perhaps whether to respond at all. While several historical and contemporary technologies aim at lie-detection, this is the first neurotechnology that may be useful for lie prevention.

A recent study by Inga Karton and Talis Bachmann measured the impact of magnetic stimulation on a particular brain region, the dorsolateral prefrontal cortex (DLPFC),²⁶ on whether subjects told the truth or a lie.²⁷ Subjects in the experiment were offered the choice to respond truthfully or falsely at will to investigators' questions about the color of a shape they had seen. Researchers found that TMS to the right lobe of the

²⁰ See F. Andrew Kozel et al., "Detecting Deception Using Functional Magnetic Resonance Imaging," Biological Psychiatry 58 (2005): 605-13, 608, Print; Tatia M.C. Lee, "Lie Detection by Functional Magnetic Resonance Imaging," Human Brain Mapping 15 (2002): 157-64, 161, Print.

²¹ Greg Miller, "fMRI Lie Detection Fails a Legal Test," Science 328 (2010): 1336–37, 1337, Print ("[Martha] Farah, like many neuroscientists, is deeply skeptical about using fMRI lie detection in legal cases, and she says she went into the hearing thinking there was no chance the judge would allow it as evidence.").

²² United States v. Semrau, No. 07-10074 MI/P, 2010 WL 6845092, U.S. Dist. Ct. W.D. TN, June 1, 2010, Print (amended report and recommendation) (holding fMRI lie detection evidence inadmissible under the

²³ Kevin A. Johnson et al., "The Neuroscience of Functional Magnetic Resonance Imaging fMRI for Deception Detection," The American Journal of Bioethics 7.9 (2007): 58-60, 60, Print. ²⁴ Johnson et al. 59.

²⁵ See note 7 and accompanying text.

²⁶ This brain region is involved in decision-making, self-control, emotional intelligence, risk-seeking, and a host of other important behaviors. See, e.g., Bruce L. Miller and Jeffrey L. Cummings, eds., The Human Frontal Lobes: Functions and Disorders (New York: Guilford, 2007) 355, Print.

²⁷ Inga Karton and Talis Bachmann, "Effect of Prefrontal Transcranial Magnetic Stimulation on Spontaneous Truth-Telling," Behavioural Brain Research 225 (2011): 209–14, Print.

DLPFC caused subjects to be somewhat more likely to tell the truth; TMS to the left-DLPFC caused subjects to be somewhat more likely to lie.²⁸

The single study, which must be repeated by other investigators, suggests that TMS on certain brain regions may act to shift preferences about whether to lie – changing mental processes and acting on what we think of as the core free will exercises of choosing between alternatives. If TMS changes a person's mental processes so that he or she makes different subjective determinations about whether to tell the truth, or to speak at all, then the state would not just be finding existing facts – it would be causally interfering with mental processes that are at the core of personhood.

II. To Speak or Not to Speak? That Is No Longer the Question

Neurotechnologies that allow investigators to obtain information by bypassing an individual's voluntary speech or other forms of voluntary communication impinge on several constitutional protections, notably the Fourth Amendment protection against unreasonable search and seizure and the Fifth Amendment privilege against self-incrimination. This Part explores the interrelated constitutional interests that arise when the state seeks to perform neuroassays on subjects.

Whether and under what circumstances the state could compel individuals to submit to neuroassays under existing Fourth and Fifth Amendment jurisprudence depends on how neuroassays and the brain products they detect are characterized. Brain waves and fMRI patterns have a dual nature as physical traces and as information products. Whether courts construe their physical sample-like properties or their information product-like properties to predominate would lead to different degrees of protection under each regime. Predicting how courts may deal with neuroassays under the Fourth and Fifth Amendments turns on the extent to which courts can find a suitable analogy between brain processes and existing categories of protected or unprotected materials. Are brain waves like breath, a mere spontaneous physical emanation? Are memory traces like documents in a file drawer, the static, physical embodiment of predetermined information? If so, the neural products detected by neuroassays look unlike testimony and unlike anything in which one would have an expectation of privacy. But if memory traces and emotional responses are brought into being – evoked, authored – in response to the neuroassay itself, then they look more like testimony or like documents authored by the subject, categories that receive high degrees of constitutional protection.

How courts construe the physical aspects of mental processes may turn in part on the biology of memory. Memory is associative and reconstructive.²⁹ It is a process, not a thing. Although our memories feel unitary, they are virtual objects that exist in diffuse brain regions and must be reassembled upon recall.³⁰ This aspect of memory would argue for the testimony-like or authorship-like view, rather than documents-in-a-file-drawer view. Query, however, if courts will be comfortable having these rights turn on the contingencies of the biology of memory – or, indeed, on the contingencies of the state

³⁰ Kandel et al.

²⁸ The effect size was small but statistically significant. rDLPFC stimulation and IDLPFC stimulation increased truth-telling and false reporting, respectively, by about five percent relative to controls. Id. at 209. ²⁹ Eric R. Kandel et al., "The Past, the Future, and the Biology of Memory Storage," *Philosophical Transactions of the Royal Society: Biological Sciences* 354 (1999): 2027–52, 2031–32, Print (describing involvement of numerous brain regions in reconstructing and experiencing a single memory; describing cases that defeated the earlier view that memory is localized to one brain region).

of the science. Advancing neuroassay technologies may glean more information from smaller and smaller amounts of neural data, making memory's author-like and associative nature moot and putting on infirm ground any constitutional conclusions that rested on the science of memory. Courts may fairly determine that constitutional values transcend the particular mechanisms by which various neural responses arise and instead ground their analyses in principles like the sanctity of a sphere of mental privacy.³¹

