Article

Consciousness, a Cosmic Phenomenon - A Hypothesis

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Abstract

A new physical worldview is introduced, which shows that mental operations are analogous to the physical world, and that just like photons, emotions carry energy. Photons are the fundamental interactions of fermions, and in the brain, sensory stimulus triggers energy imbalances, called emotions, the forces of mental interaction. Therefore, emotions motivate thoughts and actions that recover the energy-neutral state of the brain. Material interaction generates a temporal evolution that culminates in the emergence of the intelligent mind. The entropy of both elementary constituents (material and mental particles) of the universe continuously changes between the poles. Throughout life the mind maintains a low-entropy state due to constant interaction with the outside world via the sensory organs. The death of the body permits the entropy of the mind to increase. Depending on the mind's energy state, the mental entropy will either accumulate information or energy, while maintaining a constant alignment with the temporal field in its time-travel, ending at one of the poles. The energy-rich mind converges towards expanding white holes, whereas an information-saturated mind becomes part of the black hole horizon. In the expanding white hole, space is infinite, yet everything feels neighborly and the infinite feels like a moment. In black holes the moment feels like eternity, yet it imposes a two-dimensional tightness, where everything is far and beyond reach. Matter and mind are the prime building blocks of the universe, which also displays elementary particle characteristics. The three interconnected, interdependent building blocks formulate the organizational unity and fractal structure of the universe. Intelligent life is a microcosm of the universe, and the mind is an active participant in cosmic evolution.

Keywords: Consciousness, evolution, emotion regulation, string theory, self-regulation, free will.

Introduction

Numerous unexplained phenomena in physics as well as experimental contradictions with accepted theories indicate that the current physical view needs updating or reformulated anew. A new physical view is expected to form a seamlessly interconnected system that incorporates consciousness, yet it is based on the smallest unit of energy, the elementary particle. The foundation of the present physical understanding is the Standard Model. In this, elementary particles are classified and fitted into a regular and well-characterized grid. Fermions, called matter, form space. Bosons are the go-between fermions by executing the changes and rhythms of the universe. In other words fermions are subjects, whereas bosons can be considered the

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verbs of the physical world. In the material world, decoherence (i.e., the collapse of the wave function of elementary particles) produces measurable changes in physical qualities, such as speed or position, and in the brain stimulus changes neuronal activation pattern and leads to cognitive, behavioral changes. Evolution has increased neural complexity and produced the mind-blowing intricacy of the human brain, which regulates itself and organizes the whole body into a seamless orchestra. Immense energy consumption of the brain cannot be accounted for simply by the maintenance of the electric potential of neuronal cells and management of their synaptic activity. For over a century the electromagnetic activity of the brain has been measured by placing electrodes over the scalp, and more recently science has learned that external magnetic and electric fields can change brain activity. Complex electromagnetic flows and oscillating rhythms conspire to make the mind much more than simply the cortex, the amygdala, and the other structures that constitute the brain. Sensory stimulus increases oscillation frequencies, a syntactic coding for projecting information about the environment to the cortex and back.

The non-intuitive and multifarious nature of mental operation has been discussed by philosophers and sages over the millennia of human civilization, whereas neuroscience and psychiatry studies the brain. Scientific considerations of the brain's operation regarding conscious experience are often based on the electromagnetic activity of neuron assemblies. The global workplace theory proposes that a central global workspace, constituted by long-range cortico-cortical connections, assimilates mental processes according to their salience (Baars, 1988). According to multiple drafts theory, distributed neural/cognitive models manifest the greatest impact from highly diverse, parallel content (Dennett, 1991). Tononi's (2004) information integration theory (IIT) considers consciousness as the capacity of a system to integrate information. Other notable approaches attempt to relate sensory, motor, and cognitive functions to the appearance of an inner mental world based on neurological or electromagnetic patterns of the brain. However, an accepted theory on consciousness is missing. In the absence of accepted scientific consensus on the mind the question of consciousness after death has remained the subject of religious beliefs, speculation and superstition, without any scientific validity. Here I propose a novel and unitary approach to consciousness that allows a surprisingly meaningful investigation of the mind concerning both life and death.

