

The Responsible Brain. Free Will and Personal Responsibility in the Wake of Neuroscience

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Abstract: This article examines the neuroethical problem of free will that consists in explaining how the socially crucial conception of human beings as free and responsible can be combined with neuroscientific findings on human beings and their behaviour. Within neuroscience, the experience of free will has been considered 'illusory' by virtue of being (1) a brain construct, or (2) causally determined, or (3) non-consciously initiated. This article analyses these positions and suggests a neurophilosophical view on free will according to which, rather than posing a new threat to our unalienable notions of free will and personal responsibility, neuroscience can offer empirical support for them.

Key-words: neuroethics, free will, causal determination, neuronal plasticity, non-conscious mechanisms.

Resumen: Este artículo examina el problema neuroético del libre albedrío consistente en explicar cómo puede articularse la concepción, socialmente crucial, de los seres humanos como seres libres con los descubrimientos neurocientíficos sobre los seres humanos y su conducta. Desde la neurociencia, la experiencia del libre albedrío ha sido considerada ‘ilusoria’ en virtud de ser (1) un constructo cerebral, o (2) causalmente determinada, o (3) no iniciada conscientemente. Este artículo analiza estas posiciones y sugiere una visión neurofilosófica sobre el libre albedrío de acuerdo con la cual, más que plantear un nuevo obstáculo a nuestras nociones de libertad y responsabilidad moral, la neurociencia puede ofrecer un apoyo empírico para las mismas.

Palabras clave: neuroética, libre albedrío, determinación causal, plasticidad neuronal, mecanismos no conscientes.

1. Introduction

The freedom voluntarily to influence our nature and destiny lies at the heart of human identity: to be human means for many people to have a ‘free will’, to be able to choose what we do, think and say. This is also a social axiom. All human societies presume that individuals can be morally and legally responsible for their actions, specifically for those actions that we could in principle have omitted.

The philosophical problem of free will has been discussed for millennia. It is really a cluster of philosophical issues, but the basic question is: can human beings voluntarily influence their own destiny? This has been addressed in different ways and *Zeitgeists* with great cultural variations,¹ but the worry was always the same.

The neuroethical problem of free will consists in explaining how this socially crucial conception of human beings as free and responsible individuals can be combined with neuroscientific views on us and on our behaviour. Is it reasonable to believe in free will when what we experience as a free choice is the result of electrochemical interactions in the brain and a sort of biological decision-making programme shaped by evolution? Is free will simply an illusion? If it is so, what happens to the notion of personal responsibility? It would arguably be absurd to maintain social institutions based on assumptions that flatly contradict scientific knowledge or make appeal to metaphysical mysteries, or to maintain a sophisticated

¹ McCrone 1999 discusses the internalised sense of free agency as a socially induced artefact that, in its most recent Western versions, dates from Romanticism’s rebellion against the clockwork mechanistic universe of the Enlightenment.

social system of reward and punishment if we believe that there is no truth or reality corresponding to the notions of merit or guilt.

Some writers in the field take a pragmatic stance. They argue that, in the light of modern neuroscience, the notion of free choice might well be the brain's user's illusion,² or a fictional construction (Pinker 1997), but since 'social groups work best when individuals are presumed to be responsible agents' whether or not we can make sense of the notion of free will, this presumption should be kept (Churchland 2002b: 234). If free will is a fictional construction, it is a fiction that works: 'holding people responsible is the best game in town' (Dennett 1984: 162). This apparent contradiction between scientific knowledge and what is described as 'our intuitive notions of freedom' is unproblematic, some argue, because 'neuroscience is not in a position to undermine our intuitive notions' (Roskies 2006).

Others call for the re-examination of the social construction of free will,³ and there is indeed a clear historic trend in this direction: with the advance of scientific knowledge, the individual's realm of responsibility changes and often diminishes. Illness was once considered a punishment from God for some sin that had been committed, but today we do not blame the sick person for being sick, at least not as a rule. Likewise, social conditions in early infancy go far in explaining an adult's behaviour: many people (e.g. in Scandinavian cultures) are less prone to blame a person for certain crimes such as delinquency, when it is known that the person had a traumatic childhood, e.g., been exposed to parental violence. There is a trend of taking into account an increasing variation of causal backgrounds when assessing guilt or merit. That neuroscience can in many ways exert influence over countries' legal systems becomes evident in an AAAS Report, and the prediction that neuroscientific advances would enable pharmacological treatment of socially unwanted behaviours is becoming a reality.⁴ Notwithstanding, the social assumption that we are, at least partly, responsible for some of our actions and ipso facto open to praise or blame remains universally dominant.