A. Self-Incrimination via Evoked Mental Contents Under the Fifth Amendment

The Fifth Amendment's privilege against self-incrimination allows a person to refuse to make any statements or engage in communicative conduct that could place him or her in criminal jeopardy.³² The Supreme Court has repeatedly described the Fifth Amendment as being rooted in the framers' rejection of "historical practices, such as ecclesiastical inquisitions and the proceedings of the Star Chamber, 'which placed a premium on compelling subjects of the investigation to admit guilt from their own lips.'"³³ On this view, the privilege protects the individual from the excesses of state power; similarly, it may protect the state from itself by pretermitting its inclinations to extract confessions through harsh means. While scholars continue to debate the purposes behind the Fifth Amendment, there is some consensus around the "excuse" model³⁴: that the privilege provides the suspect with an excuse to avoid the "cruel trilemma of selfaccusation, perjury or contempt" he would face were he compelled to testify against himself.³⁵ Relatively recently, in *Pennsylvania v. Muniz*, the Supreme Court appeared to emphasize the value of protecting mental privacy itself.³⁶ The Court concluded in *Muniz* that the purpose of the privilege is "served when the privilege is asserted to spare the accused from having to . . . share his thoughts and beliefs with the Government,"³⁷ because it is "the attempt to force [the accused] 'to disclose the contents of his own mind" that the privilege protects against. 38

The core case that establishes the modern contours of the privilege, the case that permits the state to compel bodily-product-as-chemicals but not bodily-product-as-

³⁷ Pennsylvania v. Muniz 595 (quoting Doe v. United States, 487 US 201, 213 (1988)).

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³¹ Michael S. Pardo argues for this position in his article "Neuroscience Evidence, Legal Culture, and Criminal Procedure," *American Journal of Criminal Law* 33 (2006): 301–37, Print.

³² U.S. Const. Amend. V (stating that "[n]o person . . . shall be compelled in any criminal case to be a witness against himself").

³³ Andresen v. Maryland, 427 US 463 (1976) (quoting Michigan v. Tucker, 417 US 433, 440 (1974)). See also Couch v. United States, 409 US 322, 327 (1974) (describing the Fifth Amendment as the bulwark against "any 'recurrence of the Inquisition and the Star Chamber, even if not in their stark brutality" (quoting Ullmann v. United States, 350 US 422, 428 (1956)).

³⁴ William J. Stuntz, "Self-Incrimination and Excuse," *Columbia Law Review* 88 (1988): 1227–96, 1277, Print. See also Nita A. Farahany, "Incriminating Thoughts," *Stanford Law Review* 64 (2012): 351–408, 364–66, Print (discussing excuse model).

³⁵ Murphy v. Waterfront Comm'n, 378 US 52, 55 ((1964). The *Murphy* Court also spoke of "our respect for the inviolability of the human personality" Murphy v. Waterfront Comm'n 55 (internal quotations and citations omitted). The "human personality" view of the Fifth Amendment has, however, fallen out of favor academically and with the Court. See, e.g., United States v. Balsys, 524 US 666, 691 (1998).

³⁶ Pennsylvania v. Muniz, 496 US 582, 595 (1990).

³⁸ Pennsylvania v. Muniz 595 (quoting Curcio v. United States, 354 US 118, 128 (1957) (emphasis added)).

expression-of-mental-state-or-knowledge, is *Schmerber v. California*. Police found Armando Schmerber and his friend after Schmerber wrecked his car. The officer transported him to a hospital for treatment; having smelled alcohol on Schmerber, the officer requested that a doctor take a blood sample that would show whether Schmerber had been driving over the legal blood-alcohol limit. Schmerber refused the blood draw, so the officer instructed the doctor to take his blood against his will. Schmerber challenged the blood draw, arguing that it constituted an unreasonable search and seizure and the impermissible compulsion of self-incriminating evidence in violation of the Fourth and Fifth Amendments respectively. 40

The Court held as to the Fifth Amendment challenge that "the privilege protects an accused only from being compelled to testify against himself, or otherwise provide the State with evidence of a testimonial or communicative nature." The "withdrawal of blood and use of the analysis . . . did not involve compulsion to these ends." The Court reasoned that bodily substances, unlike thoughts and decisions, are not an individual's to control in the first place: the drunk driver's breath or blood reveal his degree of intoxication independent of his choices and beyond the reach of his perjury. Access to blood or other physical products like breath or saliva thus would not place the individual in the "cruel trilemma of self-accusation, perjury or contempt" A defendant on the stand contemplating how to answer a prosecutor's question would face that painful choice; a blood sample, which simply shows what it shows, does not. So holding, *Schmerber* established a physical/verbal divide: Physical evidence may be compelled by the state under the Fifth Amendment, ⁴⁴ but verbal statements and utterances may not be compelled because they are "communicative" or "testimonial" in ways that violate the Fifth Amendment's protection against causing one to be a "witness" against oneself.

Schmerber's deceptively simple, bright-line test has some appeal and suffices in many cases dealing with traditional bodily products like blood and traditional compelled verbal statements like forced confessions. Yet, in light of neurotechnologies that can detect and translate the physical correlates of thoughts, the line between a physical fact and a thought or feeling becomes faint, if not meaningless. Indeed, the materialist view is that all thoughts and feelings are subserved by physical brain states. Even Descartes, the exemplar of mind/body dualism, recognized that the physical brain produced mental states and behaviors.

One approach to *Schmerber*'s conundrum may come via another drunk driver case, *Pennsylvania v. Muniz*. This case helps clarify the physical/verbal or physical-verbal-mental problem because it involves a party's challenge to each kind of evidence. In *Muniz*, a drunk driver moved to suppress on Fifth Amendment grounds the following evidence: his poor physical performance on field sobriety tests on the road and in

⁴⁶ 496 US 582.

³⁹ Schmerber v. California, 384 US 757, 761 (1966).

⁴⁰ Brief of Petitioner, Schmerber v. California, 1966 WL 100527 at *3-4.

⁴¹ Schmerber v. California 761.

⁴² Schmerber v. California 761.

⁴³ Murphy v. Waterfront Comm'n 55.

⁴⁴ See Part II.B (explaining that the State's right to it is limited by the Fourth Amendment).

