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The Primordial Psyche

Abstract: *Scientific materialism is still influential in certain academic spheres. In this article, I examine multiple lines of empirical evidence showing that this ideology, while partially true, is woefully incomplete and, therefore, obsolete. This evidence indicates that we humans cannot be reduced to powerless, biophysical machines since the psyche greatly influences the activity of the brain and the body, and can operate telosomatically. Based on this evidence, I introduce the Theory of Psychelementarity (TOP) and present a few predictions. This theory proposes that the psyche plays a role as primordial as that of matter, energy, and space-time. Another central premise of this theory is that the psyche cannot be reduced to physical processes. The TOP accounts for a number of well-studied psychophysical phenomena, which are reinterpreted in light of a post-materialist perspective. This theory also accounts for anomalous phenomena that are currently rejected by materialists.*

1. Introduction

1.1. The Legacy of Scientific Materialism

Few scientists are aware that the modern science's view of reality is predicated on basic epistemological and ontological assumptions that are rooted to a great extent in classical physics. Materialism — the idea that everything in the universe is composed of collections of material particles and fields — is one of these assumptions (the terms 'materialism' and 'physicalism' are used interchangeably in this article). A related assumption is reductionism, the notion that complex

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things can be understood by reducing them to the interactions of their parts, or to simpler or more fundamental things.

Materialism and reductionism imply that the psyche (i.e. the totality of all mental processes — conscious and unconscious — including consciousness and self) is identical with or can be reduced to electrical-chemical processes in the brain. According to eliminativism, a radical materialist position, mental events such as thoughts are mere illusions generated by neural activity and we humans are mechanical automata largely determined by biophysical processes (Dennett, 1991).

The metaphysical assumptions grounded in classical physics turned into dogmas during the nineteenth century, and coalesced into an ideological belief system that came to be known as 'scientific materialism' (Burtt, 1949). This ideology became dominant in academia during the twentieth century. So dominant that a majority of scientists started to believe that it was based on established empirical evidence and represented the only rational view of the world. According to an increasing number of theorists, the dominance of scientific materialism in the academic world has hampered the development of the mind sciences (Beauregard and O'Leary, 2007; Nagel, 2012; Wallace, 2012).

Over a century ago, it became obvious that classical physics was limited; it was just not able to explain certain phenomena at the atomic level. The acknowledgment of these limitations led to the development of a revolutionary new branch of physics called quantum physics (QP). The new physics refuted the metaphysical assumptions associated with classical physics. For instance, QP showed that atoms and subatomic particles are not really *objects* — they do not exist with certainty at definite spatial locations and definite times. Rather, they show '*tendencies to exist*', forming a world of potentialities within the quantum domain (Heisenberg, 1976). Furthermore, QP demonstrated that particles being observed and the observer — the physicist and the method used for observation — are somehow linked, and the results of the observation seem to be influenced by the observer's conscious intent. This phenomenon has been called 'the observer effect'. Regarding this issue, a few theoretical physicists have argued that the physical world cannot be fully understood without making reference to the psyche (Wigner, 1967; Stapp, 2009).[1]

[1] However, other physicists do not think that the psyche is required to interpret this phenomenon (Rosenblum and Kuttner, 2006).

1.2. Introducing the Theory of Psychelementarity

Various neuroscience methods (e.g. recording, stimulation, lesion, pharmacological) have allowed researchers to make strides toward the identification of the neural correlates of mental processes and events. The results of the studies done using these experimental methods indicate that mental activity is closely associated with neuroelectrical and neurochemical activity. For instance, electrical stimulation of the fusiform gyrus (FG) in epileptic patients can lead to selective distortion during the visual perception of human faces (Parvizi *et al.*, 2012). This finding provides evidence for a key role of the FG in face perception. But it does not imply that conscious visual perception of faces can be ontologically reduced to neural activity in the FG. Indeed, neuroscience studies do not demonstrate that neural correlates directly produce mental phenomena, and they do not establish that mental states and conscious experiences are ontologically identical to brain processes (such as the propagation of nerve impulses across synapses or the release of neurotransmitters via exocytosis).

Materialist theories fail to elucidate how the brain could generate the psyche, and are unable to account for a plethora of empirical findings indicating that mental phenomena can causally interact with events occurring within and outside the confines of the brain and body. Materialistically inclined scientists and philosophers refuse to take into account some of these findings — or deny their existence — because they are not consistent with the materialist conception of the world. This is antithetical to the true spirit of scientific enquiry. Indeed, great advances in science are always made by following the evidence, wherever it leads (Beauregard, 2012).

In the present article, I shall review evidence that illustrates a number of serious limitations of the materialist framework. This corpus of evidence suggests that the psyche exerts a causal influence on the activity of the brain and the body. Other evidence indicates that the psyche can operate telosomatically, i.e. beyond the confines of the brain and body. To better account for these phenomena, I propose a Theory of Psychelementarity (TOP). This theory posits that the psyche plays a role as primordial as that of matter, energy, and space-time. Another central premise of the TOP is that the psyche cannot be reduced to physical processes. Contrary to other theories, the TOP has a fledgling yet solid base of empirical evidence to support it.

Some historical antecedents of the TOP have to be acknowledged. In terms of pre-modern thought, these antecedents include Vedanta and Neoplatonic philosophies; in terms of modern scientific thought, William James had similar ideas with respect to the mind–brain relationship. In regard to this issue, he wrote: 'When we think of the law that thought is a function of the brain, we are not required to think of productive function only; we are entitled also to consider permissive or transmissive function' (James, 1898/1900, p. 15).

2. Effect of the Psyche upon Brain Activity

A strong body of psychological research supports mental causation of behaviour. For instance, a number of studies show that thoughts can causally affect behavioural outcomes via implementation intentions that are translated into specific plans (Baumeister *et al.*, 2011). In line with this, it has been shown that the explanatory and predictive value of agentic factors (e.g. beliefs, goals, aspirations, desires, expectations) is very high (Bandura, 2001).

These psychological studies imply that mental phenomena significantly influence neurophysiological activity. With respect to this question, materialists/physicalists commonly allege that the psyche cannot have a causal effect upon the body because such an effect is incompatible with the principle of the causal closure of the physical world. This principle states that the non-physical causation of physical events would have to conduce to an increase in the amount of energy that is present in the physical world (by non-physical, I mean not pertaining to matter, energy, and the fundamental forces of physics). Now, such an increase would violate the principle of the conservation of energy, according to which the total amount of energy in a closed system remains constant. Therefore, the physical world cannot be affected by non-physical factors. In regard to this question, it is crucial to know that the principle of the causal closure of the physical world is based on the premises of classical — not quantum — physics (Stapp, 2011).

There is now considerable evidence that mental phenomena greatly affect the functioning of the brain. This evidence is examined in the next subsections.

2.1. Emotional Self-Regulation

The construct of emotional self-regulation refers to the cognitive processes by which we can consciously and voluntarily influence which emotions we have, when we have them, and how we experience and express these emotions (Gross, 1999). The cognitive strategies used to self-regulate emotion include, among others, reappraisal (reinterpreting/transforming the meaning of the emotion-eliciting stimulus/event to change one's emotional response to it) and cognitive distancing (viewing a stimulus from the perspective of a detached and distant observer).