From a neuroscientific perspective, the experience of free will has been considered 'illusory' by virtue of being (1) a brain construct, or (2) causally determined, or (3) non-consciously initiated. This article examines the arguments for these positions, and suggests a neurophilosophical model of free will according to which an act of will can be 'free' in the sense of being 'voluntary' even though it is a brain construct that is causally determined and influenced by non-conscious neuronal processes. Free will is not, I shall argue, a 'user's illusion' or a 'fictional construction' but a fundamental neuronal structure, an unalienable feature of our

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² E.g., Churchland 2002a and Smilansky 2000.

³ Blakemore 1988, Clark 1999.

⁴ Garland 2004: Part I, Blakemore 1998: note 7 and Crick 1994.

world-views. The neurophilosophical view of free will presented here holds that human beings have a certain power to influence their decisions in a way that leaves room for the rational ascription of responsibility for at least some of the choices they make.

2. Brain Constructs and Illusions

The conscious human brain is essentially intentional; it is constantly engaged in producing mental images and models of its environment. These activities are programmed for *order*: the brain continuously organises and categorises its experiences and the mental images it produces. There are many different neuroscientific accounts of how the brain organises and binds different stimuli and images together into a unified experience (neurobiologists sometimes refer to this as the ‘binding problem’), but there seems to be general agreement that organisation is an essential aspect of human experience. Modern neuroscience thus supports Kant’s view that the unity of consciousness presupposes orderly experience and that the experience of a human being is necessarily organised in certain structures, or categories (Kant 1781).

34 | The nature of these structures depends on the architecture of the experiencing subject’s brain, the evolution of which is both genetic and epigenetic: the nervous system develops within a ‘genetic envelope’ in continuous interaction with its immediate physical and socio-cultural environments (e.g., Changeux 2004). There are certain “universal” structures pre-specified in biological nature, notably the genome, different from those relative to a given culture or symbolic system. Human beings experience the world in given categories, notably space and time. This is not variable but a function of the way in which our brains are construed as a result of evolution.

Closely connected to order is the notion of *control*, which Homo sapiens are also neurobiologically programmed to experience. Having some measure of control over own movements, activities, and choices is an evolved function that is a great asset to an animal in its endeavours to survive and reproduce. As LeDoux expresses it: ‘those animals that can readily switch from automatic pilot to wilful control have a tremendous extra advantage’ (LeDoux 1998: 117). Wilful control enables an animal to shift from reaction to intentional action, and this ability is fundamental to human beings’ conception of themselves and the world they inhabit. We experience that when circumstances allow, we are in control in the sense that we have the capacity *voluntarily to influence* our environments and ourselves.

The experience of freedom is not a contingent structure but a part of our biological make-up. We can be, or feel, free and influential in different degrees and manners, but that is a matter of circumstances and individual personality; the prin-

ciple remains the same. The liberty of choice and the power to influence itself and its environment is a fundamental construct of the human brain, an axiom of our experience, similar to space and time.

However, not every one considers this experience to be compatible with the view that free will is a construct of our brains. The argument that science proves free will to be a brain construct and, therefore, an illusion is recurrent in the debates over free will.⁵

It is certainly true that the brain generates illusions, and that the maintenance of illusions can be important to well-being and even survival. However, the fact that the form or the content of an experience is a brain construct does not *make* it illusory, erroneous, or in any way unreal.⁶ Illusions can have a value, e.g. they can be necessary or useful from an evolutionary point of view. Yet in so far as the distinction between the illusory and the real remains necessary for the survival of the organism and useful in current life, we should not regard cerebral constructs in contrast to reality. Doing this makes the distinction between illusion and reality impossible to uphold, insofar as *everything* we think, feel or imagine is neuronal and the result of a biological programme shaped by evolution: our entire world of experience would thus become illusory. In other words, neuronal causation cannot be a token of the illusory lest all we experience is an illusion. The world as (if) it is in itself, independently of all things human, is not a possible object of scrutiny. We cannot know what the world is like (or if it can even be said to 'be like' anything) independently of us. We are, in a manner of speaking, prisoners of our brains, and the nature of our reality is what our brains present. In that sense, the brain constructs *are* our reality. In order to be useful to us, the distinction between illusion and reality must refer to the world *as we experience it* and, within that realm, denote a difference between illusory and veridical brain constructs. Some experiences are illusory (e.g., delusions, hallucinations, chimeras, mirages); others are not: all experiences, however, are neurally produced.