⁴⁵ Farahany 355. Several scholars have explored the relationship between neurotechnologies and the Fifth Amendment, splitting along *Schmerber*'s lines to conclude that such evidence would be "physical and unprivileged or testimonial and privileged." See also Farahany 355 n.11 (gathering articles).

custody; his spontaneous statements about his own drunkenness while he performed the sobriety tests; and his confused verbal responses to police questioning once he was in custody. In particular, Muniz could not provide police with the date and year of his sixth birthday.⁴⁷ All of these facts and statements, including his stumbling response to the birthday question, were introduced at his trial.⁴⁸

The Court held that Muniz's motor indicia of drunkenness and his spontaneous admissions of the same could be used against him, but that the content of his garbled verbal responses to questions that the police asked him once he was in custody⁴⁹ could not be used against him.⁵⁰ His verbal response to custodial questioning constituted communications against his penal interests, regardless of the fact that his responses, like his statement that he could not figure out his birthdate, did not substantively constitute inculpatory admissions.⁵¹

Drawing on *Schmerber*, the *Muniz* Court distinguished between preexisting physical facts that the police may merely discover – like blood alcohol content – versus those that the police, through their questioning, "evoke." "Evoke" can mean to elicit or call forth that which is preexisting (*e.g.*, to "evoke evil spirits"). "Evoke" can also mean "re-create imaginatively." Evocation, like provocation, causes the subject to create a novel response. We might say that a novel's textured prose evoked in the reader's mind a vision of the alien planet. This is evocation in the sense of creating anew because the reader could not previously have had thoughts or memories about a fictional world she is encountering for the first time. We might also say that a person's criticism evoked her partner's anger. In this sense, evocation straddles the preexisting and the novel: the partner surely has felt anger at other times and has the general capacity to feel anger, but this instance of anger has been created in response to or brought about by the prompting of the criticism.

The police questioning in *Muniz*, which required the suspect to formulate novel responses, created or brought about or "evoked" that which would not have existed but for the question. Put simply, if the police had not asked Muniz about his birthday and year, his blood alcohol still would have showed what it showed; but, absent the question, Muniz would not have engaged in the new mental work of creating a reply to the birthday question. The reply to the question, then, was novel mental content that the police evoked (caused to be created), while the blood sample was an independent and pre-existing physical fact.

Muniz's emphasis on the Fifth Amendment's protection of "evoked" mental responses provides a basis for transcending *Schmerber*'s problematic physical/verbal divide and making principled Fifth Amendment distinctions among numerous categories of responses. *Muniz* points to a distinction between two sets of physical signs: (1) the nonprivileged set of physical signs that does not reveal evoked mental contents and (2)

⁴⁷ Pennsylvania v. Muniz 585–86.

⁴⁸ Pennsylvania v. Muniz 587.

⁴⁹ The police failed to advise Muniz of his right to remain silent. Pennsylvania v. Muniz 585–86.

⁵⁰ See Pennsylvania v. Muniz 590–600.

⁵¹ See Pennsylvania v. Muniz 592–600.

⁵² See Pennsylvania v. Muniz 613 (Marshall, J., concurring in part and dissenting in part).

^{53 &}quot;Evoke," Merriam-Webster's Collegiate Dictionary, 2008 11th ed, Print.

⁵⁴ "Evoke," Merriam-Webster's Collegiate Dictionary.

the privileged set of physical signs that does.⁵⁵ Breath, bodily fluids, finger- and irisprints, imaging (x-ray, CT, or MRI) of body and brain for their *structural* features, and fingernail and hair clippings, among other kinds of evidence, fall into the first set of physical signs. These signs may yield legally relevant information, like DNA or evidence of intoxication, or they may help to confirm aspects of the suspect's identity.⁵⁶ But such information is not "evoked" (it exists independent of investigators' inquiry) and it does not express "contents of [the] mind."⁵⁷

Construing the Fifth Amendment to protect evoked mental responses allows for clear and consistent distinctions between all of the categories of evidence at issue in *Muniz* – and at large in the world. The static chemical composition of bodily substances is neither evoked nor reveals mental contents, and so is not privileged. Motor activity, like a field sobriety test, indicates the general state of the brain but does not evoke or show the presence or absence of particular mental content. Verbal *or* physical evoked evidence that reveals mental "contents" or "knowledge" should be subject to the privilege, and evaluated for voluntariness. Yet not all verbal utterances merit protection: A verbal utterance could reveal no mental content, as when a person with Tourette's syndrome yells out a meaningless phrase. Conversely, the body can express the contents of the mind, as through brain wave emanations and functional activation patterns. If the Fifth Amendment protects against the "compelled" "evocation" of the "contents of [the] mind," then whether the subject conveys that content through speech or through speech's precursor, brain waves, should be a matter of indifference.

B. Individual and Mass Brain Searching Under the Fourth Amendment

The Fourth Amendment protects "[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures." The Fourth Amendment applies broadly to all searches and seizures, whether of the suspect him- or herself, the alleged victim, witnesses or other third parties. Unlike the Fifth Amendment, its protections apply without regard to whether the material sought by the state tends to incriminate its source. It is not a blanket protection against undesired intrusions; rather it protects "against official intrusions up to the point where the community's need for evidence" rises to the level of "probable cause" to believe that the

⁵⁵ This set of categories is but one potential replacement for *Schmerber*'s physical/verbal dichotomy. Professor Nita Farahany has proposed as an alternative a "spectrum that spans identifying, automatic, memorialized, and uttered evidence," which emphasizes the critical distinctions between evoked and unevoked information. See Farahany 400.

⁵⁶ Physical characteristics that are merely identifying, like voice, handwriting, evidence of injuries, tattoos and the like are not protected under the Fifth Amendment. See United States v. Dionisio, 410 US 1, 7 (1973) (holding that suspects could be compelled to provide voice samples "solely to measure the physical properties of [the speakers'] voices, not for [their] . . . communicative content"); Gilbert v. California, 388 U.S. 263, 266–67 (1967) (holding that suspect could be compelled to provide handwriting sample for identification purposes only).

