

# Minds, Brains, and Law

*The Conceptual Foundations of Law  
and Neuroscience*

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# Introduction

The relationship between the mind and the brain is a topic of immense philosophical, scientific, and popular interest.<sup>1</sup> The diverse but interacting powers, abilities, and capacities that we associate with the mind and mental life both link humans with other animals and constitute what make us uniquely human. These powers, abilities, and capacities include perception, sensation, knowledge, memory, belief, imagination, emotion, mood, appetite, intention, and action. The brain, in interaction with other aspects of the nervous system and the rest of the human body, makes these possible. The relationship between the mind and the brain is undeniable, and we do not deny it in this book. We think *substance dualism*—that is, the Cartesian idea that the mind consists of an immaterial substance that is somehow in causal interaction with the physical body (including the brain)—is too implausible to be taken seriously. We are not dualists.<sup>2</sup>

<sup>1</sup> Recent, accessible discussions of philosophical issues raised by recent neuroscience include ALVA NOË, *OUT OF OUR HEADS: WHY YOU ARE NOT YOUR BRAIN, AND OTHER LESSONS FROM THE BIOLOGY OF CONSCIOUSNESS* (2010); RAYMOND TALLIS, *APIING MANKIND: NEUROMANIA, DARWINITIS, AND THE MISREPRESENTATION OF HUMANITY* (2011); PAUL THAGARD, *THE BRAIN AND THE MEANING OF LIFE* (2012); MICHAEL S. GAZZANIGA, *WHO'S IN CHARGE? FREE WILL AND THE SCIENCE OF THE BRAIN* (2012).

<sup>2</sup> In rejecting substance dualism, we endorse moderate or pragmatic forms of “naturalism”; see, e.g., PHILIP KITCHER, *THE ETHICAL PROJECT* (2011). However, for reasons discussed in Chapter Two, we reject more extreme “reductive” or “eliminative” forms of naturalism. Although modern neuroscientists (and legal scholars advocating for neuroscientific applications in law) overwhelmingly purport to reject the substance dualism associated with Descartes, their explanations retain the problematic formal structure of Cartesianism by replacing the immaterial soul with the brain. This ironic development is articulated lucidly and in detail in M.R. BENNETT & P.M.S. HACKER, *PHILOSOPHICAL FOUNDATIONS OF NEUROSCIENCE* 233–35 (2003). Moreover, as we explore in Chapter Two, the false dichotomy

Nevertheless, the relationship between the mind and the brain is enormously complicated. It is one thing to say that the mind (or some particular aspect of mental life, for example, pain) depends on the brain and another to say that the mind (or a particular aspect of it) just *is* the brain, or can be “reduced” to the brain (in the sense that it can be explained or explained away fully in terms of brain processes). Whether it can or cannot will depend on a number of empirical and conceptual issues. The empirical issues concern the evidential base and the adequacy of the scientific explanations for the phenomena that we associate with the mind and the sensory, affective, cognitive, and cognitive categories that comprise our mental lives. The empirical issues on the relationship of mind and brain have been aided by an explosion of work in cognitive neuroscience over the past couple of decades, itself aided by an explosion of technology providing detailed information about brain structure and process (most important, types of brain imaging).

The conceptual issues are sometimes more difficult to appreciate, but they are there.<sup>3</sup> This is true both with regard to the general relationship between mind and brain and issues involving particular mental categories. On the general relationship, consider the claim: “the mind *is* the brain.”<sup>4</sup> When presented with the choice—is the mind one substance (the brain) or another substance (an *immaterial* substance)—then the choice may seem obvious. But notice what is presupposed by the choice when presented this way—that the mind is a *substance*. If it *is* a substance, then the choice should depend on the empirical success of the available rival hypotheses in explaining the nature of the substance. If it is *not* a substance, however, then this way of framing the issue is based on a type of error or confusion. We call this a *conceptual* confusion because the *conception* of mind that is being deployed by each of the rival claims is confused or mistaken (i.e., by presupposing that the mind is a substance).

between Cartesianism and reductionism as conceptions of the mind sets the stage for conceptual confusion throughout the neurolaw literature.

<sup>3</sup> Indeed, as we will argue throughout this book, the fact that the conceptual issues are sometimes difficult to recognize helps to generate some of the conceptual problems that we discuss.

<sup>4</sup> See PATRICIA SMITH CHURCHLAND, *NEUROPHILOSOPHY: TOWARD A UNIFIED SCIENCE OF THE MIND/BRAIN* ix (1986) (“Since I was a materialist and hence believed that the mind is the brain ...”).