1. The foundation of the hypothesis

1.1 The deep structure of space

String theory proposes that microdimensional energy vibrations makeup particles. The particle wave function is insulated from gravity, making it orthogonal to the macrodimensions of space. As a result, the particle wave function is formulated independent of its spatial coordinates and modification of the energy function spreads instantly between entangled sister-particles. Changes in spatial curvature force interaction that equalizes the energy-information state between micro and macrodimensions via the collapse of wave function. Thus the wave function develops by the Schrödinger equation, whereas decoherence is an energy jump that coevolves the particle wave function and the field. Because the energy cost of interaction stabilizes the structure of the universe, the formation of microdimensions can be considered the birth of the cosmos.

According to general relativity the universe is a fluid spatial net that has exact, well-defined geometry or curvature at every point of space. According to the principle of static time, proposed by Page and Wootter in 1982, the global picture of the universe remains static, lacking outward change. The unchanging nature of cosmos was proven recently by Moreva and colleagues (2013). For the global state to remain constant, every curvature change must be balanced by an opposite yet equal transformation. Therefore entanglement is like a see-saw, in which opposite, equal transformations result in zero sums. This way entanglement begets time, which is measurable and relevant for internal participants only. The field's increasing curvature differences constitute a temporal evolution, where the edges of the field degenerate into poles, such as the unapproachable (two-dimensional) horizons of black hole singularities (Almheiri et al., 2012). The principle of static time requires that black hole horizons must be balanced by a four-dimensional pole, called a white hole, which was predicted by Einstein's field equations (Figure 1).

The negative field curvature white holes expand space, whereas the galactic environments gradually absorb spatial volume (indicated by white arrows) by building manifold area (Figure 2). Black holes form the edge of space; their great field strength stabilizes the universe and prevents runaway expansion. Almheiri's work, which demonstrates that black hole horizons are impenetrable firewalls, gives strong supports to this conclusion. The AdS/CFT correspondence, which recognizes a mirror symmetry between the field and its lesser dimensional horizon (Maldacena, 1997), also opens the possibility to dimensionality differences in cosmic topology. Due to the dimensional anisotropy between the black and white holes the degrees of freedom increase in white holes and decrease in black holes. The existence of gravitational waves and analysis of many years of sky surveys confirm the universe's topological simplicity and organizational predictability. Because the Schrödinger equation applies for both individual particles and the universe, the cosmos shows a fractal structure. Amazingly, consciousness forms an organic part of this highly congruent and interconnected cosmos.

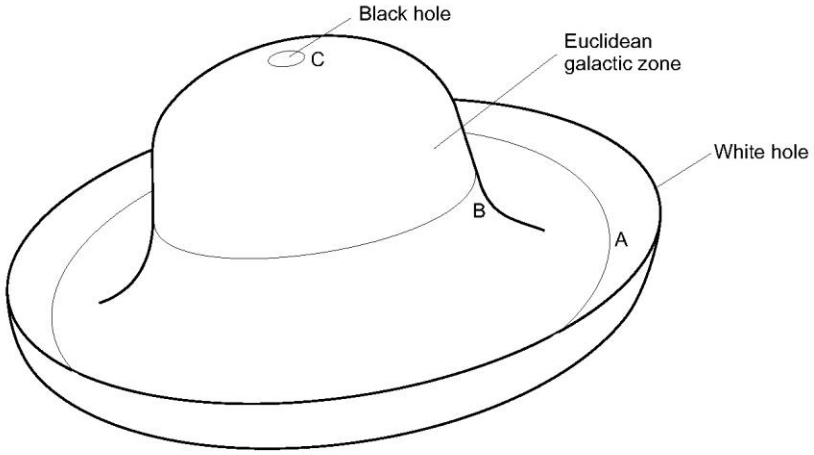

Figure 1. The topology of the universe. The breton hat shows the spatial anisotropy of the universe between its poles: positive field curvature black holes (shown at top) and negative field curvature white holes (brim of the hat). The positive field curvature of the black holes lose dimensionality, but expands time to infinity. In white holes space expands into the fourth dimension by forming hyperbolic geometry. White holes are devoid of information , which

corresponds to zero time. Euclidean field is three dimensional and highly unstable. The microdimensions, indicated by concentric circles, form minimal surface latitudes of specific field curvature (and corresponding particle energy level). Large latitude (i.e., curvature) jumps, such as great acceleration, is energetically expensive and prohibitive.