Since the turn of the millennium, several functional neuroimaging studies have demonstrated that we can consciously and volitionally alter the activity of brain regions involved in emotional processing. My research team carried out the first of these studies (Beauregard *et al.*, 2001). The main objective of the study was to identify the neural correlates of self-regulation of sexual arousal using functional magnetic resonance imaging (fMRI). Healthy male volunteers were scanned during a sexual arousal condition and a down-regulation condition. In the sexual arousal condition, the volunteers viewed a series of erotic film clips. They were instructed to react normally to these stimuli. In the down-regulation condition, the volunteers were instructed to use cognitive distancing while they were watching comparable erotic film clips. To assess the emotional reactions of the volunteers to the film excerpts, they were asked at the outset of each condition to rate on a numerical (analogue) rating scale the intensity of primary emotions felt during the viewing of the film segments.

Experientially, the viewing of the erotic film clips during both conditions induced a state of sexual arousal in all volunteers. In the down-regulation condition, most volunteers reported having been successful at cognitively distancing themselves from the erotic film clips. Consistent with this, the mean level of sexual arousal was significantly higher in the sexual arousal condition than in the down-regulation condition. Furthermore, a significant activation of the right amygdala, right anterior temporal pole, and hypothalamus was noted in the sexual arousal condition whereas in the down-regulation condition no blood oxygenation level-dependent (BOLD) activation was measured in these regions. However, activation peaks were noted in the right lateral prefrontal cortex (LPFC) and the rostro-ventral anterior cingulate cortex (ACC).

Using a similar paradigm, we conducted another fMRI study to circumscribe the neural correlates of self-regulation of sadness (Lévesque *et al.*, 2003). Healthy female volunteers were scanned during a sad condition and a down-regulation condition. Transient sadness was induced using film clips. As expected, the mean level of reported sadness was significantly higher in the sad condition than in the down-regulation condition. Moreover, significant loci of activation were measured during the sad condition in the anterior temporal pole, midbrain, right ventrolateral prefrontal cortex (VLPFC), left amygdala, and left insula. In the down-regulation condition, significant activation peaks were detected only in the right orbitofrontal cortex (OFC) and right LPFC.

A number of fMRI studies have been carried out regarding the self-regulation of negative emotion. In one of those studies, Ochsner and colleagues (2002) presented emotionally negative pictures to healthy female volunteers. The volunteers were instructed to either allow themselves to experience/feel any emotional response the pictures might elicit (attend condition) or to reinterpret the pictures so that they no longer generated a negative emotional response (reappraise condition). After the presentation of each picture, volunteers had to rate on a scale the strength of current negative emotion. Experientially, reappraisal of negative pictures successfully lessened negative emotion. The average ratings of the strength of negative emotion were significantly lower on reappraise trials than on attend trials. In addition, the right amygdala was significantly more activated on attend than reappraise trials, and reappraisal was associated with a significant activation of the dorsal and ventral regions of the left LPFC as well as the dorsomedial prefrontal cortex. Ochsner *et al.* (2004) subsequently performed another fMRI study in healthy female volunteers to compare the neural systems supporting down- and up-regulation with reappraisal of negative emotion induced by pictures. Results indicated that amygdala activation was modulated up or down in agreement with the regulatory goal.

Collectively, these studies indicate that conscious voluntary regulation of emotion is mediated mainly by a neural system encompassing a few prefrontal regulatory areas (e.g. LPFC, OFC, rostral ACC). Importantly, the findings of these studies demonstrate that, in healthy people, the conscious and voluntary use of cognitive strategies selectively alters the activity of brain regions and circuits involved in emotion processing.

2.2. Psychotherapy

During the last few decades, many functional neuroimaging studies have been carried out to measure the effects of different types of psychotherapy on brain function. To date, cognitive-behavioural therapy (CBT) has been the most extensively investigated psychotherapeutic approach. CBT helps people overcome dysfunctional emotional responses and choose new behaviours through various behavioural and cognitive techniques.

In an influential study (Schwartz *et al.*, 1996), individuals with obsessive-compulsive disorder (OCD) were studied during resting state with positron emission tomography (PET) before and after 10 weeks of the four-step cognitive-behavioural treatment method developed by research psychiatrist Jeffrey Schwartz. The main objective of this approach is to teach OCD sufferers to respond cognitively to intrusive thoughts and urges — which comprise the core symptoms of this anxiety disorder — in a novel and more adaptive way. In treatment responders, results showed significant bilateral decreases in caudate glucose metabolic rates that were greater than those measured in poor responders. Before treatment, significant correlations were found, in the right hemisphere, between the orbitofrontal gyrus and the head of the caudate nucleus, and the orbital gyrus and the thalamus. These correlations diminished markedly after effective treatment.

So far, a few neuroimaging studies have been conducted to identify regional brain changes following CBT in individuals with specific phobias. In one of those studies (Paquette *et al.*, 2003), we used fMRI in spider phobics to measure, one week before CBT and one week after CBT, brain responses to the viewing of film clips depicting spiders. The CBT consisted of gradual exposure-based treatment to spiders using guided mastery and education for correcting misbeliefs about these arthropods. During four consecutive weeks, phobic volunteers met once a week with two psychotherapists for an intensive group session. In the first session, phobic volunteers were gradually exposed to an exercise book containing colour pictures of spiders. In the second session, they were gradually exposed to film excerpts of living spiders. Self-exposure homework, with the exercise book and the videotape, was given between each session. In the third session, volunteers were exposed to real spiders. During this session, a spider expert from the Montreal Insectarium provided volunteers with a lot of information about spiders, helping them to correct their erroneous beliefs concerning these arthropods. In the fourth and last session, volunteers were asked to touch a tarantula. All phobic volunteers responded successfully. fMRI results showed that in phobic volunteers before CBT, the transient state of fear triggered by the phobogenic stimuli was associated with significant activation of the right LPFC, the parahippocampal gyrus, and the visual associative cortical areas. After successful completion of CBT, no significant activation was seen in the LPFC and the parahippocampal gyrus.

The impact of CBT has been investigated in individuals with major depressive disorder (MDD) (Goldapple *et al.*, 2004). Depressed volunteers were scanned, using 18FDG PET, before and after a 15- to 20-session CBT treatment. During this treatment, volunteers learned behavioural and cognitive strategies aimed at combating dysphoric mood and reducing automatic reactivity to negative thoughts. Significant clinical improvement was noted in all study completers. This improvement was associated with increases in hippocampus and dorsal ACC, and decreases in dorsal, ventral, and medial prefrontal cortical areas.

The effects of other forms of psychotherapy have also been examined in depressed individuals. For instance, Brody *et al*. (2001) explored the impact of interpersonal psychotherapy (IPT) — a brief form of psychotherapy that addresses interpersonal issues — on regional cerebral metabolic activity in individuals with MDD. Depressed volunteers and normal controls underwent 18FDG PET scanning before and after 12 weeks. Depressed volunteers were treated with IPT between the initial and repeat scans while controls received no treatment. The initial 18FDG PET scan revealed that depressed volunteers had higher metabolism than controls in the PFC, caudate, and thalamus, while lower metabolism was found in the anterior inferior temporal lobe. Following IPT, depressed volunteers had metabolic changes in the direction of normalization in these brain regions. Symptomatic improvement was associated with decreases in the right PFC and left anterior cingulate gyrus, and increases in the left temporal lobe. Normal controls had no significant changes in these cerebral structures.