What is true of the general question is also true of specific ones. Consider the following example drawn from clinical psychology. In discussing the relationship between depression and brain chemistry, psychologist Gregory Miller explains:

The phenomenon that a particular usage of the term *depression* refers to does not change if we redeploy the term to refer to something else, such as the biochemistry associated with depression. If by consensus the term *depression* refers today to sadness as a psychological state and in 10 years to a brain chemistry state, we have not altered the phenomenon of sadness, nor have we explained it in terms of brain chemistry.<sup>5</sup>

Notice two things about this quotation. First, there is an underlying phenomenon referred to by “depression,” and the term expresses a concept. Second, concepts can change, and when they do the meaning of the terms used to express those concepts will change as well. We take no issue with changing concepts (or using terms to mean different things)—doing so may be fruitful and illuminating, particularly in light of scientific developments.<sup>6</sup> But changing the concept does not change the underlying phenomenon previously referred to by the term. Therefore, claims employing the new concept do not necessarily explain the phenomenon referred to previously. In our parlance, a conceptual error or confusion may arise when an empirical claim purports to rely on a current concept (e.g., the concept expressed by the term “depression”) but the claim presupposes a changed concept or a mistaken view about the current one.

Understanding the complex relationship between the mind and mental life and the brain thus requires not only increased empirical knowledge about the brain but also conceptual clarity regarding the various issues and claims being made. The brain sciences have contributed much to the former, and philosophy (primarily those working in the philosophy of mind and related areas) to the latter. But a great deal of work remains to be done in both domains and the interactions between them.

<sup>5</sup> Gregory A. Miller, *Mistreating Psychology in the Decades of the Brain*, 5 PERSPECTIVES PSYCHOL. SCI. 716, 718 (2010).

<sup>6</sup> For an illuminating discussion of conceptual change in science, see MARK WILSON, WANDERING SIGNIFICANCE: AN ESSAY ON CONCEPTUAL BEHAVIOR (2006). For another example of conceptual change, see SUSANNE FREIDBERG, FRESH: A PERISHABLE HISTORY (2009), discussing changes in the concept of “freshness” as it relates to food.

It is against this intricate backdrop that issues of law and public policy enter the picture.<sup>7</sup> The complex issues regarding the mind and the brain become, like three-body problems in physics, increasingly more complicated by the introduction of this third variable: law. The proposed uses of neuroscience to inform issues of law and public policy raise the same types of empirical and conceptual questions discussed above, but they introduce further complications for these issues and they raise new challenges. On the empirical side, the issues are further complicated by the fact that law often employs its own standards for the empirical adequacy of claims, and these standards deviate from those employed by scientists or others.<sup>8</sup> On the conceptual side, the issues are further complicated by the fact that legal doctrine and legal theory make use of our “ordinary” concepts of mind and mental life on some occasions and do not on others. Therefore, further conceptual difficulties are introduced by the concepts employed by legal doctrine and legal theory.<sup>9</sup> Together with increased empirical and conceptual issues, the law also introduces a host of additional practical and ethical issues.

## I. Clarifications and Caveats about the Scope of This Project

In exploring the relationships among these three variables (the mind, the brain, and the law), we think it helpful to introduce the following general taxonomy of methodological issues: empirical, practical, ethical, and conceptual. We believe that maintaining clarity among these

<sup>7</sup> The MacArthur Foundation’s “Research Network on Law and Neuroscience” provides and collects resources on the intersection of law and neuroscience. See <http://www.law-neuro.org/>. The Research Network provides a useful starting point for exploring the growing interdisciplinary field of neurolaw. For overviews of neurolaw scholarship, see Oliver R. Goodenough & Micaela Tucker, *Law and Cognitive Neuroscience*, 6 ANN. REV. L. & SOC. SCI. 28.1 (2010); INTERNATIONAL NEUROLAW: A COMPARATIVE ANALYSIS (Tade Matthias Spranger ed., 2012); Francis X. Shen, *The Law and Neuroscience Bibliography: Navigating the Emerging Field of Neurolaw*, 38 INT. J. LEGAL INFO. 352 (2010).

<sup>8</sup> Fred Schauer has emphasized this theme and elucidated the several ways in which the standards diverge. See Frederick Schauer, *Can Bad Science Be Good Evidence? Neuroscience, Lie Detection, and Beyond*, 95 CORNELL L. REV. 1191 (2010).

