



Abbreviated notes

Can the Spirit, the Soul and Free Will survive the scrutiny of a Neuroscientist?

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**The concepts of the spirit, the soul, and free will are difficult to define.
However, this should not put us off examining them scientifically.**

In the words of Francis Crick (of Double Helix fame):

“You do not win battles by debating exactly what is meant by the word ‘battle’. You need to have good troops, good weapons, a good strategy, and then hit the enemy hard. The same applies to solving a difficult scientific problem”.

Before I delve into this scientific process, I would like to use this opening quote:

“The human person is endowed with a spiritual and immortal soul, intelligence and free will. In these things is rooted the dignity of human beings.”

It is because it includes something that is extremely important and that is the word *dignity*. These concepts are so fundamental that their scrutiny by neuroscientists demands understanding of their innate value to people of all persuasions and that such scrutiny is ethically undertaken. The belief in free will for example has implications for individual moral choice, the basis of responsibility, and in turn culpability. If neuroscientists do not proceed with extreme ethical caution they will be open to the criticism that the investigation of free will is an attempt to provide a materialistic account of human nature and thus an attack on traditional belief systems.[1]

Scrutiny by Neuroscientists

“Men ought to know that from nothing else but the brain come joys, delights, laughter and sports, and sorrows, griefs, despondency and lamentations.”

Hippocrates (460-370 BC)

Let us take these words of Hippocrates as a starting point for further investigation and propose an explanation as the starting point for further scientific investigation.

Let us hypothesize that the spirit, the soul, and free will are either physically located within our brains, or are at result of brain function, or both. Francis Crick did this with his book *The Astonishing Hypothesis: The Scientific Search for the Soul*.[2]

“The Astonishing Hypothesis is that “You,” your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll’s Alice might have phrased it: ‘You’re nothing but a pack of neurons’. This hypothesis is so alien to the ideas of most people alive today that it can truly be called astonishing.”

Crick is of course referring to the moment in the twelfth chapter of Lewis Carroll's *Alice in Wonderland* when Alice declares, "Who cares for you? You're nothing but a pack of cards!" A statement from the real world destroys the world of Wonderland. And, of course, this is very much how Francis Crick sees it. For the man who cracked the genetic code, the complexity of consciousness and the soul will ultimately be explained when know how all the building blocks fit together and function.

Free will

Kornuber, *Bereitschaftspotential (readiness potential)*

Electroencephalography (EEG - the recording of electrical activity along the scalp which measures voltage fluctuations resulting from ionic current flows within the neurons of the brain). In doing so it was discovered an entity known as the *Bereitschaftspotential* (readiness potential).

In the words Nobel Prize winning physiologist Sir John Eccles:

"There is a delightful parallel between these impressively simple experiments and the experiments of Galileo Galilei who investigated the laws of motion of the universe with metal balls on an inclined plane".

Benjamin Libet

In the 1980's Benjamin Libet at the University of California (LA), carried out a series of experiments in order to examine the relationship between between conscious experience of volition and the readiness potential. Libet's famous finding was that the BP started about 0.35 sec earlier than the subject's reported conscious awareness that 'now he or she feels the desire to make a movement. The ramifications of such an observation where that free will is nothing but a rationalization produced by the mind after the fact in order to explain its actions. However, Benjamin Libet found that subjects could prevent movement at the last minute. This led Libet to conclude that we have no free will in the initiation of our movements but that we do have the ability to veto these actions – he called this the "free won't". It is interesting to note that because of the implications of the lack of free will with respect to liability and responsibility Libet felt obliged to write in 1999 that although the veto power may not seem like much, it was probably enough to satisfy ethical standards:

"After all, most of the Ten Commandments are 'do not' orders"

In 2009, here at the University of Otago, Judy Trevenan and Jeff Miller of the psychology department carried out an experiment that cast doubt on Libet's experiments.[3] They found that the readiness potential was present irrespective of the decision made. *It would appear therefore, that the readiness potential is not specific to movement preparation and that Libet's results do not provide evidence that voluntary movements are initiated unconsciously.*

In Paris in 2012, Aaron Schurger's team, seemed to find an explanation.[4] They hypothesized that readiness potential might represent the background noise of electrical activity of the brain and that in order to initiate movement a certain threshold would need to be crossed. If this was the case then repeating Libet's experiment it would be possible to see faster reaction times with more accumulated background noise. And, indeed, this is what they found. They concluded that what looks like a pre-conscious decision process may not in fact reflect a decision at all. It only looks that way because of the nature of spontaneous brain activity.