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⁵ E.g. discussions in Kane 2002. Neurobiological aspects of the feeling of freedom are discussed notably by Frith and Spence 1999.

⁶ An 'illusion' is an erroneous conception. In neuroscience, it is mainly understood as an error of the senses, such as an optical illusion or a hallucination. In philosophy, it is often more broadly understood as an erroneous viewpoint (sensory or non-sensory). My argument suggested here is meant to hold for either sense.

3. Free Will and Neuronal Determination

The modern debate over free will has largely focused on the compatibility or incompatibility of free will with ‘determinism’, understood as the doctrine that everything that happens has a causal background. This definition of determinism is often enforced by the assumption that the relation between cause and effect is *necessary*, turning determinism into a kind of conditional necessity.⁷ That strong definition of ‘determinism’ will not be used here. The question is not whether free will is compatible with *conditional necessity*, but whether free will is compatible with *causality*, leaving the issue of how the causal relation can best be scientifically interpreted (initially) open.

Some writers argue that causation is a *prerequisite* for free will. They reason that a complete absence of causes would make our behaviour entirely random, and as such impossible to direct, control, predict or explain and thus human choices cannot be either intentional or voluntary, or, in that sense, free.⁸ Others maintain that causation is *incompatible* with free will because our choices are then by necessity predetermined by antecedent causes leaving no room for volitional control, or, in that sense, freedom, a view often referred to as incompatibilism.⁹ The philosophical tradition known as metaphysical libertarianism argues that an action can only be free and voluntary if it is uncaused.¹⁰ A similar thesis is argued by existentialism in versions that develop a notion of free acts as motiveless (Sartre 1943). It has also been argued that free will is illusory if our ‘consciously willed acts are fully determined by natural laws that govern the activities of nerve cells in the brain’ (Libet 1999).

Strict indeterminism and strict determinism have something in common: in these views, our experience of voluntary decision-making may indeed seem to be an illusion: not by virtue of being a brain construct but by virtue of being an illusory brain construct. In either case we may *feel* as though we have a choice between alternative actions, but that is not so: in the first case, we are generators of chance; in the second case, we live on automatic pilot.

A traditional neuroscientific position is that the brain is a causal system, and thus everything we do, think or feel has antecedent causes. The brain seems to function in a completely causal way and ‘there is no evidence at all that some neuronal events happen without any cause’.¹¹ This is not entirely uncontroversial, for the possibility of chance events is not unequivocally denied in neuroscience. However,

⁷ E.g. Kane 2002: note 12, van Inwagen 1975 and 1983, Campbell, O’Rourke and Shier 2004.

⁸ This argument can be traced to David Hume 1739.

⁹ E.g., van Inwagen 1983 and Ginet 1990.

¹⁰ E.g., Kane 1996, O’Connor 1995 and 2000.

¹¹ Churchland 2002b: 204.

even if we agree with the view that all neuronal events are caused, that does not entail strict determinism. Neuroscientific theories have been proposed that reject both indeterminism and strict determinism as theories of how the brain functions.

In these neuroscientific accounts, the brain is a causal system, but it is not an invariable causal system that functions with conditional necessity. It is a causal system in which the relation between cause and effect need neither be invariable nor necessary but can be *variable* and *contingent* admitting a *variability of outcomes*. Thus, in principle, things could have been different from what they are; we could have done what we did not do, thought what we did not think, etc.

The brain is distinguished by its *neuronal plasticity*, where ‘plasticity’ designates the capacity of the neuron and its synapses to change properties as a function of their state of activity. ‘This basic fact’, argues Changeux, ‘contradicts the naïve picture of the brain as a sort of rigid automaton, made up exclusively of neuronal cogs and wheels whose operation is wholly determined in advance.’¹² In his account, cerebral connections are organised in a gigantic network wherein distribution in space depends on a species-specific, organisational arrangement of connections that are, to a large extent, genetically determined (the genetic envelope), and *at the same time*, this distribution depends on a ‘reserve of random variations’ that is sufficient to assure the network’s plasticity and its accessibility to physical, social, and cultural inputs.

These neuroscientific arguments open a door to free will and personal responsibility, self-improvement and innovation. To this extent, rather than posing a new threat to the notion of free will, neuroscience can actually be interpreted to support it by introducing an element of variability into the causal relation.