<sup>9</sup> For example, even if neuroscience can tell us something about knowledge in general or a particular type of knowledge, it may or may not tell us anything about knowledge for purposes of *mens rea* in criminal law.

categories is crucial for making progress on issues at the intersection of law and neuroscience. We explain and illustrate the categories with the example of brain-based lie detection. First, some issues are *empirical*—they concern various issues pertaining to neuroscientific data. With the example of brain-based lie detection, these issues will include, for example, the strength of the correlations between particular brain activity and behavior associated with lies and truthful responses, respectively, and whether (and the extent to which) these correlations vary among individuals, different groups, and different types of lies, and a host of other relevant variables. Second, some issues are *practical*—they concern practical challenges regarding the integration of neuroscience into issues of law and public policy. With the example of lie detection, the practical issues involve, for example, determining when and how such evidence should be introduced into legal proceedings, as well as determining what legal standards and instructions will govern the inferences that may or not be drawn from that evidence. Third, some of these issues are *ethical*—they concern various questions regarding privacy, safety, dignity, autonomy, and other values implicated by proposed uses of neuroscience in law. With the example of lie detection, these issues concern, for example, how the compelled uses of lie detection would fit or clash with these values and the rights of parties.

Finally, some issues are *conceptual*. This category of issues is our primary focus throughout this book, and it is one that has garnered considerably less attention in the scholarly literature. The conceptual issues concern the presuppositions and applications of concepts associated with the mind and mental life in claims about neuroscience and law. These concepts include knowledge, belief, memory, intention, voluntary action, and free will, among several others, as well as the concept of mind itself. The primary utility of philosophical work on these issues is *corrective*, by which we mean correcting mistaken inferences and conceptual errors that result from presupposing and deploying problematic or mismatched concepts. We have said that our focus will be on *conceptual* issues and the value of the inquiry will be *corrective*. In order to forestall confusion, we clarify in more detail at the outset what we mean by each of these terms. Once again, we will use the example of lie detection to illustrate.

Conceptual issues concern the application of concepts involving the mind and the diverse array of psychological powers, capacities, and abilities that we associate with having a mind. The conceptual issues focus on the scope and contours of the concepts being employed in



claims involving law and neuroscience. One such ability possessed by people with minds is the ability to lie to those around them. It is an *empirical* question whether a particular person is lying on a particular occasion, and it is an *empirical* question whether particular brain activity is correlated with lying behavior. But what constitutes a “lie” is a *conceptual* question. It concerns the scope and contours of what it means to “lie.” Notice also that any answer to the two examples of empirical questions noted above (i.e., whether a person is lying and whether brain activity is correlated with lying) will presuppose some conception of what constitutes “lying.”

To say that what constitutes a “lie” is a conceptual question is not to deny that there are empirical aspects to this issue, including how the term has been used in the past or how it is currently used by most people. Moreover, “concepts” and “conceptual analysis” are philosophically loaded terms, with a number of different ideas and theories sometimes attaching to each.<sup>10</sup> Therefore, a few additional caveats are necessary to further clarify what we mean by “concepts” and “conceptual analysis.” We think of concepts simply as abstractions from the use of words. Concepts are not the same as words because different words may express the same concept,<sup>11</sup> and the same words may express different concepts. But we take ordinary usage as a starting point when the claims at issue involve our everyday “folk psychological”<sup>12</sup> mental concepts, and we take current legal usage as a starting point when the claims at issue involve doctrinal or theoretical concepts in law. We do not presuppose that these concepts necessarily have (1) fixed boundaries (rather, concepts can and do change); (2) sharp boundaries (rather, there may be borderline cases); or (3) essences or necessary

<sup>10</sup> For a useful overview of the philosophical literature, see Eric Margolis & Stephen Laurence, *Concepts*, in *STANFORD ENCYCLOPEDIA OF PHILOSOPHY* (2011), available at <http://plato.stanford.edu/entries/concepts/>. For more detailed discussions of the differing roles played by conceptual analysis, see FRANK JACKSON, *FROM METAPHYSICS TO ETHICS: A DEFENCE OF CONCEPTUAL ANALYSIS* (2000); *CONCEPTUAL ANALYSIS AND PHILOSOPHICAL NATURALISM* (David Braddon-Mitchell & Robert Nola eds., 2008).

<sup>11</sup> For example, the words “snow,” “Schnee,” and “neve” are all expressions of the same concept.

