

# Neuroscience, Free will and Responsibility

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## ABSTRACT

Some cognitive neuroscientists and psychologists claim that our conscious mental states and actions can be explained entirely in terms of unconscious mechanical processes in the brain. This suggests that our belief in free will is an illusion and that we cannot be responsible for our actions. I argue that neuroscience as such does not threaten free and responsible agency. The real threat to free will is not normal brain function but brain dysfunction that impairs or undermines our capacity for agency.

**Please note:** A glossary of some of the philosophical terminology used in this article may be found following the article.

## Key words:

Compassion Fatigue, Moral Stress, Marginalized Populations

## Introduction

Some cognitive neuroscientists and psychologists claim that our motivational states and actions are determined by and can be completely explained in terms of unconscious mechanical processes in the brain. This suggests that our actions are not within our control because our conscious mental states and events play no causal role in what we do. Yet if we are not the source of our actions and if our mental states and events have no causal force, then our idea of conscious free will is an illusion. Further, if free will is an illusion, then presumably no one can be responsible for their actions, since being responsible rests on the assumption that we have free will.

I argue that neuroscience does not undermine free will because it does not demonstrate that deterministic mechanical processes in the brain completely explain human behavior. Any plausible conception of free will is consistent with the idea that some conscious mental states can causally influence actions while having physical causes in the brain. Causal determinism is not equivalent to coercion or compulsion, which do undermine free and responsible behavior. Because the brain generates and sustains the mind, and the mind in turn influences the brain, any satisfactory account of human action must include both

unconscious physical and conscious mental states and events among its causes. My aim is not to argue on practical grounds that, even if our belief in free will were an illusion, we would still hold people responsible for what they do or fail to do. Rather, my aim is to show that the argument from illusion is misguided and flawed on theoretical grounds.<sup>1</sup>

## Free Will as an Illusion

Psychologists Joshua Greene and Jonathan Cohen claim that “every decision is a thoroughly mechanical process, the outcome of which is completely determined by the results of prior mechanical processes.”<sup>2</sup> They make this claim partly on the basis of experiments that they and others have conducted on human subjects using functional brain imaging. From this, they conclude that “neuroscience will undermine people’s common sense libertarian conception of free will.”<sup>3</sup> Among other things, this should make us revise our retributive view of punishment. Although these claims by Greene and Cohen are made in the context of the implications of neuroscience for the law, they challenge a common assumption about free will. Expressing a slightly different view, psychologist Daniel Wegner claims that “the real causal mechanisms underlying behavior are never present to consciousness.”<sup>4</sup> Psychologist Henry Roediger and colleagues more confidently assert: “Clearly conscious intentions cannot cause an action if a neural event that precedes and correlates with the action comes before conscious intentions.”<sup>5</sup>

These claims present three distinct but related worries from neuroscience regarding free and effective action. One worry concerns determinism. If the brain is a deterministic system, then we cannot be free because free will is incompatible with determinism. Another worry concerns mechanism. If our conscious mental states are reducible to brain mechanisms, then we cannot be free because free will is incompatible with the idea that all natural phenomena can be explained by natural causes and mechanical principles. A third worry concerns epiphenomenalism. If our conscious mental states and events are not causally efficacious, then none of our actions results from these states and events. Together, these arguments appear to threaten free will in two respects: that we are the authors of our actions; and that as agents we have a causal impact on events in the world. Determinism, mechanism, and epiphenomenalism together form the argument from illusion.

To assess the argument from illusion, we need to place it within the historical philosophical debate on free will. In a basic sense, having free will implies that our choices and actions are within our conscious control. We can control the choices we make and the actions we perform by identifying with the beliefs, desires, emotions, and intentions that issue in our actions. Control implies that we can guide these mental states in the appropriate way to what we choose and do. It also implies that at least some of these mental states play a causal role in our decisions and actions. For philosophers, the main threat to this sense of control has come from causal determinism. This says that natural laws and events in the past jointly determine a unique future. If causal determinism is true, then any action one performs at a particular time is the only action one could have performed at that time. This rules out alternative possibilities (APs) to do otherwise than what one actually does. Incompatibilists hold that APs are necessary for free will and that causal determinism precludes APs. Hard incompatibilists believe that causal determinism is true and that we do not have free will. Libertarian incompatibilists believe that we have free will and that causal determinism is false. Compatibilists claim that we choose and act freely when we are not constrained, coerced, or compelled. Since causal determinism does not entail constraint, coercion, or compulsion, free will is compatible with causal determinism.

