

One Image, One Thousand Incriminating Words: Images of Brain Activity and the Privilege against Self-Incrimination

Matthew Baptiste Holloway*

I. INTRODUCTION

A bomb explodes at the Constitution Center in Philadelphia, Pennsylvania. Citizens of the city and visiting tourists are injured and killed; the Liberty Bell is destroyed. The public and the U.S. government want answers: who did this, is there another bomb. Dragnets are implemented; suspects are caught. The desire to obtain information leads to questionable methods of interrogation. Are they moral? Is the information reliable? Neuroimaging techniques offer a viable way to bypass these concerns by producing and recording brain activity that provides investigators with information regarding the subject's memory of or familiarity with certain objects, people, or places. With an emotionally loaded situation such as this it is easy to ignore the subtle legal issues surrounding the use of neuroimaging in interrogation. We want the terroristic act avenged, whatever the cost.

A less affective scenario allows a more rational appraisal of the implications of unrestrained government use of non-invasive brain imaging technology. Picture a man who is mugged while walking home one night. A suspect is apprehended but denies ever seeing the victim. The victim is unable to provide a positive identification even after the suspect appears in a line up and repeats the phrase, "Give me your wallet." The police put the suspect in a brain scanner and record

changes in brain activity associated with the presentation of different pictures.¹ Some are of scenes around Philadelphia, some are of the crime scene, some are of random faces, some “famous faces” (e.g. movie stars), and some are the victim. Sometimes the police require the suspect to press a button to answer “yes” or “no” to certain questions. Other times the suspect need only perceive the stimuli presented. Analysis of the data suggests that the suspect recognizes the crime scene and the victim’s face.² The imaging results are used against the suspect at trial. The suspect is convicted and appeals, arguing the use of the images of brain activity violated his Fifth Amendment right against self-incrimination.

The Orwellian scene is set. Government agents, aided by technological advances made by well-meaning scientists, force citizens to submit to tests resulting in three-dimensional, color-coded images representing “truth” or “lie,” “seen” or “unseen,” “like” or “dislike,” and perhaps “capitalist” or “communist,” and “Christian” or “Muslim.”³ The impact of brain imaging technology is inevitably framed by the fact

* Candidate for Juris Doctorate, 2009, Temple University James E. Beasley School of Law; Vassar College 2002. Thanks to Professor David Post and Dr. Daniel Langleben for instruction on the form and substance of this comment. Thanks to Professor Marina Angel for instruction on everything else.

¹ This comment will not address the situation where the victim is placed in the scanner and shown images of the suspect in an attempt to obtain a brain response associated with familiarity. *See infra* note 2 (listing studies where seen and unseen faces elicited differential brain activity). This use of scan technology would not violate the privilege against self-incrimination because the Fifth Amendment privilege protects against the use of information, produced under compulsion, against the person from whom it is obtained. *See infra* notes 113-17 and accompanying text (discussing the incrimination prong of the three-part Fifth Amendment test).

² *See, e.g.,* Alex Hofer et al., *Neural Substrates for Episodic Encoding & Recognition of Unfamiliar Faces*, 63 *BRAIN & COGNITION* 174, 179 (2007) (investigating differences in brain activation during the encoding and retrieval of newly presented faces and distracter faces not previously seen); Patrick Khader et al., *Content-Specific Activation During Associative Long-Term Memory Retrieval*, 27 *NEUROIMAGE* 805, 810-11 (2005) (reporting differential brain activity associated with the long-term memory recall of faces as opposed to spatial information).

³ *See, e.g.,* Elizabeth A. Phelps et al., *Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activation*, 12 *J. OF COGNITIVE NEUROSCIENCE* 729, 733-34 (2000) (reporting that activation of the limbic structure known as the amygdala, involved in emotional processing, correlated positively with measures of unconscious attitudes towards individuals of different races); Kristine M. Knutson, *Politics on the Brain: An fMRI Investigation*, 1 *SOC. NEUROSCIENCE* 25, 35-6 (2006) (reporting on brain areas associated with processing of politically related stimuli).

In a post-9-11 world, a historical consciousness of America’s willingness to set-aside liberty and privacy in favor of security is the responsibility of any patriot. As Chief Justice Earl Warren poignantly stated, “[i]mplicit in the term ‘national defense’ is the notion of defending those values and ideals which set this Nation apart. For almost two centuries, our country has taken singular pride in the democratic ideals enshrined in its Constitution . . . It would indeed be ironic if, in the name of national defense, we would sanction the subversion of one of those liberties... which makes the defense of the Nation worthwhile.” *United States v. Robel*, 389 U.S. 258, 264 (1967) (finding unconstitutional a bar keeping member of Communist action committee from working in defense plant). Security sought to allay fear should not blind the citizen to the rights that security was originally established to maintain. *See* Ben Franklin, <http://www.ushistory.org/franklin/quotable/singlehtml.htm> (last visited April 22, 2008) (stating “Those who can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety” which has come to be rephrased as “Those Who Sacrifice Liberty For Security Deserve Neither”).

Commentators express serious concern over the invasion of privacy such technology makes feasible. The Center for Cognitive Liberty & Ethics, <http://www.cognitiveliberty.org/> (last visited April 22, 2008). Generally, the discussions concern, and thereby raise awareness of, the potential impact neuroimaging technologies may have on privacy and individual autonomy. *See, e.g.,* Richard Willing, *MRI Tests Offer Glimpse at Brain Behind the Lies*, *USA Today*, June 26, 2006,

that it is being developed in a post 9-11 world, with omnipresent rhetoric concerning the “War on Terror.”⁴ The awesome power an irresponsible government might wield with an unhindered ability to use brain-imaging technology must be addressed, whether the technology is ready or not.⁵

Fields such as cognitive neuroscience have had a veritable explosion of growth since the recent discovery and implementation of non-invasive brain imaging techniques such as Blood Oxygen Level Dependent Functional Magnetic Resonance Imaging (BOLD fMRI).⁶ The press has become especially enamored with the color images of brain activity BOLD fMRI produces.⁷ Headlines, with no room for details, suggest that scientists are able to read minds, determine beliefs, and produce pictures of conscious experience.⁸ Though the technology is not presently capable of “reading minds” BOLD fMRI is able to reveal a heretofore-invisible world to the probing eyes of whoever can pay for a brain scan.⁹

Is the production of maps of cognition protected by the Constitution? The

http://www.usatoday.com/tech/science/2006-06-26-mri-lie_x.htm (reviewing the scientific research on and surrounding the use of brain scanners to detect deception); Press Release, American Civil Liberties Union, ACLU Seeks Information About Government Use of Brain Scanners in Interrogations (July 28, 2006), available at <http://www.aclu.org/privacy/medical/26035prs20060628.html>.

Popular awareness is essential should the Constitution prove unable, via judicial interpretation, to protect the cognitive autonomy of the individual. Cf. Employee Polygraph Protection Act of 1988, 29 U.S.C.A. §2001-2009 (West 1999) (passing law to protect employees from being forced to undergo a polygraph to be hired). Broad cultural awareness and concern will facilitate the use of the legislative branch in ensuring the continuance of government free cognition because “without freedom of thought there can be no free society.” *Kovacs v. Cooper*, 336 U.S. 77, 97 (1949); cf. Employee Polygraph Protection Act of 1988, 29 U.S.C.A. §2001-2009 (West 1999).

⁴ Nevertheless, the existence of a state of war cannot suspend or change the operation of the constitutional guaranty against self-incrimination. *United States v. L. Cohen Grocery Co.*, 255 U.S. 81, 88 (1921). Compare the 11,000,000 hits for “war on terror” to the 40,000 for “BOLD fMRI.” Search Page, Google.com (last visited Apr. 12, 2008).

⁵ See Sean K. Thompson, *A Brave New World of Interrogation Jurisprudence?*, 33 AM. J.L. & MED. 341, 341-44 (arguing that not inquiring into the legal implications of brain imaging technology because the technology has not been proven reliable is unwise given the potential impact such technology could have); ACLU Seeks Information About Government Use of Brain Scanners in Interrogations, June 28, 2006, <http://www.aclu.org/privacy/medical/26035prs20060628.html> (expressing concern over the use of such technology though its reliability is unproven); see also *infra* note 14 (noting the technology must still pass judicial scrutiny before courts will allow the images to be entered into evidence).

⁶ HANDBOOK OF FUNCTIONAL NEUROIMAGING OF COGNITION 3, 11 (Roberto Cabeza & Alan Kingstone eds., MIT Press 2001).

⁷ Margaret Talbot, *Duped: Can Brain Scans Uncover Lies*, THE NEW YORKER, July 2, 2007; Gigi Stone, *See a Lie Inside the Brain: Research Detect the Truth and Find Lies With an FMRI*, ABC WORLD NEWS, Aug. 30, 2007 <http://abcnews.go.com/WN/story?id=3542921&page=1>; Robin M. Henig, *Looking for the Lie*, N.Y. TIMES MAGAZINE, Feb. 5, 2006; *Wired Science: Lie Detectors* (Public Broadcasting System 2007), available at <http://www.veoh.com/videos/v12881105ewNNPEf> (showing an MRI in action and interviewing entrepreneurs and researchers who are beginning to market fMRI to detect deception).

⁸ See, e.g., Francine Russo, *Who Should Read Your Mind?*, TIME, Jan. 19, 2007, available at <http://www.time.com/time/magazine/article/0,9171,1580378,00.html>; *Lie Detection: Making Windows in Men's Souls*, ECONOMIST, Jul. 8, 2004, available at <http://www.med.upenn.edu/langleben/Economist.pdf>.

⁹ Private companies already offer imaging services to private individuals, government agencies, and corporations. No Lie MRI, <http://www.noliemri.com/> (last visited April 22, 2008). One sponsor of scientific research into the use of fMRI technology for detecting deception is the Defense Advanced Research Projects Agency (DARPA). Daniel D. Langleben, *Telling Truth From Lie in Individual Subjects With Fast Event-Related fMRI*, 26 HUMAN BRAIN MAPPING 262, 271 (2005) (acknowledging funding by DARPA).

visceral response individuals have against the government-sanctioned invasion of our minds stems from popular conceptions of autonomy, eloquently defined and often defended by the Supreme Court.¹⁰ The Court has recognized that “[o]ur whole constitutional heritage rebels at the thought of giving government the power to control men’s minds.”¹¹ The unfettered ability to compel a suspect to submit to a brain scan raises the specter of a chilling of cognition for fear that thoughts might become incriminating information used in a future criminal proceeding.¹²

I argue that a suspect may assert the Fifth Amendment protection against self-incrimination to bar the government from compelling him or to undergo a brain scan in order to produce BOLD fMRI data. Part II provides a general description of BOLD fMRI technology and lays out three imaging paradigms that require different levels of conscious participation to perform. Part III provides a summary of Supreme Court Fifth Amendment jurisprudence. Part IV analyzes BOLD fMRI, as used in the three paradigms, under the current precedent.

Part IV argues that the data produced by BOLD fMRI is the type of evidence the privilege against self-incrimination is meant to protect.¹³

II. FUNCTIONAL MAGNETIC RESONANCE IMAGING

1. Brief Overview of the Technology

Magnetic Resonance Imaging (MRI) is a true multidisciplinary technique, encompassing physics, cognitive psychology, neuroscience, and mathematics.¹⁴ Functional Magnetic Resonance Imaging (fMRI) is a derivative of MRI.¹⁵ MRI involves the use of a huge magnet, typically the shape of a large donut, into which the scan subject is inserted.¹⁶ The magnet causes the magnetic molecules of the

¹⁰ See, e.g., *Palko v. Connecticut*, 302 U.S. 319, 326-27 (1937) (stating the “freedom of thought and speech . . . is the matrix, the indispensable condition, of nearly every other form of freedom”).

¹¹ *Stanley v. Georgia*, 394 U.S. 557, 565 (1969).

¹² See *The NewsHour With Jim Lehrer* (PBS television broadcast May 29, 1996) (JIM LEHRER: ‘Are you keeping a diary? Are you keeping good notes on what’s happening?’ HILLARY CLINTON: ‘Heavens no! It would get subpoenaed. I can’t write anything down. [Laughing]’).

¹³ See Ronald J. Allen & M. Kristin Mace, *The Self-Incrimination Clause Explained and its Future Predicted*, 94 J. CRIM. L. & CRIMINOLOGY 243 (2004) (arguing that the Fifth Amendment protects the substantive results of cognition as revealed through technologies that measure brain activity).

¹⁴ See N.F. Ramsey et al., *Functional MRI Experiments: Acquisition, Analysis, and Interpretation of Data*, 12 EUROPEAN NEUROPSYCHOPHARMACOLOGY 517, 517 (2002) (providing an incomplete list of academic fields involved in brain imaging and noting the specific area to which each contributes). The *Frye* and *Daubert* tests for admissibility of scientific evidence must be met. *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923); *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 589-92 (1993). This comment will assume that the technology has been tested, reviewed, and approved by U.S. courts.

¹⁵ See Cabeza, *supra* note 6, at 4-11 (providing an interesting history of the development of brain imaging technology).

¹⁶ *Id.*; Edson Amaro & Gareth J. Barker, *Study Design in fMRI: Basic Principles*, 60 BRAIN AND COGNITION 220, 221 (2006). The use of the magnet narrows the pool of individuals who may undergo an MRI imaging session. Cf. Center for Functional Neuroimaging, University of Pennsylvania, Standard fMRI Consent Form Wording, http://www.cfn.upenn.edu/regulatory/ConsentFormTemplate_8-2003.doc, 4 (outlining reasons a volunteer may be excluded from an imaging study) (last visited Jan. 21, 2008). Pacemakers, metal joints, shrapnel from bullets or battle, or metal bits from welding getting into an individual’s eyes are all a basis for exclusion from MRI experiments. *Id.* The magnet could pull the metal from the individual’s body. *Id.* This could result in a black market wherein criminals intentionally

subject's body to align to its magnetic field.¹⁷ Once the molecules are aligned to the MRI machine's magnetic field, radiofrequency waves change the molecules' position until they are perpendicular to the machine's magnetic field.¹⁸ Knocking the molecules out of alignment with the MRI magnet's field creates a signal that the MRI machinery is able to detect and locate in space.¹⁹ Computer software then translates this information into a three-dimensional image.²⁰

MRI relies on the magnetic properties of hydrogen, comprising a large proportion of all biological organisms.²¹ The type of fMRI this comment addresses relies on the magnetic properties of hemoglobin, which carries oxygen in blood.²² Using imaging equipment to measure the change in the oxygen content of blood is known as Blood Oxygen Level Dependant (BOLD) fMRI.²³ When saturated with oxygen, hemoglobin (oxyhemoglobin) is diamagnetic (weakly repulsed from a magnetic field), but when oxygen is removed (deoxyhemoglobin) it become paramagnetic (attracted to a magnetic field).²⁴ When an area of the brain becomes active (e.g. upon presentation of a stimulus), hemoglobin in the blood carries more oxygen to that area than is needed, resulting in an excess of oxygenated blood.²⁵ This alters the magnetic properties of the brain region, resulting in an increased signal that the MRI machine can detect.²⁶ This is because oxygenated blood produces a stronger signal

place metal in their bodies. Cf. *Wired Science: Lie Detectors* (Public Broadcasting System), available at <http://www.veoh.com/videos/v12881105ewNNPEf> (last visited April 22, 2008) (video showing a virtual scan).

¹⁷ Amaro, *supra* note 16, at 221. The strength of the magnetic field used in MRI machines is measured in Teslas. See, e.g., Guang Cao, MR Advanced Application Manager, GE Healthcare Techs. Great China, Presentation: MRI Basics (May 30, 2005), available at http://home.ust.hk/~ecneuro/pdf/presentation_2005-05-30.pdf. Typically, MRI machines used in brain imaging experiments have a magnetic strength of 1.5-3 Teslas. See, e.g. Center for Functional Neuroimaging, *supra* note 16, at 2 (listing these levels); Functional Magnetic Resonance Imaging, http://en.wikipedia.org/wiki/Functional_magnetic_resonance_imaging (last visited April 22, 2008) (describing the different magnetic strengths and corresponding BOLD signal intensity). The magnetic field of the earth is around 0.00005 Tesla. Basic Physics, <http://www.astralvoyage.com/projection/charge.html>; Radioactive Nuclear Beams (last visited April 22, 2008), http://www.nd.edu/~nsl/Research_Facilities/RNB_Facility/rnb.html last visited April 22, 2008); Big Brains and Even Bigger Magnets, http://www.bbc.co.uk/dna/h2g2/pda/A642133?s_id=2&s_split=2 (last visited April 22, 2008).