<sup>12</sup> The expression “folk psychology” refers to our common psychological/mental concepts and our ordinary use of words expressing these concepts. The notion of “folk psychology” or “folk psychological concept” is philosophical and controversial. We use the expression without endorsing the many uses to which it is put in the philosophical literature. However, the concept is a staple of the philosophical literature and, for that reason, we employ it. Nothing in our arguments depends upon a rejection of the idea of folk psychology. Thus, we prescind from direct controversy over the viability and explanatory perspicacity of this notion.

and sufficient conditions (rather, criteria for their application may be defeasible). Nevertheless, there are various criteria for applying the relevant concepts (or terms expressing the concepts), and our analysis often focuses on drawing attention to these criteria. The criteria at issue serve a normative role: they partly constitute the meaning of the relevant terms and they regulate applications. To continue with the example of lie detection, the criteria serve as the *measure* of what constitutes a lie and not just a *measurement* of whether someone is lying on a particular occasion.<sup>13</sup>

Beyond these relatively modest methodological commitments, we do not tie our analysis to any particular theory of concepts or conceptual analysis. Nor is our concern merely with words and the use of words. Words such as “lie” pick out certain phenomena in the world. Our—and the law’s—concern is with the underlying phenomena. Conceptual clarity will improve our understanding of the phenomena; conceptual confusion will obscure what we are trying to understand.

This is what we mean by *conceptual* issues. In what sense, then, is the primary value of the analysis *corrective*? Empirical claims in the neuro-law literature will rely on concepts (e.g., to lie), and the presupposed criteria for applying terms expressing the concepts may be confused or erroneous (e.g., presupposing a lie necessarily requires an intent to deceive<sup>14</sup>). There is nothing wrong with using a term in a novel way, but it *is* a mistake to use it in a new way *and* think that it has the same meaning or plays the same inferential roles it did previously. A conceptual inquiry will serve a useful corrective function when it identifies conceptual errors or mistaken inferences made in arguments and claims about law and neuroscience. These inferential errors can arise in a variety of ways. For example, consider a claim that certain neural activity is correlated with lying. If the behavior being correlated with the neural activity is not in fact lying, then the claim may be relying on an erroneous conception of what it is to lie. Similarly, it would be mistaken to presuppose that brain activity *constitutes* lying when there is none of the behavior that we typically associate with lying (e.g., saying something believed to be false). Moreover, even when a claim relies on appropriate conceptions, given the ordinary meanings of the terms

<sup>13</sup> We discuss the criteria for lying in depth in Chapter Four.

<sup>14</sup> As we discuss in Chapter Four, one can lie without an intent to deceive. For example, a threatened witness may lie on the witness stand in court not intending to deceive the judge and hoping the judge “sees through” the lie (and does not rely on the witness’s statement).

employed, a similar error may arise when the claim relies on a mistaken conception of how a term is employed in legal doctrine. Errors may also arise when two premises of an argument rely on different conceptions and draw mistaken inferences based on this mismatch.

In the chapters that follow, we illustrate how a variety of these types of conceptual errors and mistaken inferences arise within the neurolaw literature. It is not surprising that these types of conceptual issues would arise frequently for law and neuroscience. The relationships between neuroscience and the various mental and psychological concepts are themselves enormously complex, and this complexity is further increased by adding a new variable—law—which brings with it a host of issues regarding legal proof, legal doctrine, and legal theory. The conceptual issues we will discuss focus on all three of these levels: proof, doctrine, and theory. The issues of proof concern the use of neuroscientific evidence (for example, brain-based lie detection) in court. The doctrinal issues are drawn primarily from the areas of criminal law and constitutional criminal procedure. The issues in legal theory are drawn from the areas of general jurisprudence, economics, morality, and criminal punishment.

Although the primary thrust of our conceptual inquiry is corrective, we wish to dispel one other potential confusion at the outset. Our aim is ultimately not a negative or skeptical one about the positive role the brain sciences may play in informing and, in some cases, transforming legal issues. We maintain that increased sensitivity to these conceptual matters can only improve our understanding of the relevant issues. Progress on matters that lie at the intersection of law and neuroscience depends not only on increased empirical investigation but also on conceptual clarity regarding these investigations and, more important, the inferences and conclusions drawn from them. Empirical investigations free of conceptual confusions tell us so much more about what we need to know than investigations that proceed from problematic conceptual assumptions; empirical investigations based on conceptual confusions may lead us astray.

Two other caveats about our project must be noted in this Introduction. First, because our focus is on conceptual issues, we will largely take the neuroscientific data presented in the scientific literature or relied upon in legal literature as a given. This is not because we necessarily endorse these empirical claims, and we will point out a number of empirical issues along the way, but rather because it frees us methodologically to pursue the conceptual and legal issues at the heart of our inquiry. More important, we are not neuroscientists, and nothing

in our analysis is offered as a critique of neuroscience qua science. Let us be clear about this. Our primary concern is with conceptual claims about how current neuroscientific data relates to our mental concepts as those concepts matter for law, legal theory, and public policy. These concerns must be informed by neuroscience, but the issues they raise exist outside the domain of neuroscientific expertise.