⁵⁷ See notes 39-40, 54 and accompanying text.

⁵⁸ Pennsylvania v. Muniz 595 (stating that the Fifth Amendment protects a person from being forced to disclose the "contents of his own mind" (quoting Curcio v. United States 128).

⁵⁹ Pennsylvania v. Muniz 591–92 (discussing the protection of "knowledge").

⁶⁰ See notes 34-35, 39-40, 54 and accompanying text.

⁶¹ U.S. Const. Amend. IV.

search will yield evidence of a crime. 62 Once probable cause has been established, "it is ordinarily justifiable for the community to demand that the individual give up some part of his interest in privacy and security to advance the community's vital interests in law enforcement."63

The Fourth Amendment protection attaches where "a person [has] exhibited an actual (subjective) expectation of privacy and . . . the expectation [is] one that society is prepared to recognize as 'reasonable.' Physical or informational products that people expose to public view, like their facial features or voice, or publish, like public social media updates or documents, lack any expectation of privacy. In matters people do not make public, a privacy expectation may attach. Case law and cultural norms support the conclusion that people have a reasonable expectation of privacy and security in their physical bodies, in the contents of and in their actions within private spaces like the home, and in their unexpressed or unpublished thoughts and reflections.

Neuroassays sit at the juncture of these three categories of searches of the body, private spaces, and thoughts. Spontaneous physical emanations of the brain may be analogous to breath or blood. The mind, housed within the cranium, might be a sphere of cherished and presumptive privacy like the home. 65 And the information content of the brain – particularly evoked thoughts, as discussed in the section above – may be analogous or partially homologous to private thoughts committed to a diary. The first part of this section will explore the implications of the physical-spatial-informational distinction in the context of Fourth Amendment jurisprudence. This is the "how" of Fourth Amendment neuroassay problems: How should neuroassays be characterized – as searches of the body, of a privileged private space, or of authored information?

This section will then turn from the "how" to the "who": The degree to which the Fourth Amendment applies to neuroassays may depend upon who is subject to search. If a reasonable expectation of privacy depends in part on what "society is prepared to recognize as 'reasonable,'"66 then outcomes may turn on the ways in which social expectations of privacy and criminal procedures vary as to different categories of individuals – from suspect, to key witness, to general member of the population.

Bodily searches and samples

The threshold for a "reasonable" bodily intrusion under the Fourth Amendment is the presence of probable cause and either a warrant or a warrant exception like exigent circumstances. 67 After the threshold requirement is met, the reasonableness inquiry turns

⁶² Winston v. Lee, 470 US 753, 759 (1985).

⁶³ Winston v. Lee 759.

⁶⁴ Katz v. United States, 389 US 347, 361 (1967) (Harlan, J., concurring).

⁶⁵ Discussed infra, at notes ____. Searches of the body additionally could be construed as trespasses in light of the Court's renewed emphasis on physical trespass in its recent case of *United States v. Jones*, 132 S. Ct. 945 (2012). The Court has not looked to trespass its canonical bodily search cases but perhaps may do so in future cases if *Jones* prefigures a general turn toward trespass as the touchstone for Fourth Amendment jurisprudence. Trespass has some superficial appeal in bodily search cases but would create paradoxes in the context of neuroassays and other technological searches that detect internal information. A trespass standard would provide more protection for a cheek swab than for some kinds of brain scans. It would lead to significant differences in Fourth Amendment protection among functionally indistinguishable forms of brain scans based on slight differences in their underlying technologies.

⁶⁶ Katz v. United States, 389 US 347, 361 (1967) (Harlan, J., concurring).

⁶⁷ Schmerber v. California 770 ("Search warrants are ordinarily required for searches of dwellings, and absent an emergency, no less could be required where intrusions into the human body are concerned.").

to the type of procedure, its degree of intrusiveness, and the manner in which it is performed.⁶⁸ Courts evaluate the permissibility of bodily searches and sampling along a continuum of invasiveness, with the least protection accorded to the least invasive procedures.

In *Schmerber*, the defendant challenged the state's compelled, warrantless extraction of his boozy blood on the Fourth Amendment ground that the blood draw constituted an unconstitutional search and seizure.⁶⁹ The Court concurred with Schmerber that the state's compelled extraction of blood falls within the Fourth Amendment's purview both because it is a "search" and because "[t]he integrity of an individual's person is a cherished value of our society."⁷⁰ Indeed, where "intrusions into the human body are concerned," as with intrusions into the home, a warrant is required.⁷¹ However, the Court rejected Schmerber's argument that the state's failure to obtain a warrant rendered the blood draw unconstitutional. Alcohol in a person's bloodstream decreases rapidly and, therefore, the physical facts of the case presented "exigent circumstances" that relieved the state of its obligation to obtain a warrant.⁷²

In approving the warrantless seizure of blood under exigent circumstances, the Court held out the prospect that constitutional considerations might narrowly limit or even fully bar other bodily intrusions by the state. While the Constitution "does not forbid . . . minor intrusions into an individual's body under stringently limited circumstances," the Court observed, this small grant of authority "in no way indicates that [the Constitution] permits more substantial intrusions, or intrusions under other conditions.",73

This prediction cashed out in *Winston v. Lee.* ⁷⁴ In *Winston*, the state of Virginia sought and received a warrant to compel a suspect, Rudolph Lee, to have a bullet surgically removed from beneath his collarbone, based on its assertion that it had probable cause to believe the bullet would link Lee to a crime.⁷⁵ The Court granted certiorari "to consider whether a State may, consistently with the Fourth Amendment, compel a suspect to undergo surgery of this kind in a search for evidence of a crime." The Court concluded that the state could not compel Lee to have surgery under general anesthesia, which involved a risk of permanent injury or death, to remove a bullet under circumstances where the state already had ample evidence to link Lee to the crime. Even where probable cause is present, the Court held, and even where the search is "likely to produce evidence of a crime," a "compelled surgical intrusion into an individual's body for evidence, . . . implicates expectations of privacy and security of such magnitude that the intrusion may be 'unreasonable.'",⁷⁷

See also Hammer v. Gross, 884 F.2d 1200, 1204-05 (9th Cir. 1989), vacated on other grounds, 932 F.2d 842 (9th Cir. 1992); United States v. Berry, 866 F.2d 887 (6th Cir. 1989).