The variability theorem developed by Changeux, Courrège, and Danchin states that as a consequence of the ‘synapse selection’—a Darwinian epigenetic mechanism of neuroselection in which new combinatory models are continually produced and tested as a neural embodiment of ‘creative’ activity¹³—the same afferent message may stabilise different arrangements of connections:

1- ...different learning inputs may produce *different* connective organizations and neuronal functioning abilities but the same behavioural capacity... in spite of the totally deterministic character of the model.¹⁴

2- ...for any given neuronal network, a single afferent message can stabilize different patterns of connections while at the same time preserving the same output or behavioural capacity—and this despite the deterministic character of the model.¹⁵

¹² Changeux 2004: 26.

¹³ Pylyshyn 2001.

¹⁴ Changeux 1983: 247, Changeux, Courrège y Danchin 1973.

¹⁵ Changeux 1983: 200.

This is what might happen in the brain when it shows the capacity to produce and propagate universal and communicable representations of the world, despite the enormous phenotypic variance of connectivity. It has been suggested that one of the main advantages of the theory of epigenesis by selective stabilisation of neurons and synapses during development is its ability to take variability into account.¹⁶

Insofar as the expression ‘totally deterministic’ is to be understood as ‘totally causal’ and not as ‘invariably necessitating each effect’ (since the outcome of each set of causes might be variable in this model) it is possible to talk about free will. The introduction of spontaneous neuronal activity (physiologically extremely important even in the so-called resting state of the brain) and its contingent component is incompatible with the strictly (necessity-based) deterministic approach. If the scientifically possible determinism is one where cause and effect are contingently related then it is possible to restore an element of voluntary choice that can serve as a basis for personal responsibility. For, if the effect (outcome) of a given set of causes is not predetermined, it is theoretically possible voluntarily to *influence* the outcome in some direction, at least so far as causality is concerned. That is to say, to the extent that we are not free to influence our destiny, this is not because our destiny is caused, if the causal relation is contingently understood.¹⁷

4. Non conscious Volition and the Responsible Brain

In the late 19th century, the idea that the human brain and mind operate largely *non-consciously* emerged in mind science. Hermann von Helmholtz, the founder of perceptual physiology, first developed theories of perception as non-conscious inferences. His ideas gave rise to a complex historical controversy: since the received view at the time was that consciousness is required for moral judgement, Helmholtz’ theories were considered threatening to morality, responsibility, and the justification of praise or blame.

Sigmund Freud later developed the idea of an active and unconscious mind with a more behavioural focus. As Freud used the term ‘unconscious’, there is a difference between unconscious elements that can be transformed into conscious states (the ‘preconscious’) and unconscious elements that cannot be thus trans-

¹⁶ Changeux 1983: note 24.

¹⁷ The nature and range of this influence as well as the nature of this causal contingency remain to be accounted for in greater detail. It may be possible to operate with different concepts of causality on different levels; say, arguing for strict determinism on the molecular level and for contingent determinism on higher cognitive levels.

formed (the ‘unconscious proper’).¹⁸ A similar distinction has been drawn in neuroscience between the brain’s *subliminal processing* ‘as a condition of information inaccessibility where bottom-up activation is insufficient to trigger a large-scale reverberating state in a global network of neurons with long range axons’, and *preconscious processing*, ‘a neural process that potentially carries enough activation for conscious access, but is temporarily buffered in a non-conscious store because of a lack of top-down attentional amplification (for example, owing to a transient occupancy of the central workspace system)’ (Dehaene *et al.* 2006). In terms of content, the non-conscious outweighs the conscious aspects of the mind: the contents of conscious subjective experience is at any moment in fact expected to be rather limited and even further constrained in its access by its internal spontaneous activity (Dehaene and Changeux 2005). The actual conscious content would be rather modest compared to the immense neuronal space of non-conscious active processes and/or latent long-term memory traces, implemented as synaptic efficacies distributed throughout our brain and body. From this neurophysiological point of view, consciousness is what psychoanalysis claimed a century earlier: merely ‘the tip of the mental iceberg’ (LeDoux 1998: 17).