The second caveat concerns our focus on the law. The vast majority of our examples and the bulk of the doctrine we discuss involve law within the United States, and our discussions will predominately focus on doctrine pertaining to criminal law. In part, this is because this is where our particular expertise lies. Additionally, a number of important recent developments involving cases in the United States and criminal law have dominated the discussions. Although the doctrinal analysis will relate primarily to criminal law within the United States, we believe the examples are of more general interest in illustrating how problematic conceptual issues arise at the level of legal doctrine.<sup>15</sup> Moreover, a number of the theoretical issues we discuss are of general relevance for law.

## II. A Brief Overview of the Science and Technology

As we explained above, our conceptual investigations in this book will largely take the neuroscientific data produced by various experiments as a given for purposes of discussion. We provide the relevant empirical details when discussing specific issues in the chapters that follow; however, some basic general understanding of the field and the relevant technology may be useful to readers not otherwise familiar with them. In this section, we provide some basic background details that

<sup>15</sup> Recent discussions of neuroscience and other doctrinal areas include Jean Macchiaroli Eggen & Eric J. Laury, *Toward a Neuroscience Model of Tort Law: How Functional Neuroimaging Will Transform Tort Doctrine*, 13 COLUM. SCI. & TECH. L. REV. 235 (2012); Jeffrey Evans Stake, *The Property "Instinct,"* in LAW & THE BRAIN 185 (Semir Zeki & Oliver Goodenough eds., 2006); Edwin S. Fruehwald, *Reciprocal Altruism as the Basis for Contract*, 47 LOUISVILLE L. REV. 489 (2009); Richard Birke, *Neuroscience and Settlement: An Examination of Scientific Innovations and Practical Applications*, 25 OHIO ST. J. DISPUTE RES. 477 (2011); Steven Goldberg, *Neuroscience and the Free Exercise of Religion*, in LAW & NEUROSCIENCE: CURRENT LEGAL ISSUES (Michael Freeman ed., 2010); Collin R. Bockman, Note, *Cybernetic-Enhancement Technology and the Future of Disability Law*, 95 IOWA L. REV. 1315 (2010).

some readers may find useful. (Readers already familiar with the field of neuroscience and techniques such as EEG and fMRI can skip ahead.)

Neuroscience investigates the brain and nervous system more generally, focusing on structures, functions, and processes within this system and its interactions with other bodily systems. Within this field, *cognitive neuroscience* investigates the relationship between the nervous system and *mental* attributes, often looking for links between the brain and the various powers, abilities, and capacities that we associate with the mind and mental life such as decision making, knowledge, memory, and consciousness.<sup>16</sup> Many of the issues at the intersection of law and neuroscience concern *cognitive* neuroscience because the law is typically interested in these mental attributes and their roles in human behavior. In addition to neural investigations of mental processes generally, the law also has a great need for knowledge from *clinical* neuroscience, which investigates the neural links to mental disorders that may be relevant to a host of legal issues (e.g., competence to draft a will or criminal defenses), and from *developmental* neuroscience, which investigates brain development and may be relevant to a host of legal issues involving children, young adults, and the elderly.<sup>17</sup>

<sup>16</sup> For general discussions, see MICHAEL S. GAZZANIGA, RICHARD B. IVRY & GEORGE R. MANGUN, *COGNITIVE NEUROSCIENCE: THE BIOLOGY OF THE MIND* (3d ed. 2008); M.R. BENNETT & P.M.S. HACKER, *HISTORY OF COGNITIVE NEUROSCIENCE* (2008). For a clear, accessible introduction, see A JUDGE'S GUIDE TO NEUROSCIENCE: A CONCISE INTRODUCTION (Michael S. Gazzaniga & Jed S. Rakoff eds., 2010).