⁶⁸ Schmerber v. California 772.

⁶⁹ See note 42 (describing the facts of the case).

⁷⁰ Schmerber v. California 772.

⁷¹ Schmerber v. California 769–70.

⁷² Schmerber v. California 770–71.

⁷³ Schmerber v. California 772 (emphasis added).

⁷⁴ 470 US 753.

⁷⁵ Lee v. Winston, 717 F.2d 888 (4th Cir. 1983).

⁷⁶ Winston v. Lee 758.

⁷⁷ Winston v. Lee 759.

This holding protected Lee from compelled surgery and fulfilled *Schmerber*'s prediction that some bodily intrusions may be so great that probable cause and a warrant do not suffice to compel them. But the case actually establishes a weak and uncertain rule: *Winston* does not identify when a person may be secure in his body from surgical intrusion by the state. It instead defaults to a "case-by-case" balancing test "in which the individual's interest in privacy and security are weighed against society's interests in conducting the procedure." In Lee's particular case, the Court found the risk of death from general anesthesia to be unreasonable to procure marginal evidence in an attempted robbery case where the state already had enough other evidence to convict. But it did not find the intrusion to be unreasonable *per se* as shocking to the conscience or treading on inviolable rights against bodily intrusion by the state. It is impossible to say how *Winston* might have come out had it involved a less risky procedure or a greater need for the evidence.

Winston and Schmerber together create uncertainty about the permissible bounds of the state's intrusion upon the body: If probable cause is present, if the public's need for the evidence is great, and if the physical risk to the suspect is slight, there currently is no defined Fourth Amendment limit on the state's power to physically intrude into the suspect. To the extent these cases establish limits, such limits primarily relate to the risk of bodily harm: Schmerber emphasizes that the blood draw was permissible because it was physically nearly without risk; Winston emphasizes that Lee had to be spared surgery because of the physical risk.

This harm-focused standard provides very little guidance in the context of state intrusions via neuroassay. fMRI and EEG-based CIT tests are less physically invasive than even a blood test and involve negligible risk of physical harm. Given the low degree of physical discomfort and inconvenience, the state likely would need to make only a traditional showing of probable cause. Indeed, in physical sample cases where the sample is obtained noninvasively – as with saliva samples – courts have split on whether the state's compulsion of such samples even requires a warrant.

Although this potentially low degree of protection comports with the physical nonintrusiveness of the test, it belies the nature of the thing: Who among us would value our thoughts equally to our fingernail clippings just because both can be obtained without risk or pain? Looking at brain emanations as physical samples apart from their informational content and apart from the extent to which mental privacy allows us to constitute our identities is so impoverished as to be false. Fortunately, cases involving bodily samples are not the only precedents that may apply to brain searches; precedents developed for spatial and informational searches also may apply to neuroassays.

2. Spatial and informational Fourth Amendment protections

Brain waves and thought processes are not tangible physical products, like DNA or blood, and neuroassay techniques do not physically intrude inside the body like a

⁷⁸ Winston v. Lee 760.

⁷⁹ EEG and fMRI carry no risk of harm in themselves. A subject conceivably could suffer from claustrophobia or other discomfort while being examined in an MRI machine or CIT helmet.

⁸⁰ See Part II.B, principally discussing *United States v. Nicolosi*, 885 F. Supp. 50 (E.D. N.Y. 1995) (holding a warrant to be required to compel defendants to produce saliva sample; prosecutor's non-grand jury subpoena invalidated as insufficient) and In re *Grand Jury Proceedings Involving Vickers*, 38 F. Supp. 2d 159 (D. N.H. 1998) (holding grand jury subpoena sufficient to compel production of saliva).

blood draw or surgery. More robust analogies for neuroassay, then, may come from Fourth Amendment jurisprudence dealing with the detection of intangible information, protection of the traditionally private spaces like the home, and the authorship of information. *Katz v. United States*⁸¹ and *Kyllo v. United States*⁸² together show the heightened privacy interest that the Court has recognized under the Fourth Amendment in intangible information products that people generate in traditionally private spaces. Emphasizing the non-bodily, information-content aspects of the neural products detected by neuroassay may result in a higher degree of protection against such searches than emphasizing their brain-based, physical aspects. This mirrors the possible Fifth Amendment treatment of neuroassays, where construing the substrates detected by neuroassays as evoked mental contents rather than as bodily products (physical samples) results in a higher degree of protection. ⁸³

In *Katz v. United States*, the Court held that a listening device placed outside of a phone booth constituted a "search" even though the device did not intrude into the phone booth. The Court reasoned that "what [a person] seeks to preserve as private, even in an area accessible to the public, may be constitutionally protected," while what he "knowingly exposes to the public, even in his own home ... is not a subject of Fourth Amendment protection." Thus, "the Fourth Amendment protects people, not places."

