Minority Shareholdings (2016). This shows that a more in-depth understanding of the problem is still being sought and that the design of a response proportionate to the size of the problem remains under active consideration.

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Philosophical Foundations of Law and Neuroscience. By DENNIS PATTERSON and MICHAEL S. PARDO (eds.) [Oxford University Press, 2016. 272 pp. Hardback £60. ISBN 978-0-19-874309-5.]

Neuroscience has the potential to transform aspects of legal theory, doctrine and proof by transforming our understanding of human agency, mental states and the mind. The nature and scope of this potential, however, are deeply contested. While it is clear that neuroscience will revolutionise our understanding of the brain, the implications of neuroscience for the law are not straightforward, but rather turn on a variety of controversial issues that are carefully explored in the chapters of this volume. For any reader who is interested in the intersection of neuroscience and the law, as well as for many who are not as yet, this collection will provide thought-provoking and enlightening reading.

One argument for modifying the law based on neuroscience, advanced in the opening chapter by Adam Kolber (ch. 1), relies on the intent of those who created the various parts of the law. Regarding the criminal law in particular, Kolber argues that although Anglo-American criminal law does not explicitly adopt a theory of free will, it was created by individuals who are likely to have believed that humans have souls and the ability to make decisions that are not wholly determined by the laws of physics. If so, it is plausible that they did not intend to punish decisions that are made, as neuroscience suggests human decisions are made, in a purely mechanistic manner. Kolber thus concludes that if the meaning of laws (including the criminal law) is to be determined at least in part by its intended purpose, there is a strong argument that the criminal law embodies a faulty assumption and should be modified.

If we set aside the original intended purpose of the criminal law, however, and instead focus on its normative justification, there is a strong argument – developed by Stephen Morse (ch. 2) – that it does not assume the existence of free will. Rather, the criminal law merely assumes that we have rational agency: the ability to act for reasons, such that our behaviour can be causally explained by our mental states. Even if these mental states are themselves causally determined, Morse argues, we are justified in holding people legally responsible, contrary to the claim that determinism is incompatible with responsibility. Morse then turns to a more radical neuroscience-based critique of responsibility, according to which mental states do not exist or are mere epiphenomena. He concludes that either possibility would be incompatible with rational agency and responsibility, but that neuroscientific evidence does not currently support this critique.

The relationship between determinism and responsibility is also the focus of the contribution by Nita Farahany (ch. 3), who argues that the law's conception of free will should be understood as mere "freedom of action", consisting of three components: acting in a manner that one desires, moving with a will that is one's own and identifying and being identified with the action. On this view, determinism and retributivism are compatible, regardless of whether we have freedom with respect to our underlying desires or dispositions. In addition, going beyond mere compatibility,

Farahany envisions a constructive role for neuroscience in helping detect and disaggregate the component parts of free and voluntary actions. Departing from Morse, who identifies little role for neuroscience in the law, Farahany concludes that neuroscience can help provide a scientific foundation for a retributivist theory of justice.

The implications of neuroscience for legal responsibility do not only arise around issues of free will, but also consciousness, as Katrina Sifferd (ch. 8) explores in her analysis of unconscious mens rea in criminal responsibility. Rejecting the argument that we must be consciously aware of the moral significance of an act in order to be held responsible for it, Sifferd argues that there are cases in which mental lapses are morally blameworthy even though they cannot be traced to prior blameworthy conscious choices. To make sense of such cases, she argues that we can be held responsible by virtue of our capacity for diachronic agency, which allows us to exercise self-control in ways that reduce the chances that we will have harmful mental lapses in the future.

While several chapters advance a compatibilist response to the challenge of causal determinism, Michael Moore (ch. 9) questions whether this response can make sense of our commitment to the possibility of volitional excuses. According to Moore, the concept of volitional excuse presupposes that there is a meaningful distinction between what we were unable to do and what we refused to do in a given case, and much of his chapter is devoted to exploring how we might make sense of that distinction. In conclusion, Moore argues that although neuroscience might someday contribute to the counter-factual analysis that is needed to judge volitional excuses, it will never answer the question of whether someone could have acted otherwise in a morally or legally relevant sense, as the answer to this turns on judgements about the closeness of possible counter-factual worlds.