<sup>17</sup> Our discussion in this book will focus primarily on claims about cognitive neuroscience and law; clinical issues, however, arise in the discussion of the insanity defense (Chapter Five). A number of important diagnostic issues at the intersection of law and neuroscience—including those involving pain, determination of brain death, and patients in vegetative states—are generally outside the scope of our discussion, but are mentioned occasionally where relevant. On pain, see Amanda C. Pustilnik, *Pain as Fact and Heuristic: How Pain Neuroimaging Illuminates Moral Dimensions of Law*, 97 CORNELL L. REV. 801 (2012); Adam Kolber, *The Experiential Future of Law*, 60 EMORY L.J. 585 (2011). On brain death, see Laurence R. Tancredi, *Neuroscience Developments and the Law*, in *NEUROSCIENCE & THE LAW: BRAIN, MIND, AND THE SCALES OF JUSTICE* (Brent Garland ed., 2004). On vegetative states, see Adrian M. Owen & Martin R. Coleman, *Functional Neuroimaging of the Vegetative State*, 9 NATURE REV. NEURO. 235 (2008); Rémy Lehembre et al., *Electrophysiological Investigations of Brain Function in Coma, Vegetative and Minimally Conscious Patients*, 150 ARCH. ITAL. BIOL. 122 (2012). On aging and memory, see Rémy Schmitz, Hedwige Dehon & Philippe Peigneux, *Lateralized Processing of False Memories and Pseudoneglect in Aging*, CORTEX (forthcoming, published online June 29, 2012). Developmental neuroscience and law is also outside the scope of our discussion. See Terry A. Maroney, *The False Promise of Adolescent Brain Science in Juvenile Justice*, 85 NOTRE DAME L. REV. 89 (2009); Terry A. Maroney, *Adolescent Brain Science after Graham v. Florida*, 86 NOTRE DAME L. REV. 765 (2011). The U.S. Supreme Court has relied upon developmental neuroscience in its recent jurisprudence limiting criminal sentencing. See *Miller v. Alabama*, 567 U.S. (2012); *Graham v. Florida*, 130 S. Ct. 2011 (2010); *Roper v. Simmons*, 543 U.S. 551 (2005).

Neuroscience has been aided significantly by technological advances over the past couple of decades. The most significant development has been “neuroimaging” in general and functional magnetic resonance imaging (fMRI) in particular.<sup>18</sup> Neuroimaging techniques allow for safe and noninvasive methods to learn ultrafine details about brain structure and function. Many of the proposals and experiments that we discuss in this book depend on data gathered through fMRI. Both MRI (magnetic resonance imaging) and fMRI work by having people lie down inside a scanner that contains a large and powerful magnet. The key distinction between MRI and fMRI is that MRI investigates structure and fMRI, as its name suggests, investigates function. MRI measures the magnetic properties of water molecules in the body.<sup>19</sup> The scanner creates a magnetic field that aligns the hydrogen nuclei of water molecules, and a radiofrequency pulse is then briefly applied to rotate the hydrogen nuclei into a high-energy state. When the pulse ends, the hydrogen nuclei spin back into alignment, releasing differing amounts of energy. An electromagnetic field then detects energy released by protons in the nuclei. The protons in different types of matter (such as the cerebral cortex, nerve tracks, and cerebrospinal fluid) “resonate” at different frequencies. The differences are translated to an image and appear in different shades, which can be enhanced further through a variety of techniques. The results are “images” of the brain that can even be “sliced” and examined from different angles. MRI is an amazing diagnostic tool.

In measuring brain process, fMRI focuses on the magnetic properties in blood.<sup>20</sup> Magnetic properties in blood are used as a proxy for brain activity because blood flow correlates with brain activity. When hemoglobin in blood delivers oxygen to areas of the brain it becomes “paramagnetic” and disrupts a magnetic field created by the scanner. When brain activity increases in a particular area, “blood flow increases more than needed to supply the increase in oxygen consumption.”<sup>21</sup> When there is increased blood flow to an area of the

<sup>18</sup> For general overviews of neuroimaging, see Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 5 STAN. TECH. L. REV. (2009); Teneille Brown & Emily Murphy, *Through a Scanner Darkly: Functional Neuroimaging as Evidence of a Criminal Defendant’s Past Mental States*, 62 STAN. L. REV. 1119 (2012); Henry T. Greely & Judy Illes, *Neuroscience-Based Lie Detection: The Urgent Need for Regulation*, 33 AM. J. L. & MED. 377 (2007); Marcus Raichle, *What Is an fMRI?*, in A JUDGE’S GUIDE TO NEUROSCIENCE, *supra* note 16, at 5–12.

<sup>19</sup> Raichle, *supra* note 18.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.* at 6.

brain, the hemoglobin contains more oxygen, and the MRI signal increases. The increased signal suggests that area of the brain is more “active” or is otherwise involved in whatever activity the person is currently engaged in while in the scanner. This signal is the “blood oxygen level dependent” (BOLD) and it is the foundational principle for fMRI.<sup>22</sup> In the claims and experiments we will discuss, the activities being correlated with the BOLD signal typically include tasks such as answering questions, making decisions, perceiving images, thinking of things, or playing games. Statistical data from the measurements are then processed and translated through one of a variety of statistical techniques into a brain scan “image.” In linking brain function and mental processes, claims based on fMRI sometimes rely on inferences from mental processes to “active” brain activity to arrive at conclusions about which brain areas are responsible for producing or enabling the mental process, or on inferences from brain activity to mental process (i.e., because a subject has X brain activity he or she is likely engaged in Y mental process). The latter are more controversial.<sup>23</sup>