Philosopher Robert Kane insists that AP is too thin a basis on which to rest the case for libertarianism. Kane says that, in addition to the forward-looking AP condition, a backward-looking condition of ultimate responsibility (UR) is necessary for libertarian free will. UR consists in “the power of agents to be the ultimate creators (or originators) and sustainers of their own ends and purposes.”<sup>6</sup> Kane emphasizes that this condition “puts the emphasis for being up to us not in the power to do otherwise, but on the *source* or *explanation* of the action that is actually performed: that source must be in us.” We must be the “ultimate, buck-stopping originators of our actions.”<sup>7</sup> For a libertarian such as Kane, we cannot be the originators of actions if the mental states and events from which they issue are causally determined by antecedent events. I take Greene and Cohen to be referring to a version of UR when they write of “people’s common sense libertarian conception of free will.” On their view, the threat to libertarian free will is not from natural laws and events in the past. Rather, the threat is from mechanical processes and physical events in the brain and the idea that they, not our conscious mental states and events, are the ultimate and only effective source of our choices and actions. Neuroscience suggests that the UR condition cannot be met. Insofar as neuroscience implies that brain processes do all of the work in the causal pathway leading to action, we cannot be ultimately responsible for our choices and actions because “we” are not the authors of them.

## Defusing the Threat

The claims by Greene and Cohen, Wegner, and Roediger et al. that mechanistic unconscious processes in the brain completely determine all behavior suggest that these processes completely explain my behavior. But consider the following example. Suppose that I have distinct desires to begin writing an essay and exercise at the same time. Each of these desires corresponds to a proximal urge in my brain. But whether I form and execute an intention to do one thing rather than the other cannot be explained

satisfactorily in terms of unconscious neural urges. Each of these competing desires is influenced by distinct long-range plans of mine to be more productive in my scholarship and healthy. My decision to write or exercise at a particular time depends on how I respond to the reasons for performing these actions. My response to these reasons will be influenced by my conscious response to factors external to my brain, such as the weather, the volume of noise in my home, or the deadline for submitting the essay. These reasons involve more than proximal urges in my brain. They also involve conscious beliefs whose content reflects features of the external environment. In addition, the reasons for performing either action reflect the fact that I live in a culture that values both scholarship and health. Appeal to the brain alone cannot explain why I perform one action instead of the other.

Mechanical processes in the brain are part of the pathway leading to my decision and action. But one must not mistakenly infer from the fact that a decision has an unconscious cause that the decision itself is unconscious. Unconscious mental states may initiate actions. Yet this does not imply that conscious mental states play no causal role in forming and executing proximal intentions in actions.<sup>8</sup> An unconscious urge to act may be influenced by a conscious distal intention involving long-range planning, where this planning is in turn influenced by cultural and environmental factors. Events in the brain are not doing all of the causal work in the process leading up to and resulting in action and as such causally *underdetermine* it. At least some mental states and events are doing some of the causal work. This, in addition to the fact that factors external to me and my brain influence my plan and course of action, indicates that more than just the brain is involved in what I choose and do.

Most cognitive neuroscientists and psychologists give more weight to libertarianism than it has in philosophical debates on free will. Libertarians are a minority among philosophers writing about this issue. The majority are compatibilists. For most compatibilists, causal determinism just means that our motivational states and actions are the products of antecedent physical events, such that if the latter did not occur, the former would not occur. Mental states are necessarily generated and sustained by brain states. Free will is compatible with the fact that our mental states are caused by normal brain processes when this type of causation is not equivalent to constraint, coercion, or compulsion. This is consistent with what Hume calls “liberty of spontaneity.” He argues that since the existence of causal laws governing our actions does not undermine this type of liberty, there is no conflict between causal determinism and moral responsibility.<sup>9</sup> Locke expresses a similar view in presenting his example of a man who finds himself in a room whose door is locked. Because this fact does not affect his choice to remain in the room at that moment, he chooses freely even though he could not have done otherwise.<sup>10</sup> These examples illustrate a negative default account of free will. Many compatibilists offer positive accounts as well.