¹⁸ Amaro, *supra* note 16, at 221; see also Ramsey, *supra* note 14, at 518 (noting that different sequences of radiofrequency pulses can make the MRI sensitive to different types of tissue; in the brain this would be grey matter, white matter, cerebral spinal fluid, or blood).

¹⁹ Amaro, *supra* note 16, at 221.

²⁰ *Id.*

²¹ Amaro, *supra* note 16, at 221.

²² This property of hemoglobin was known since at least 1930. Peter A. Bandettini, *fMRI: The Spatial, Temporal, and Interpretive Limits of Functional MRI*, NEUROPSYCHOPHARMACOLOGY: THE FIFTH GENERATION OF PROGRESS 343, 343 (Lippencott Williams & Wilkins 2002). It was not until 1991 that BOLD fMRI was used. *Id.* at 344; see also Amaro, *supra* note 16, at 221 (describing the physical basis of BOLD fMRI); Ramsey, *supra* note 14, at 518 (describing the basis of BOLD fMRI).

²³ Cabeza, *supra* note 6, at 29.

²⁴ Amaro & Barker, *supra* note 16, at 221.

²⁵ See Cabeza, *supra* note 6, at 28 (providing a good introduction to and history behind fMRI and other imaging techniques); Amaro & Barker, *supra* note 16, at 222 (providing a detailed yet accessible account of BOLD fMRI).

²⁶ Ramsey, *supra* note 14, at 519; Amaro & Barker, *supra* note 16, at 221; see also Richard Robinson, *fMRI Beyond the Clinic: Will it Ever be Ready for Prime Time?*, 2 PUBLIC LIBRARY OF SCIENCE BIOLOGY, June 15, 2004, at 0715 (noting that the "influx of oxygenated blood alters the strength of the

than blood without oxygen.²⁷ The result is that “areas [of the brain] with a higher concentration of oxyhemoglobin give a higher signal (a brighter image) than areas with low concentration.”²⁸ The areas that are more active have more blood and literally “light-up.”²⁹

While an MRI image is three-dimensional, BOLD fMRI produces a four-dimensional map of brain activity.³⁰ Researchers present a predetermined sequence of stimuli to the subject while taking continuous recordings of BOLD signal change.³¹ I assume that the study paradigm implements an event related task design.³² In an event related study stimuli are presented to the subject in discrete moments of time called trials.³³ A new trial begins each time a different stimulus is presented.³⁴ The result is a “time-line” (i.e. a continuous measurement of brain activity across all trials), or four-dimensional image, of brain activity.³⁵

Computer software, using algorithms based on assumptions about how neurons

local magnetic field in proportion to the increase in flow, which is detected and recorded by the imaging machinery”).

²⁷ Amaro & Barker, *supra* note 16, at 221-22 (noting “[t]his signal increase (the positive BOLD effect) is proportional to the underlining neural activity”); Ramsey, *supra* note 14, at 519 (noting that blood without oxygen, or deoxygenated hemoglobin “causes inhomogeneity in the [magnetic] field”; adding that “the drop in signal that follows an increase in deoxyhaemoglobin [sic] is proportional to the local quantity of the (deoxygenated) molecule”); Cabeza *supra* note 6, at 11 (“[W]hen a BOLD signal is detected, blood flow to a region of brain has changed out of proportion to the change in oxygen consumption. When blood flow changes more than oxygen consumption . . . there is a [] change in the amount of deoxyhemoglobin present locally in the tissue, thus changing the local magnetic field properties.”).

²⁸ Amaro, *supra* note 16, at 221.

²⁹ *Id.*

³⁰ See Cabeza, *supra* note 6, at 32 (noting images of the whole brain can be acquired in 2 seconds); Ramsey, *supra* note 14, at 518 (noting that the scans collected are “stored as a time-series of 3D volumes”).

³¹ Cabeza, *supra* note 6, at 32-33 (discussion differing study designs and associated difficulties); see also Amaro, *supra* note 16, at 224-225 (discussing differing task designs). Stimuli can be pictures or movies, projected into the scanner and reflected from a mirror so the subject can view them unobstructed though lying down. Langleben et al., *Brain Activity During Simulated Deception: An Event-Related Functional Magnetic Resonance Study*, 15 NEUROIMAGE 727, 729 (2002). Further, headphones may be worn that allow the researchers to communicate with the subject and allow the delivery of auditory stimuli to the subject. Jennifer Maria Nunez et al., *Intentional False Responding Shares Neural Substrates With Response Conflict and Cognitive Control*, 25 NEUROIMAGE 267, 269 (2005).

³² This is the design used in the majority of the deception imaging studies. Compare F. Andrew Kozel et al., *Detecting Deception Using Functional Magnetic Resonance Imaging*, 58 BIOLOGICAL PSYCHIATRY 605, 606 (2005) (using an event-related task) and Langleben, *supra* note 9, at 263 (using an event-related task) with Tatia M.C. Lee et al., *Lie Detection by Functional Magnetic Resonance Imaging*, 15 HUMAN BRAIN MAPPING 157, 159 (2002) (using a block-design wherein each section of the study required only one type of response, for example all responses were “lie”).

³³ See Randy L. Buckner, *Event-Related fMRI & the Hemodynamic Response*, 6 HUMAN BRAIN MAPPING 373, 374-75 (1998) (describing generally the event-related paradigm); Amaro *supra* note 16, at 224 (noting the great advantage of event-related paradigms is the ability to capture the temporal changes in BOLD signal associated with the presentation of stimuli).

³⁴ Trials presenting certain classes of stimuli or requiring certain responses are presented in random order. See Buckner, *supra* note 33, at 375-76 (describing the event-related paradigm as utilizing randomly presented stimuli and noting that this contributes to its efficacy in modeling brain activity).

³⁵ See Amaro, *supra* note 16, at 229 (describing the general analysis performed by most imaging software that includes the reordering of data to create a timecourse of brain activity that model the hemodynamic response signal, or the BOLD signal change).

function, analyzes the data.³⁶ Researchers also use the software to average trials containing the same class of stimuli together, resulting in an activation map of a single subject for a specific condition or stimulus type (e.g. all trials in which the subject lied are averaged together).³⁷ This allows researchers to determine what brain activity “looked like” when a given class of stimuli was presented.³⁸ Researchers often form a hypothesis targeting a specific brain region or network, allowing the researchers to focus on specific regions a priori.³⁹ This focus is due to scientific integrity, forcing researchers to form hypothesis and predict a study’s outcome (e.g. what areas of the brain will be most affected by a particular task). It is also related to the practical necessity of obtaining statistically valid results.⁴⁰ This need not be the case. Once a scan is complete, the resulting data set contains information about the BOLD signal change for the entire region scanned, often the whole brain, for the entire duration of the scan.⁴¹ Thus, if an initial hypothesis proves wrong, researchers can reanalyze the fMRI data, focusing on another area of the brain.⁴² Likewise, the government could analyze specific areas of the suspect’s

³⁶ *Id.* at 223-24, 228-29 (discussing different ways in which BOLD signal change may be analyzed and outlining basic processing steps). A basic assumption of mathematical models used in modeling brain activity is that the hemodynamic response follows a specific time-course. *Id.* at 225. Most mathematical models use what is basically a generic Hemodynamic Response Function (HRF) to model the time-course of brain activity in response to a specific stimulus. See Buckner, *supra* note 33, at 375 (describing generally the HRF).

There are many cogent critiques of BOLD fMRI and this article presumes that the technology is not “ready for prime time.” For good discussions of the current shortcomings of the technology and the public perception, see e.g. Bandettini, *supra* note 22, at 343; Cabeza, *supra* note 6, at 28; Robinson, *supra* note 26, at 0715. See also Daniel D. Langleben et al., *True Lies: Delusions and Lie-Detection Technology*, 34 J. OF PSYCHIATRY & L. 351 (2006) (discussing delusional subjects, whose internal truth does not line up with external reality, a situation that could cast an important light on the brain areas associated with subjective conscious interpretation of (objective) sensory data).

³⁷ Amaro, *supra* note 16, at 229.

³⁸ See *id.* at 224-225 (describing the different methods researchers use to present stimuli).

³⁹ See, e.g., Langleben, *supra* note 9, at 264 (discussing the specific areas of the brain the researchers were interested in); Ramsey, *supra* note 14, at 521 (discussing the selection of a specific brain area to scan).

⁴⁰ For a given analysis, each voxel in an image is analyzed, the more comparisons that are made, the harder it is to obtain statistically significant results. Ramsey, *supra* note 14, at 523. For this reason, researchers will identify a limited number of regions of interest prior to the analysis of data. *Id.* Furthermore, identifying regions of interest beforehand allows the researchers to tailor the paradigm to ensure that the tasks performed will elicit activation in those regions (i.e. if one was interested in the visual cortex, one would not likely choose to use auditory stimuli). *Id.*; see e.g. Langleben, *supra* note 9, at 264 (discussing the specific areas of the brain the researchers were interested in); Ramsey, *supra* note 14, at 521 (discussing the selection of a specific brain area to scan).

⁴¹ Amaro, *supra* note 16, at 227-28.

⁴² If the government were to mandate a BOLD fMRI scan, should they be allowed to analyze region after region until something of import is obtained? But see *supra* note 39 (noting principles of scientific integrity prevent researchers from taking this course). This raises questions associated with the requirement of specificity in the Fourth Amendment’s Warrant Clause. U.S. CONST. amend. IV. Government use of sense enhancing technology to obtain evidence not otherwise available is a violation of the Fourth Amendment protection against unreasonable searches. *Kyllo v. United States*, 533 U.S. 27, 31, 40-1 (holding unreasonable a warrantless police search of defendant’s home using infrared imaging technology). Given the Court’s emphasis on the security and privacy a home affords in deciding *Kyllo*, an analogous argument could be made for using the sense-enhancing technology of brain scanners when used to invade a man’s mind. *Id.* at 31. Further, a defendant cannot be compelled to take part in a search and seizure for evidence that will be used against him. See *Andresen v. Maryland*, 427 U.S. 463, 480-82 (holding that in the absence of compelled participation, defendant’s Fourth Amendment rights were not

brain.⁴³ It would likely focus on regions associated with a specific phenomenon (e.g. areas of the brain associated with the act of lying).⁴⁴

Typically, researchers combine these single-subject maps into a group map to increase the statistical power, and thus the validity, of findings.⁴⁵ These maps may represent the brain activation for one group of subjects.⁴⁶ Often these group maps are compared with one another, producing a map representing the differences in brain activity between different groups of subjects.⁴⁷ Importantly, meaningful results have been detected on the single-subject level.⁴⁸ This is essential if fMRI is to be a useful tool for the forensic analysis of criminal suspects.⁴⁹

Think of a typical crime: one victim and one attacker. There is no “group” from

violated). A suspect compelled to undergo a brain scan would be forced to take part in the search for and seizure of evidence to be used against him by allowing the government to rummage through his memories using BOLD imaging technology. A warrant to perform a brain scan, setting out the specific regions to be scanned, would likely be required by the Fourth Amendment. *Cf. id.* (stating the Fourth Amendment protects a defendant from compelled participation in the production of evidence to be used); *Kyllo*, 533 U.S. at 28 (holding unreasonable a search into a private enclave using sense-enhancing technology). There might also be concerns similar to those raised in the area of subpoena *duces tecum* wherein sweeping and vague language might not withstand scrutiny. *See United States v. Hubbell*, 530 U.S. 27, 40-43 (2000) (dismissing an indictment because subpoena’s language was so vague it required defendant to exert a constitutionally protected amount of mental effort to respond to it). Again, the government would likely have to identify, in a warrant, specific brain regions to search. *Id.*

⁴³ Ramsey, *supra* note 14, at 523 (noting that limiting the number of regions scanned increases statistical power which produces more meaningful results).

⁴⁴ Lying is conceived of as a conscious suppression of true information and the intentional production of false information. Langleben, *supra* note 31, at 727. Memory recall has many essential and specific processes that occur subconsciously. G. WILLIAM FARTHING, *THE PSYCHOLOGY OF CONSCIOUSNESS* 127 (Prentice Hall 1992). Though a given paradigm may require overt behaviors on the part of the suspect, the region(s) of interest will not always be associated with conscious acts or conscious perception. *Id.* As studies of specific cognitive phenomena accumulate, regions of interest emerge from the data such that particular areas of the brain are associated with particular phenomena. *Compare* Langleben *supra* note 9, at 266 (reporting differential activity in frontal regions, among others, for lie compared to truth); *and* Kozel, *supra* note 32, at 608 (reporting differential activity in frontal regions, among others, for lie compared to truth); *and* Lee, *supra* note 32, at 159-60 (reporting differential activity in frontal regions, among others, for lie compared to truth).

⁴⁵ *See* Amaro, *supra* note 16, at 229 (describing image analysis strategies).

⁴⁶ Ramsey, *supra* note 14, at 521. One such comparison could involve the presentation of images of drug paraphernalia to a group of heroin addicts and a group with no history of drug addiction. Langleben et al., *Methadone reduces limbic system response to salient drug cues in patients with a history of heroin dependence*, Presentation at Society for Neuroscience, Washington, D.C., Nov. 2005. These studies present the same stimuli to each subject in each group (drug users v. non-drug users), average the brain activity of each subject in a group, and compare the group’s brain activity. *Id.*

These activation maps are made up of voxels, similar to pixels, which represent different size regions of the brain (i.e. 1.5 mm x 1.5 mm x 4 mm, the size of a grain of rice). Robinson, *supra* note 26, at 0715. There are around 150,000 of these sized voxels in the brain compared to “an estimated 100 billion neurons.” *Id.* The size of a voxel can be changed and is often determined in concert with other variables associated with overall image quality and time constraints. Ramsey, *supra* note 14, at 518. An MRI session lasting fifteen minutes to obtain anatomical data may have a voxel size of less than 1 mm³, while an fMRI scan may need to use larger voxels because larger voxels allow for greater brain area to be scanned in a given amount of time. *Id.* The activation of a voxel does not necessarily tell researchers whether the voxel was essential to the task or merely involved. *Id.* at 522.

⁴⁷ *E.g.*, Langleben *supra* note 9, at 265; Lee, *supra* note 32, at 160.

⁴⁸ Langleben, *supra* note 9, at 269.

⁴⁹ Some researchers have called this new use of brain imaging technology, Forensic Brain Imaging (F.B.I.). Daniel D. Langleben, Address at The Wharton School of Business Administration, University of Pennsylvania: Forensic Brain Imaging (Jan. 2003).

which an average can be obtained.⁵⁰ The government will only be able to scan the attacker or victim. Thus, it is essential that meaningful results be obtainable from a single-subject scan.

The outcome of all this processing is a color-coded, three-dimensional map of brain activity associated with a specific condition.⁵¹ The “brighter” the color, the more “intense” the brain activity, as evidenced by changes in BOLD signal.⁵² Though the technology has many hurdles to clear before it is ready for prime time it is well accepted that changes in BOLD signal are “proportional to the underlining neural activity.”⁵³ Also, the results of fMRI studies are consistent with the results from human lesion studies and from non-human primate studies.⁵⁴ Ultimately, it can be said with confidence that BOLD fMRI detects signal changes that are meaningful to researchers because it allows them to measure brain activity associated with a cognitive task or the perception of specific stimuli.⁵⁵ BOLD fMRI allows researchers to associate spatially localized brain activity, caused by identifiable stimuli, with specific cognitive functions, beliefs, and knowledge.⁵⁶ The scan technology locates the brain activity in space (on the level of millimeters).⁵⁷ The researchers are able to identify the stimulus that caused the brain activity because the activity is linked to a specific trial. This allows the researchers to infer what knowledge or belief the activity represents (e.g. the research knows when a familiar

⁵⁰ Notably, facial recognition studies have utilized the comradery of college fraternities to their advantage, as fraternity members are uniquely familiar. Steven M. Platek et al., *Neural Substrates for Functionally Discriminating Self-Face From Personally Familiar Faces*, 27 HUM. BRAIN MAPPING 91, 93, 97 (2006). It is easy to imagine this paradigm used to reveal the structure of terrorist cells by determining which faces a terrorist detainee is familiar with.

⁵¹ E.g., Langleben, *supra* note 9, at 266.

⁵² See Amaro, *supra* note 16, at 221.