In addition to fMRI (and MRI), another technique that features in the neuroscientific claims we will discuss is electroencephalography (EEG). EEG measures electrical activity in the brain, typically through electrodes on the scalp. Based on the presence of particular electrical activity, researchers draw inferences about the brains and minds of subjects. For example, in Chapter Four we will examine a controversial technique that uses EEG as a type of “lie detector,” more specifically, as a measure of whether a person has “guilty knowledge” or knows details about a crime. Other neuroscientific techniques for gathering information about the brain include “positron emission tomography” (PET) and “single photon emission computed tomography” (SPECT), along with newer technologies such as “transcranial magnetic stimulation” (TMS) and “near-infrared spectroscopy” (NIRS).<sup>24</sup> We mention these other techniques when relevant to the discussion, but most of the

<sup>22</sup> See William G. Gibson, Les Farnell & Max. R. Bennett, *A Computational Model Relating Changes in Cerebral Blood Volume to Synaptic Activity in Neurons*, 70 *NEUROCOMPUTING* 1674 (2007).

<sup>23</sup> See Russell A. Poldrack, *Can Cognitive Processes Be Inferred from Neuroimaging Data?*, 10 *TRENDS IN COG. SCI.* 79 (2006) (discussing problems with drawing “reverse inferences” about mental processes from brain data).

<sup>24</sup> For a concise general overview, see Amanda C. Pustilnik, *Neurotechnologies at the Intersection of Criminal Procedure and Constitutional Law*, in *THE CONSTITUTION AND THE FUTURE OF THE CRIMINAL LAW* (John Parry & L. Song Richardson eds., forthcoming 2013), available at <http://ssrn.com/abstract=2143187>.



claims and arguments that we evaluate are based primarily on fMRI data (and to a lesser extent on EEG).

### III. A Summary of the Chapters

Chapters One and Two discuss general philosophical topics and explain the methodological approach that we employ throughout the book. Chapters Three through Seven employ the methodological framework and philosophical issues presented in the first two chapters to a variety of issues in law, legal theory, and public policy.

Chapter One discusses several philosophical issues at the heart of claims about the ways that neuroscience will or ought to inform (and in some cases, transform) law. In this chapter, we introduce the primary methodological position on which our discussion and arguments depend: the distinction between conceptual and empirical issues. Conceptual issues concern whether a claim “makes sense,” by which we mean that the claim employs correct conceptions of the relevant concepts (or presupposes the correct meaning for the terms expressing these concepts). For example, if a claim is about lying, does the claim employ a correct conception of lying? In other words, does “lying” in the claim mean lying or something else (does it express the concept of lying, or a different concept, or no concept at all)? We refer to claims lacking this feature as “nonsensical.”

Empirical issues, by contrast, concern whether propositions are true or false, whether certain conditions obtain:<sup>25</sup> for example, “is Jones lying when he asserts that he was not at the crime scene?” In explicating this distinction, we explain two other subsidiary issues: (1) a distinction between criterial and inductive evidence, and (2) the “mereological fallacy.”<sup>26</sup> We illustrate these methodological considerations with

<sup>25</sup> Of course, for this reason there will be empirical aspects to conceptual claims (e.g., we can ask whether propositions about concepts are true or false). But a key difference between a conceptual and an empirical claim is the role that each plays; conceptual claims primarily involve a normative, regulative role and empirical claims primarily involve a descriptive role. Another way to think about this distinction is that conceptual claims are about the *measure* constituted by the concept, and empirical claims are about particular *measurements made with the concept*. A conceptual claim about lying is about what constitutes a lie; empirical claims about lying are whether someone is lying on a particular occasion or whether particular brain activity is correlated with lying.

<sup>26</sup> BENNETT & HACKER, *supra* note 2.



discussions of competing conceptions of rule following, interpretation, and knowledge.

Turning from the general philosophical considerations underlying many law-and-neuroscience claims, Chapter Two focuses in more detail on the concept of mind itself. Many claims in the neurolaw literature rely upon a “reductionist” conception of the mind, according to which the mind can be “reduced” in the sense of being explained fully (or explained away in some “eliminative” proposals) in terms of brain functions and processes. We discuss the controversial presuppositions underlying this conception of mind. We also outline three general conceptions of mind: Cartesian Dualism, the reductionist conception of mind-as-brain, and an Aristotelian conception of mind as an array of powers, abilities, and capacities.