Looking beyond the law's theory of free will and agency to its underlying theory of mind, Dov Fox and Alex Stein (ch. 6) argue that various areas of law presuppose a mistaken mind-body dualism. In particular, they identify and explore: tort law's rejection of mental suffering as a stand-alone harm; constitutional law's exclusion of physical evidence from its prohibition of compelled self-incrimination; and criminal law's requirement that intent be ascertained by reference to thoughts rather than deeds. Rejecting all three of these doctrines, Fox and Stein argue that operations of the mind and the body are not functionally or normatively distinct in the ways the law presupposes, and that dualism does not find an alternate justification in expressive or pragmatic considerations. They conclude by advocating for an integrative model of mental and physical phenomena – based in part in neuroscience – and exploring the doctrinal changes that it would require.

Whether or not advances in neuroscience justify revisions in legal doctrine and theory, there is a separate question of whether neuroscientific evidence should be admissible in court, which Deborah Denno (ch. 4) reveals is the subject of an often-misinformed debate. Through an analysis of how neuroscientific evidence has been used in 800 cases, Denno dispels some common concerns about its use, including the concern that jurors will be overly swayed by it or that it will be used to exculpate those who are in fact blameworthy. Finding that neuroscientific evidence is most often introduced as mitigating evidence in sentencing, rather than in determining criminal liability, Denno argues that it is at least as reliable as other types of evidence used in sentencing. Turning finally to an affirmative case for the use of neuroscience, she suggests that it might be used to improve jury instructions and the criminal law more generally.

The relationship between neuroscience and the law of evidence is also explored in a chapter by Frederick Schauer (ch. 5) on the use of fMRI as a tool of lie-detection. Schauer begins with a historical overview of lie-detection technologies and their

treatment by courts, challenging the claim that fMRI provides a qualitatively differ-ent type of window into the mind. Turning next to arguments against the use of fMRI data as evidence of lying, Schauer contends that it would be more reliable than many other types evidence of lying that are regularly admitted in court. He con-cludes, however, that the exclusion of fMRI evidence is nevertheless likely to con-tinue under the test that governs the admissibility of scientific expert testimony in federal courts (and most state courts) in the US, which he criticises as improperly relying on the epistemic standards and norms of science. He argues that the law's standards for the reliability of evidence should be context specific (for example, varying based on whether evidence is being offered to prove guilt or to establish rea-sonable doubt), embodying normative commitment not found in science.

The possibilities and limits of technologies such as fMRI are further illuminated in a chapter by Gideon Yaffe (ch. 7), who departs from Schauer in arguing that brain-reading can allow us to access the mind in ways that are not possible through behavioural, psychological or cultural evidence. Specifically, Yaffe argues that brain-reading can allow actual mind-reading, rather than mere inferences of mental activity, when we identify brain states that are constitutive of mental states, rather than mere proxies for them. He ultimately concludes that this approach may illumin-ate how specific psychological disorders impact mental states that are relevant to criminal responsibility. Most of his chapter, however, is devoted to highlighting the limits of this approach, including its ability to illuminate three key issues: what a person thought in the past, what a person will think in the future, and what types of thoughts a person is capable of having.

The general limits of neuroscience are also the focus of the concluding chapter by Dennis Patterson and Michael Pardo (ch. 10), who critically explore claims about the power of neuroscience to shed light on issues of jurisprudence, morality and eco-nomics. In particular, they focus on the claims that neuroscience: provides insights in jurisprudence by revealing that justice-based and rule-based reasoning occur in different parts of the brain; answers questions in moral philosophy by revealing that deontological judgements occur in the "emotional" part of the brain, while utili-tarian judgements occur in the "cognitive" part; and provides insight into how the law should deal with economically irrational behaviour by revealing that judge-ments of unfairness occur in the part of the brain associated with negative emotional states. They demonstrate that all of these conclusions amount to "over-claiming", revealing the problematic assumptions that each entails.

The importance of adopting a sceptical stance towards claims about the legal rele-vance of neuroscience is not only the central argument of the concluding chapter, but also a lesson that emerges from the volume as a whole. While the authors offer different views of whether neuroscience will or should transform aspects of legal theory, doctrine and proof, they all reveal the complexity of these potential intersections of science and the law. The case for modifying the law in light of advances in neuroscience is not straightforward, nor is the case for not doing so. Either way, careful argument and analysis is required, and that is exactly what this volume provides. The reader will come away with a nuanced understanding of the ways in which neuroscience may challenge, support or be irrelevant to the law – and of the reasoning and assumptions necessary to reach these conclusions. It is a rare treat to read an edited collection as good as this.

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