⁵³ Amaro, *supra* note 16, at 222; compare Cabeza, *supra* note 6, at 28, and Ramsey, *supra* note 14, at 519 (summarizing research showing that BOLD signal change does not have a completely linear relation to neuronal activity), and Michael S. Pardo, *Neuroscience Evidence, Legal Culture, and Criminal Procedure*, 33 AM. J. CRIM. L. 301, 311-16 (2006) (summarizing what the technology purports to measure and noting that a given brain state is not equivalent to the conscious experience of “lie” or “I have seen that”), with Robinson, *supra* note 26, at 0715-16 (noting the inability to determine what specific neurons are doing), and Bandettini, *supra* note 22, at 349, 352 (discussing such problems as motion artifacts, signal-to-noise ratios, and the limited inferences that can be drawn from current fMRI data). Aside from these scientific concerns, the legal standards set by *Frye* and *Daubert* must still be met. See *Frye*, 293 F. at 1014; *Daubert*, 509 U.S. at 589-92. Again, this comment will assume that the technology has been tested, reviewed, and approved by U.S. courts.

⁵⁴ Ramsey, *supra* note 14, at 520.

⁵⁵ Amaro & Barker, *supra* note 16, at 222; Cabeza, *supra* note 6, at 29 (summarizing research supporting the assertion “that signals detected by . . . fMRI are valid measurements of local changes in neuronal activity”).

⁵⁶ See, e.g., Hofer, *supra* note 2, at 179 (finding differential brain activity in specific brain regions for familiar versus unfamiliar faces); Phelps, *supra* note 3, at 734 (reporting that activation of the limbic structure known as the amygdala correlated positively with measures of unconscious attitudes towards individuals of different races); Daniel L. Schacter et al., *Neuroanatomical Correlates of Veridical & Illusory Recognition Memory: Evidence From Positron Emission Tomography*, 17 NEURON 267, 721-22 (1996) (using another form of neuroimaging to detect differences in brain activity between words actually seen and words the subject thought they saw but did not); Uri Hasson et al., *Vase or Face? A Neural Correlate of Shape-Selective Grouping Processes in the Human Brain*, 13 J. OF COGNITIVE NEUROSCIENCE 744, 750 (2001) (summarizing prior research finding distinct patterns of brain activity associated with specific categories of visual stimuli (e.g. houses versus faces) and extending this research).

⁵⁷ Amaro & Barker, *supra* note 16, at 221.

face is being viewed by a subject as opposed to an unfamiliar face and will use this knowledge to classify the brain activity).⁵⁸

2. Three Imaging Paradigms

There are three basic paradigms that the government could use in an fMRI scan of a criminal suspect.⁵⁹ Paradigm refers to the design of the task, from the stimuli used (e.g. pictures), to the mode of presentation (e.g. an event related task), to any task the subject is asked to perform (e.g. pressing a button).⁶⁰ The paradigms I discuss form a scale shifting from overt conscious evaluation of stimuli accompanied by response selection, to unconscious perception producing measurable and meaningful brain activity.⁶¹ Researchers choose a paradigm based on the questions they wish to answer.⁶² The government's choice will be influenced by whether the paradigm produces evidence that is constitutionally protected.

The button-press paradigm is currently used in paradigms investigating brain activity associated with deception.⁶³ In this paradigm the subject is told to press one button to confirm a fact and another button to deny a fact.⁶⁴ A deception task would be designed such that the suspect would consciously evaluate the image presented and decide whether to press "yes" or "no" (i.e. "Yes, I have that" or "No, I do not have that"). In Professor Langleben's work the button-press represented the confirmation or denial of the fact that the subject possessed the playing card being presented at any particular time.⁶⁵ If the paradigm were designed to test memory the button-press could signify an answer of "I have seen that" or "I have not seen that."⁶⁶

The government could place a suspect in the scanner and show various images (e.g. the murder weapon or victim) and ask various questions ("Did you kill him?" or

⁵⁸ E.g., Hofer, *supra* note 2, at 179 (investigating differences in brain activation during the encoding and retrieval of newly presented faces and distracter faces not previously seen).

⁵⁹ These are not the only paradigms. E.g., Bandettini, *supra* note 22, at 349, 351-53 (discussing different imaging paradigms).

⁶⁰ See Ramsey, *supra* note 14, at 518 (distinguishing between "reactive" tasks, requiring a specific response to a certain stimulus based on the rules of the experiment, and "receptive" tasks, requiring only that the subject perceive certain stimuli).

⁶¹ Compare Langleben, *supra* note 9, at 263 (describing task where subjects consciously perceived stimuli); with FARTHING, *supra* note 44, at 144-46 (noting that in the backward masking paradigm subjects are not conscious of the masked image but unconscious neural phenomenon record and respond to it).

⁶² See Ramsey, *supra* note 14, at 522 (noting that "[t]he choice of tasks and the spacing between stimuli in time determine the meaning of the [activation] maps").

⁶³ The specific paradigm is called a "forced-choice" paradigm because the subject is required to make a choice for each trial. E.g., Langleben, *supra* note 9, at 263 (describing task where subjects had to press button to respond to question); Lee, *supra* note 32, at 159 (describing a forced-choice paradigm wherein the pressing of an air pump indicated a "yes" response).

⁶⁴ E.g., Langleben, *supra* note 9, at 263 (describing task where subjects had to press button to respond to question). The button presses could stand for "I have seen that" or "I have not seen that." Cf. *id.* (button-press stands for "Yes" or "No").

⁶⁵ Langleben, *supra* note 9, at 263; see also Kozel, *supra* note 32, at 606 (using the buttons to represent "yes" and "no" responses to varying types questions).

⁶⁶ This would be a basic test of episodic memory. E.g., Roberto Cabeza et al., *Brain Activity During Episodic Retrieval of Autobiographical & Laboratory Events: An fMRI Study Using a Novel Photo Paradigm*, 16 J. OF COGNITIVE NEUROSCIENCE 1583 (implementing an event-related task design requiring subjects to determine whether the image presented was one they had taken with a camera).

“Have you seen this?”).⁶⁷ The government would be investigating the suspect’s episodic memory, which “consists of your memories of personal experiences in your life.”⁶⁸ Without knowing what the suspect thought was “true” the government would be able to discern whether the suspect was lying based on the BOLD signal change associated with the suspect’s response to a question.⁶⁹ In classifying the suspect’s responses, the government could take advantage of recent work by researchers who have created complex mathematical algorithms that are able to “learn” to analyze imaging data of deception.⁷⁰ These researchers have been able to classify a single trial (i.e. a single instance of the question, “Have you seen this?”), for a single subject, as “Lie” or “Truth” based only on brain activity.⁷¹

The second paradigm involves the passive perception of stimuli.⁷² In this paradigm the subject lies in the scanner and looks at pictures, watches movies (e.g. a digital reconstruction of the crime scene), or listens to sounds.⁷³ No overt response is required.⁷⁴ In order for this paradigm to produce meaningful results, the subject

⁶⁷ E.g., Langleben, *supra* note 9, at 263.

⁶⁸ FARTHING, *supra* note 44, at 17. Researchers have been able to detect differences in brain activity when showing subjects pictures they took and comparing them to pictures of the same material that the subjects did not take. Cabeza, *supra* note 66, at 1587-89. In this study, BOLD signal was greater (for pictures the subjects took) in areas associated with self-referential processing, visual and spatial memory, and recollection. *Id.* at 1591. As noted above, researchers have also been able to classify a single trial (i.e. a single instance of the question, “Have you seen this?”), for a single subject, as “Lie” or “Truth” based only on brain activity. C. Davatzikos et al., *Classifying Spatial Patterns of Brain Activity with Machine Learning Methods: Application to Lie Detection*, 28 NEUROIMAGE 663, 668 (2005); Langleben, *supra* note 9, at 266-67, 270. This is the beginning of the production of a “neural signature” for the phenomenon of lying. *See id.*; *supra* note 44.

⁶⁹ Davatzikos, *supra* note 68, at 663, 668 (describing study involving 22 participants performing a button-press task in which 99% of the responses were identified correctly by machines). A “lie” response might indicate that the subject had in fact seen the murder weapon or victim. *But cf.* Daniel D. Langleben et al., *True Lies: Delusions and Lie-Detection Technology*, 34 J. OF PSYCHIATRY & L. 351, 363 (2006) (discussing a situation wherein a delusional individual honestly believes something occurred though it really had not and highlighting implications for brain imaging of deception).

⁷⁰ Davatzikos, *supra* note 68, at 665.

⁷¹ *Id.* at 668; Langleben, *supra* note 9, at 266-67, 269-70.

⁷² This is sometimes referred to as “free viewing” of stimuli. *See, e.g.*, Andreas Bartels & Semir Zeki, *Functional Brain Mapping During Free Viewing of Natural Scenes*, 21 HUMAN BRAIN MAPPING 75, 76 (2004) (describing a paradigm wherein subjects passively viewed a movie, a paradigm the authors describe in the title as “Passive Viewing”). Both descriptions highlight the absence of any requirement of an overt response on the part of the scnee. *Compare* Hengyi Rao et al., *Imaging Brain Activity During Natural Vision Using CASL Perfusion fMRI*, 28 HUMAN BRAIN MAPPING 593, 595 (2007) (describing an imaging paradigm where subjects passively watched a video while being scanned), *with* Langleben, *supra* note 9, at 263 (describing a button-press paradigm where the subject is required to press a button, produce an overt response).

⁷³ The stimulus may be a picture, but it is also possible that a digital reproduction of the crime scene is created and played back to the individual in the scanner in an attempt to elicit a brain response associated recognition or strong emotion. *Cf.* Klaus Mathiak et al., *Toward Brain Correlates of Natural Behavior: fMRI During Violent Video Games*, 27 HUMAN BRAIN MAPPING 948, 952-53 (reporting the measurement and interpretation of brain activity during play of violent video games); Axel Schafer et al., *Stimulus Type and Design Influence Hemodynamic Responses Towards Visual Disgust and Fear Elicitors*, 57 INTERNATIONAL J. OF PSYCHOPHYSIOLOGY 53, 54-55 (2005) (subjects asked to passively view fear and disgust eliciting stimuli).

⁷⁴ The button-press may be utilized to provide behavioral data, such as an indication that the subject is aware or to provide a measure of reaction time (i.e. the subject presses the button as soon as possible upon consciously perceiving a particular stimulus and researchers determine if certain stimuli require a longer reaction time). *E.g.*, Langleben, *supra* note 9, at 264 (recording response times for each stimulus).

must perceive the stimuli (e.g. not fall asleep); otherwise there will be no meaningful change in BOLD signal.⁷⁵ For instance, the investigators might present stimuli aimed at probing episodic memory or evoking a recognition response (e.g. pictures of the victim).⁷⁶ The key difference is that in this paradigm the suspect is not compelled to respond overtly.⁷⁷ The suspect is not required to classify the stimulus (e.g. select which button to press).⁷⁸

The third paradigm bypasses the suspect's consciousness altogether.⁷⁹ This paradigm involves a phenomenon known as "backward masking."⁸⁰ During a backward masking test, an image is shown for a very brief amount of time (around 43 milliseconds) and is followed by the presentation of a different image for a longer amount of time (i.e. 2 seconds).⁸¹ The result is that the subject is only conscious of the second image shown.⁸² There is no conscious knowledge of the "masked" (the first) image.⁸³ Nevertheless, these "masked" images produce BOLD signal changes in regions associated with emotion and the early stages of stimulus processing.⁸⁴ The government could present masked images aimed at eliciting a response in brain areas associated with episodic memory.⁸⁵ Thus, the government would be able to

class in an event-related lie-detection paradigm).

⁷⁵ BOLD signal change is only meaningful if it can be associated with class of stimuli. See Ramsey, *supra* note 14, at 522 (describing the difficulty of determining the meaning of brain activity and the necessity of having something to associate it with).

⁷⁶ The images could contain information that only an individual who had been at the crime scene would be familiar with. E.g., Cabeza, *supra* note 66, at 1591 (implementing an event-related task design requiring subjects to determine whether the image presented was one they had taken with a camera). Also, if the defendant denied any familiarity with the victim, images of the victim's face could be presented to attempt to elicit brain activity associated with familiarity. Hofer, *supra* note 2, at 179 (investigating differences in brain activation during the encoding and retrieval of newly presented faces and distracter faces not previously seen); Bruno Rossion et al., *The Functionally Defined Right Occipital & Fusiform "Face Areas" Discriminate Novel From Visually Familiar Faces*, 19 *NEUROIMAGE* 877, 879 (2003) (reporting that areas associated with identifying faces also plays a role in differentiating familiar from novel faces).

⁷⁷ Thus, this task is not well suited to be a lie-detecting task because the subject is not required to answer (i.e. to lie or tell the truth). E.g., Langleben, *supra* note 9, at 263 (describing task where subjects had to press button to respond to question).

⁷⁸ Based on the assumption of "pure insertion," it is plausible to state that the only difference between the passive viewing paradigm and the button-press paradigm is the brain activity associated with the planning and execution of the motor response (pressing a button) because each task could be aimed primarily at eliciting brain activity in areas associated with episodic memory recall. See Amaro, *supra* note 16, at 4 (discussing the concept of "pure insertion"); Cabeza, *supra* note 6, at 8-9 (discussing the concept of "pure insertion" which treats areas of the brain involved with specific tasks or behaviors like discrete bricks whose activity does not influence the other areas around it).

⁷⁹ See, e.g., FARTHING, *supra* note 44, at 144-46 (describing early investigations of backward-masking).

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² *Id.*

⁸³ *Id.*

⁸⁴ Michael F. Green et al., *Regional Brain Activity Associated With Visual Backward Masking*, 17 *J. OF COGNITIVE NEUROSCIENCE* 13, 15-16 (2005); Talma Hendler et al., *Sensing the Invisible: Differential Sensitivity of Visual Cortex and Amygdala to Traumatic Context*, 19 *NEUROIMAGE* 587, 596 (2003); Stanislas Dehaene et al., *Imaging Unconscious Semantic Priming*, 395 *NATURE* 597, 597-99 (1998).

⁸⁵ Cf. Cabeza, *supra* note 66, at 1583 (implementing an event-related task design requiring subjects to determine whether the image presented was one they had taken with a camera). Additionally, the government may attempt to elicit some emotional response from the suspect based on presumptions of fear of getting caught. The government might be attempting to detect brain activity that produces the peripheral physiological responses that traditional lie-detection machines detect. Cf. Talma Hendler et

determine where a suspect had been or what a suspect had seen with the suspect unaware that this information was revealed.

III. THE FIFTH AMENDMENT

1. Policies Behind the Fifth Amendment

The Federal Constitution provides that “[n]o person . . . shall be compelled in any criminal case to be a witness against himself.”⁸⁶ The Supreme Court has identified numerous policies supporting the Fifth Amendment privilege against self-incrimination.⁸⁷ These policies reflect the basic concern of protecting the individual from government attempts to extort information involuntarily.⁸⁸ The privilege is viewed by the Court as “a response to certain historical practices . . . which placed a premium on compelling subjects of the investigation to admit guilt from their own lips,” typically through physical abuse.⁸⁹ The privilege against self-incrimination

al., *Sensing the Invisible: Differential Sensitivity of Visual Cortex and Amygdala to Traumatic Context*, 19 *NEUROIMAGE* 587, 596 (2003) (finding traumatic experiences produced differential brain activity when viewing visual stimuli). Thus, seeing the murder weapon might produce brain activity that causes the increased heart rate a traditional lie detector measures. *Cf. id.* Still, some criminals may have reduced or muted emotional response due to anti-social personality disorder. *Cf. Adrian Raine, Biosocial Studies of Antisocial and Violent Behavior in Children and Adults: A Review*, 30 *J. OF ABNORMAL CHILD PSYCHOL.* 311, 315 (2002) (discussing the reduced arousal associated with antisocial personality disorder). Investigators could use the backward masking paradigm to foil any countermeasures a suspect might employ when consciously presented with a potentially incriminating stimulus. *E.g.*, Jennifer Granick, *The Lie Behind Lie Detectors*, *WIRED*, Mar. 15, 2006, <http://www.wired.com/politics/law/commentary/circuitcourt/2006/03/70411?currentPage=all> (noting “fMRI is susceptible to simple countermeasures. Since fMRI measures oxygen in the brain, a subject can defeat the test by breathing deeply or by holding her breath”).

⁸⁶ U.S. CONST. amend. V.

⁸⁷ *See infra* notes 89-97 and accompanying text.