Yet, place matters: In his concurrence, Justice Harlan noted that determining the degree of protection the Fourth Amendment affords to people "requires reference to a 'place." This is because the rule requires not only that a person have kept the materials in question actually private but that society recognize his expectation of privacy as "reasonable." Society's conventions about whether an expectation of privacy is reasonable have much to do with place; "[t]hus a man's home is, for most purposes, a place where he expects privacy." **88**

The Court strengthened the union between private information and private space in *Kyllo v. United States*. In *Kyllo*, the Court held that the state of California violated Danny Lee Kyllo's Fourth Amendment rights when, without a warrant, it used a fairly crude thermal imaging technology to discern heat patterns emanating from Kyllo's home. The thermal detection system did not reveal specific, private activities; rather, it produced thermal readings, which the system converted into pictures of relative heat, from which investigators could make inferences about activities within the home. The heat images, the United States argued, did not constitute information in which Kyllo had any reasonable expectation of privacy because they revealed no intimate details and because the information was so indistinct that it had meaning only based on later inferences by investigators. The Court rejected both contentions. Emphasizing the special expectations of privacy around the home, it asserted that, "[i]n the home, . . . all details are intimate

⁸¹ 389 US 347.

⁸² 533 US 27.

⁸³ See Part II.A.

⁸⁴ Katz v. United States 351 (citations omitted).

⁸⁵ Katz v. United States 351.

⁸⁶ Katz v. United States 361 (Harlan, J., concurring).

⁸⁷ Katz v. United States 361.

⁸⁸ Katz v. United States 361.

⁸⁹ Kyllo v. United States 34–41.

details, because the entire area is held safe from prying government eyes."⁹⁰ Indeed, "the interior of [the] home[] [is] the prototypical . . . area of protected privacy."⁹¹

The Court then rejected the contention that thermal imaging did not constitute a search because the patterns and blobs that were its output took on meaning only through investigators' inferences. Criticizing "the dissent's extraordinary assertion that anything learned through 'an inference' cannot be a search," the majority noted that technological searches frequently produce data that needs analysis, "*i.e.*, the making of inferences." Moreover, because the expectation of privacy in the home is so high, "[t]he Fourth Amendment's protection of the home has never been tied to measurement of the quality or quantity of information obtained." ⁹³

Kyllo and Katz together suggest the ongoing power of place, of a spatial seclusion interest, in informing the expectations of privacy that a society recognizes as reasonable. The spatial analogy applies powerfully to neuroassays that invade the ultimate private space of mind. fMRI, which peers directly into the private space of the brain, and EEG, which detects its emanations, are much like the listening and thermal imaging technologies at issue in Katz and Kyllo that detected without invasion the content subjects secluded in private spaces. The idea of the mind as a house has deep roots in Western thought and literature. This powerful metaphor recurs through religious and philosophical writings, as when Saint Augustine refers to his memory as a "great harbour," through poetry, as when Joseph Beaumont and Emily Dickinson speak of the "house of the mind" and its "corridors," through to popular culture, as when Sherlock Holmes says in the Hound of the Baskervilles that to solve the crime he must retreat to his "mind palace."

Kyllo's thermal imaging of heat from the home makes an excellent analogy with EEG-detection of brain waves that emanate from the mind. Electrical brain waves, like thermal signatures from an occupied home, are automatically and continuously produced as long as a person is alive and a home is not abandoned. Yet we maintain an expectation of privacy in both of these forms of physical information, in part because they are invisible and undetectable absent special technology. Such technologies may produce only thermal patterns or, in the case of EEG, jagged lines; but the need for decoding does not make the raw information itself unprotected by the Fourth Amendment. ⁹⁸ Nor is it of significance for constitutional purposes if the information

⁹¹ Kyllo v. United States 34.

⁹⁰ Kyllo v. United States 37.

⁹² Kyllo v. United States 36 (citing United States v. Karo, 468 US 705 (1984) ("[W]here the police 'inferred' from the activation of a beeper that a certain can of ether was in the home.")).

⁹³ Kyllo v. United States 37.

⁹⁴ Aurelius Augustinus, *The Confessions of St. Augustine*, trans. Edward B. Pusey (New York: Collier, 1909) 174

⁹⁵ Joseph Beaumont, "The House of the Mind," *Lyra Sacra: A Book of Religious Verse*, ed. H.C. Beeching (London: Methuen, 1895) 147.

⁹⁶ Emily Dickinson, "One Need Not Be a Chamber to Be Haunted," *The Complete Poems of Emily Dickinson* (Boston: Little Brown, 1924).

⁹⁷ "The Hounds of Baskerville," *Sherlock*, dir. Paul McGuigan, perf. Benedict Cumberbatch, Martin Freeman, Rupert Graves, BBC, 2012, Television (basing show on A Conan Doyle, *The Hound of the Baskervilles* (London: George Newnes, 1902)).

⁹⁸ See Kyllo v. United States 36 (rejecting the argument that a search that obtains only raw information from which investigators must make inferences is not subject to the Fourth Amendment).

obtained reveals little of "intimate" interest. ⁹⁹ *Kyllo* thus may suggest that people have a reasonable expectation of privacy in the information that they automatically generate, and that may be covertly detectible, but that they do not broadcast or otherwise expose to the public gaze. ¹⁰⁰

A distinct way of conceptualizing the neural products evoked and detected by neuroassay as informational products for Fourth Amendment purposes is to construe them as "authored works." Leveraging the frameworks of intellectual property law, Professor Nita Farahany applies the concept of a secrecy right in authored works to the search and collection of brain waves and neural response patterns. ¹⁰¹ She notes that while courts have relied on the common law property interest of seclusion to determine whether a Fourth Amendment interest has been violated during a search, ¹⁰² they often also have implicitly relied on the interest of secrecy drawn from intellectual property law. ¹⁰³ A standard that explicitly uses this intellectual property secrecy interest in conjunction with the traditional Fourth Amendment seclusion interest would provide a clearer basis for the existing heightened protection of novel information and would extend logically to protect authored mental phenomena. ¹⁰⁴

3. Mass Brain Searches: What Is the Privacy of Crowds?

Beyond the traditional Fourth Amendment domains of search and seizure, neuroassays may be useful as a substitute for more traditional methods of questioning witnesses. It also may enable mass searches of groups and crowds. Returning to *Schmerber*, consider the information that investigators could obtain about whether Schmerber was drunk from Schmerber's friend and from all the people who happened to be in the same bar as Schmerber on the night in question. Police could subject all of them to a session in the CIT helmet to assay whether their brains recorded relevant information. Would Schmerber's friend and all the bystanders have any Fourth Amendment grounds on which to resist an on-the-spot brain scan? As with the issues considered above, this potential use of neuroassays sits at the intersection of verbal questioning and of compelled physical samples. It also sits at the procedural intersection of investigations that may be conducted by grand jury subpoena and those that must be conducted pursuant to a warrant or a recognized warrant exception, like exigent circumstances.