Taken together, these neuroimaging investigations suggest that the mental functions and processes (e.g. conscious recognition of negative thoughts and beliefs, voluntary regulation of negative emotional states) involved in the various types of psychotherapy do exert a significant influence on the functioning and plasticity of the brain.

2.3. Placebo Effect

The word placebo is Latin for 'I shall please'. Placebo refers to any treatment (e.g. drugs, surgery, psychotherapy) used for its ameliorative effect on a disease but that is actually ineffective for the condition being treated (Shapiro and Shapiro, 1997). The physiological responses induced by placebos appear to reflect a mind/body interaction that is driven by subjective factors such as beliefs, expectations, meaning, hope for improvement, and relational parameters.

Several neuroimaging studies have investigated brain responses to placebo treatments administered to clinical and non-clinical populations. Some of these studies have focused on Parkinson's disease (PD). This neurological disorder is characterized by a progressive loss of dopaminergic neurons in the dorsal striatum (caudate and putamen). Clinically, PD is associated with poverty of movements. Classic treatment with levodopa (L-dopa) aims at increasing dopamine levels in the dorsal striatum. Such increase improves motor function (de la Fuente-Fernandez and Stoessl, 2004).

De la Fuente-Fernandez *et al*. (2001) have scanned patients with PD using PET and a labelled dopaminergic agonist ([11C] raclopride), which binds to dopamine D2/D3 receptors. The striatal raclopride binding potential was evaluated under two conditions: (1) a placebo-controlled, blinded study in which the patients did not know when they were receiving placebo or active drug (apomorphine, a dopamine receptor agonist) — all patients received both placebo and active drug; (2) an open study in the same patients without placebo (baseline). When placebo was administered, a significantly decreased raclopride binding potential was found in the dorsal striatum relative to baseline. This decrease in raclopride binding capacity was correlated with improvement in clinical symptoms. Of note, the magnitude of the placebo response was similar to that of apomorphine. These results provide evidence for substantial release of endogenous dopamine in the dorsal striatum of PD patients in response to placebo. This powerful placebo effect in PD seems to be mediated by an increase in the synaptic levels of dopamine in the impaired nigrostriatal dopamine system. Interestingly, the estimated amount of released dopamine was higher in those patients who experienced a placebo effect than in those who did not.

It is well established that the placebo effect plays a pivotal role in controlled clinical trials of antidepressant drugs (Shapiro and Shapiro, 1997). To learn more about the neural mechanisms underlying this effect, Mayberg and colleagues (2002) used FDG PET to measure changes in regional brain glucose metabolism in patients with MDD who were participating in a randomized, double-blind, placebo-controlled study of the antidepressant fluoxetine. Responses to the administration of placebo or fluoxetine were assessed after a six-week trial. FDG PET scans were acquired before treatment (baseline) and after one and six weeks of treatment. For the responders in both groups (placebo and fluoxetine), clinical response at the end of the six-week trial was associated with increases in prefrontal, parietal, and posterior cingulate cortices, and decreases in subgenual cingulate cortex, parahippocampus, and thalamus. These results indicate that placebo can generate metabolic changes in cortical and paralimbic areas that are relatively comparable to those of fluoxetine, a selective serotonergic reuptake inhibitor known to uplift mood and reduce dysphoria.

The brain mechanisms associated with placebo analgesia have also been examined. Placebo-induced analgesia seems to depend upon the endogenous opioid system since it can be blocked by the administration of the opioid antagonist naloxone (Levine *et al*., 1978). This effect of naloxone suggests that placebo analgesics can promote the release of endogenous opioids. To explore this question, Petrovic *et al*. (2002) scanned healthy volunteers with PET. The analgesic effects of a placebo treatment (saline) and remifentanil, a rapidly acting opioid agonist, were compared in a pain-stimulus paradigm containing six different conditions: heat pain and opioid treatment; non-painful warm stimulation and opioid treatment; heat pain and placebo treatment; non-painful warm stimulation and placebo treatment; heat pain only; and non-painful warm stimulation only. To produce placebo responses, volunteers were told that each of the drugs was a potent analgesic. The placebo treatment was also preceded by active opioid during noxious stimulation. Remifentanil was associated with rCBF increases in the rACC and lower brainstem, two cerebral structures known to be involved in opioid analgesia. Pain intensity rating during the placebo condition decreased in most volunteers, compared to the pain condition. The placebo analgesia (heat pain and placebo treatment vs. heat pain only) was accompanied by increased rCBF in the orbitofrontal regions, bilaterally, and the contralateral rACC (rostral to the ACC activation during pain). These results support the view that the rACC is involved in the analgesic response mechanism during placebo.

Many other neuroimaging studies have been conducted with respect to the placebo effect. The results of these studies provide convincing evidence that beliefs, expectations, and hope for improvement can markedly modulate neurophysiological and neurochemical activity in brain regions involved in a variety of functions (e.g. perception, movement, pain, emotion).

3. Psychosomatic Influence

The sphere of influence of the psyche is not restricted to the brain. Indeed, there is now a wealth of evidence suggesting that the psyche plays a key role in health and disease. Concerning this question, a direct connection was discovered in the 1980s between nerve fibres of the sympathetic nervous system and cells of the immune system in the spleen, lymph nodes, thymus, and bone marrow. At about the same time, neuropeptide receptors were found in the immune system. Neuropeptides — composed of short chains of amino acids — are small molecules that are used by neurons to communicate with each other. These molecules are implicated in various functions including emotions, motivation, learning, and memory, as well as food intake. These findings established the field of psychoneuroimmunology (or PNI), the study of the interactions between mental processes and the nervous and immune systems.

PNI researchers demonstrated that there are, in fact, a myriad of connections between the brain and the immune system. Studies conducted during the last 30 years have shown that chemical messengers produced by immune cells signal the brain, and the brain sends chemical signals to the immune system. Other studies have confirmed that our thoughts and feelings do affect our health and well-being. These studies indicate that the causes, development, and outcomes of an illness are determined by the interaction of psychological and social factors with biochemical changes that affect the immune system, the endocrine system, and the cardiovascular system (Ray, 2004).

In line with this, events and situations that we perceive as uncontrollable can lead to important disruption of the immune and endocrine systems. For instance, during marital discord, immune responses are weakened, and the levels of stress hormones are elevated in the spouse who experiences the greatest amount of stress and feelings of helplessness (Vitetta *et al*., 2005). In contrast, a positive emotional state can bolster the immune function. In regard to this question, Cohen *et al.* (2006) have performed experiments in which volunteers were administered standard doses of infectious organisms such as rhinovirus (common cold) and influenza virus. The responses to the viruses were analysed in relation to the emotional state of the participants. In these studies, volunteers were monitored in quarantine. Results revealed that participants whose affect remained very positive over several days had reduced risk of developing an infection.

The influence of the psyche on the activity of the physiological systems connected to the brain is exerted mostly in a non-conscious manner. However, there is some evidence that the psyche can influence the body consciously and volitionally. For example, it has been shown that healthy volunteers can intentionally use mental imagery to positively influence the functioning of their immune system, in particular the activity of neutrophils, the most abundant type of white blood cells (Trakhtenberg, 2008).