Philosopher Harry Frankfurt has developed one of the most influential positive compatibilist accounts of free will. He defines persons as individuals with the capacity to form first-order desires to perform certain actions. They also have the capacity to form second-order desires to have certain first-order desires. The will is the effective first-order desire that moves one all the way to action. One wills and acts freely when one’s effective first-order

desires align with one's second-order desires, and one identifies with both.<sup>11</sup> Identification follows from a process of critical self-reflection, after which the relevant desires become part of the set of the person's motivational states. This reflective process enables one to make the mental springs of action one's own. If neuroscience threatens only libertarianism and not also compatibilism, then the threat to free will might not be so great after all. Still, the challenge from psychologists such as Wegner and Roediger et al. is not that brain processes interfere with identification, or that they coerce or compel us to act. Instead, the challenge is that brain processes alone may account for all of the events in the pathway leading to action. These processes seem to render mental states epiphenomenal.

Our first-order desires may very well be causally determined in the sense that they are necessarily generated and sustained by events in the brain. But this does not put these and other motivational states and events beyond our conscious control or render them causally inert. Our capacity to make these desires conform to second-order desires, to identify with, and translate them into actions may provide us with enough conscious control over our motivational states to make them our own. The effects of psychotherapy on cortical brain functions indicate that there is both brain-mind and mind-brain causal interaction, which shows that our mental states can be causally efficacious in shaping brain states and how they issue in our behavior.<sup>12</sup> This may be enough for us to be "ultimate buck-stopping originators" of at least some of our actions. In this respect, Frankfurt's version of compatibilism can satisfy a condition analogous to UR. We do not need to endorse a libertarian rejection of causal determinism to satisfy it. Unlike libertarians such as Kane, for Frankfurt and other compatibilists what matters in having or lacking free will is not so much whether external sources influence our mental states and actions. Indeed, they do. What matters more is whether we have the internal resources to identify with our desires, beliefs, and intentions and execute them in actions. Just because these resources have physical causes in the brain does not mean that we cannot consciously identify with or act on them. Some would claim that social factors beyond our control have such a strong influence on our thought and behavior that they are not up to us.<sup>13</sup> These external sources play such a significant role in the causal history of our choices and actions that they preclude free will and responsibility. This may be a legitimate challenge to compatibilism. Yet it is not the challenge to free will from neuroscience, which is not concerned with social factors but events and processes in the brain.

There are four main problems with the argument from illusion. This is by no means an exhaustive list. But these problems are enough to expose flaws in the argument.

First, claims about neuroscientific determinism and mechanism stripping us of authorship of our actions and rendering our mental states epiphenomenal presumably are based on empirical evidence. Most of this evidence is from neuroimaging. Functional brain imaging experiments conducted by neuroscientists and cognitive psychologists such as Greene and Cohen show correlations between brain activity and some cognitive and affective mental states. Correlation is not causation, however. Images of increased or decreased brain activity produced by fMRI or PET scans are not identical to events and processes occurring at the neuronal level. They are visualizations of statistical averages based on

large numbers of images and are more accurately described as scientific constructs than pictures of what is actually occurring in the brain. The claim that every decision is a thoroughly mechanical process determined by prior mechanical processes in the brain is a causal claim. Some correlations may be strong enough to suggest causation, especially if one can eliminate other factors in explaining the relation between brain activity and behavior. An example would be a case where wrongful behavior is associated with a tumor in the prefrontal cortex. If the behavior resolved with the removal of the tumor, then this could support the claim that there was a causal connection between the tumor and the behavior.<sup>14</sup> But this is an example of brain *dysfunction*. It does not support the claim that imaging establishes a causal connection between normal brain *function* and a particular action or pattern of behavior. In most cases, correlations between normal brain activity and behavior are not strong enough to indicate causation. Moreover, claims of a causal connection between brain events and conscious decisions assume that decisions are based on localized brain activity, when in fact the activity that underlies them is distributed throughout the brain. Neuroimaging experiments do not support claims of determinism or mechanism because they fail to establish the necessary empirical evidence showing a causal connection between brain activity and behavior.

Second, the argument from illusion involves a mistaken inference about causation. The fact that a mental state or event has a physical cause in the brain does not imply that it is not among the causes of an action. Just because an action is preceded by unconscious brain events does not mean that no conscious mental states have a causal role in the pathway leading to that action. As philosopher Alfred Mele points out, "not only is there no rule against causes themselves having causes, it is also the *norm* for causes to have causes (How many causal processes start with uncaused causes?)"<sup>15</sup>