The example of Schmberer's friend helps isolate the issue of subpoena versus warrant in the context of neuroassaying non-suspects. Suppose that police seek to question Schmerber's friend about the events preceding Schmerber's arrest for drunk driving and suppose further that the friend, having had no legal duty to prevent Schmerber from driving drunk, has no Fifth Amendment privilege relative to these

Nita A. Farahany, "Searching Secrets," *University of Pennsylvania Law Review* 160 (2012): 1239–1308, 1241, Print.

⁹⁹ Kyllo v. United States 37 (stating that, relative to searches of the home, "*all* details are intimate details, because the entire area is held safe from prying government eyes").

¹⁰⁰ Kyllo v. United States 34–41.

¹⁰² Farahany, "Searching Secrets," 1243.

¹⁰³ An author's discretion to limit the audience and exposure of an original work is part of the secrecy interest protected by copyright law. Farahany, "Searching Secrets," 1261, 1293 (citing Richard A. Posner, *The Economics of Justice* (Cambridge: Harvard UP, 1981) 268–76).

¹⁰⁴ Farahany, "Searching Secrets," 1304.

questions. In a world without neuroassays, the friend can decline to speak with investigators. If he were to decline, investigators could seek a grand jury subpoena or its equivalent pursuant to which he would be compelled to appear and answer questions – although he could appear and claim he had no recollection, which would end the matter ¹⁰⁵

Matters change once neuroassays are introduced. A prosecutor could seek a grand jury subpoena to compel him to undergo neuroassays that may reveal the events of that night. If a subpoena were to issue, could Schmerber's friend move to quash by claiming that the neuroassay constitutes an unreasonable search under the Fourth Amendment? Or could the state search the friend's brain based on the much slighter showing that supports a subpoena than that which supports a warrant?

To the extent that neuroassays are construed as bodily intrusions, the field is particularly undeveloped. No Supreme Court case has addressed the compulsion of physical samples from non-suspects; indeed, a state rarely has cause to compel a physical sample from a non-suspect. Neuroassays, however, present a case where the physical traces stored in one person's body may powerfully incriminate another person. Schmerber's friend's blood could not have proven whether Schmerber was intoxicated. But Schmerber's friend's memories could show whether he saw Schmerber drinking or whether he believed Schmerber was drunk as he drove away in his car.

Courts have split on the degree of intrusion into the subject's body, privacy expectations, and dignitary interests that renders a subpoena inadequate to compel the intrusion. In one case, *In re Grand Jury Proceedings Involving Vickers*, the respondents to a grand jury subpoena challenged the subpoena's request for saliva samples, arguing that such a search and seizure required a warrant.¹⁰⁶ The court declined to quash the subpoena, reasoning that a cheek swab does not go "beneath the skin" and involves "no risk of physical pain, injury, or embarrassment." It held that the state may compel such a physical sample by subpoena as long as it is "relevant" to an investigation and "could be probative" in furthering the investigation, a fairly minimal standard. Conversely, in another saliva-by-subpoena case, *United States v. Nicolosi*, the court quashed a prosecutor's (non-grand jury) subpoena, holding that the Fourth Amendment requires a warrant or probable cause plus exigent circumstances before the state may compel such an intrusion. *Nicolosi* describes a saliva sample as "a search within the skin, if not literally beneath it," and emphasized the private medical information that the state could discern from the sample. ¹¹¹

The single case to consider the issue as to blood samples held that a grand jury subpoena does not suffice to compel the physical sample. In *In re Grand Jury Proceedings (T.S.)*, a subpoena respondent moved to quash a grand jury subpoena compelling his blood sample. Considering "whether a grand jury subpoena, rather than a

¹⁰⁷ In re Grand Jury Proceedings Involving Vickers 167.

¹¹¹ United States v. Nicolosi 56.

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¹⁰⁵ A "subpoena to appear before a grand jury is not a 'seizure' [of the person] in the Fourth Amendment sense, even though that summons may be inconvenient or burdensome." United States v. Dionisio, 410 US 1, 9 (1973) (citations omitted).

¹⁰⁶ 38 F. Supp. 2d 159.

¹⁰⁸ In re Grand Jury Proceedings Involving Vickers 167.

¹⁰⁹ In re Grand Jury Proceedings Involving Vickers 167.

¹¹⁰ 885 F. Supp. 50.

warrant," can be used to obtain a blood samples, the court considered the intrusion under the skin and the privacy interests one has in the medical information that can be obtained from blood; separately, it emphasized the inadequacy of the subpoena process in light of the warrant requirements for blood samples set forth in *Schmerber*. ¹¹² *T.S.* quashed the subpoena and concluded that "the warrantless search and seizure" of a blood sample "should be subject to the same standards as any warrantless search," which are "probable cause ... and exigent circumstances justifying the search." ¹¹³ The court instructed that a warrant should only issue if the state's need for the evidence "is greater than the extent to which the blood test poses a risk of harm to T.S. and infringes his dignitary interests in privacy." ¹¹⁴

Neuroassays do not require an invasion beneath the skin in the sense of puncturing or cutting and pose no risk of physical harm to the subject. Thus a court might follow the reasoning of *Vickers* to hold that the state can, without a warrant, compel an individual to undergo a neuroassay. Alternatively, a court might conclude that neuroassays are "a search *within* the skin, if not literally beneath it," implicating the individual's privacy interests and requiring the Fourth Amendment balancing of reasonable expectations of privacy against the state's need for the information.