4. The Extended Psyche

Materialist scientists and philosophers commonly argue that what appear to be instances of mental influence on brain activity are, in reality, the result of the action of certain cerebral structures on other areas of the brain (Dennett, 1991). Other, non-materialist dual-aspect, theorists propose that while normal, embodied mental experiences appear causally effective from a first-person perspective, the causal effects of these experiences can also be explained in neural terms from a third-person perspective (see, for instance, Velmans, 2002). As far as these analyses go, neither of them examines the possibility that the psyche might be able to exert an influence outside of the confines of the body (with the exception of Velmans, who proposes that distant mental influence on physical and living systems might reflect connections within the unconscious ground of being — see Velmans, 2012 and 2013). However, such extended causal effects have to be taken seriously. As we shall see in this section, empirical evidence indicates that the psyche can exert telosomatic effects that can operate even when the brain is non-functional.

4.1. Psi Phenomena

Psi effects refer to mental phenomena that cannot be explained by known physical principles (i.e. via sensory capacities and motor activity). People throughout history and across all cultures have reported these phenomena, and thousands of controlled scientific experiments conducted over the last several decades have demonstrated the reality of psi effects. Nevertheless, psi phenomena are still being rejected as impossible by scientists who have faith in the materialist ideology. Why? Because these phenomena demonstrate that scientific materialism is just an obsolete ideology.

Telepathy — the mental transmission of information from one person to another without the use of ordinary senses — represents one type of psi phenomenon whose existence has been empirically established. In the 1970s, three researchers — Charles Honorton, Adrian Parker, and William Braud — independently arrived at the hypothesis that a reduction of sensory stimulation should favour the occurrence of psi. Honorton, Parker, and Braud surmised that psi operates as a weak signal that is usually concealed in stronger signals related to our senses and continually bombarding us. Separately, these researchers devised a telepathy experiment based on the *ganzfeld condition* — a sensory deprivation technique that rapidly evokes an agreeable, dreamy state of awareness, and which was originally developed to investigate visual mental imagery. The three researchers speculated that with sensory stimulation blocked, the likelihood of perceiving subtle impressions would be greatly enhanced.

Ganzfeld telepathy experiments typically involve two participants: one who concentrates on mentally transmitting an image — the sender — and another who receives it — the receiver. These experiments are generally conducted in three phases: preparation, sending, and judging. In the preparation phase, the receiver sits in the ganzfeld room in a cozy reclining chair, wearing translucent hemispheres (usually halved ping-pong balls) over her eyes and headphones on her ears. A red light shines on her face as she listens to a constant stream of white noise played through the headphones. The experimenter asks an assistant to randomly select one 'target pack' of pictures out of a large pool of such packs. Each pack comprises four pictures, and all the target packs and target pictures are hidden inside opaque envelopes. The receiver is then locked in the room. During the sending phase, the experimenter gives the sender the target, still in its opaque envelope, and the sender is then locked in a room. The sender views the target picture and tries to mentally send it to the receiver. The sender is requested to attempt to become 'immersed' in the target picture and to send her 'full experience'. In the judging phase, the experimenter informs both the sender and the receiver that the sending phase is terminated. The red lamp and the white noise are turned off, and the ping-pong ball eyeshades are removed. The experimenter then presents the receiver with copies of the four pictures and asks her to rank these pictures (1 to 4) as to how well each accords with her subjective impressions during the sending phase. A 'hit' is scored if the receiver ranks the target number 1. If not, the experiment is considered a 'miss'. Statistically this experiment has a 25 percent chance hit rate — that is, it should produce a hit every four trials (Radin, 1997).

At the beginning of the 1980s, Honorton and his colleagues improved the methodological quality of ganzfeld experiments by creating a fully automated procedure they called the 'autoganzfeld'. In typical autoganzfeld experiments, the target pool consists of 80 short audio-video clips (taken from motion pictures, cartoons, and TV shows). The video-based target pack and the video-clip target are selected randomly by a computer, and a closed-circuit video system presents the target to the sender over a video monitor. Additionally, the interactions between the experimenter, receiver, and sender are totally automated, and a computer presents the four targets in random order to a video monitor in the receiver's room.

Honorton and his co-workers carried out a six-year research programme using autoganzfeld sessions. Overall, 240 people participated as receivers in 354 autoganzfeld sessions. The hit rate was 37 percent (12 percent above chance expectation) and the odds against chance were 45,000 to one (Honorton and Schecter, 1987).

From 1974 through 2004, 88 ganzfeld experiments had been reported by researchers Dean Radin, Dick Bierman, Daryl Bem, and Adrian Parker. A meta-analysis of the replication studies conducted by these researchers revealed a hit rate of 32 percent (a 7 percent effect above chance) with odds against chance of 29 quintillion (29,000,000,000,000,000,000) to one (Radin, 2006). The results of this meta-analysis provide strong evidence that that the results were not due to chance.

One complication in conducting meta-analysis has been called the 'file-drawer problem'. This problem refers to hypothetical studies that scientists performed but did not bother to publish — and consigned to the 'file drawer' — because they produced a null result. For a long time, critics have argued that these hypothetical studies were concealed on purpose by psi researchers. Fortunately, meta-analyses provide a solid basis for calculating how many file-drawer studies there would have to be to explicate the positive results that have been published. In the case of the experiments conducted by Radin, Bierman, Bem, and Parker, a conservative assessment of the number of experiments required to invalidate this finding is 2,002. This number represents a ratio of 23 file-drawer studies to each published experiment. In other words, each of the 30 known investigators would have had to perform but not report 67 supplementary experiments. Considering that the average ganzfeld experiment had 36 trials, these 2,002 'concealed' investigations would have required 72,072 additional sessions. To produce this number of sessions would entail unceasingly running ganzfeld sessions 24 hours a day, seven days a week, for 36 years. As Radin (2006) notes, this is highly unlikely.

At this point in time, more than 50 researchers have reported successful replications from laboratories across the United States, Sweden, UK, Argentina, Australia, and Italy. Some ask why hit rates are not higher, but it is important to realize that the 32 percent hit rate was obtained mainly with volunteers who do not claim any particular ability (Tressoldi *et al.*, 2010). When special populations are investigated, such as creative artists, much higher hit rates (e.g. 47 percent, i.e. 22 percent above chance expectation) are measured (Holt, 2007).

Ganzfeld telepathy experiments suggest that we can send information across space without the use of ordinary senses to other human beings. Can we also mentally influence at a distance physical systems and living organisms?

Some researchers have explored these intriguing questions. In the 1960s physicist Helmut Schmidt began using random-number generators (RNGs) to explore mental interaction with inanimate matter. A random-number generator (RNG) is an electronic circuit that produces thousands of random coin-flips per second. But rather than heads and tails, the RNG produces sequences of random bits, 0s and 1s. Contemporary RNG devices mainly rely upon one of two random sources, radioactive decay times or electronic noise based on quantum processes. These two sources provide electronic spikes that may occur randomly a thousand times a second. These spikes are used to generate sequences of random bits by interrupting a precise, crystal-controlled clock. The random bit used is determined by the state of the clock when it is interrupted by a random spike.