⁸⁸ *Couch v. United States*, 409 U.S. 322, 328 (1973) (noting the Fifth protects against the “extortion of information from the accused”). In addition to individual autonomy the Court has noted that the Fifth Amendment protects privacy. *E.g.*, *Fisher v. United States*, 425 U.S. 391, 416 (1976) (Brennan, J., concurring) (stating “[t]he privilege reflects ‘our respect for the inviolability of the human personality and of the right of each individual to a private enclave where he may lead a private life.’”) (citation omitted); *United States v. Nobles*, 422 U.S. 225, 233 (1975) (“The Fifth Amendment privilege against compulsory self-incrimination . . . protects ‘a private inner sanctum of individual feeling and thought and proscribes state intrusion to extract self-condemnation.’”) (citation omitted). “The Fifth Amendment in its Self-Incrimination Clause enables the citizen to create a zone of privacy which government may not force him to surrender to his detriment.” *Fisher*, 425 U.S. at 416 (Brennan, J.) (quoting *Griswold v. Connecticut*, 381 U.S. 479, 484 (1965)). Justice Brennan continues, arguing that the privilege is “designed as it is ‘to maintain inviolate large areas of personal privacy.’” *Id.* at 415 (quoting *Feldman v. United States*, 322 U.S. 487, 490 (1944)). While privacy is out of vogue in Constitutional jurisprudence, conceptions of mental privacy and individual autonomy still hold some sway. *See Thompson, supra* note 5, at 348 (noting that shifting conception of the historical meaning of the Fifth Amendment and conceptions of privacy make these policies less favorable than others).

⁸⁹ *Andresen v. Maryland*, 427 U.S. 463, 470 (1976) (quoting *Michigan v. Tucker*, 417 U.S. 433, 440 (1974)) (discussing the methods of the ecclesiastical inquisitions and the Star Chamber) (quotations omitted); *Griffin v. California*, 380 U.S. 609, 620 (1965) (noting a suspect refusing to testify in front of or lying to the Star Chamber suffered “incarceration, banishment, or mutilation”); *see, e.g.*, *Pennsylvania v. Muniz*, 496 U.S. 582, 595 (1990) (noting that the protection of compulsory “testimonial evidence reflects an awareness of the historical abuses against which the privilege against self-incrimination was aimed”); *but see* Richard A. Nagareda, *Compulsion “to be a Witness” and the Resurrection of Boyd*, 74 *N.Y.U. L. REV.* 1575, 1577-80 (1999) (arguing the Supreme Court has failed to carry out an appropriate

was designed to halt these physical invasions of individual autonomy.⁹⁰

This guarantee protects the physical wellbeing of the criminal suspect as well as “the contents of his own mind.”⁹¹ The Court has viewed the privilege against self-incrimination as a constitutional guarantee that the government will gain convictions “by its own independent labors, rather than by the cruel, simple expedient of compelling it from [the suspect’s] mouth.”⁹² The Court has also held that the privilege protects the individual from government attempts to obtain disclosures involving the accused’s “consciousness of the facts and the operations of his mind in expressing it.”⁹³ Put another way, the privilege protects “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.”⁹⁴ The Court has held that, at a minimum, the privilege is triggered when a suspect is confronted with the “cruel trilemma” of truth, falsity, or silence.⁹⁵ When a suspect must make a choice between truth, falsity, or silence, the suspect “disclos[es] the contents of his own mind,” implicating the privilege.⁹⁶

Even in the face of these policies, the Court has maintained flexibility in their application. The Court has noted repeatedly “the scope of the privilege does not coincide with the complex of values it helps to protect.”⁹⁷ Not every governmental

historical analysis of the meaning of the term “witness” and therefore has produced a body of case law inconsistent with the Founder’s intent).

⁹⁰ *Muniz*, 496 U.S. at 596 (quoting *Ullmann v. United States*, 350 U.S. 422, 428 (1956) (noting “the privilege was designed primarily to prevent ‘a recurrence of the Inquisition and the Star Chamber, even if not in their stark brutality,’” continuing that “[h]aving had much experience with a tendency in human nature to abuse power, the Founders sought to close the doors against like future abuses by law-enforcing agencies”).

⁹¹ *Curcio v. United States*, 354 U.S. 118, 128 (1957).

⁹² See, e.g., *Miranda v. Arizona*, 384 U.S. 436, 460 (1966) (stating policies such as maintaining the individual’s dignity and requiring the government to shoulder the load of convicting a suspect and to do so “by its own independent labors, rather than by the cruel, simple expedient of compelling it from his own mouth”); *Murphy v. Waterfront Comm’n*, 378 U.S. 52, 54-57 (1964) (summarizing that the Fifth Amendment regulates the relation between the government and the individual to ensure the prevention of inhumane treatment of suspects and to satisfy popular sentiment that an individual’s sovereignty would be violated if required to aid the government in his conviction). Thus, the individual has a right “to remain silent unless he chooses to speak in the unfettered exercise of his own will, and to suffer no penalty . . . for such silence.” *Malloy v. Hogan*, 378 U.S. 1, 8 (1964).

⁹³ *Doe v. United States*, 487 U.S. 201, 211 (1988) (quoting Wigmore, *EVIDENCE*, 8 § 2265); see also *Rochin v. California*, 342 U.S. 165, 175 (1952) (Black, J., concurring) (“[A] person is compelled to be a witness against himself not only when he is compelled to testify, but also when as here, incriminating evidence is forcibly taken from him by a contrivance of modern science.”); *Id.* at 179 (Douglas, J., concurring) (“I think that words taken from his lips, capsules taken from his stomach, blood taken from his veins are all inadmissible provided they are taken from him without his consent. They are inadmissible because of the command of the Fifth Amendment.”). *Rochin* involved a stomach pump used by police to obtain evidence to use against defendant. *Id.* at 166 (majority opinion). The court addresses Due Process and Fifth Amendment concerns, deciding the case on the Due Process issue. *Id.* at 172 (establishing the “shock the conscience” standard).

⁹⁴ *Doe*, 487 U.S. at 213.

⁹⁵ *Muniz*, 496 U.S. at 597 (stating the privilege “must encompass all responses to questions that, if asked of a sworn suspect during a criminal trial, could place the suspect in the ‘cruel trilemma’”).

⁹⁶ *Curcio*, 354 U.S. at 128.

⁹⁷ *Doe*, 487 U.S. at 213 n.11; see *Schmerber v. California*, 384 U.S. 757, 762-63 (1966) (“[T]he privilege [against self-incrimination] has never been given the full scope which the values it helps to protect suggest. History and a long line of authorities in lower courts have consistently limited its protection to situations in which the State seeks to submerge those values by obtaining the evidence against an

intrusion into the suspect's knowledge or beliefs will run counter to these policies.⁹⁸ Nor will the Court hold as protected all physical acts the government compels a defendant to perform.⁹⁹ The Court has stated that "the societal interests in privacy, fairness, and restraint of governmental power are not unconstitutionally offended by compelling the accused to have his body serve as evidence that leads to the development of highly incriminating testimony"¹⁰⁰

Even with such hedging, the policies behind the Fifth Amendment privilege against self-incrimination seem to be aimed at protecting the individual from an overbearing government. The privilege appears to be a protection against government attempts to destroy the individual's autonomy in obtaining incriminating evidence.¹⁰¹ Specifically, the privilege is geared toward protecting knowledge of facts the suspect might have from being obtained involuntarily in the course of a criminal trial.¹⁰² The privilege protects suspects from compulsory revelation of the contents of his or her mind, be they facts or beliefs.¹⁰³

2. Applying the Fifth Amendment

The Supreme Court has created a three-prong test to determine when the Fifth Amendment privilege against self-incrimination is triggered. The privilege protects evidence that is: compelled, incriminating, and testimonial.¹⁰⁴ Evidence is compelled when, "considering the totality of the circumstances, the free will of the witness was overborne."¹⁰⁵ The state compels the production of evidence when, "whether by force or by psychological domination, [it] overcom[es] the mind and will of the person under investigation and depriv[es] him of the freedom to decide

accused through the cruel, simple expedient of compelling it from his own mouth.") (quotations omitted).

⁹⁸ *Doe*, 487 U.S. at 213-14; *Fisher*, 425 U.S. at 399.

⁹⁹ *Infra* notes 126-36 (describing the exemplar cases).

¹⁰⁰ *Doe*, 487 U.S. at 213 n.11.

¹⁰¹ *Supra* notes 88-96 and accompanying text.

¹⁰² *E.g.*, *Doe*, 487 U.S. at 213 (stating the privilege protects "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").

¹⁰³ *E.g.*, *id.* (noting the privilege protects individuals knowledge and beliefs); *Miranda*, 384 U.S. at 460 (stating policies such as maintaining the individual's dignity and ensuring the government shoulder the load of convicting a suspect by obtaining that conviction "by its own independent labors, rather than by the cruel, simple expedient of compelling it from his own mouth").

¹⁰⁴ *See, e.g.*, *Hiibel v. Sixth Judicial Dist. Court of Nevada, Humboldt County*, 542 U.S. 177, 189 (2004) ("To qualify for the Fifth Amendment privilege, a communication must be testimonial, incriminating, and compelled."); *Doe*, 487 U.S. at 409 ("[T]he privilege protects a person only against being incriminated by his own compelled testimonial communications."); *Fisher*, 425 U.S. at 408 ("[T]he Fifth Amendment does not independently proscribe the compelled production of every sort of incriminating evidence but applies only when the accused is compelled to make a Testimonial Communication that is incriminating."); *see also* Allen, *supra* note 13, at 249-259 (outlining the meaning of the three components of Fifth Amendment jurisprudence); Jody C. Barillare, *As Its Next Witness, the State Calls . . . the Defendant: Brain Fingerprinting as "Testimonial" Under the Fifth Amendment*, 79 TEMP. L. REV. 971, 981 (noting the "privilege against self-incrimination focuses on three basic elements: compulsion, incrimination, and testimonial communication").

¹⁰⁵ *United States v. Washington*, 431 U.S. 181, 187-88 (1977) ("Absent some officially coerced self-accusation, the Fifth Amendment privilege is not violated."). When governmental compulsion is "overbearing," it violates the Fifth Amendment protection. *Id.* at 190. Voluntary disclosures will not trigger the privilege. *Id.*

whether to assist the state in securing his conviction.”¹⁰⁶ Generally, when a defendant produces evidence involuntarily the production is compelled.¹⁰⁷ For example, production of documents is compelled if the government obtains the documents via a *subpoena duces tecum* because the defendant would not voluntarily turn them over.¹⁰⁸ Also, evidence that is the result of police coercion is clearly compelled.¹⁰⁹

Even if evidence is obtained under compulsion a suspect will be unable to invoke successfully the Fifth Amendment if there is no risk that the evidence will be used against him or her in a criminal proceeding.¹¹⁰ The Fifth Amendment will not apply if a witness will not be subject to any criminal sanction as a result of testifying or otherwise producing evidence.¹¹¹ The privilege protects a suspect from providing evidence “which may possibly expose him to a criminal charge.”¹¹² The defendant must be “confronted by substantial and real, and not merely trifling or imaginary, hazards of incrimination.”¹¹³ However, if the criminality is removed the amendment ceases to apply.¹¹⁴ For example, removal of the threat of incrimination by granting immunity renders the privilege inapplicable.¹¹⁵

The government, by physically forcing the hypothetical defendant to participate in the scan, is compelling the suspect under the Fifth Amendment.¹¹⁶ Further, in the

¹⁰⁶ Application of Gault, 387 U.S. 1, 47 (1967).

¹⁰⁷ *Id.* While the privilege protects a suspect against physical or mental pressure, there is no clear rule as to when the privilege will and will not apply. See *McKune v. Lile*, 536 U.S. 24, 41 (2002) (“Courts must decide whether the consequences of an inmate’s choice to remain silent are closer to the physical torture against which the Constitution clearly protects or the de minimis harms against which it does not.”); see also *Allen*, *supra* note 13, at 250-56 (describing the difficulty in identifying a clear standard or test). Determining the limits of compulsion under the Fifth Amendment is “a question of judgment” for the courts. *McKune*, 536 U.S. at 26. This flexibility, and the requirement that all three prongs be met to trigger Fifth Amendment protections, has led the Court to hold that some compelled action is constitutional. E.g., *Schmerber*, 384 U.S. at 761 (stating “[i]t could not be denied that in requiring petitioner to submit to the withdrawal and chemical analysis of his blood the State compelled him to submit to an attempt to discover evidence that might be used to prosecute him for a criminal offense,” but finding blood draw constitutional because blood is not testimonial).

¹⁰⁸ See, e.g., *United States v. Hubbell*, 530 U.S. 27, 34-37 (2000) (describing cases where the Court has allowed compelled evidence at trial and noting the rule that responding to a subpoena may entail compelled testimony).

¹⁰⁹ *Colorado v. Connelly*, 479 U.S. 157, 177 (1986); see also *Malloy*, 378 U.S. at 8 (holding that the Due Process Clause of the Fourteenth Amendment “secures against state invasion the same privilege that the Fifth Amendment guarantees against federal infringement”).

¹¹⁰ *Chavez v. Martinez*, 538 U.S. 760, 767 (2003). Thus, if a brain scan were compelled to gather evidence to use against another person, it would not be considered incriminating for Fifth Amendment self-incrimination purposes. *Id.*

¹¹¹ *Ullmann v. United States*, 350 U.S. 422, 431 (1956) (quoting *Hale v. Henkel*, 201 U.S. 43, 67 (1906) (quotations omitted); see also *Kastigar v. United States*, 406 U.S. 441, 445 (1972) (adding the privilege “protects against any disclosures that the witness reasonably believes could be used in a criminal prosecution or could lead to other evidence that might be so used”).

¹¹² *Ullmann*, 350 U.S. at 431.

¹¹³ *United States v. Freed*, 401 U.S. 601, 606 (1971); see *Rogers v. United States*, 340 U.S. 367, 373-74 (1951).

¹¹⁴ *Ullmann*, 350 U.S. at 431 (quoting *Hale*, 201 U.S. at 67) (quotations omitted); see also *Estelle v. Smith*, 451 U.S. 454, 462 (1981) (“[T]he availability of the [Fifth Amendment] privilege [turns] . . . upon the nature of the statement or admission and the exposure which it invites.”) (citations omitted).

¹¹⁵ *Kastigar*, 406 U.S. at 445 n13. Conceivably, the government could avoid violating the privilege by granting immunity to a suspect it compels to undergo a brain scan. *Id.* at 445-47.

¹¹⁶ *Supra* notes 105-09 and accompanying text.

hypothetical the police used the images produced by the brain scan against the mugger at trial to link the suspect to the crime scene and to contradict the suspect's statement that he had never seen the victim before. Thus, the evidence is incriminating.¹¹⁷ The only question that remains is whether the images produced by the brain scan are testimonial.¹¹⁸ If they are not, the compelled and incriminating evidence will be allowed.¹¹⁹ If the images are deemed testimonial, the mugging suspect will be able to invoke his Fifth Amendment right against self-incrimination and refuse to take-part in the brain scan.

2 A. *Real and Physical v. Testimonial and Communicative*

In *Schmerber v. California*,¹²⁰ the Supreme Court held that the compelled drawing of blood from defendant's body, to analyze and use as evidence of intoxication to convict a defendant of driving under the influence, was not a violation of the Fifth Amendment because the defendant was compelled to produce "real evidence" not "testimony."¹²¹ The Court saw the suspect as a donor not as a witness.¹²² The Supreme Court reasoned that, although the evidence was incriminating, it was not the result of a "communicative act."¹²³ The Court held the blood at issue was "physical" or "real" evidence, distinguishable from "testimonial" or "communicative" evidence.¹²⁴ Because the Fifth Amendment only protects a suspect from compelled production of incriminating "testimonial" evidence, the defendant in *Schmerber* had no right to invoke the privilege.¹²⁵

The distinction between "physical" and "testimonial" was based on the rationale that the Fifth Amendment "is a prohibition of the use of physical or moral compulsion to extort communications from [the suspect], not an exclusion of his body as evidence."¹²⁶ This distinction led to a line of cases known as the "exemplar cases," in which the Court upheld the use of a defendant's body in the production of various types of evidence.¹²⁷ The Court allows this evidence to be used even "where the evidence could be produced only through some volitional act on the part of the

¹¹⁷ *Chavez*, 538 U.S. at 767 (holding the Fifth will not bar evidence if it is not used at a criminal proceeding).

¹¹⁸ See *Schmerber*, 384 U.S. at 761 (describing evidence that was both incriminating and compelled but not testimonial).

¹¹⁹ See, e.g., *id.* (acknowledging that the evidence was produced under compulsion but holding the Fifth Amendment was not violated because the evidence was not testimonial).

¹²⁰ 384 U.S. 757 (1966).

¹²¹ *Id.* at 765.

¹²² *Id.* (noting that defendant's "participation, except as a donor, was irrelevant to the results of the test, which depend on chemical analysis and on that alone").