In 1965, neuroscientists H.H. Kornhuber and L. Deecke performed experiments suggesting that a non-conscious *readiness potential* precede voluntary acts by approximately one second (Kornhuber and Deecke 1965). On the basis of these experiments Kornhuber argued that volition need not be a manifestation of conscious attention, i.e., that the brain is non-consciously volitional (Kornhuber 1984). In 1983, further experiments performed by B. Libet and colleagues likewise suggested that acts of the will are preceded by a readiness potential that arises in the brain some 350 ms before the subject becomes aware of the decision (Libet, Gleason, Wright & Pearl 1983). According to Libet, that would mean that volitional acts are initiated non-consciously, and to that extent they cannot be ‘free’, since free, voluntary decisions must be conscious. However, he did not see this as a total refutation of free will, because, according to him, even though the act in question was non-consciously initiated, conscious acts of will still had the power to stop the decision before it led to actual action. Free will remained through *veto or triggering power* (Libet 1999: note 19).

An important criticism, that Libet himself recognises, is that the veto or trigger might also be non-consciously initiated: ‘There is nothing in our new evidence to entail that a conscious veto or trigger is not itself initiated by preceding cerebral processes’ (Libet 1985: 563). In that case, free will would not be possible even as a veto or triggering power, in Libet’s account. A further objection is that the

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¹⁸ I shall here use the term ‘non-conscious’ instead of the term ‘unconscious’ because the latter is so closely connected to Freud’s psychoanalytic theories to which I *prima facie* wish remain neutral.

evidence fails to show that the non-conscious processes are not themselves consciously triggered (Dennett 1991: 164). Even if Libet's experimental methods are sufficiently adequate to show that there is this non-conscious 'readiness potential' preceding conscious decisions to act, this does not show that consciousness is not instrumental in an earlier stage in a manner that safe-guards free will over and above the veto/trigger-power.

In my view, the question whether a specific act is voluntary or not must be considered in a wider perspective than the moment in which the act in question occurs. In order to determine the roles of non-conscious versus conscious mechanisms in producing a given act, it is not sufficient to ask whether the immediate causes, or the immediate initiation of that act are non-conscious (assuming that these can be identified); we must also ask whether these causes are themselves effects of causes that are consciously or non-consciously controlled, and so forth. In other words, the possibility of conscious causal mechanisms underlying non-conscious causal mechanisms must be taken into account.

Consciousness may be but 'the tip of the mental iceberg', but that tip is closely connected to the rest. Underlying our conscious experiences are brain mechanisms of which we are unaware; notably, non-conscious emotions, cognitive processes, and memories. There is no single moment in time where our conscious neuronal states and processes are causally disconnected from these non-conscious mechanisms.¹⁹ However, it seems reasonable to assume that the conscious and the non-conscious operate in evolutionary correlation rather than designating operationally discrete realms with unilateral causal influence, though it should be noted that the influence would not be symmetrical. The possibility of consciously influencing the non-conscious mental mechanisms is a crucial assumption in any programme of learning, education, self-improvement, or therapy. We *would* personalities, of which the non-conscious is an important part. We do not merely control behaviour but strive to influence the underlying mechanisms as well.

If the relationship between the non-conscious and the conscious is most adequately described as mutual (though not symmetrical), then it seems that the discovery of non-conscious mechanisms is not the major threat to free will that it has sometimes been presented to be. Admittedly, the non-conscious poses a challenge to conscious control and may in many cases reduce it severely, but it does not exclude it in principle.

It might be fruitful to conceive free will as the capacity to *acquire causal power* coupled with a capacity to voluntarily *influence the use of* such power. With the power of influencing actions, responsibility follows. If to a certain extent we can

¹⁹ Dehaene *et al.* 2006: note 11.

control our non-conscious, we thereby have responsibility for some of the choices that we non-consciously make: we are, or *can be*, personally responsible for behaviour resulting from non-conscious influences. Given a certain level of maturity and health, the brain can accordingly be described as *a responsible organ*.

5. Conclusion

A main conclusion from the analysis is that human beings can act as free and responsible agents whilst being contingently causally determined and influenced by non-conscious processes that are not entirely beyond conscious control. Rather than posing a new threat to our unalienable notions of free will and personal responsibility, neuroscience can be interpreted as offering empirical support for them.

Having said that, it is important to bear in mind that our realm of freedom may in fact be far more limited than we believe, or are willing to admit. Even if a capacity for free (voluntary, controlled) choice is a fundamental characteristic of the brain, most choices are probably far less voluntary and controlled than they may seem.

This should lead naturally to enhanced tolerance towards human conditions whilst avoiding the mechanistic view on human beings as fettered and irresponsible automats. We have the basic capacity for freedom, and we are responsible for how we use it, but the *extent* of our freedom and of our responsibility is limited: the number of influences over which we have no control is such that praise and blame should be applied with caution, when at all.

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