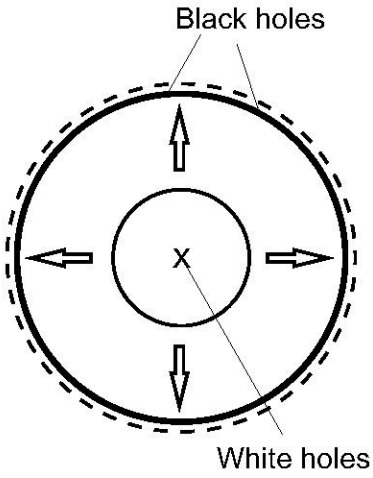

Figure 2. The structure of cosmos with white holes and black holes. The microdimensions of the cosmos (indicated by thin circle) can be visualized as concentric circles, which form closed minimal surface. White holes (in the center) expand space, which pushes against the black holes (indicated by dotted line), and generates a pressure of excess gravity (thick line). The galactic environments (region of white arrows) gradually absorb the expanding volume by building manifold area. The great field strength of black hole horizons forms the outer boundary of space and slows expansion.

1.2 The unity and elementary character of the mind

Elementary particles, the smallest units of energy, cannot be subdivided and appear stable and constant from the outside. Unity also being an essential feature of the mind has been recognized in philosophy by Descartes, Kant, and others. The mind is a cacophonous sensory kaleidoscope, peppered with transient ideas and possibilities that distill into a single decision or understanding. The sensory forest coalescences a single, unified experience. Fractured perception is inhibited: ambiguity forces a non-deterministic, quantum-like fluctuation between two possibilities (images, ideas, or concepts). Indeed, although we can contemplate many possibilities, once we decide on a problem all other options cease to exist. Ideas and thoughts form a highly fluid, malleable, constantly changing, complex and elaborate mental background, over which interaction with the outside world becomes possible. The mental world can only be accessed from the inside; for outside observers it is a holographic projection, which however appears strangely constant from childhood to old age, even if dramatic changes affect the body or the brain. Festinger's cognitive dissonance theory (1957) shows that even core beliefs might be sacrificed in order to maintain mental congruency.

According to string theory, particle vibrations are motions of loops within a Calabi-Yau manifold, where field curvature changes are recorded by a holographic organization. In the brain the appropriate temporal order of the cortical neuronal activation pattern forms a "temporal horizon" of memories or experience. Since the constantly changing cortical projection can be replayed repeatedly, past experiences inform present behavior and lead to far superior responses (Carillo-Reid et al., 2016). However, of the billions of photons hitting the retina and the millions projected to the optic nerve, less than a few thousand bits of information produce the conscious

perception of the moment. Therefore, consciousness forms on a highly subjective (holographic) mental landscape: the momentary projection of the temporal manifold (subconscious) depends on both the viewer and the self.

In animals, bodily functions and interaction with the environment are centrally regulated from the brain, which uses electromagnetic means to achieve an intricate regulation of the body based on sensory information, nutrient needs and survival interest of the individual or the species. Animals with limbic brains respond to environmental stimuli in a linear fashion; their behavior is regulated exclusively by genetically choreographed program and basic bodily needs. The evolution of the cerebrum introduces a nonlinear regulation. In birds the cerebrum is modular, whereas in mammals the neocortex has a laminar structure. The evolution of the cortex dramatically changes the dynamics of the brain and forms an advanced homeostatic regulation, which always recovers an energy-neutral resting state, known as the default mode network (DMN), which turns it into a self-regulating system. There is a strong correlation between intellectual abilities and the complexity, convolution, and overall size of the neocortex (Deaner et al., 2007; Deli, 2015, Chap 2). Since old associations can be reconnected in a novel way, experience can accumulate in the immensely complex neuronal connections of the cortex. Hence, large mammals with convoluted cortices display emotional stability, compassion and kinship, and form close-knit, stable social groups. The neuronal activation pattern of the brain gives rise to thought processes, the manifestations of consciousness. A ball rolling down the hillside is following a determined path depending on its speed, the slope of the hill and the characteristics of the ball itself. Likewise, energy balances of the brain change according to physical laws, the principle of least action, and dictate animal behavior. Hence, free will might be an illusion.

The mathematical formalism of quantum mechanics describes the non-intuitive behavior of elementary particles. In contrast to classical systems, where measurement merely observes a preexisting quality, quantum measurement entails decoherence, which actively changes some property of the system being measured. Probabilistic assessment is often strongly context and order dependent, and individual states can form entangled, composite systems. Remarkably, the same principles – that measurement (i.e., interaction) corresponds to a cognitive change (i.e., decoherence) – appear to apply to the mind as well. Mental operation is contextual and the context of measurement influences the outcome, which includes almost all cognitive processes, such as decision making, memory, perception, and judgments. Quantum theory became a mainstream, accepted scientific idea for modeling mental phenomena (Khrennikov, 2015) and the mind's quantum-like behavior is exploited in fields as diverse as search-engine optimization, psychology, economy, and sociology – in some cases for nearly a century. Quantum probability can successfully model not only elementary particle behavior, but the organizational intricacy of the brain as well (Brembs, 2011; Pothos & Busemeyer, 2009).