¹²³ *Contra id.* at 773, 775 (Black, J., dissenting) ("[T]he conclusion that compelling a person to give his blood to help the State convict him is not equivalent to compelling him to be a witness against himself strikes me as quite an extraordinary feat." "It is a strange hierarchy of values that allows the State to extract a human being's blood to convict him of a crime because of the blood's content but proscribes compelled production of his lifeless papers.").

¹²⁴ *Schmerber*, 384 U.S. at 764.

¹²⁵ *Id.*

¹²⁶ *Id.* at 763 (quoting *Holt v. United States*, 218 U.S. 245, 252-53 (1910)); but see *United States v. Dionisio*, 410 U.S. 31, 35 (1973) (Marshall, J., dissenting) (becoming a member of the Supreme Court after *Schmerber* was decided and arguing that the *Holt* quote used by the majority in *Schmerber* was dicta "elevated . . . to full constitutional stature").

¹²⁷ See, e.g., *Muniz*, 496 U.S. at 591-92 (summarizing case law).

suspect.”¹²⁸ Thus, suspects may be compelled to appear in a line-up, repeat a specific phrase, produce a handwriting exemplar, provide a voice exemplar, and in certain circumstances provide a name, without violating the privilege.¹²⁹

The evidence at issue in the exemplar cases was not considered testimonial for multiple reasons.¹³⁰ First, defendants were not required to choose a response; they were not subjected to the cruel trilemma.¹³¹ Responding to a government direction “to do something is not an assertion of fact or . . . a disclosure of information.”¹³² Second, the evidence at issue was viewed as examples of the physical properties or characteristics of the defendant’s body.¹³³ These physical characteristics do not “explicitly or implicitly[] relate a factual assertion or disclose information” and are unprotected by the privilege.¹³⁴ Third, the government did not compel the defendant’s action to obtain any knowledge the defendant might have.¹³⁵ The evidence produced served only as a sample of a physical trait of the defendant, it “shed[] no light on [the defendant’s] actual intent or state of mind.”¹³⁶

¹²⁸ *Id.*

¹²⁹ *Hiibel*, 542 U.S. at 189-90 (upholding law requiring an individual stopped by police, and reasonably believed to be associated with past or impending criminal activity, to identify himself. The Court did not decide this case on Fifth Amendment grounds but dicta suggests that this law was not viewed as violating the privilege due to its narrow applicability); *Dionisio*, 410 U.S. at 7 (“Wade and Gilbert [sic] definitively refute any contention that the compelled production of the voice exemplars in this case would violate the Fifth Amendment. The voice recordings were to be used solely to measure the physical properties of the witnesses’ voices, not for the testimonial or communicative content of what was to be said.”); *Gilbert v. California*, 388 U.S. 263, 266-67 (1967) (“A mere handwriting exemplar, in contrast to the content of what is written, like the voice or body itself, is an identifying physical characteristic outside [the privilege’s] protection.”); *United States v. Wade*, 388 U.S. 218, 221-23 (1967) (reasoning that the lineup was merely “compulsion of the accused to exhibit his physical characteristics, not compulsion to disclose any knowledge he might have . . . [because] compelling [the defendant] to speak within hearing distance of the witnesses, even to utter words purportedly uttered by the robber, was not compulsion to utter statements of a ‘testimonial’ nature; he was required to use his voice as an identifying physical characteristic, not to speak his guilt.”).

¹³⁰ *Supra* note 129; *infra* notes 131-36.

¹³¹ *See, e.g., Muniz*, 496 U.S. at 597 (holding that, at a minimum, the Fifth protects any response that subjects the suspect to the “cruel trilemma” and explaining that the evidence in *Schmerber* and its progeny was outside the protections of the privilege because the defendants in those cases were not presented with the “trilemma”); *Dionisio*, 410 U.S. at 3, 7 (describing the process through which suspects were given a transcript to read and holding that the recording of these readings was used to compare physical properties of the suspect’s voice); *Gilbert*, 388 U.S. at 266-67 (differentiating the content of what is written, which is testimonial, from how it is written, a mere physical characteristic); *Schmerber*, 384 U.S. at 765 (holding that the blood drawn under compulsion was not testimonial because it did not involve “even a shadow of testimonial compulsion upon or enforced communication by the accused”).

¹³² *Doe*, 487 U.S. at 217 (arguing that defendant’s act was analogous to the production of a handwriting or voice exemplar).

¹³³ *See, e.g., Gilbert*, 388 U.S. at 266-67 (noting a handwriting exemplar was an identifying characteristic outside of the privilege’s protection); *Wade*, 388 U.S. at 221-23 (finding constitutional compelled appearances in a lineup because it only compels “the accused to exhibit his physical characteristics, not . . . any knowledge he might have”).

¹³⁴ *Doe*, 487 U.S. at 210.

¹³⁵ *Id.* at 217 (citations & quotations omitted); *see, e.g., Wade*, 388 U.S. at 222-23 (differentiating the constitutionality of compelling a suspect to reveal a physical characteristic as opposed to knowledge).

¹³⁶ *Doe*, 487 U.S. at 216; *see also Schmerber*, 384 U.S. at 765 (noting that the defendant’s “participation, except as a donor, was irrelevant to the results of the test, which depend on chemical analysis and on that alone” and the incriminating evidence “was obtained in a manner that did not entail any testimonial act on the part of the suspect”).

Though *Schmerber* created a distinction between physical and testimonial evidence, it reaffirmed the rule that the Fifth Amendment applies to a suspect's "communications, whatever form they might take."¹³⁷ This rule is highlighted in *Estelle v. Smith*.¹³⁸ The defendant in *Estelle* was ordered to undergo a psychiatric evaluation.¹³⁹ The evaluating psychiatrist then testified as to the defendant's future dangerousness.¹⁴⁰ On appeal, the defendant objected to the use of this testimony on the grounds that it violated the defendant's Fifth Amendment right against self-incrimination.¹⁴¹ The government argued that the incriminating evidence (the psychiatrist's opinion) was not related to any testimonial or communicative act of the defendant and should not be barred by the Fifth Amendment.¹⁴² The Court held for the defendant because his Miranda rights were violated.¹⁴³ Nevertheless, the Court was careful to note that the privilege against self-incrimination was "directly involved" because the psychologist did not base his testimony on the physical characteristics of the defendant (e.g. how he talked).¹⁴⁴ Rather, the psychiatrist based his testimony on what the suspect said and on what the suspect *omitted* (e.g. an expression of remorse) during the evaluation.¹⁴⁵ In using the psychiatrist's opinion, based on the defendant's omissions, the state relied on the defendant's beliefs about the crime.¹⁴⁶ Here, these beliefs were communicated by remaining silent (i.e. not conveying remorse).¹⁴⁷ The suspect's silence "implicitly[] relate[d] a factual assertion" and therefore the privilege applied to the psychiatrist's testimony.¹⁴⁸

In *Pennsylvania v. Muniz* the Court continued its exploration of the distinction between physical and testimonial evidence.¹⁴⁹ In *Muniz*, the government attempted to enter into evidence an intoxicated defendant's response to the question, "When you turned six-years-old, do you remember what the date was?"¹⁵⁰ The defendant replied, "No, I don't."¹⁵¹ The Commonwealth argued that defendant's response should be admitted because it was only incriminating insofar as it concerned "the physiological functioning of [defendant's] brain," which is an unprotected physical characteristic of the defendant's body.¹⁵² The Commonwealth asserted that the privilege against self-incrimination did not protect physical characteristics and any

¹³⁷ *Schmerber*, 384 U.S. at 763-64.

¹³⁸ *Estelle v. Smith*, 451 U.S. 454 (1981).

¹³⁹ *Id.* at 456-57.

¹⁴⁰ *Id.* 459-60.

¹⁴¹ *Id.* at 460-61 (describing the lower courts' reasoning and holdings).

¹⁴² *Id.* at 463.

¹⁴³ *Id.* at 464-67, 469-70 (holding that defendant's Fifth Amendment rights were violated because the suspect was not given Miranda Warnings and because the psychiatrist based his testimony on communications privileged by the right against self-incrimination. The Court also held that the suspect was denied his Sixth Amendment right to counsel prior to the initiation of the evaluation).

¹⁴⁴ *Estelle*, 451 U.S. at 465.

¹⁴⁵ *Id.* The psychiatrist's "prognosis as to future dangerousness rested on statements respondent made, and remarks he omitted." *Id.* at 464.

¹⁴⁶ *Id.* at 464-65.

¹⁴⁷ *Id.*

¹⁴⁸ *Id.* at 464-465.

¹⁴⁹ 496 U.S. 582, 591-92 (1990).

¹⁵⁰ *Muniz*, 496 U.S. at 586. This question was asked during booking. *Id.* at 585-86 (describing the booking procedure which included the creation of a video recording of the defendant and the asking of general questions such as "name, address, height, weight, eye color date of birth, and current age").

¹⁵¹ *Id.*

¹⁵² *Id.* at 593 (quoting petitioner's brief) (quotations omitted).

incriminating inference based on them should be admissible.¹⁵³ The Court disagreed, holding that the privilege barred the use of the statement at trial.¹⁵⁴ The Court acknowledged that the incriminating evidence (defendant was intoxicated) concerned the physical functioning of defendant's brain.¹⁵⁵ Nevertheless, the incriminating evidence was "drawn from a testimonial act" and any incriminating inferences based on this "testimonial act" were privileged.¹⁵⁶ The plurality in *Muniz* held that by asserting his inability to answer the officer's question, the defendant "communicate[d] an express or implied assertion of fact or belief."¹⁵⁷ Therefore, the privilege against self-incrimination barred the use of the statement or any incriminating inferences based thereon.¹⁵⁸

Muniz held that an incriminating inference about a physical characteristic of a defendant (e.g. a brain functioning in an inebriated state) is covered by the privilege against self-incrimination if the inference is "drawn from" a testimonial communication (i.e. an act communicating a fact or belief).¹⁵⁹ The unprotected physical evidence in the exemplar cases "was *obtained* in a manner that did not entail any testimonial act on the part of the suspect" (e.g. the suspect was not subjected to the cruel trilemma).¹⁶⁰ Because it was physical evidence obtained without any testimonial communication, it was unprotected.¹⁶¹

These cases demonstrate that a defendant's responses to governmental inquiries are protected testimonial communications if they "involv[e the defendant's] consciousness of the facts and the operations of his mind in expressing it."¹⁶² These statements are protected no matter what form they take.¹⁶³ At a minimum, the privilege protects the suspect from the "cruel trilemma" of having to choose between truth, falsity, and silence.¹⁶⁴ More generally, the privilege is implicated whenever the suspect is forced to "disclose the contents of his own mind."¹⁶⁵ The exemplar

¹⁵³ *Id.*

¹⁵⁴ *Id.* at 597. The Court acknowledged that any slurring of speech due to intoxication was an unprotected physical characteristic of defendant's speech. *Id.* at 590-91, 592 ("Requiring a suspect to reveal the physical manner in which he articulates words, like requiring him to reveal the physical properties of the sound produced by his voice, . . . does not, without more, compel him to provide a 'testimonial' response for purposes of the privilege.") (citation omitted).

¹⁵⁵ *Id.* at 592-93 (reasoning that because the defendant could not answer correctly, "the trier of fact could infer from [defendant's] answer (that he did not *know* the proper date) that his mental state was confused") (emphasis in original).

¹⁵⁶ *Muniz*, 496 U.S. at 593-96 ("In this case, the question is not whether a suspect's 'impaired mental faculties' can fairly be characterized as an aspect of his physiology, but rather whether [defendant's] response to the sixth birthday question that gave rise to the inference of such an impairment was testimonial in nature.")

¹⁵⁷ *Id.* at 597.

¹⁵⁸ *Id.*

¹⁵⁹ *Id.* at 593. In *Muniz*, the Court focused on the basis of the inference not its content. *Id.* at 593, 598-99; *see also Schmerber*, 384 U.S. at 763-64 (noting the privilege protects communications no matter what their form).

¹⁶⁰ *Muniz*, 496 U.S. at 593-94.

¹⁶¹ *Id.* at 588-99 (referring to prior case law).

¹⁶² *Doe*, 487 U.S. at 211 (discussing why the privilege was not implicated in *Schmerber* and the exemplar cases) (citation omitted).

¹⁶³ *Schmerber*, 384 U.S. at 763-64.

¹⁶⁴ *Muniz*, 496 U.S. at 597; *Fisher*, 425 U.S. at 410.

¹⁶⁵ *Doe*, 487 U.S. at 211 (citation omitted); *see also Muniz*, 496 U.S. at 597 (holding a statement was protected because defendant, acting under compulsion, "communicate[d] an express or implied assertion

cases highlight the limits of the privilege by showing that it is not implicated when the government instructs the defendant to write or say something.¹⁶⁶ Though a communication, such writings and statements reveal no belief or fact; they do not “involv[e] [the accused’s] consciousness of the facts and the operations of his mind in expressing it.”¹⁶⁷ Thus, they are not testimonial.¹⁶⁸

2 B. Compelled Acts as Testimonial

Case law concerning a defendant’s actions taken in response to subpoenas and court orders sheds further light on the type of communications the Supreme Court is willing to treat as testimonial.¹⁶⁹ In *Fisher v. United States*, the Court upheld the enforcement of subpoenas issued to defendants’ lawyers requesting tax documents the lawyers were holding for defendants.¹⁷⁰ The defendants argued that production of the subpoenaed tax documents violated the Fifth Amendment privilege against self-incrimination.¹⁷¹ The Court noted that it “has held repeatedly that the Fifth Amendment is limited to prohibiting the use of ‘physical or moral compulsion’ exerted on the *person asserting the privilege*.”¹⁷² Because the subpoenas were directed to the defendants’ attorneys, the defendants’ Fifth Amendment privilege was not violated.¹⁷³ This clean reasoning was muddled by the existence of the attorney-client privilege.¹⁷⁴ The Court had to decide whether the defendants could have claimed successfully that the privilege against self-incrimination protected them from having to comply with the subpoena.¹⁷⁵ If the defendants would have been unable to make such a claim successfully, then neither the attorney-client privilege nor the privilege against self-incrimination would bar the government from obtaining the documents from the defendants’ attorneys.¹⁷⁶

The Court asserted that “[t]he act of producing evidence in response to a subpoena [] has communicative aspects of its own, wholly aside from the contents of the papers produced.”¹⁷⁷ The physical act of production “tacitly concedes the existence of the papers demanded,” defendant’s “possession or control” of the documents, and the defendant’s “belief that the [documents produced] are those described in the subpoena.”¹⁷⁸ These are beliefs or facts communicated implicitly by

of fact or belief’ to a government agent).

¹⁶⁶ *Dionisio*, 410 U.S. at 7; *Gilbert*, 388 U.S. at 266-67; *Wade*, 388 U.S. at 221-23.

¹⁶⁷ *Doe*, 487 U.S. at 211 (citation omitted).

¹⁶⁸ *Id.*; see *supra* notes 129, 131 and accompanying text (describing the evidence and holdings of the exemplar cases).

¹⁶⁹ E.g., *Fisher*, 425 U.S. at 414 (holding the act of producing subpoenaed documents may not violate the privilege).

¹⁷⁰ *Id.* at 396-97. The Court reasoned that the physical act of producing documents provided the government with information about the defendant’s beliefs and knowledge of those documents. *Id.* at 411. In *Fisher*, the Court decided two cases with the same issue. *Id.* at 393.

¹⁷¹ *Id.* at 396-97.

¹⁷² *Id.* 397 (citations omitted) (emphasis added).

¹⁷³ *Id.* 397, 398-99 (“[B]y reason of the transfer of the documents to the attorneys, those papers may be subpoenaed without compulsion on the [defendant].”).

¹⁷⁴ *Id.* 405.

¹⁷⁵ *Fisher*, 425 U.S. at 405.

¹⁷⁶ *Id.*

¹⁷⁷ *Fisher*, 425 U.S. at 410.