Third, the idea that conscious mental states and events have no causal role in action and are epiphenomenal offers an impoverished account of human agency. It suggests that we never do anything on the basis of our conscious desires, beliefs, emotions, intentions, and decisions. All of our behavior is the product of unconscious mechanical processes. It seems to explain away practical and moral reasoning and decision-making. Indeed, if we define persons as essentially agents who act in virtue of conscious mental states and events, then on this account persons do not exist. This is an extremely implausible form of skepticism about the will. Neurosurgeon and philosopher Grant Gillett points out that "a decision is. . . not a circumscribed event in neuro-time that could be thought of as an output, and an intention is not a causal event preceding that output, but both are much more holistically interwoven with the lived and experienced fabric of one's life."<sup>16</sup> Decisions and actions are more than just a function of discrete events in the brain occurring at specific times. They are a function of what the subject needs to navigate in and adapt to the world, which involves a more temporally extended process. Mental states emerge from the brain in order to provide human agents with an accurate map of the natural and social environment, a map that brain processes cannot provide on their own. As one aspect of neuroplasticity, the interaction of the subject with the environment influences the activity of neurons and can change the morphology and functions of the brain. This casts doubt on the claim that brain processes and their relation to behavior are deterministic or mechanistic. Every human agent enlists unconscious and

conscious mental states and events to enable this interaction. The mind is neither reducible to nor independent of the brain. Mind and brain mutually influence each other in a nested series of feed-forward and feedback loops that promote the adaptability of the subject to the world.

Fourth, if our behavior just consists of neurons all the way up and down, then it is unclear what motivates the claim that we should revise our retributive practices. This is an attempt to pull a normative rabbit out of an empirical hat, which turns the argument from illusion on its head. There is a need to explain how one can derive the normative “ought” from the empirical “is.”

In earlier work, neuropsychologist Patrick Haggard made causal claims about the relation between the brain and behavior similar to those made by Wegner and Roediger et al. In a recent paper, he notes that networks in the pre-supplementary motor cortex, anterior prefrontal cortex, and parietal cortex underlie voluntary and responsible action. Yet Haggard suggests that mental states may causally influence the brain in saying that “responsibility might depend on the reason that triggered a neural process culminating in action and on whether a final check should have stopped the action.”<sup>17</sup> Reasons can be either external or internal to human agents. External reasons are associated with rules or norms of behavior recognizable by any rational person as a subject in a social and cultural environment. These reasons obtain independently of particular agents. Internal reasons consist of combined desires and beliefs regarding actions that one should or should not perform. They may be prudential, concerning one’s own interests, or moral, concerning the interests of other agents. Haggard appears to use ‘reason’ in both senses. While internal reasons depend on neuronal processes, one can plausibly assume that these reasons are not identical to these processes but are emergent mental states with nonreducible psychological properties. Insofar as these reasons can function as a “check” on our actions, they can influence events at the neuronal level. If so, then we have at least some control of our behavior because of processes operating at the conscious mental level.

Haggard further notes that our ability to respond to external reasons for or against actions can also influence processes at the neuronal level: “Interestingly, both decisions [to act or not to act] have a strong normative element; although a person’s brain decides what they carry out, culture and education teach people what are acceptable reasons for action, what are not, and when a final predictive check should recommend withholding action. Culture and education therefore represent powerful learning signals for the brain’s cognitive-motor circuits.”<sup>18</sup> Haggard adds: “Although neuroscientific detection of the brain circuits that generate actions and conscious awareness can contribute to an evidence-based theory of responsibility, it is unclear whether they can capture all the nuances of social and legal concepts of responsibility.”<sup>19</sup> Given the role that Haggard attributes to internal and external reasons and associated normative practices surrounding actions, it appears that neuroscience cannot capture these nuances.

There are three points that are worth making in light of Haggard’s claims. First, they suggest that the social environment can influence the brain and how it mediates the mental states associated with voluntary action. Second, they suggest that mental states associated with internal reasons and one’s response to external reasons can

influence events in the brain and our actions. Third, the upshot of the first two points is that neural networks alone cannot satisfactorily explain human behavior. The brain itself does not “decide” what we do. As psychiatrist Sean Spence puts it: “no account of human action (and therefore human moral responsibility) is complete in the absence of a subjective report . . . so when we wish to apportion responsibility, we are not merely identifying an organism. . . . we are saying something about ‘its’ underlying volitional processes: the symmetry pertaining between desires and deeds, intentions and actions.”<sup>20</sup> A satisfactory explanation of behavior must include not only neuronal processes but also internal and external reasons. These reflect the normative dimension of voluntary action and how this dimension is shaped by the social and cultural environment in which human subjects live and act. All three points indicate that free will and responsibility are not just metaphysical notions involving considerations of causation, determinism, possibility, and necessity based on empirical studies of the brain. They are also normative notions reflecting the fact that we are social beings who act and interact with each other and whose expectations of what we can and should do are grounded in this interaction. The most plausible model of free will and responsibility is one that consists of complementary empirical and normative dimensions reflecting causal interaction and influence between and among the brain, the mind, and the environment.