There have been more sophisticated tools applied to Libet's paradigm by way of fMRI at the Max Planck [Institute] in Germany which have appeared to show more impressive results than with EEG with brain activity.[5] [One set of findings] suggested that the outcome of a

decision can be encoded in brain activity up to 10 s[econds] before it enters awareness. In the words of the researchers – “*this delay presumably reflects the operation of a network of high-level control areas that begin to prepare an upcoming decision long before it enters awareness.*”

As Lavazzo and De Caro have said:

“It should be clear that this experiment adds something very interesting and may even represent a major breakthrough for the intense debate dealing with the inaccuracy of conscious reports on our own mental lives. A different issue, however, is whether it has anything interesting to say about the free will problem, as is boldly claimed by the title, the abstract and the article itself.”

One of the main philosophical objections to this experiment, and indeed to Libet’s, has been raised by Daniel Dennett in that it assumes what he refers to as ‘Cartesian materialism’ with his Cartesian theatre in which there is a tiny theatre in the brain where a homunculus performs the task of observing all the sensory data projected on a screen at a particular instant, making the decisions and sending out commands.

Andrea Lavassa and Mario De Caro of the University of Rome have pointed out that:

“Freedom does not imply consciousness, then; and so, by the logical principle of contraposition, lack of consciousness does not imply lack of freedom.”

Other Neuroscientific Assaults on Free Will: The Warrior Gene – Molecular Neurogenetics, Free Will and Diminished Responsibility.

The presence of this gene has been successfully used as a successful “biological defence” to change a conviction from first degree murder charge (a wilful and premeditated murder) to a second degree charge (not premeditated) in the USA. A skilful lawyer managed to weave a tale to the judge and jury that the bad warrior gene had gotten the better of the accused before his murderous rampage. The implication is that the free will of the defendant was diminished because of their particular neurogenetic make up.

But what of neural plasticity and epigenetics?

Tom Wolfe (American Culture Critic) wrote an essay “Sorry but your soul just died” in response to neuroimaging studies purporting to show what is going on inside your brain when you have a thought or particular emotion:

“Since consciousness and thought are entirely physical products of your brain and nervous system – and since your brain arrived fully imprinted at birth – what makes you think you have free will? Where is it going to come from? What ‘ghost’, what ‘mind’, what ‘self’, what ‘soul’, what anything that will not be immediately grabbed by those scornful quotation marks, is going to bubble up the brainstem to give it to you?”

Even if we accept that there is a genetic component that predetermines our behaviour we need to remember that neuroscience has revealed that our brains have the ability to change – a concept called neuroplasticity. The phenotype of our brain is, by definition, the result of the interaction of the genotype and its environment. This has certain implications. We know that if we bring up a child reading only one book of moral philosophy then it is likely that that child will inherit a system of moral philosophy contained within that book. But we can train our own brains. Just as the practice of mental arithmetic strengthens our ability to perform calculations, we can train our brains in other ways. Would it be possible to design an experiment that examined conscious decision-making and neuronal plasticity. Can we choose to change our brains?

Has the concept of Free Will withstood the scrutiny of neuroscience?

Neuroscience is, perhaps, a threat to our notions of free will if it can truly preclude that there is any conscious mental planning of actions. As more is revealed through experimentation and we gain a deeper understanding of the brain it seems increasingly unlikely that the circuits responsible for making decisions are different in kind from those that underlie more lowly functions. It appears to many neuroscientists that although we are conscious of our plans we may not be aware of the computations that led to them.

Spirituality

Hypothesis

Our soul, our spirit, our free will are simply an illusion created by the neurons in our brains. How do we test this?

1. Take some pictures of religious experiences, e.g., perform a fMRI study of people undergoing religious experiences - meditating monks or contemplative nuns.
2. See if we can find a way of making the brain have a spiritual experience, i.e., use neuroscience to reverse engineer spiritual experiences and then recreate them in people who don't believe they are possible.

The God Spot - Temporal Lobe Epilepsy

There are many cases of people with temporal lobe seizures who report spiritual experiences. In Mario Beauregard and Denys O'Leary's book *The Spiritual Brain - A Neuroscientist's Case for the Existence of the Soul*[6] they use the example of Mark Salzman's novel, *Lying Awake* in which a nun is diagnosed with temporal lobe epilepsy after experiencing some very vivid visions and faces the dilemma of having surgery and losing those experiences.[7]

The God Helmet

Neuroscientist Michael Persinger developed The God Helmet which develops very weak magnetic fields. Famously, Richard Dawkins spent 40 minutes in it without any religious experience and results have never been replicated.

The God Chemical?

It is easy enough to create a spiritual experience in a person – just give them peyote, LSD, psilocybin... These are tried and tested ways of making people feel spiritual. We know that drugs have effects on the monoaminergic components of the brain. This has not served to weaken spiritual experiences for many. Some people simply see the drugs as unlocking their minds to a truer reality.