¹⁷⁸ *Id.* (citations omitted).

a defendant when producing the subpoenaed documents.¹⁷⁹ The Court acknowledged that determining whether the act of production communicated protected testimonial statements did not lend itself to a “categorical answer” but “instead depend[ed] on the facts and circumstances of particular cases.”¹⁸⁰ The Court concluded that the question to be answered was whether the implicit testimony communicated by the act of production “[rose] to the level of testimony within the protection of the Fifth Amendment.”¹⁸¹

In *Fisher*, an accountant, not the defendants, created the subpoenaed documents.¹⁸² Thus, the documents “contain[ed] no testimonial declarations by [defendants].”¹⁸³ The defendants were not able to “vouch for [the documents]’ accuracy.”¹⁸⁴ Thus, the government would not have to rely on the defendants’ beliefs about or knowledge, 1) of the contents of the documents’, 2) of the accuracy of the documents, or 3) that the documents were the subpoenaed documents.¹⁸⁵ The Court also noted that the government had independent knowledge of documents’ existence and location.¹⁸⁶ Even if the defendant were compelled to produce the documents, any implicit testimony in the act of production would “add[] little or nothing” to the government’s case.¹⁸⁷ A subpoena issued to the defendant would “in no way rely[] on the ‘truth-telling’ of the [defendant] to prove the existence of or [defendant’s] access to the [subpoenaed] documents.”¹⁸⁸ For these reasons, the Court held that compelling the defendant to produce the documents did not “rise[] to the level of testimony within the protection of the Fifth Amendment.”¹⁸⁹ Thus, the defendants’ action was not “sufficiently testimonial for purposes of the privilege.”¹⁹⁰

In *Doe v. United States*, the Court addressed the compelled signing of a consent directive.¹⁹¹ In *Doe*, the defendant was issued a court order requiring him to sign a consent form authorizing foreign banks to release, to the government, confidential information about defendant’s accounts.¹⁹² The form was “carefully drafted not to make reference to a specific account.”¹⁹³ The form did not acknowledge the existence of any account or defendant’s control over any account.¹⁹⁴ Indeed, the

¹⁷⁹ *Id.* at 411.

¹⁸⁰ *Id.* at 410.

¹⁸¹ *Id.* at 411.

¹⁸² *Id.* at 409.

¹⁸³ *Fisher*, 425 U.S. at 409.

¹⁸⁴ *Id.* at 409, 413; *see also Hubbell*, 530 U.S. at 36 (describing *Fisher*, the Court explained, “[b]ecause the papers had been voluntarily prepared prior to the issuance of the summonses, ‘they could not be said to contain compelled testimonial evidence’”).

¹⁸⁵ *Fisher*, 425 U.S. at 411.

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ *Id.* at 412.

¹⁸⁹ *Id.* at 411, 413; *but see id.* at 415 (Brennan, J., concurring) (noting that the holding “might not protect against compelled production of tax records that are [defendant’s] ‘private papers’” and arguing that this runs counter to settle law).

¹⁹⁰ *Fisher*, 425 U.S. at 411. The Court held that the attorney-client privilege did not bar the production of the subpoenaed documents. *Id.* at 414.

¹⁹¹ *Doe*, 487 U.S. at 202, 203 n.1 (“It is a criminal offense for a Cayman bank to divulge any confidential information with respect to a customer’s account unless the customer has consented to the disclosure.”).

¹⁹² *Id.* at 202.

¹⁹³ *Id.* at 215.

¹⁹⁴ *Id.* at 202.

form lacked any explicit acknowledgement of any fact.¹⁹⁵

The defendant refused to sign the consent directive, claiming that signing the form was testimonial.¹⁹⁶ The defendant argued that his signature was privileged because the government would use the content, rather than the physical characteristics, to obtain incriminating evidence.¹⁹⁷ The defendant claimed that signing the directive was equivalent to an implicit assertion that the defendant maintained accounts at the foreign banks and was responsible for their contents.¹⁹⁸ The Supreme Court disagreed.¹⁹⁹ The Court stated, “in order to be testimonial, an accused’s communication must itself, explicitly or implicitly, relate a factual assertion or disclose information. Only then is a person compelled to be a ‘witness’ against himself.”²⁰⁰ The Court reasoned that the consent directive was not testimonial because it did not assert any fact.²⁰¹ Thus, signing the form could not be taken as an assertion of any fact, implicit or otherwise.²⁰²

The Court highlighted that the bank was the only party making any factual statement because it was the party responsible for identifying and producing the requested documents.²⁰³ The Court compared the compelled signature to the evidence produced in the exemplar cases because it was obtained pursuant to a government order.²⁰⁴ The Court stated that being directed “to do something is not an assertion of fact or . . . a disclosure of information.”²⁰⁵ Signing the directive did not “forc[e] the defendant] to express the contents of his mind” and did not trigger Fifth Amendment protection.²⁰⁶

¹⁹⁵ *Id.* at 215 (noting the directive lacked any acknowledgement of the existence of foreign bank accounts, defendant’s control over any account, or any indication any “information relating to [the defendant was] present at the foreign bank”). “The form purported to apply to any and all accounts over which [defendant] had a right of withdrawal, without acknowledging the existence of any such account.” *Id.* at 204.

¹⁹⁶ *Id.* at 207.

¹⁹⁷ *Doe*, 487 U.S. at 207. The “content” being the consent implied by the presence of the defendant’s signature on the consent form. *Id.*

¹⁹⁸ *Id.* at 204.

¹⁹⁹ *Id.* at 208 n.6, 215 (rejected defendant’s argument that a “statement significant for its content is necessarily testimonial for purposes of the Fifth Amendment” by drawing a distinction between a statement being testimonial rather than incriminating).

²⁰⁰ *Id.* at 210.

²⁰¹ *Id.* at 215.

²⁰² *Doe*, 487 U.S. at 215-16 (“By signing the form, [the defendant] makes no statement, explicit or implicit, regarding the existence of a foreign bank account or his control over any such account. Nor would his execution of the form admit the authenticity of any records produced by the bank. [Further,] because petitioner did not prepare the document, any statement by [the defendant] to the effect that it is authentic would not establish that the records are genuine. Authentication evidence would have to be provided by bank officials.”) (citations omitted).

²⁰³ *Id.* at 218 (“The fact that the bank’s customer has directed the disclosure of his records ‘would say nothing about the correctness of the bank’s representations.’”) (citation omitted).

²⁰⁴ *Id.* at 217.

²⁰⁵ *Id.* at 217 (arguing that defendant’s act was analogous to the production of an handwriting or voice exemplar). Just as in the exemplar cases, when the government provides a framework wherein no choice of response is required, the Fifth is not implicated. *Id.*; see also *Muniz*, 496 U.S. at 597 (holding that the Fifth protects any response that subject the subject to the “cruel trilemma”).

²⁰⁶ *Id.* at 210. Justice Stevens wrote a strong dissent arguing that the directive “compelled [the defendant] to use his mind to assist the prosecution in convicting him of a crime.” *Id.* at 219 (Stevens, J., dissenting). Justice Stevens analogized that the defendant “may in some cases be forced to surrender a key to a strongbox containing incriminating documents, but I do not believe he can be compelled to

In *Fisher*, the defendant's evaluation of the subpoenaed documents did not "rise[] to the level of testimony within the protection of the Fifth Amendment."²⁰⁷ The act of production was not "*sufficiently testimonial* for purposes of the privilege."²⁰⁸ In *Doe*, signing a consent form "shed[] no light on [the defendant's] actual intent or state of mind" because no specific fact was communicated.²⁰⁹ The compelled act did not *itself* communicate any information.²¹⁰ In neither case did the defendant's compelled physical act implicitly communicate testimonial information.²¹¹ Thus, the Court held that the respective defendants could not claim the government's use of the evidence violated their Fifth Amendment right against self-incrimination.²¹²

On the other hand, the act of production in *United States v. Hubbell* involved the "extensive use of the contents of [the defendant's] mind" and did trigger the privilege against self-incrimination.²¹³ *Hubbell* represents the opposite end of the implicit testimony spectrum (i.e. it holds as privileged the information conveyed by producing documents).²¹⁴ The defendant in *Hubbell* was served a *subpoena duces tecum* and produced the requested documents when the government granted him immunity.²¹⁵ The government later indicted the defendant a second time for separate crimes not related to those at issue when the subpoena was initially served.²¹⁶ The District Court of the District of Columbia dismissed the indictment.²¹⁷ The District Court reasoned that all the incriminating evidence used in the second indictment was "derived either directly or indirectly from the testimonial aspects of respondent's immunized act of producing those documents."²¹⁸ The Court of Appeals vacated this judgment and remanded in order to determine the extent of the government's knowledge of the defendant's affairs on the day the subpoena was issued.²¹⁹ If the government could prove that it knew, prior to the issuance of the subpoena, that the defendant possessed the subpoenaed documents, "then the wide distance [] traveled from the subpoena to the substantive allegations contained in the indictment would

reveal the combination to his wall safe-by word or deed." *Id.* Justice Stevens also distinguished the exemplar cases, arguing that these cases "involve[d] no intrusion upon the contents of the mind of the accused," whereas here, the compelled action "invade[d] the dignity of the human mind." *Id.* at 219 n.1 ("The expression of the contents of an individual's mind falls squarely within the protection of the Fifth Amendment.").

²⁰⁷ *Fisher*, 425 U.S. at 411.

²⁰⁸ *Id.* (emphasis added).

²⁰⁹ *Doe*, 487 U.S. at 216. In *Doe*, the compelled signing was not carried out in order "to obtain any knowledge [the defendant] might have." *Id.* at 217 (quotations omitted).

²¹⁰ *Id.* at 210.

²¹¹ *Fisher*, 425 U.S. at 411; *Doe*, 487 U.S. at 215-16.

²¹² *Supra* notes 207-11.

²¹³ 530 U.S. at 43 (quotations & citations omitted); *contra Fisher*, 425 U.S. at 411 (holding the act of production did not reach the threshold of protected implicit testimony).

²¹⁴ *Infra* note 226.

²¹⁵ *Hubbell*, 530 U.S. at 31. The defendant produced 13,120 pages of documents. *Id.*

²¹⁶ *Id.* The Court has held that the privilege against self-incrimination extends to testimony that "would furnish a link in the chain of evidence needed to prosecute the claimant for a federal crime." *Id.* at 38 (quoting *Hoffman v. United States*, 341 U.S. 479, 486 (1951)). Ultimately, the Court found it "clear that the testimonial aspect of respondent's act of producing subpoenaed documents was the first step in a chain of evidence that led to [the second] prosecution." *Id.* at 42.

²¹⁷ *Id.* at 32.

²¹⁸ *Id.* The District Court likened the government's actions to a "fishing expedition." *Id.*

²¹⁹ *Id.*

be based upon legitimate intermediate steps.”²²⁰ The level of prior knowledge would determine the extent the government had to rely on the suspect’s implicit communications in obtaining a conviction.²²¹ The extent of the government’s reliance would in turn determine how much of the defendant’s implicit communication (communicated via producing the documents) was used in obtaining his own conviction.²²² The Supreme Court granted certiorari to determine whether the defendant’s production of the subpoenaed documents was privileged.²²³

The government argued that it did not intend to use the testimonial aspects of the defendant’s production against him at trial (i.e. it would not discuss that defendant produced, authenticated, or maintained control over the incriminating documents).²²⁴ Further, the government argued that “its possession of the documents [was] the fruit only of a simple physical act -- the act of producing the documents.”²²⁵ The Supreme Court disagreed, reasoning that the breadth and vagueness of the subpoena required the defendant “to make extensive use of the contents of his own mind in identifying the hundreds of documents responsive to the requests in the subpoena.”²²⁶ The government had no prior knowledge of any of the requested documents.²²⁷ The government relied on “the testimonial aspect of respondent’s act of producing subpoenaed documents [as] the first step in a chain of evidence that led to [the second indictment].”²²⁸ The Court also rejected the government’s “anemic view” that its possession of the documents was due only to a physical act of the defendant.²²⁹ The Court asserted that the physical act cannot “be entirely divorced from its ‘implicit’ testimonial aspect.”²³⁰ The act of production contained implicit testimonial communications because the defendant was required to take “the mental and physical steps necessary to provide the prosecutor” with the correct documents.²³¹ The production resulted in the compelled revelation of the results of the defendant’s cognition, the “contents of his mind,” and triggered the protection of the Fifth Amendment.²³²

²²⁰ *Id.* at 33 (quoting *United States v. Hubbell*, 167 F.3d 552, 581 (D.C. Cir. 1999)).

²²¹ *Hubbell*, 530 U.S. 32-34. Implicit communications being the information conveyed by the act of producing the document. *Id.*

²²² *Id.*

²²³ *Id.* at 34, 41.

²²⁴ *Id.* at 41.

²²⁵ *Id.* at 43 (quotations and citations omitted). A judge, dissenting from the Court of Appeals decision, agreed with the reasoning and wrote that the documents had arrived in the government’s hand like “manna from heaven,” and their possession provided the government with no information about the defendant’s beliefs. *Id.* at 33.

²²⁶ *Id.* at 43 (citations omitted) (quotation omitted).

²²⁷ *Hubbell*, 530 U.S. at 45.

²²⁸ *Id.* at 42.

²²⁹ *Id.* at 43.

²³⁰ *Id.*

²³¹ *Id.* at 42.

²³² *Id.* at 43 (asserting that the implicit testimonial aspects of the physical act of production cannot be entirely separated from the physical act of production).

Justice Thomas writes an interesting concurrence expressing his “willing[ness] to reconsider the scope and meaning of the Self-Incrimination Clause” in future cases. *Hubbell*, 530 U.S. at 49 (Thomas, J., concurring). Citing numerous sources, Justice Thomas presents evidence that at the time of the founding “the term ‘witness’ meant a person who gives or furnishes evidence, a broader meaning than that which our case law currently ascribes to the term.” *Id.* at 50. Justice Thomas concludes, “in light of the historical evidence that the Self-Incrimination Clause may have a broader reach than *Fisher* holds, I

In *Hubbell*, the government had no prior independent knowledge of the information in the documents.²³³ The inability of the government to identify specific documents in the subpoena required the defendant to make “extensive use of the contents of his own mind” in responding to the subpoena.²³⁴ The government relied extensively on the information communicated by the act of production in obtaining a conviction.²³⁵ Because the suspect used his mind extensively and because the government relied heavily on the information conveyed by the act of production, the act the act was treated as a testimonial communication.²³⁶ Unlike in *Fisher*, the information conveyed by the act of production was not a “forgone conclusion,” therefore the privilege protected the act.²³⁷

IV. PERSONAL ANALYSIS

If images produced by BOLD fMRI (i.e. representations of brain activity in response to specific stimuli) are testimonial the Fifth Amendment will shield a suspect from compulsory participation in their production for use at trial.²³⁸ If the images are not testimonial the Fifth Amendment will not be a bar against the government from compelling a suspect to undergo a scan for the purpose of producing such images.²³⁹ I argue that BOLD fMRI data should be considered testimonial.²⁴⁰ I discuss how the Supreme Court’s holdings could be applied to the three imaging paradigms discussed above. I conclude that BOLD fMRI is a unique form of evidence that is simultaneously physical and testimonial. Existing case law suggests that the form of the evidence is not the deciding factor; rather, the privilege applies if the evidence communicates information about the suspect’s beliefs.²⁴¹ I argue that the Fifth Amendment privilege against self-incrimination prevents the government from compelling a suspect to undergo a brain scan aimed at measuring with fMRI technology changes in BOLD signal.

1. Button-Press: The Trilemma

In addressing the button-press paradigm, the question of whether BOLD signal change is testimonial need not be reached because this paradigm subjects the suspect

remain open to a reconsideration of that decision and its progeny in a proper case.” *Id.* at 56.

²³³ *Hubbell*, 530 U.S. at 41.

²³⁴ *Id.* at 43 (quotations & citations omitted).

²³⁵ *Id.* at 32, 35, 45.

²³⁶ *Id.* at 43. The act expressed the contents of the defendant’s mind. *Id.*; *Doe*, 487 U.S. at 211 (noting the privilege protects a suspect’s “consciousness of the facts and the operations of his mind in expressing it” (citation omitted)).

²³⁷ *Fisher*, 425 U.S. at 411.

²³⁸ *E.g.*, *Schmerber*, 384 U.S. at 761 (holding that the privilege only protects against compelled production of testimonial evidence not compelled production of physical evidence).

²³⁹ *Id.*

²⁴⁰ *See Pardo*, *supra* note 53, at 328-29 (arguing that compelled production of the content of beliefs or knowledge is protected by the Fifth Amendment); *Allen*, *supra* note 13, 266 (arguing that “‘testimony’ means substantive cognition—the product of cognition that results in holding or asserting propositions with truth-value”); *Barillare*, *supra* note 104, at 990-91 (arguing that the use of electroencephalograph technology to measure brain waves implicates the Fifth Amendment protection against self-incrimination).

²⁴¹ *Infra* note 254.

to the “cruel trilemma.”²⁴² The Court has held that, at a minimum, the privilege against self-incrimination protects a defendant from being subjected to the choice between “truth, falsity, and silence.”²⁴³ In the button-press paradigm the suspect chooses to press one among multiple buttons under government compulsion.²⁴⁴ By having to choose which button to press, the subject is faced with the choice between: pressing the button that represents the true answer, pressing the button that represents a lie, or remaining silent by not pressing any buttons.