Nothing about the structure and function of the brain, or how it generates and sustains the mind, implies that we are mistaken in believing that we have the capacity to respond to reasons and to consciously form and execute intentions in actions. Normal neurological function does not provide grounds for questioning the conviction that we can control our thought and behavior. It is possible that future advances in neuroscience may call into question the belief that we have free will and can be responsible for our actions. If it does, then it will remain unclear how empirical findings about the brain will influence normative judgments of moral and legal responsibility. Even with refinements in neuroimaging, there will always be a need for behavioral and normative criteria in making and upholding these judgments. There is an additional problem with the idea that neuroscience might cause us to question our belief in free will. How brain function mediates the cognitive capacity for decision-making is described entirely in objective terms. But there is an essential subjective aspect of the will. A description of cognitive-motor circuits cannot capture the first-person experience of deliberating and choosing, or how this experience is shaped by the world in which we act and live.

## Conclusion

Neuroscience does not threaten free will and responsibility because it does not show that we are not the authors of our actions or that our conscious mental states and events play no causal role in our behavior. It is mistaken to infer that, just because a desire or intention has a physical cause in the brain, these and other mental states and events do not influence our ability to act. From the fact that conscious mental states and events are generated and sustained by unconscious mechanical processes in the brain, it does not follow that they play no causal role in action. Causation is not equivalent to compulsion and does not imply that we have

no conscious control over what we do or fail to do.

The real threat to free will is not from normal brain function but brain dysfunction that impairs or undermines the capacity for agency. This includes seizure disorders, loss of motor control in Parkinson's or Huntington's disease, and damage to the prefrontal cortex making one unable to inhibit violent urges. It also includes psychosis in schizophrenia making one unable to accurately perceive or engage with the world, the anhedonia and avolition in schizophrenia and depression making it difficult to will oneself to act, and the alien and overwhelming desires and beliefs in obsessive-compulsive disorder. These conditions impair or undermine free will when they interfere with one's cognitive, affective, and volitional capacities to identify with one's motivational states and initiate and complete actions. Persons are not responsible for their behavior when brain dysfunction causes them to lose these capacities.

Brain dysfunction does not always strip persons of their agency, however. In some cases, they may retain an important aspect of the will in trying to act and make sense of their condition and the world around them. One illustration of willing as trying is the autobiography of the Russian soldier Zazetsky, written in collaboration with neuropsychologist A. R. Luria.<sup>21</sup> During the Battle of Smolensk in 1943 during the Second World War, Zazetsky sustained a severe head injury from a bullet wound with extensive damage to the left occipital-parietal region of his brain. This caused his memory, visual field, and body perception to become fragmented. It left him with the experience of a constantly shifting and unstable self in what for him had become a shattered world. To cope with this fragmentation, he kept a journal for twenty years, recording thoughts and memories as they occurred on a daily basis. In doing this, he attempted to reshape his lost self by reconstructing the unity and integrity of his psychological properties. Because of his mental impairment, Zazetsky was not able to completely re-establish psychological continuity with his pre-injury state. But his effort enabled him to retain a basic autobiography and adjust its later chapters to his post-injury state while retaining his basic interests and values. Zazetsky's determination in trying to reshape his identity and construct a meaningful narrative of his experience with a brain injury shows how one can retain and exercise the will to some degree despite neurological and psychological impairment. It is an example of the human capacity to recognize, invent, and realize possibilities of action despite being constrained to some extent by a damaged brain. Neuroscience can tell us much about persons, but not everything. Although it is necessary to understand human thought and behavior, it does not explain away free will and moral responsibility.

## References

<sup>1</sup> Different arguments leading to the same conclusion have been advanced by Adina Roskies, "Neuroscientific Challenges to Free Will and Responsibility," *Trends in Cognitive Sciences* 10 (2006): 419-423, Chris Kaposy, "Will Neuroscientific Discoveries about Free Will and Selfhood Challenge Our Ethical Practices?," *Neuroethics* 2 (1) (2009): 51-59, and Nancey Murphy and Warren S. Brown, *Did My Neurons Make Me Do It? Philosophical and Neurobiological Perspectives on Moral Responsibility and Free Will* (New York: Oxford University Press, 2007).

<sup>2</sup> "For the Law, Neuroscience Changes Nothing and Everything," *Philosophical Transactions of the Royal Society of London* 359 (2004): 1775-1785, at 1775.