In a prototypical experiment, participants sit in front of a computer screen, observing a moving graphic line which represents the outputs of the RNG. They are asked to mentally influence the RNG's output so that it produces more 0s than 1s (or *vice versa*). When, for example, the RNG produces more 0s than 1s, the graphic line moves upwards; with more 1s than 0s, it moves downwards (or *vice versa*). Under normal circumstances, the graphic line is expected to fluctuate slightly, moving up and down randomly.

In 1987, research psychologist Roger Nelson, of Princeton University, and psi researcher Dean Radin conducted a meta-analysis of RNG experiments. A total of 597 studies conducted by 68 different researchers were included in their meta-analysis. The overall results generated odds against chance beyond one trillion to one. The number of unreported studies required to render null the statistically significant RNG effect was found to be 54,000 (Nelson and Radin, 1987).

Later, engineer Robert Jahn and his colleagues at the Princeton Engineering Anomalies Research Laboratory (PEAR Lab) published a review of 12 years of RNG experiments performed in their lab. These experiments included more than 100 volunteers, who were asked to try to intentionally influence the RNG outputs to drift above the chance-expected average (the *High aim* condition), then below-chance (the *Low aim* condition). The results showed that when the participants wished for high scores, the RNG outputs drifted up; whereas when the participants wished for low scores, the RNG outputs drifted down. Jahn and his co-workers estimated that the results over the entire database produced odds against chance of 35 trillion to one. Interestingly, in some of the PEAR experiments, the participants were thousands of miles away from the RNG, and no decline in effects was found as a function of distance (Jahn *et al*., 2000).

Psychologist William Braud and his colleague, anthropologist Marilyn Schlitz, have carried out several experiments to investigate whether it is possible to mentally influence at a distance living organisms. In these experiments, skin resistance in the receiver (the target person) was constantly monitored while at randomly selected periods a sender in a separate room attempted to arouse or calm the receiver by means of intentions, thoughts, and images. During the control periods, that were also randomly selected, the sender was asked to focus his/her attention elsewhere. Braud and Schlitz performed a meta-analysis of all these experiments (n = 37), which comprised 655 sessions, with 153 people acting as senders and 449 people or animals acting as receivers. The combined experiments resulted in odds against chance of more than a hundred trillion to one. The results of these experiments provided evidence for successful remote influence of skin conductance (Braud and Schlitz, 1991). These studies support the view that people can respond unconsciously to distant mental influences. Other investigations indicate that people can mentally influence at a distance living organisms such as enzymes, bacteria, plants, mice, and dogs.

Various sceptical theories have been proposed to explain reports of psi. These theories include wishful thinking, embellishment, sensory illusions, delusion, memory tricks, experimental design flaws, underestimates of the frequency of coincidence, selective reporting, and fraud (Alcock, 1981; Hyman, 1989). Under certain circumstances, these factors may mimic psi effects. However, the experimental protocols used to collect the data presented in this section were designed to preclude such explanations. In this context, sceptical theories cannot be the sole explanation for psi phenomena (Radin, 2006).

To sum up, psi research indicates that the human psyche can obtain specific, meaningful information in ways that transcend the usual limitations of space and time. Moreover, psi research suggests that physical systems and living organisms can be influenced by mental intention.

4.2. Near-Death Experiences in Cardiac Arrest

Near-death experiences (NDEs) are vivid, realistic, and often deeply life-changing experiences occurring to people who have been physiologically or psychologically close to death (Holden, 2009). Enhanced mental activity, a clear memory of the experience, and a conviction that the experience is more real than ordinary waking consciousness are core features of NDEs (Greyson, 2011). Other common features include an out-of-body experience (OBE), i.e. a sense of having left one's body and watching events going on around one's body and, occasionally, at some distant physical location; feelings of peace and joy; passage though a region of darkness or a dark tunnel; seeing an otherworldly realm of great beauty; encountering deceased relatives and friends; seeing an unusually bright light, sometimes experienced as a 'Being of Light' that radiates complete acceptance and unconditional love and may communicate telepathically with the near-death experiencer (NDEr); seeing and reliving major and incidental events of one's life, sometimes from the perspective of the other people involved; and returning to the physical body, often unwillingly (*ibid.*).

Perhaps unsurprisingly, a number of materialist interpretations have attempted to explain away the subjective experience of NDEs. Some researchers have speculated that NDEs are hallucinations produced by lowered levels of oxygen, i.e. hypoxia or anoxia (Blackmore, 1993). However, NDEs can occur in the absence of hypoxia or anoxia (as in non-life-threatening illnesses and near-accidents), and the subjective effects of hypoxia do not have much in common with NDEs (Holden, 2009). Furthermore, when oxygen levels decrease markedly, individuals whose lungs or hearts do not work properly experience an 'acute confusional state', during which they are highly confused and agitated, and have little or no memory recall. In stark contrast, during NDEs people experience lucid consciousness, well-structured thought processes, and clear reasoning (Parnia *et al*., 2001). In addition, if anoxia would play a central role in the production of NDEs, most cardiac arrest patients would report an NDE. Studies show that this is clearly not the case (van Lommel *et al*., 2001).

Other researchers have hypothesized that increased levels of carbon dioxide — hypercarbia — may be implicated in NDEs (Morse *et al*., 1989). However, NDE-like features are rarely reported in hypercarbia. Moreover, there have been instances in which arterial blood gases in NDErs did not reflect elevated carbon dioxide levels (Parnia *et al*., 2001).

It has also been speculated that temporal lobe epilepsy (TLE) can produce all the main features of NDEs (Saavedra-Aguilar and Gómez-Jeria, 1989). A review of the literature on epilepsy, however, indicates that the typical features of NDEs are not associated with epileptic seizures located in the temporal lobes (Rodin, 1989). Experiential symptoms of such seizures include mental confusion, hallucinations, illusions, and negative emotional states.

Nearly half of the NDErs report an OBE. Reports of OBE perception of events (e.g. attempts of medical personnel to resuscitate the NDErs) are quite important because they can be independently corroborated, i.e. proven to coincide with reality. With respect to this issue, several reports of OBE perception have been corroborated by independent witnesses (Holden, 2009). Veridical OBE perception constitutes a serious hurdle for materialist theories of the psyche. Some proponents of these theories (Saavedra-Aguilar and Gómez-Jeria, 1989; Woerlee, 2004) argue that OBE perception of events happening around the NDEr's body is simply a retrospective imaginative reconstruction based on the memory of events that the NDEr might have witnessed just before losing consciousness or while regaining consciousness. This hypothesis is incorrect since, generally, memory of events occurring just before or after loss of consciousness is either confused or totally absent (Holden, 2009; van Lommel *et al*., 2001). Importantly, confused experiences remembered by individuals as they lose or regain consciousness do not have a life-transforming impact (Greyson, 2011).

NDEs occurring in cardiac arrest pose another major problem for materialist theories of the psyche. During cardiac arrest, breathing stops, and blood flow and oxygen uptake in the brain are rapidly interrupted. When this happens, the electroencephalogram (EEG) becomes isoelectric (flatline) within 10–20 seconds and brainstem reflexes disappear (Clute and Levy, 1990). The individual having the cardiac arrest is then considered to be clinically dead. Because the brain structures mediating conscious experience and higher mental functions, such as perception and memory, are severely impaired, such patients are expected to have no clear and lucid mental experiences that will be remembered. Nonetheless, studies conducted in the Netherlands (van Lommel *et al*., 2001), United Kingdom (Parnia *et al*., 2001), and United States (Schwaninger *et al*., 2002; Greyson, 2003) have revealed that approximately 15 percent of cardiac arrest survivors do report some recollection from the time when they were clinically dead. In those studies, more than 100 cases of full-blown NDEs were reported. In some of these cases, NDErs provided evidence for veridical OBE perception.