The pressing of the button should be protected because Fifth Amendment protects a suspect’s “communications, whatever form they might take.”²⁴⁵ Even silence, if it communicates information, is protected.²⁴⁶ Evidence is protected by the privilege if it is “a communication-written, oral or otherwise-upon which reliance is to be placed as involving [the accused’s] consciousness of the facts and the operations of his mind in expressing it.”²⁴⁷ Though it is not an oral statement or a writing, a compelled button-press is equivalent to a compelled “disclos[ure] of the contents of [the suspect’s] mind” (e.g. pressing the left button communicates a response of “Yes, that is true”).²⁴⁸ The government would compare the information conveyed by the button-press (e.g. the suspect responded “Yes” by pressing the left button) with the BOLD signal change to determine whether the suspect was lying or telling the truth in responding to a particular question.²⁴⁹ The button-press stands in the place of the verbal response and should be protected by the privilege.²⁵⁰

2. Passive-Viewing: BOLD Signal Change As Testimonial

If the government was unable to counter the arguments concerning the button-press task, or wished to avoid them altogether, it could implement a scanning regime utilizing the passive viewing paradigm. The passive viewing paradigm does not require the suspect to “choose” a response by pressing a button.²⁵¹ The passive

²⁴² The paradigm requires the subject to press a button in lieu of making a statement (e.g. press the left button for “Yes” and the right button for “No”). *E.g.*, Langleben, *supra* note 9, at 263 (describing task where subjects had to press button to respond to questions).

²⁴³ *Muniz*, 496 U.S. at 596-97.

²⁴⁴ *Supra* note 242.

²⁴⁵ *Schmerber*, 384 U.S. at 763-64.

²⁴⁶ *Estelle*, 451 U.S. at 464-66.

²⁴⁷ *Doe*, 487 U.S. at 211 (quoting Wigmore, EVIDENCE, 8 § 2265) (adding that the privilege “may be asserted only to resist compelled explicit or implicit disclosures of incriminating information”).

²⁴⁸ *Accord Doe*, 487 U.S. at 210 n.9, 211; *Schmerber*, 384 U.S. at 763-64.

²⁴⁹ *Supra* note 242.

²⁵⁰ Further, the Court has held that physical evidence will be protected if it is “obtained in a manner that [] entail[s] [a] testimonial act on the part of the suspect.” *Muniz*, 496 U.S. at 593-94. If the pressing of a button is a testimonial act, any BOLD signal change recorded during the button-press task will have been “obtained in a manner that [] entail[ed] [a] testimonial act on the part of the suspect.” *Id.* As such, the privilege would bar the use of any BOLD signal recorded in this task. The concept of pure insertion might be used to counter this argument. *Supra* note 78 (describing pure insertion). It could be argued that no incriminating inference is based on BOLD signal change associated with the communicative act of pressing the button. *Id.* The only physical changes used against the defendant would be those associated with perceiving the stimuli. *Id.* This argument would require the Constitution to be applied to specific neural networks, a question outside the scope of this humble comment. Further, it forces a question addressed in the next section, “Is BOLD signal change testimonial?” *Infra* notes 251-54 and accompanying text.

²⁵¹ *See Doe*, 487 U.S. at 212-13 (noting the privilege was meant to protect the suspect from being subject to the trilemma).

viewing paradigm only requires the suspect to consciously perceive the stimuli presented. The suspect makes no overt communication of any kind.²⁵² The change in BOLD signal is the sole basis of any incriminating inference.²⁵³ This paradigm forces the question, “Is BOLD signal change testimonial?” Is this indirect measure of neural activity equivalent to a government attempt to obtain, through compulsion, incriminating information concerning the defendant’s knowledge of facts?²⁵⁴

In *Schmerber*, the Supreme Court displayed great prescience when it stated:

There will be many cases in which . . . a distinction [between physical and testimonial evidence] is not readily drawn. 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. To compel a person to submit to testing in which an effort will be made to determine his guilt or innocence on the basis of physiological responses, *whether willed or not*, is to evoke the spirit and history of the Fifth Amendment.²⁵⁵

This quote addresses the central issue raised when considering whether BOLD signal change is testimonial.²⁵⁶ Can a physical response be protected testimony? BOLD signal change is a measure of a physical phenomenon.²⁵⁷ However, a suspect undergoing an fMRI scan is not a mere “donor” of physical evidence.²⁵⁸ The physical change in BOLD signal is the very thing that communicates information about the suspect’s beliefs and knowledge.²⁵⁹ The physical change itself is the communication.²⁶⁰ The spatial location of oxyhemoglobin, a physical aspect of the

²⁵² *Supra* note 72 (describing the passive viewing paradigm); *see also* Thompson, *supra* note 5, at 345-46 (describing the involuntary aspects of what brain scans reveal).

²⁵³ *Supra* note 53-58 and accompanying text.

²⁵⁴ *See Doe*, 487 U.S. at 211 (the privilege protects “[the suspect’s] consciousness of the facts and the operations of his mind in expressing it” (citation omitted)).

²⁵⁵ 384 U.S. at 764 (emphasis added).

²⁵⁶ *See, e.g.*, Barillare, *supra* note 104, at 992-95 (describing how this quote impacts the discussion of whether electroencephalograph data should be considered testimonial or merely physical).

²⁵⁷ *See, e.g.*, *supra* notes 21-29 and accompanying text (describing the physical phenomena upon which research involving BOLD signal change is based).

²⁵⁸ *Schmerber*, 384 U.S. at 765 (“[The defendant’s] participation, except as a donor, was irrelevant to the results of the test, which depend on chemical analysis and on that alone.”).

²⁵⁹ *See supra* notes 21-29, 52-58 and accompanying text (describing what BOLD signal change is and how it is able to convey information about knowledge and beliefs). This argument asserts that BOLD signal change is a physical aspect of the suspect’s body and at the same time is the communicative act. *Id.* *Muniz* held that a communication was protected even if it gave rise to incriminating inferences about the physical traits of the suspect. 496 U.S. at 593-94. With BOLD signal change, a physical piece of evidence gives rise to a communication, as addressed in dicta from *Schmerber*. 384 U.S. at 764. The observations of Sean K. Thompson are pertinent: it has come to a point where attempts to squeeze anomalous cases into existing rules concerning the privilege against self-incrimination should cease and a reevaluation of the underlying assumptions behind these rules should commence. Thompson, *supra* note 5, at 350 (“The issue is not so much that the Court went off the rails when it originated the communicative/physical dichotomy but, rather, that the implicit assumption of mind-body dualism, which underlies this thinking, is dated and, most likely, no longer tenable.”).

²⁶⁰ *See Doe*, 487 U.S. at 209-10 (highlighting that in order to be testimonial, the “communication itself, explicitly or implicitly, [must] relate a factual assertion or disclose information”). Justice Stevens analogized that a suspect “may in some cases be forced to surrender a key to a strongbox containing incriminating documents, but [not] the combination to his wall safe-by word or deed.” *Id.* at 219 (Stevens, J., dissenting). BOLD signal change could be viewed as both the key and the combination.

defendant's body, contains an implicit assertion of fact; it communicates to the government information such as, "I have seen that."²⁶¹ BOLD fMRI data falls squarely into the category of physical evidence identified in *Schmerber* that should be treated as testimonial and whose compulsory acquisition implicates the Fifth Amendment.²⁶²

The dicta from *Schmerber* quoted above highlights that Fifth Amendment protection does not turn *solely* on whether a piece of evidence is physical. As the Court noted in *Doe*, *Schmerber* did "not draw a distinction between unprotected evidence sought for its physical characteristics and protected evidence sought for its content."²⁶³ *Doe* clarified that the privilege can apply to both physical and verbal communications.²⁶⁴ Indeed, the Court has acknowledged that a physical act cannot be separated from its testimonial aspects.²⁶⁵ It seems that a court would be well served to focus less on what type of evidence is at issue and focus more on determining whether the evidence communicates information.²⁶⁶ BOLD signal change represents the operations of a suspect's mind.²⁶⁷ fMRI technology allows these physical operations to be expressed to third parties in a manner that discloses a suspect's beliefs and knowledge.²⁶⁸ A suspect should be able to invoke the privilege and prevent the government from compelling participation in a brain scan.

BOLD signal is distinguishable from the unprotected physical evidence discussed in the exemplar cases. The exemplar cases dealt with evidence that was an "identifying physical characteristic" of the suspect, distinguishable from the content of what the suspect wrote or said.²⁶⁹ This evidence was "stagnant" (e.g. handwriting does not change).²⁷⁰ Changes in queries made by government agents could create no meaningful change in what the evidence conveyed.²⁷¹ The government was able to mute the communicative aspects of the evidence by telling the suspect what to write

²⁶¹ See *Schmerber*, 384 U.S. at 765 (noting that the government relied solely on a chemical test to produce the incriminating evidence).

²⁶² *Id.* at 764.

²⁶³ *Doe*, 487 U.S. 211 n.10 ("[T]he [*Schmerber*] Court distinguished between the suspect's being compelled himself to serve as evidence and the suspect's being compelled to disclose or communicate information or facts that might serve as or lead to incriminating evidence.").

²⁶⁴ See *Doe*, 487 U.S. 211 n.10.

²⁶⁵ *Hubbell*, 530 U.S. at 43.

²⁶⁶ See, e.g., *Doe*, 487 U.S. at 211 (noting the privilege protects a suspect's "consciousness of the facts and the operations of his mind in expressing it") (quoting Wigmore, EVIDENCE, 8 § 2265); *Couch*, 409 U.S. at 328 (noting that the privilege was meant to protect against the "extortion of information from the accused").

²⁶⁷ *Supra* notes 57-58 and accompanying text.

²⁶⁸ *Id.*

²⁶⁹ See *Dionisio* 410 U.S. at 7 (1973) (allowing voice exemplars when used "solely to measure the physical properties of the witnesses' voice[.]"); *Wade*, 388 U.S. at 222-23 (differentiating the constitutionality of compelling a suspect to reveal a physical characteristic as opposed to knowledge).

²⁷⁰ In *Muniz*, the Court acknowledged that any slurring of speech due to intoxication was an unprotected physical characteristic of defendant's speech. *Muniz*, 496 U.S. at 590-91. "Requiring a suspect to reveal the physical manner in which he articulates words, like requiring him to reveal the physical properties of the sound produced by his voice, . . . does not, without more, compel him to provide a 'testimonial' response for purposes of the privilege." *Id.* at 592. Though slurred speech is a more transient, less "permanent" trait than handwriting (speech returns to normal as alcohol leaves the body), it does not communicate a suspect's beliefs or knowledge. *Id.* at 597.

²⁷¹ The form or style of the handwriting does not change based on what is written.

or say, allowing the suspect to respond without revealing any belief.²⁷² Responding to a command “to do something is not an assertion of fact or . . . a disclosure of information.”²⁷³ Additionally, in the exemplar cases the production of the evidence was not “compelled to obtain any knowledge [the suspect] might have” (e.g. the government wanted to see what the suspect’s handwriting looked like not what the suspect would write).²⁷⁴ Thus, the suspect’s compliance “shed[] no light on [the defendant’s] actual intent or state of mind.”²⁷⁵

On the other hand, BOLD signal is stimulus specific; it varies according to what stimuli are shown.²⁷⁶ Showing different stimuli (auditory or visual) or changing the question asked will cause different BOLD signal responses.²⁷⁷ BOLD signal change is not a stagnant physical characteristic but a dynamic process whose unfolding communicates information.²⁷⁸ The court has stated that “in order to be testimonial, an accused’s communication must *itself* . . . relate a factual assertion or disclose information.”²⁷⁹ A change in BOLD signal does just that. It is the stimulus specificity of changes in BOLD signal that allows it to communicate information concerning the beliefs and knowledge of the suspect.²⁸⁰ There is no way that the government could measure BOLD signal change without “spare[ing] the accused from having to reveal . . . his knowledge of facts relating him to the offense.”²⁸¹ The government could not mute the communicative aspects of BOLD signal change by telling the suspect what BOLD signal change to have.²⁸² Further, participation in a brain scan would be compelled solely for the purpose of obtaining information the

²⁷² See *Doe*, 487 U.S. at 217 (being directed “to do something is not an assertion of fact or . . . a disclosure of information”). The only cognition (conscious evaluation) required was that of the witness or victim in evaluating the physical evidence provided by the suspect. See *Muniz*, 496 U.S. at 593 (noting the privilege was not triggered in *Schmerber* “because the evidence was *obtained* in a manner that did not entail any testimonial act on the part of the suspect”) (emphasis in original).

²⁷³ *Doe*, 487 U.S. at 217 (arguing that the defendant’s act was analogous to the production of an handwriting or voice exemplar). Just as in the exemplar cases, when the government provides a framework wherein no choice of response is required, the Fifth is not implicated. *Id.*

²⁷⁴ *Id.* (citations & quotations omitted).

²⁷⁵ *Doe*, 487 U.S. at 216; accord *Schmerber*, 384 U.S. at 765 (holding the privilege was not implicated because defendant’s testimonial capacities were not implicated).

²⁷⁶ The brain dedicates specific brain regions to process specific information. E.g. Stephen M. Kosslyn & Olivier Koenig, *Wet Mind: The New Cognitive Neuroscience*, 55-57, 218-19 (The Free Press 1995) (noting distinct areas of the brain process different forms of stimuli); compare, e.g., Gerry A. Stefanatos, *Activation of Human Auditory Cortex During Speech Perception: Effects of Monaural, Binaural, and Dichotic Presentation*, 46 NEUROPSYCHOLOGIA 301, 310-11 (2008) (describing activation of auditory cortex during speech perception); and Ryuichiro Hashimoto et al., *Functional Differentiation in the Human Auditory and Language Areas Revealed by a Dichotic Listening Task*, 12 NEUROIMAGE 147, 156-57 (describing activation in the auditory cortex in response to auditory stimuli); with Bruno Rossion, *The Functionally Defined Right Occipital and Fusiform “Face Areas” Discriminate Novel From Visually Familiar Faces*, 19 NEUROIMAGE 877, 879 (2003) (noting distinct areas in visual cortex that respond to faces visually presented).

²⁷⁷ E.g. Langleben, *supra* note 9, at 271 (reporting different BOLD signal for subject responses based on the answers provided, “lie” or “truth”); *supra* note 276.

²⁷⁸ *Supra* notes 56-58.

²⁷⁹ *Doe*, 487 U.S. at 210 (emphasis added).

²⁸⁰ *Supra* notes 55-58 and accompanying text.

²⁸¹ *Doe*, 487 U.S. at 213.

²⁸² BOLD signal change is a physical response to stimuli. *Supra* note 24-29 and accompanying text; see *Doe*, 487 U.S. at 217 (being directed “to do something is not an assertion of fact or . . . a disclosure of information”).

suspect will not otherwise provide. The scan would be compelled to “extort[] information from the accused.”²⁸³

The act of production cases provide additional support for finding that the privilege should apply to compelled brain scans.²⁸⁴ Responding to a *subpoena duces tecum* requires a suspect to rummage through file cabinets and determine whether any particular document is the documents the government has requested. When the defendant hands the documents to the government the defendant communicates information wholly separate from that contained in the document.²⁸⁵ For example, the act communicates that the defendant believed the papers produced to be those requested by the subpoena.²⁸⁶ Likewise, the scan suspect must “rummage” through memories to determine whether she is familiar with the image being presented by the government. The ability to detect BOLD signal change allows this “rummaging” to be recorded in a meaningful way.²⁸⁷ The images produced communicate information wholly separate from the physical change in brain blood flow (e.g. recognition).²⁸⁸ By compelling the act of undergoing a brain scan the government is compelling the suspect to communicate information.²⁸⁹

Additional factors considered by the Supreme Court in the act of production cases also strike toward finding compelled brain scans protected by the privilege. These cases noted that when the government orders a suspect to act the suspect takes “the mental and physical steps necessary” to respond to the government’s order.²⁹⁰ A suspect’s utilization of sufficient amounts of cognitive effort in responding to a government order, combined with heavy governmental reliance on the implicit information conveyed by that response, imbues the act with testimonial aspects.²⁹¹

²⁸³ *Couch*, 409 U.S. at 328.