The God Gene

The God Gene: a book by Dean Hamer, Director of the Gene Structure and Regulation Unit at the U.S. National Cancer Institute.[8] Hamer takes the trait of self-transcendence: the perception of oneself as part of one great totality. Hamer carried out a study whereby he analyses the genetic variation in monoamine genes and how they relate to scores in a test for self-transcendence. He found that a change from adenine (A) to cytosine (C) in the VMAT2 (vesicular monoamine transporter) gene, which is involved in transporting monoamine neurotransmitters across synapses in the brain, is associated with self-transcendence, and then wrote about this finding by calling it "The God Gene".

But it is anything but the God gene! The study did not consider belief in God. As the American Science writer Carl Zimmer puts it, a better name for the gene would be: "*A Gene That Accounts for Less Than One Percent of the Variance Found of Scores of Psychological*

Questionnaires Designed to Measure a Factor Called Self- Transcendence, Which Can Signify Anything from Belonging to the Green Party to Believing in ESP, According to One Unpublished, Unreplicated Study”[9]

We need to appreciate that studying spiritual experience is an extremely difficult task. Such experiences are extremely subjective and defining these experiences and observing them well enough, and importantly in a manner that is reproducible without confounding variables is an extremely difficult task. The only way around this with our current tools is to dissect piecemeal with the hope of rebuilding the whole somehow. The approach is, of course, prone to error and mistakes, but that does not mean the journey is not worthwhile.

The Soul

Jennifer Sills, writing in Science in 2009 compared the neuroscientific search for the soul equivalent to the science-religion clash of Galileo’s heliocentricity in the 17th Century and Darwin’s 19th century evolutionary challenge to biblical creation.

To the extent that belief in the soul is used as a metaphysical explanation for the mind, it is likely that this belief may be threatened by neuroscientific explanations for the mind. But there is a limit:[10]

“Although neuroscientists can identify neural correlates associated with mental processes, they are still unable to explain precisely how activity in the brain creates the experience of these mental phenomena. This issue can have some important implications for belief in the soul.”

Conclusions

In obtaining some truths about the spirit, the soul and free will, neuroscience is, to my mind, only one part of the puzzle. The biggest threat of neuroscience is that the soul, the spirit, the will not be subject to the laws of science, that they are purely a myth, simply metaphysical toys. As Lavazza and De Caro have put it, the threat is that neuroscientists will offer *“a complete explanatory reduction of all aspects of the human mind to the electro-chemical functioning of the brain.”*

As Francis Crick’s Alice says – we will be shown to merely a pack of neurons. But should that be a threat? Does it really devalue them as concepts? I believe there will be some inevitable controversies, but whatever neuroscience reveals, or fails to reveal, I think it will not devalue these concepts. For many, the external reality of a spiritual experience, such as the belief in the existence of a god or deity, cannot be directly proven or disproven by studying the brain. So why should the neuroscientific study of the brain pose any real threat to these concepts.....

I will leave you with the following quote:

“When you look into the abyss, the abyss also looks into you” [11]

In seeking to question the existence of the soul there is a feeling that we may be probing a dangerous truth, and that without the soul we will face the abyss within ourselves.

Thank you.

The Author

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Neurosurger' by Oxford University Press which he authored and co-edited with Alex Green from Oxford and which in 2013 was translated and published in Chinese. He is a senior lecturer in neurosurgery at the Dunedin School of Medicine, at the University of Otago and a consultant neurosurgeon at Dunedin Hospital.

Endnotes:

- 1 Does neuroscience threaten human values (editorial). *Nature Neuroscience* (1998) 1, 535-536.
- 2 Francis Crick. The Astonishing Hypothesis. Charles Scribner's Sons, New York, 1993.
- 3 Trevena J and Miller J. Brain preparation before a voluntary action: evidence against unconscious movement initiation. *Conscious Cogn* 2010; 19: 447-456.
- 4 Schurger A, Sitt JD, Dehaem S. An accumulator model for spontaneous neural activity prior to self-initiated movement. *PNAS* 2012; E2904-E2913.
- 5 Soon CS et al. Unconscious determinants of free decisions in the human brain. *Nature Neuroscience* 2008; 11: 543-545
- 6 Mario Beauregard and Denys O'Leary's book The Spiritual Brain – A Neuroscientist's Case for the Existence of the Soul, Harper, New York, 2007
- 7 Mark Salzman. Lying Awake
- 8 Dean Hamer. The God Gene: How Faith is Hardwired into Our Genes, Doubleday 2005
- 9 Carl Zimmer. Faith Boosting Genes, *Scientific American*, 2004
- 10 Preston et al. Neuroscience and the soul: compelling explanations for the human experience. *Neuron* 2012; 127: 31-37.
- 11 Nietzsche – Beyond Good and Evil (epigrams and interludes).