<sup>3</sup> *Ibid.*, 1775.

<sup>4</sup> *The Illusion of Conscious Will* (Cambridge, MA: MIT Press, 2002), 97.

<sup>5</sup> H. Roediger, M. Goode, and F. Zaromb, "Free Will and the Control of Action," in J. Baer, J. Kaufman, and R. Baumeister eds., *Are We Free? Psychology and Free Will* (Oxford: Oxford University Press, 2008), 208. See also Martha Farah, "Neuroethics: The Practical and the Philosophical," *Trends in Cognitive Sciences* 91 (2005): 34-40.

<sup>6</sup> *The Significance of Free Will* (New York: Oxford University Press, 1996), 4.

<sup>7</sup> *Ibid.*, 34.

<sup>8</sup> Alfred Mele presents a similar set of arguments in *Effective Intentions: The Power of Conscious Will* (New York: Oxford University Press, 2009).

<sup>9</sup> *A Treatise of Human Nature*, ed. L. A. Selby-Bigge, rev. P. H. Nidditch, second edition (Oxford: Clarendon Press, 1978), 407 ff.

<sup>10</sup> *Essay Concerning Human Understanding*, ed. P. H. Nidditch (Oxford: Clarendon Press, 1975), Book II, Chapter XXI.

<sup>11</sup> "Freedom of the Will and the Concept of a Person," and "Identification and Externality," in Frankfurt, *The Importance of What We Care About* (New York: Cambridge University Press, 1988), 11-25, 58-68. See also John Martin Fischer, *The Metaphysics of Free Will: An Essay on Control* (Cambridge, MA: Blackwell, 1994) and Fischer and Mark Ravizza, *Responsibility and Control: An Essay on Moral Responsibility* (New York: Cambridge University Press, 1998).

<sup>12</sup> H. Mayberg, K. Goldapple, Z. Segal, et al., "Modulation of Cortical-Limbic Pathways: Treatment-Specific Effects of Cognitive-Behavior Therapy," *Archives of General Psychiatry* 61 (2004): 34-41.

<sup>13</sup> This claim has been made by "source incompatibilists" such as Galen Strawson in "The Impossibility of Moral Responsibility," *Philosophical Studies* 75 (1994): 5-24, and Derk Pereboom in *Living without Free Will* (New York: Cambridge University Press, 2001).

<sup>14</sup> J. M. Burns and R. H. Swerdlaw, "Right Orbitofrontal Tumor with Pedophilia Symptom and Constructional Apraxia," *Archives of Neurology* 62 (2003): 437-440.

<sup>15</sup> *Effective Intentions*, 72.

<sup>16</sup> "Intention, Autonomy, and Brain Events," *Bioethics* 23 (6) (2009): 330-339, at 333.

<sup>17</sup> "Human Volition: Towards a Neuroscience of Free Will," *Nature Reviews Neuroscience* 9 (2008): 934-946, at 944.

<sup>18</sup> *Ibid.*, 944.

<sup>19</sup> *Ibid.*, 944.

<sup>20</sup> *The Actor's Brain: Exploring the Cognitive Neuroscience of Free Will* (Oxford: Oxford University Press, 2009), 236.

<sup>21</sup> A.R. Luria, *The Man with a Shattered World: The History of a Brain Wound*, trans. L. Solotaroff (New York: Basic Books, 1972).

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## Glossary

### Alternative Possibilities

We can choose and act in ways other than how we in fact choose and act. A necessary condition of libertarian incompatibilism.

### Anhedonia

An inability to experience pleasure from normally pleasurable life events.

### Avolition

A general lack of motivation and inability to initiate action plans.

### Causal Determinism

Laws of nature and events in the past jointly determine a unique future. This implies that an action one performs at a particular time is the only action one could have performed at that time.

### Compatibilism

Free will is compatible with causal determinism because causal determinism does not constrain, coerce, or compel one's choices and actions.

### Epiphenomenalism

Mental events are caused by physical events in the brain, but mental events have no effect on any physical events.

### Hard Incompatibilism

Causal determinism is true and therefore we do not have free will.

### Incompatibilism

Free will is incompatible with causal determinism.

### Libertarian Incompatibilism

Causal determinism is false and therefore we have free will.

### Mechanism

All natural phenomena can be explained by natural causes and mechanical principles.

### Ultimate Responsibility

We are the authors and originators of our actions, which are not determined by any antecedent events. A necessary condition of libertarian incompatibilism

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