Advocates of materialist theories of the psyche frequently argue that, even if the EEG is isoelectric, there may be some residual brain activity that goes undetected because of the limitations of scalp-EEG technology. This is possible given that current scalp-EEG technology measures mainly the activity of large populations of cortical neurons. However, as notes Greyson, the crucial 'issue is not whether there is brain activity of *any* kind whatsoever, but whether there is brain activity of the specific form agreed upon by contemporary neuroscientists as the necessary condition of conscious experience' (Greyson, 2011, p. 4688). This form of neuroelectrical activity, which is well detected via current EEG technology, is clearly abolished by cardiac arrest.

The fact that enhanced mental experiences and accurate OBE perception can occur at a time when brain activity is greatly impaired or seemingly absent (during clinical death) strongly challenges the prevalent neuroscientific view that the psyche results solely from brain activity. It is noteworthy that, from an ontological perspective, NDEs occurring in cardiac arrest suggest that there may be other levels of reality that are non-physical.

5. Postulates and Predictions

The goal of this section of the article is to enumerate and explain succinctly the postulates of the TOP. These postulates are mostly based on the empirical evidence presented in the preceding sections. A few predictions derived from some of these postulates are also presented.

Postulate 1: The Psyche is Primordial and Irreducible

The first postulate of the TOP is that the psyche is irreducible and its ontological status is as primordial as that of matter, energy, and space-time. In regard to this question, philosopher David Chalmers (1996) and cosmologist Andrei Linde (1990) have both argued that consciousness, one of the psyche's core properties, is a fundamental constituent of the universe.

This postulate is based on the undeniable and irremediable fact that the world we experience is apprehended subjectively through the psyche. Consciousness is a prerequisite for reality because it allows us to have subjective experiences related to both the physical side and the mental side of the world. Without consciousness, we could not enjoy the musical genius of Mozart or the exquisite taste of a Dom Perignon champagne, and there would be no sense of self, no science, and no apprehension of the world.

In keeping with this, it is becoming increasingly obvious that the universe cannot be adequately explained without taking the psyche into consideration. As we have seen, this view is supported by the fact that, at the quantum level, the human psyche does appear to influence the physical events being measured (Wigner, 1967; Rosenblum and

Kuttner, 2006; Stapp, 2009). Moreover, at a macro-level, it is not possible to reach a correct understanding of the causal determinants of behaviour if mental processes are not integrated into our conceptual frame of reference (Bandura, 2001; Baumeister *et al*., 2011).

Postulate 2: The Psyche is a Fundamental Force

Albeit non-physical, the psyche is a force because it has the capacity to cause change. Furthermore, it is fundamental since its acknowledgment allows us to account for a multitude of natural phenomena at various levels of organization. The psyche is also fundamental in the sense that it is the means through which we humans can incessantly construct and transform the world.

The evidence reviewed here indicates that mental phenomena do exert a causal influence on the functioning of the brain and body, as well as on behaviour. As shown in this article, numerous neuroimaging studies demonstrate that the subjective nature and the intentional content (what they are 'about' from a first-person perspective) of mental phenomena causally influence neurophysiological processes.

The activity of the psyche can be seen as mental information processing. I have proposed earlier (Beauregard, 2007) that conscious and unconscious mental events are specifically encoded by the brain, i.e. translated through a psychoneural transduction mechanism, into different forms of information, i.e. neural events at the various levels of brain organization (e.g. biophysical, molecular, chemical, neural circuits). In turn, the resulting neural events are translated into other forms of information, that is, events in other physiological systems that are part of the psychosomatic network.

As shown above, the impact of the psyche is not limited to the body since mental intentions can influence at a distance the activity of physical and biological systems.

Postulate 3: The Psyche and the Physical World are Deeply Interconnected

Our experiences of physical phenomena may be very different than our experiences of mental phenomena. Nonetheless the empirical evidence presented here indicates that the psyche and *physis* (the physical world) interact because they are not really separated — they only appear to be separated (except during certain transcendent states of consciousness) (Beauregard, 2012). *De facto*, the psyche and physis are deeply interconnected since they arise out of a common ground, i.e. they are complementary aspects (or manifestations) of an undividable whole that we call reality (as already suggested by Wolfgang Pauli, Carl Gustav Jung, David Bohm, and Max Velmans) (Atmanspacher, 2012; Velmans, 2013). It is this undividable wholeness which renders the psyche capable of influencing various physical and biological phenomena.

Mental interaction at a distance with physical systems and living organisms suggests that the unconscious part of the psyche is communicating — i.e. exchanging meaningful mental information capable of triggering an action — with the physical world. Moreover, the results of ganzfeld telepathy experiments indicate that the unconscious parts of individual human psyches are linked together.

The basic interconnectedness between the psyche and physis does not appear to rest on quantum entanglement. Indeed, non-local connections between entangled particles do not involve the transfer of information (Kafatos and Nadeau, 1999), whereas interaction at a distance between humans, or between humans and physical systems or living organisms, seems to implicate a mental information transfer. Furthermore, this type of interaction implicates various types of mental phenomena that are not accounted for by QP.

Postulate 4: The Psyche is not Produced by the Brain

The findings of neuroscience studies clearly show that under normal circumstances mental activity is closely associated (correlated) with neuroelectrical and neurochemical activity. That is, concomitant variation between states of the psyche and states of the brain are found in these studies. Nevertheless, the fact that mental functions are disturbed when the brain is damaged does not prove that the brain generates mind and consciousness. In addition, enhanced mental experiences and accurate OBE perception occurring at a time when cerebral activity is seemingly absent (i.e. in cardiac arrest) accord with the view that the psyche is not generated by the brain.

This organ appears to act as an interface for the psyche. This idea was first proposed by William James, the father of American psychology. James further speculated that the brain acts as a filter normally restricting the access to extended forms of consciousness. This idea was also defended by philosopher Ferdinand Schiller (Beauregard, 2012; Schiller, 1891). It implies that during transcendent experiences (e.g. NDEs), the filter function of the brain is deactivated to various degrees. Phenomenologically, such a deactivation can lead to an expansion of consciousness and the experience of domains of reality that are non-physical.

In line with the idea that the brain may be an interface for the psyche, this organ may be compared to a television (TV) set. This device receives broadcast signals (electromagnetic waves) and converts them into image and sound. If we damage the electronic components within the TV set, we may induce a distortion of (or even lose) the image on the screen and the sound because the capacity of the TV to receive and decode the broadcast signals is impaired. But this does not mean that the broadcast signals (and the programme) are actually produced by the TV set. Likewise, damage to a specific region of the brain may disrupt the mental processes mediated by this cerebral structure. But such disruption does not entail that these mental processes are totally reducible to neural activity in this area of the brain.