No case yet has dealt with mass physical intrusions into bystanders or their mass detention for compelled questioning, as would be the case if police sought to put the CIT helmet on everyone in Schmerber's bar. Ordinarily, mere bystanders' expectations of privacy and security in their person against state intrusion would be quite high. Police do question bystanders for relevant information; but while there is no legal right to lie about a crime, there is also no affirmative duty to speak up. By custom if not by law, there may be a higher expectation within society that mere bystanders will be free of unanticipated neural intrusion by the state than there is relative to suspects or key witnesses.

Yet, the high expectation of privacy might be defeated by the potentially low intrusiveness of the search and, under some circumstances, exigent need for the information. The degree of intrusion would be low if the neuroassay could do the barest of scans: A binary yes-no test as to whether the subject saw Schmerber that night. Such a test would be brief and would not intrude on the private reflections or feelings of the subject. Perhaps the helmet either would not collect ancillary mental information or could automatically shield certain information from the operator. Further tilting the balance in favor of mass, on-the-spot brain searches, the state might plead, as with Schmerber's blood, exigent circumstances: The memories might not decay rapidly like alcohol in the bloodstream, but the bystanders themselves might disperse, never to be seen again. These hypotheticals are merely speculative but point to the need to develop reasoned Fourth Amendment positions relative to non-traditional subjects of a non-traditional kind of search.

Collateral information gleaned via neuroassay might heighten the privacy interest of Schmerber's friend and the people in Schmerber's bar, further arguing for the protection of the warrant process. A subject's neuroassay might incidentally show that he

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¹¹² In re Grand Jury Proceedings (T.S.), 816 F. Supp. 1196, 1205 (W.D. KY 1993).

¹¹³ In re Grand Jury Proceedings (T.S.) 1200 (quoting United States v. Berry 891 (citing Chambers v. Maroney, 399 US 42, 51 (1970)).

¹¹⁴ In re Grand Jury Proceedings (T.S.) 1206.

¹¹⁵ United States v. Nicolosi 56 (emphasis added).

suffers from a medical or psychiatric condition, or is likely to develop one, or has some markers of negative personality traits like psychopathy. The investigating authority could store such information and use it in future investigations, or fail to keep it sufficiently private. Such sensitive information implicates strong privacy interests, as it could lead to adverse social, financial and employment consequences. Judicial balancing would need to take place to ensure that the state's need for the information outweighs the witness's – and society's – interest in the mental and neurological privacy of the common citizen.

CONCLUSION

The house of thought and memory has no doors, yet may be more searchable than a dwelling. The mind has no mouth but can be made to speak against us. This is because U.S. constitutional law has yet to grapple with the informational content of what we keep private within our bodies. Instead, it has emphasized the grosser aspects of bodily intrusions, limiting the state's right to collect information from our bodies based largely on the risks of physical pain and injury from those intrusions.

Law enforcement's use of neuroassays will require reexamining the relationship between physical, informational, and spatial intrusions. Going forward, the Court may choose to develop jurisprudence around neuroassay and other sophisticated forms of informational monitoring that draw less on cases like *Schmerber* and *Winston*, which emphasize risk and pain, and more on cases like *Muniz*, which emphasizes the protection of mental contents. Perhaps even more instructive is the *Katz* and *Kyllo* line of cases dealing with intrusions into spaces that carry an expectation of privacy. These cases conclude that using high technology to detect emanations from a private space is equivalent to searching within it. This conclusion as to houses and phone booths maps exactly onto the case of neuroassays, where high technologies detect the emanations and internal processes of an otherwise completely secluded space. This relationship between private structures and private bodily spaces goes beyond analogy: Property in one's body fundamentally anchors rights in real property in Anglo-American political history.¹¹⁶

Neuroassays will force courts to think more deeply, too, about ordinary predetermined biological information versus information that the state's search itself brings into being. The DNA in one's cells or the alcohol content of a person's blood exist independently of the tests that measure them. When the state samples these, it finds preexisting facts just as when it finds traditional physical evidence in a person's cabinets or drawers. Such preexisting and independent facts are due Fourth Amendment protection depending upon the invasiveness of the search and society's expectation of privacy in the body and in the information that the bodily samples encode. When such a search finds independent, preexisting biological facts about the brain, like its size, structure, or regional rates of glucose metabolism, these may be due a similar or higher

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¹¹⁶ The relationship between property in one's own body and all other property rights is put most famously by John Locke in his Two Treatises of Government:

Though the Earth...be common to all Men, yet every Man has a Property in his own Person. This no Body has any Right to but himself. The Labour of his Body, and the Work of his Hands, we may say, are properly his. Whatsoever then he removes out of the State that Nature hath provided, and left it in, he hath mixed his Labour with, and joyned to it something that is his own, and thereby makes it his Property ..., that excludes the common right of other Men.

Locke 1988 [1689], II, para. 27.

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degree of protection as these features may reveal even more sensitive information than a person's genetic code.

But when a search goes beyond finding facts about the brain and detects information encoded within the brain – even information as binary and bare as whether a mental room is empty or contains a package – the matter changes: that search treads into the private details held within an archetypal space of seclusion. As invasive as such a search would be, neuroassays go further than merely detecting information encoded in the brain: They incite the brain to assemble new information in response to question-like prompts. These evoked responses are like testimony, or like a compilation document that the state causes the subject to create from his or her preexisting data. The brain creates its responses to these prompts preconsciously. But in circumventing not just the subject's volition but the subject's very *capacity* for volition, these tests impose the truest possible compulsion, as if words could be pulled like a rope from a subject's throat or the hand automated to write its confession. This is the ultimate aim of every Star Chamber: To compel reliable self-accusation. That these brain-based techniques are bloodless and painless should be a matter of indifference, unless the great and deep proscription against these reviled practices reduces to no more than a squeamishness about blood. Precisely because they are both bloodless and effective, neuroassays will challenge the meaning of core constitutional protections – as well as our fidelity to them.