With these philosophical considerations in place, we then turn in the next several chapters to specific claims made in the neurolaw literature. We sometimes use the term “neurolegalist”<sup>27</sup> as shorthand to denote scholars making strong and enthusiastic claims about how scientific data about the brain can illuminate or transform law and legal issues. Chapter Three discusses several issues at the intersection of neuroscience and legal theory. We first discuss claims about how neuroscience may illuminate issues in general jurisprudence. We next discuss the relationship between the brain and morality, focusing both on work by Joshua Greene and colleagues on emotion and moral decision making and by John Mikhail on “moral grammar.” Finally, we examine recent work on neuroeconomics.

Chapter Four discusses brain-based lie detection. We examine two types of brain-based technology that are currently being studied in laboratory settings and marketed for real-world use. Parties in both civil and criminal litigation have attempted to introduce the results of such testing as probative evidence in court. The first type uses fMRI to examine whether someone is exhibiting neural activity correlated with deceptive lies or with sincere responses. The second type uses EEG to examine whether someone possesses “guilty knowledge” (e.g., incriminating details about a crime scene). We outline the various empirical and practical issues facing the use of this type of evidence in litigation settings, but we focus the bulk of our discussion on several

<sup>27</sup> We do not mean to refer to everyone writing in the field of law and neuroscience by this term. The field is immense and diverse, with a wide range of views expressing optimism, pessimism, caution, frustration, and concern.

problematic *conceptual* presuppositions underlying arguments about this evidence and the inferences that may legitimately be drawn from it in litigation settings.

Chapters Five and Six focus on legal doctrine in criminal cases. Chapter Five discusses substantive legal doctrine, and examines arguments about the use of neuroscience to inform three primary doctrinal categories for adjudicating guilt: *actus reus*, *mens rea*, and the insanity defense. Chapter Six focuses on criminal procedure, and examines the three primary constitutional provisions that limit the gathering and use of neuroscientific evidence by the government: the Fourth Amendment, the Fifth Amendment privilege against self-incrimination, and Due Process. Throughout these chapters, the discussion will, like the rest of the book, focus primarily on conceptual issues.<sup>28</sup> In addition to our specific analyses of the various provisions, our general aim in these chapters is to illustrate that the arguments for how neuroscience fits (or ought to fit) with legal doctrine depend on these conceptual issues, and the practical consequences that follow.

Chapter Seven turns from doctrine back to theory and examines arguments about the relationship between neuroscience and theories of criminal punishment. We evaluate two different challenges neuroscience purports to present for retribution-based theories of criminal punishment. The first challenge focuses on information about the brains of those engaged in punishment decisions, and seeks to undermine retributivism because of the relationship between emotion and retributive punishment decisions. The second challenge focuses on information about the brains of criminals (and people generally)

<sup>28</sup> Two related issues involving neuroscience and criminal law that are outside the scope of our discussion are predicting violence and the unique roles played by neuroscientific evidence in death penalty cases after guilt has been determined. On predicting violence, see Thomas Nadelhoffer et al., *Neuroprediction, Violence, and the Law: Setting the Stage*, 5 *NEUROETHICS* 67 (2012); Amanda C. Pustilnik, *Violence on the Brain: A Critique of Neuroscience in Criminal Law*, 44 *WAKE FOREST L. REV.* 183 (2009). On death penalty cases, see O. Carter Snead, *Neuroimaging and the “Complexity” of Capital Punishment*, 82 *N.Y.U. L. REV.* 1265 (2007). To the extent the relevance of neuroscientific evidence at sentencing in capital cases is to raise doubts about culpability (because of doubts regarding *mens rea*, insanity, or *actus reus*), our analysis in Chapter Five applies here as well. We do not address potential mitigating uses of neuroscience at sentencing that do not track the doctrinal issues. In our discussion of constitutional criminal procedure, we take the constitutional provisions and their surrounding doctrine as a given and we do not address whether new rights should be created in light of developments in neuroscience. For an argument advocating a right to “cognitive liberty,” see Richard G. Boire, *Searching the Brain: The Fourth Amendment Implications of Brain-Based Deception Devices*, 5 *AM. J. BIOETHICS* 62 (2005).

and predicts that this will undermine retributivism by showing that no defendants ever deserve punishment. We illustrate how both challenges depend on a number of problematic conceptual presuppositions. Exposing these problems undermines the challenges and reveals why their conclusions ought to be resisted.

We conclude our book with some thoughts on what we believe our arguments demonstrate and why we believe our approach to the issues has much to recommend it. As we have stated, our position is that the conceptual issues raised by the literature on law and neuroscience are significant and largely neglected. Our purpose in writing this book is to draw attention to these issues, demonstrate their importance, and propose concrete solutions to the problems we identify.