Predictions

Some of the postulates of the TOP lead to a number of testable predictions. With respect to the influence of the psyche on the soma, this theory predicts that the activity of brain regions and circuits, and the secretion and release of neurotransmitters, can be altered *in a specific manner*, via the psychoneural transduction mechanism, by voluntarily changing the nature of the thoughts and the emotional states experienced (for instance, positive thoughts and feelings vs. negative thoughts and feelings). Moreover, the theory predicts that physiological responses to medications and drugs, as well as the neural responses to various types of brain stimulation (electric, magnetic), can be affected volitionally. In addition, the psychoneural transduction mechanism entails that the neurochemical correlates of positive vs. negative thoughts and/or emotional feelings are markedly different. Another prediction is that thoughts, emotional feelings, beliefs, and intentions can lead to changes in the expression of genes related to behaviour (inasmuch as genes should be seen as components of the psychosomatic network).

As a force, it is likely that the 'power' of the psyche — i.e. its capacity to exert an influence somatically and exosomatically — differs between individuals. Importantly, it is possible to enhance its power by undergoing mental training. For example, meditative training techniques can be used to develop sustained concentration (the ability to direct volitionally mental activity toward a specific object). In this context, the TOP predicts that the more focused the psyche is, the greater is its somatic and telosomatic power.

7. Conclusions

Scientific materialism still continues to be influential in certain academic spheres. Nevertheless, quantum physics and the multiple lines of empirical evidence examined in this article indicate that this ideology is obsolete and erroneous. This evidence tells us that we humans cannot be reduced to powerless, biophysical machines, since the psyche can greatly influence the activity of the brain and body, and operate exosomatically. Given this, it is now time to recognize the primordial role played by the psyche, and to integrate this fundamental and irreducible non-physical force into a post-materialist view of the world. The TOP aims to achieve such objectives. This theory accounts for a number of well-studied psychophysical phenomena, which are reinterpreted in light of a post-materialist perspective. The TOP also accounts for anomalous phenomena that are currently rejected by materialists.

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References

Alcock, J. (1981) *Parapsychology, Science or Magic?: A Psychological Perspective*, Oxford: Pergamon Press.

Atmanspacher, H. (2012) Dual-aspect monism à la Pauli and Jung, *Journal of Consciousness Studies*, **19** (9–10), pp. 96-120.

Bandura, A. (2001) Social cognitive theory: An agentic perspective, *Annual Review of Psychology*, **52**, pp. 1–26.

Baumeister, R.F., Masicampo, E.J. & Vohs, K.D. (2011) Do conscious thoughts cause behavior?, *Annual Review of Psychology*, **62**, pp. 331–361.

Beauregard, M. (2007) Mind does really matter: Evidence from neuroimaging studies of emotional self-regulation, psychotherapy, and placebo effect, *Progress in Neurobiology*, **81** (4), pp. 218–236.

Beauregard, M. (2012) *Brain Wars*, New York: Harper Collins.

Beauregard, M., Lévesque, J. & Bourgouin, P. (2001) Neural correlates of the conscious self-regulation of emotion, *Journal of Neuroscience*, **21** (RC165), pp. 1–6.

Beauregard, M. & O'Leary, D. (2007) *The Spiritual Brain*, New York: Harper Collins.

Blackmore, S.J. (1993) *Dying to Live: Science and the Near-Death Experience*, London: Grafton.

Braud, W.G. & Schlitz, M.J. (1991) Consciousness interactions with remote biological systems: Anomalous intentionality effects, *Subtle Energies*, **2** (1), pp. 1–46.

Brody, A.L., Saxena, S., Stoessel, P., Gillies, L.A., Fairbanks, L.A., Alborzian, S., Phelps, M.E., Huang, S.C., Wu, H.M., Ho, M.L., Ho, M.K., Au, S.C., Maidment, K. & Baxter Jr, L.R. (2001) Regional brain metabolic changes in patients with major depression treated with either paroxetine or interpersonal therapy: Preliminary findings, *Archives of General Psychiatry*, **58** (7), pp. 631–640.

Burtt, E.A. (1949) *The Metaphysical Foundations of Modern Science*, London: Routledge.

Chalmers, D.J. (1996) *The Conscious Mind: In Search of a Fundamental Theory*, New York: Oxford University Press.

Cohen, S., Alper, C.M., Doyle, W.J., Treanor, J.J. & Turner, R.B. (2006) Positive emotional style predicts resistance to illness after experimental exposure to rhinovirus or influenza A virus, *Psychosomatic Medicine*, **68** (6), pp. 809–815.

Clute, H.L. & Levy, W.J. (1990) Electroencephalographic changes during brief cardiac arrest in humans, *Anesthesiology*, **73** (5), pp. 821–825.

De la Fuente-Fernandez, R., Ruth, T.J., Sossi, V., Schulzer, M., Calne, D.B. & Stoessl, A.J. (2001) Expectation and dopamine release: Mechanism of the placebo effect in Parkinson's disease, *Science*, **293** (5532), pp. 1164–1166.

De la Fuente-Fernandez, R. & Stoessl, A.J. (2004) The biochemical bases of the placebo effect, *Science and Engineering Ethics*, **10** (1), pp. 143–150.

Dennett, D.C. (1991) *Consciousness Explained*, New York: Back Bay Books.

Goldapple, K., Segal, Z., Garson, C., Lau, M., Bieling, P., Kennedy, S. & Mayberg, H. (2004) Modulation of cortical-limbic pathways in major depression: Treatment-specific effects of cognitive behavior therapy, *Archives of General Psychiatry*, **61** (1), pp. 34–41.

Greyson, B. (2003) Incidence and correlates of near-death experiences in a cardiac care unit, *General Hospital Psychiatry*, **25** (4), pp. 269–276.

Greyson, B. (2011) Cosmological implications of near-death experiences, *Journal of Cosmology*, **14**, pp. 4684–4696.

Gross, J.J. (1999) Emotion regulation: Past, present, future, *Cognition and Emotion*, **13** (5), pp. 551–573.

Heisenberg, W. (1976) *Physics and Philosophy: The Revolution in Modern Science*, p. 186, New York: Harper and Row.

Holden, J.M. (2009) Veridical perception in near-death experiences, in Holden, J.M., Greyson, B. & James, D. (eds.) *The Handbook of Near-Death Experiences: Thirty Years of Investigation*, pp. 185–211, Santa Barbara, CA: Praeger/ABC-CLIO.

Holt, N.J. (2007) Are artistic populations psi-conducive? Testing the relationship between creativity and psi with an experience-sampling protocol, *Proceedings of the 50th Annual Convention of the Parapsychological Association*, pp. 31–47, Petaluma, CA.

Honorton, C. & Schecter, E.I. (1987) Ganzfeld target retrieval with an automated system: A model for intitial ganzfeld success, in Weiner, D.B. & Nelson, R.D. (eds.) *RIP 1986*, pp. 36–39, Metuchen, NJ: Scarecrow Press.

Hyman, R. (1989) *The Elusive Quarry: A Scientific Appraisal of Psychical Research*, Amherst, NY: Prometheus Books.

Jahn, R., Dunne, G., Bradisj, Y., Dobyns, A., Lettieri, A., Nelson, R., Mischo, J., Boller, E., Bösch, H., Vaitl, D., Houtkooper, J. & Walter, B. (2000) Mind/machine interaction consortium: PortREG replication experiments, *Journal of Scientific Exploration*, **14** (4), pp. 499–555.