²⁸⁴ *Id.*; *Hubbell*, 530 U.S. at 43; *Doe*, 487 U.S. at 209 (“Conclud[ing] that the act of production could constitute protected testimonial communication because it might entail implicit statements of fact.” “[T]he Court [has] made clear that the Fifth Amendment privilege against self-incrimination applies to acts that imply assertions of fact.”); *Fisher*, 425 U.S. 410-11 (“[P]roducing evidence in response to a subpoena [] has communicative aspects of it own.”); see also Allen, *supra* note 13, at 266-67 (arguing that the Fifth Amendment protects the substantive results of cognition); Pardo, *supra* note 54, at 330-32 (discussing the “substantive results of cognition” theory within the context of neuroscience and other theories of what the Fifth Amendment protects).

²⁸⁵ *Fisher*, 425 U.S. 410.

²⁸⁶ *Id.*

²⁸⁷ *Supra* text accompanying notes 56-58.

²⁸⁸ *Supra* note 2.

²⁸⁹ *Id.* Conscious perception causes changes in BOLD signal that reveals “the contents of [the suspect’s] mind.” *Curcio*, 354 U.S. at 128; see also *Hubbell*, 530 U.S. at 35 (noting the privilege protects against any act that “relates [an] implied assertion[] of fact or belief”); *Doe*, 487 U.S. at 211 (noting the privilege protects a suspect’s “consciousness of the facts and the operations of his mind in expressing it” (quotations omitted)).

²⁹⁰ *Hubbell*, 530 U.S. at 42-43 (noting a physical act will be protected when becomes “unquestionably necessary for [the defendant] to make extensive use of the contents of his own mind” to satisfy a government order (quotations & citations omitted)).

²⁹¹ *Id.* at 32-34. Implicit communications being the information conveyed by the act of producing the document. *Id.*

Vague directions require the suspect to expend greater amounts of cognitive effort in satisfying them. *Hubbell*, 530 U.S. at 43 (noting the vague subpoena required defendant to make “extensive use” of the contents of his mind); see Allen, *supra* note 13, at 277 (calling this “compelled cognition”). The greater the amount of cognitive effort required by the suspect, the more knowledge the act conveys. *Id.* (holding when it is “unquestionably necessary for [the defendant] to make extensive use of the contents of his own mind” the privilege against self-incrimination is triggered) (citations and

Because a physical act (e.g. producing a document) cannot “be entirely divorced from its ‘implicit’ testimonial aspect” (e.g. knowledge that the papers existed) the privilege may apply to the physical act (e.g. compelling the act is barred by the privilege).²⁹² Compelling such an act is equivalent to the “extortion of information” from the defendant and therefore the act is protected.²⁹³

By forcing a suspect to consciously view stimuli, the government is compelling the suspect to take “the mental and physical steps necessary to provide [the government]” with incriminating evidence.²⁹⁴ Moreover, it can be assumed (as this comment’s hypothetical has) that the government will be relying heavily on the defendant to reveal his knowledge of facts in order to convict him.²⁹⁵ The change in BOLD signal, detected during a compelled scan, provides information the government did not previously have and could not obtain short of forcing it from the suspect’s “own mouth.”²⁹⁶ Further, the physical changes in brain blood flow cannot

quotations omitted)); *Fisher*, 425 U.S. at 412 n.12 (citing numerous authorities in support of the notion that the act of production represents the suspect’s belief and or knowledge that the produced document is the one requested); *see also* Allen, *supra* note 13, at 277 (arguing that the Court was protecting the “compelled cognition” that accompanies the fulfillment of a subpoena). Additionally, the degree to which the government relies on the information conveyed by the act is also used in determining whether the act should be protected. *Fisher*, 425 U.S. at 411. When the act “adds little or nothing to the sum total of the Government’s information” it will not be protected. *Id.* However, the government cannot rely solely on the information conveyed by the physical act in obtaining a conviction. *Hubbell*, 530 U.S. 42-44.

²⁹² *Accord* *Hubbell*, 530 U.S. at 43; *Doe*, 487 U.S. at 209 (noting the act of production “would indicate the [suspect’s] belief that the papers are those described in the subpoena”). In *Fisher*, the defendant’s production of the papers was not considered testimonial because the defendant did not create the papers and could not attest to their correctness or authenticity. *Fisher*, 425 U.S. at 409-10; *see also* Allen, *supra* note 13, at 267, 278-80 (defining cognition, protected by the Fifth Amendment, as “the acquisition, storage, retrieval, and use of knowledge,” this being what is compelled when the suspect satisfies a subpoena).

²⁹³ *Couch*, 409 U.S. at 328; *accord* *Hubbell*, 530 U.S. at 42-43; *Fisher*, 425 U.S. 410, 412 n.12; Allen, *supra* note 13, at 277-78. For example, the physical act of producing the documents might reveal “that the papers existed, were in [the suspect’s] possession or control, and were authentic.” *Doe*, 487 U.S. at 209.

²⁹⁴ *Hubbell*, 530 U.S. at 42. Opponents of my reasoning could argue that the imaging specialist is the only party making a testimonial communication (e.g. when she interprets the brain scan). This argument would rely on *Doe*, where the Court reasoned that the privilege was not implicated because the bank was the only party making a factual assertion. *Doe*, 487 U.S. at 218. Further support could be found in *Fisher*, where the Court noted that the subpoenaed documents were not prepared by the defendant and did not contain any “testimonial declarations by him.” *Fisher*, 425 U.S. at 409. Technically, in the case of brain imaging, the fMRI machinery and the technician create the actual “documents” that are used to incriminate the suspect (i.e. the images of brain activity). This argument ignores the fact that the suspect is compelled to provide the content of the images. It is similar to arguing that a suspect giving a written confession doesn’t make a testimonial communication because only the police officer who writes down what the suspect says and reads it makes any kind of communication. In each case, the government compels the suspect to reveal his or her knowledge thereby violating the privilege.

²⁹⁵ The degree of reliance can determine the extent to which the results of the scan are “a foregone conclusion.” *See* *Fisher*, 425 U.S. at 411 (relying on the facts that, 1) the government knew the location of the subpoenaed papers and, 2) the papers were voluntarily created to find no violation of the privilege); *Andresen*, 427 U.S. at 472 (holding that because the suspect was not involved in the production or identification of the document they were not protected).

²⁹⁶ *Miranda*, 384 U.S. at 460 (stating the privilege is designed to force the government to gain a conviction “by its own independent labors, rather than by the cruel, simple expedient of compelling it from his own mouth”).

be separated from the information it conveys.²⁹⁷ The government, by compelling the act and relying substantially on the resulting information communicated, is forcing the suspect “to share his thoughts and beliefs with the Government.”²⁹⁸ Such governmental compulsion is what the privilege is meant to stop.²⁹⁹

3. Backward Masking: Unconscious Brain Activity Is Still Brain Activity

The backward masking paradigm allows the government to circumvent all conscious barriers between the individual and the formerly hidden cognitive activity that preceded any statement or accompanied the perception of stimuli.³⁰⁰ The backward masking paradigm also renders the trilemma rationale null and void.³⁰¹ Not only is no response required, the suspect is not even aware that a response has been obtained.³⁰² Nevertheless, if the Supreme Court holds that BOLD signal change itself is testimonial, images produced using the backward masking paradigm would be protected by the privilege against self-incrimination.³⁰³ Alternatively, if the Court holds that BOLD signal is not testimonial, the privilege would not cover the backward masking paradigm. The government would be able to elicit information from a defendant without the defendant’s conscious knowledge of what information the government was taking.

Even if BOLD signal change is testimonial, one could argue that unconscious processing of stimuli should not be treated as an “extensive use” of the suspect’s mind.³⁰⁴ The Court may view BOLD signal change that is completely disassociated from a suspect’s conscious perception of stimuli as “insufficiently testimonial” and therefore unprotected.³⁰⁵ However, dicta from *Schmerber* suggests that the conscious participation of the suspect in the production of incriminating evidence is not a factor in determining whether the privilege applies.³⁰⁶ In *Schmerber* the court noted that “determin[ing] . . . [a suspect’s] guilt or innocence on the basis of physiological responses, *whether willed or not*, is to evoke the spirit and history of the Fifth Amendment.”³⁰⁷ It seems that the Court is willing protect evidence that communicates information even if the evidence was produced without the suspect’s conscious input.³⁰⁸

²⁹⁷ *Supra* note 55-58 and accompanying text; *Hubbell*, 530 U.S. at 43 (noting a physical act cannot “be entirely divorced from its implicit testimonial aspect”) (quotations omitted).

²⁹⁸ *Doe*, 487 U.S. at 213.

²⁹⁹ *Id.*; *Schmerber*, 384 U.S. at 763-64.

³⁰⁰ FARTHING, *supra* note 44.

³⁰¹ *Id.*

³⁰² *Id.*

³⁰³ *Doe*, 487 U.S. at 210 (noting the compelled communication must itself communicate incriminating information); *Fisher*, 425 U.S. at 411.

³⁰⁴ *Hubbell*, 530 U.S. at 43. This argument could plausibly be extended to the passive viewing paradigm. Nevertheless, viewing and classifying stimuli (e.g. “I have seen that”) seems intuitively to take as much cognitive power as viewing and classifying documents (e.g. “This one is listed on the subpoena, this one is not”). When the production of the documents reveals the results of this cognitive evaluation, the act is protected. *Id.*

³⁰⁵ *Fisher*, 425 U.S. at 411.

³⁰⁶ *Schmerber*, 384 U.S. at 764 (“To compel a person to submit to testing in which an effort will be made to determine his guilt or innocence on the basis of physiological responses, *whether willed or not*, is to evoke the spirit and history of the Fifth Amendment.”) (emphasis added).

³⁰⁷ *Id.* (emphasis added).

³⁰⁸ *Id.* Indeed, were this not the case hypnosis might be a standard interrogation technique.

While it is unclear whether a court would treat the brain activity of the suspect as sufficiently testimonial, it is doubtful that the government could prove independent knowledge of the testimony BOLD signal change would communicate (and the hypothetical assumes the government could not). As such, the government would rely wholly on the information provided by the suspect in determining guilt. Relying entirely on the information provided by the suspect to obtain his conviction is unconstitutional.³⁰⁹

4. Policies and Summation

Taken together, the policies behind the Fifth Amendment strike against allowing the government to compel participation in a brain scan no matter which imaging paradigm is used. The privilege, as a response to historical practices, is a condemnation of the use of physical coercion to extract information from a defendant.³¹⁰ fMRI is a painless, noninvasive imaging technique but its unrestrained use violates the practice that the privilege against self-incrimination was designed to halt: physical invasions of individual autonomy.³¹¹ Extracting information with brain scan technology breaches the most personal barrier between the state and the individual by destroying the individual's ability to guard that "private enclave where he may lead a private life."³¹² Allowing the government to compel brain scans would deny that the privilege "protects 'a private inner sanctum of individual feeling and thought and proscribes state intrusion to extract self-condemnation.'"³¹³

If BOLD signal is not testimonial, the government could place the burden of conviction squarely on the individual's shoulders by using the individual's own cognition against him.³¹⁴ The government would profit from compelled and incriminating "disclosure[s] of information."³¹⁵ This runs counter to the idea that the

³⁰⁹ *Hubbell*, 530 U.S. at 43-45; *supra* notes 294-99 and accompanying text.

³¹⁰ *Muniz*, 496 U.S. at 595 (noting that the protection of compulsory "testimonial evidence reflects an awareness of the historical abuses against which the privilege against self-incrimination was aimed"); *Andresen*, 427 U.S. at 470 (discussing the methods of the ecclesiastical inquisitions and the Star Chamber); *Griffin*, 380 U.S. at 620 (noting a suspect refusing to testify in front of or lying to the Star Chamber suffered "incarceration, banishment, or mutilation"); *but see* Nagareda, *supra* note 89, at 1577-80 (arguing the Supreme Court has failed to carry out an appropriate historical analysis of the meaning of the term "witness" and therefore has produced a body of case law inconsistent with the founder's intent).

³¹¹ *Muniz*, 496 U.S. at 596 ("[T]he privilege was designed primarily to prevent 'a recurrence of the Inquisition and the Star Chamber, even if not in their stark brutality.'"); *Ulmann v. U.S.*, 350 U.S. 422, 428 (1956) ("Having had much experience with a tendency in human nature to abuse power, the Founders sought to close the doors against like future abuses by law-enforcing agencies.").

³¹² *Doe*, 487 U.S. at 212 (quoting *Murphy*, 378 U.S. at 55); *Fisher*, 425 U.S. at 416 (Brennan, J., concurring) ("The privilege reflects 'our respect for the inviolability of the human personality and of the right of each individual to a private enclave where he may lead a private life.'" (quoting *Murphy*, 378 U.S. at 55)); *Fisher*, 425 at 416 (Brennan, J., concurring) ("The Fifth Amendment in its Self-Incrimination Clause enables the citizen to create a zone of privacy which government may not force him to surrender to his detriment." (quoting *Griswold v. Conn.*, 381 U.S. 479, 484 (1965))). If the Supreme Court shirks its duty the legislature may be petitioned to provide protection from compelled brain scans. For example, Congress passed the Employee Polygraph Protection Act in 1988 to protect employees from being forced to undergo a polygraph to be hired. Employee Polygraph Protection Act of 1988, 29 U.S.C.A. § 2001-2009 (West 1999).

³¹³ *Nobles*, 422 U.S. at 233 (quoting *Couch*, 409 U.S. at 327).

³¹⁴ *See Miranda*, 384 U.S. at 460 (stating the privilege is meant to ensure the government shoulders the load of obtain a conviction).

³¹⁵ *Doe*, 487 U.S. at 217.

privilege protects the defendant from being compelled to reveal “his knowledge of facts relating him to the offense,” his thoughts, or his beliefs to the government.³¹⁶ Brain scans have the potential to render void the defendant’s “right to remain silent” by allowing the government to extract all the information it desires without a single word from the defendant.³¹⁷

BOLD signal change is a code for the suspect’s brain activity, for the suspect’s thoughts, beliefs, and knowledge.³¹⁸ It is a code just as language, or silence, is a code.³¹⁹ BOLD signal change can reveal the suspect’s knowledge and beliefs to the same degree that a verbal or written confession would. By compelling BOLD signal change the government is compelling the suspect “to share his thoughts and beliefs with the Government.”³²⁰ Such compelled revelations are what the privilege against self-incrimination prohibits.³²¹ Advances in technology should not be allowed to so easily sever the privilege against self-incrimination from its constitutional roots.

V. CONCLUSION

Polices behind the Fifth Amendment demand that an individual remain free from unfettered, compulsory, and intrusive governmental attempts to obtain incriminating testimony.³²² The Supreme Court has held as protected by the Fifth Amendment suspects’ beliefs and knowledge, be they physical or testimonial in nature.³²³ BOLD fMRI communicates the workings of the suspect’s mind to the government’s prying eyes. Though a physical phenomenon, BOLD signal change can communicate incriminating testimony by providing the government with information relating the suspect to the crime that is equivalent to a verbal confession. Compulsory production of such information is exactly what the Fifth Amendment was designed to prevent.³²⁴ The information provided by brain imaging technology is not outside the scope the Fifth Amendment’s protection against self-incrimination as interpreted by the Supreme Court. The Court should consider information obtained using BOLD fMRI to be testimonial evidence that the privilege protects.

³¹⁶ *Doe*, 487 U.S. at 213.

³¹⁷ *Miranda*, 384 U.S. at 444; *see Malloy*, 378 U.S. at 8 (“[T]he Fifth Amendment guarantee[] against federal infringement—the right of a person to remain silent unless he chooses to speak in the unfettered exercise of his own will, and to suffer no penalty . . . for such silence.”).

³¹⁸ *See Allen & Mace*, *supra* note 13, at 268-69 (making the comparison of language as a code to thoughts with the physiological responses measured by a traditional lie-detection machine).

³¹⁹ *See Estelle*, 451 U.S. at 464-66 (finding that the absence of any statement of remorse revealed the contents of a suspect’s mind and implicated the privilege); *see also Allen & Mace*, *supra* note 13, at 268-69 (comparing language and physiological measures in terms of being a code to thoughts).

³²⁰ *Doe*, 487 U.S. at 213.

³²¹ *See id.* (noting the privilege is served when the suspect is protected from revealing knowledge with the government); *Wade*, 388 U.S. at 222 (holding the privilege implicated with the suspect is required “to disclose any knowledge he might have”); *Malloy*, 378 U.S. at 8 (noting that the individual has a right “to remain silent unless he chooses to speak in the unfettered exercise of his own will, and to suffer no penalty . . . for such silence”).

³²² *Supra* notes 88-94.

³²³ *See, e.g., Hubbell*, 530 U.S. at 45 (holding a defendant’s physical act of production was protected by the privilege); *Muniz*, 496 U.S. at 596-97 (finding defendant’s statement protected by the privilege).

³²⁴ *Doe*, 487 U.S. at 213.