James, W. (1898/1900) *Human Immortality: Two Supposed Objections to the Doctrine*, 2nd ed., Boston, MA: Houghton Mifflin.

Kafatos, M. & Nadeau, R. (1999) *The Conscious Universe: Parts and Wholes in Physical Reality*, New York: Springer.

Lévesque, J., Eugène, F., Joanette, Y., Paquette, V., Mensour, B., Beaudoin, G., Leroux, J.-M., Bourgouin, P. & Beauregard, M. (2003) Neural circuitry

underlying voluntary self-regulation of sadness, *Biological Psychiatry*, **53** (6), pp. 502–510.
Levine, J.D., Gordon, N.C. & Fields, H.L. (1978) The mechanism of placebo analgesia, *Lancet*, **2** (8091), pp. 654–657.
Linde, A. (1990) *Particle Physics and Inflationary Cosmology*, Chur: Harwood Academic Publishers.
Mayberg, H.S., Silva, J.A., Brannan, S.K., Tekell, J.L., Mahurin, R.K., McGinnis, S. & Jerabek, P.A. (2002) The functional neuroanatomy of the placebo effect, *American Journal of Psychiatry*, **159** (5), pp. 728–737.
Morse, M.L., Venecia, D. & Milstein, J. (1989) Near-death experiences: A neurophysiological explanatory model, *Journal of Near-Death Studies*, **8** (1), pp. 45–53.
Nagel, T. (2012) *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False*, New York: Oxford University Press.
Nelson, R.D. & Radin, D. (1987) When immovable objections meet irresistible evidence, *Behavioral and Brain Sciences*, **10** (4), pp. 600–601.
Ochsner, K.N., Bunge, S.A., Gross, J.J. & Gabrieli, J.D. (2002) Rethinking feelings: An fMRI study of the cognitive regulation of emotion, *Journal of Cognitive Neuroscience*, **14** (8), pp. 1215–1229.
Ochsner, K.N., Ray, R.D., Cooper, J.C., Robertson, E.R., Chopra, S., Gabrieli, J.D. & Gross, J.J. (2004) For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion, *Neuroimage*, **23** (2), pp. 483–499.
Paquette, V., Lévesque, J., Mensour, B., Leroux, J.-M., Beaudoin, G., Bourgouin, P. & Beauregard, M. (2003) Change the mind and you change the brain: Effects of cognitive-behavioral therapy on the neural correlates of spider phobia, *Neuroimage*, **18** (2), pp. 401–409.
Parnia, S., Waller, D.G., Yeates, R. & Fenwick, P. (2001) A qualitative and quantitative study of the incidence, features, and aetiology of near death experiences in cardiac arrest survivors, *Resuscitation*, **48** (2), pp. 149–156.
Parvizi, J., Jacques, C., Foster, B.L., Witthoft, N., Rangarajan, V., Weiner, K.S. & Grill-Spector, K. (2012) Electrical stimulation of human fusiform face-selective regions distorts face perception, *Journal of Neuroscience*, **32** (43), pp. 14915–14920.
Petrovic, P., Kalso, E., Petersson, K.M. & Ingvar, M. (2002) Placebo and opioid analgesia — imaging a shared neuronal network, *Science*, **295** (5560), pp. 1737–1740.
Radin, D. (1997) *The Conscious Universe: The Scientific Truth of Psychic Phenomena*, New York: HarperEdge.
Radin, D. (2006) *Entangled Minds: Extrasensory Experiences in a Quantum Reality*, New York: Pocket Books.
Ray, O. (2004) The revolutionary health science of psychoendoneuroimmunology, *Annals of the New York Academy of Sciences*, **1032**, pp. 35–51.
Rodin, E. (1989) Comments on 'a neurobiological model for near-death experiences', *Journal of Near-Death Studies*, **7** (4), pp. 255–259.
Rosenblum, B. & Kuttner, F. (2006) *Quantum Enigma: Physics Encounters Consciousness*, New York: Oxford University Press.
Saavedra-Aguilar, J.C. & Gómez-Jeria, J.S. (1989) A neurobiological model for near-death experiences, *Journal of Near-Death Studies*, **7** (4), pp. 205–222.
Schiller, F. (1891) *Riddles of the Sphinx*, London: Swan Sonnenschein.

Schwaninger, J., Eisenberg, P.R., Schechtman, K.B. & Weiss, A.N. (2002) A prospective analysis of near-death experiences in cardiac arrest patients, *Journal of Near-Death Studies*, **20** (4), pp. 215–232.

Schwartz, J.M., Stoessel, P.W., Baxter Jr, L.R., Martin, K.M. & Phelps, M.E. (1996) Systematic changes in cerebral glucose metabolic rate after successful behavior modification treatment of obsessive-compulsive disorder, *Archives of General Psychiatry*, **53** (2), pp. 109–113.

Shapiro, A.K. & Shapiro, E. (1997) *The Powerful Placebo: From Ancient Priest to Modern Physician*, Baltimore, MD: Johns Hopkins University Press.

Stapp, H.P. (2009) Quantum reality and mind, *Journal of Cosmology*, **3**, pp. 570–579.

Stapp, H.P. (2011) *Mindful Universe: Quantum Mechanics and the Participating Observer*, New York: Springer.

Trakhtenberg, E.C. (2008) The effects of guided imagery on the immune system: A critical review, *International Journal of Neuroscience*, **118** (6), pp. 839–855.

Tressoldi, P., Storm, L. & Radin, D. (2010) Extrasensory perception and quantum models of cognition, *Neuroquantology*, **8** (4), pp. S81–S87.

Van Lommel, P., Van Wees, R., Meyers, V. & Elfferich, I. (2001) Near-death experience in survivors of cardiac arrest: A prospective study in the Netherlands, *Lancet*, **358** (9298), pp. 2039–2045.

Velmans, M. (2002) How could conscious experiences affect brains?, *Journal of Consciousness Studies*, **9** (11), pp. 3–29.

Velmans, M. (2012) Reflexive monism: Psychophysical relations among mind, matter and consciousness, *Journal of Consciousness Studies Special Issue on Monist Alternatives to Physicalism*, **19** (9–10), pp. 143–165.

Velmans, M. (2013) How to arrive at an Eastern place from a Western direction: Convergences and divergences among samkya dualism, advaita nondualism, the body-mind consciousness (Trident) model and reflexive monism, in Prasad, B.S. (ed.) *Consciousness Gandhi and Yoga: Interdisciplinary, East–West Odyssey of K.Ramakrishna Rao*, pp. 107–139, New Delhi: D.K.Printworld.

Vitetta, L., Anton, B., Cortizo, F. & Sali, A. (2005) Mind–body medicine: Stress and its impact on overall health and longevity, *Annals of the New York Academy of Sciences*, **1057**, pp. 492–505.

Wallace, B.A. (2012) *Meditations of a Buddhist Skeptic*, New York: Columbia University Press.

Wigner, E.P. (1967) *Symmetries and Reflections: Scientific Essays of Eugene P. Wigner*, Bloomington, IN: Indiana University Press.

Woerlee, G.M. (2004) Cardiac arrest and near-death experiences, *Journal of Near-Death Studies*, **22**, pp. 235–249.

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