The mind displays entanglement and hysteresis-like behavior and the context of judgments and decisions form in analogue to quantum interference of elementary matter particles, because the presumed context of the first judgment or decision interferes with subsequent judgments or decisions. These and other similar findings arise from the brain's structure and characterize the elementary particle-like behavior of the mind. As successive regulatory layers in the brain unbalance due to stimulus, emotions, the energy states of the brain form. In turn, emotions trigger actions that restore the energy-neutral state, while changing the neural landscape (such as

the strength of neuronal connections). This way, mental operation is reflected in the ebb and flow of our emotions, as the brain changes and adapts to its constantly changing environment. Therefore, the brain processes information on a temporal language, and the laws that govern the physical world, such as the Newton's Laws or the Laws of thermodynamics, dictate temporal relationships over the mental world (Deli, 2015, chap 3).

According to general relativity, material interactions and physical processes are governed by the spatial field curvature and here I will show that the temporal field, which is organized orthogonally to space, is structurally identical to the field of gravity. As the spatial field controls matter, the temporal field governs social interactions. Currently the understanding of time is highly insufficient and the special importance of the temporal field in biological processes and evolution has been overlooked. Rather than energetic changes occurring in ecosystem or society, the temporal field manifests as momentary differences in the comfort and wellbeing of the organisms. While matter takes shape in space, life is a function of time due to biological dependence on air, water, rest, and food. The temporal field underlies society and its unique flavor is felt as soon as one steps out of the airport of any country. The temporal field forms our beliefs and our uncertainties, which give rise to the cultural habits, customs, and the palpable social fabric of society.

Just as gravity is the most important force in the material world, emotional (temporal) gravity permeates society and the individual's place in it. Gravity is the ever-present force of the physical world that holds onto matter, and temporal gravity is the strength of relationships. People who are enclosed within greater curvature are *squeezed for time*; this temporal pressure leads to rigidity and turbulent, chaotic emotional life. Lack of time, which is appropriately called stress, forces a constant struggle for everyday needs and even survival. A lesser curvature temporal field is often associated by financial means, as it provides the luxury of time, allowing greater freedom and flexibility. Social evolution is the evolution of the temporal field, manifested as a decreasing social distance (decreasing temporal field curvature differences of society). Hence, the temporal field produces revolutions, social or economic changes and spurs individual social mobility.

The increasing complexity throughout evolution is a perplexing and undeniable fact, and it is especially difficult to explain the high organizational complexity of the human brain. However, brain organization evolved via increasingly precise responses to stimuli, turning the brain into a better and better organizational reflection of the material environment, even operating by the same governing principles. The holographic principle recognizes the importance of the horizon as the information record of interaction. In the brain, experiences and memories form as a holographic record in the neuronal connections of the cortex. As microdimensional toroidal energy resonances manifest as fundamental particle behavior in physical (macro) space, emotional particles form an orthogonal, folded manifold in the temporal space of emotional functioning. In material fermions information accumulation parallels a loss of dimensionality of space, whereas information accumulation in the mind robs time. Stimuli unbalance successive regulatory layers in the brain and generate an electromagnetic potential that forces changes that recover the neutral state. Energy neutrality means discrete energy processing that also leads to the quantum character of material fermions. In the 21st century the time has come to consider the mind as a physical entity. The possibility that matter fermions and the mind have identical

structures and identical operation could open the book of insight into human motivation and behavior.

2. Energy neutrality through self-regulation

2.1 The mind as a temporal (emotional) fermion

According to string theory, energy vibrations take shape as matter, but the material brain projects stimulus as oscillations that form a fluid, inner world based on energy. Environmental changes constantly modulate brain frequencies via the sensory organs. The importance of brain oscillations in consciousness is unequivocal. In the brain the direction of information (energy) transfer in the limbic structures is highly dependent on frequency, neocortical-limbic transfer occurs during slow theta waves (4–10 Hz), and data transfer reverses during gamma frequencies (30–130 Hz), as reported by Buzsaki (2011). The frequency dependence of energy flow means that low brain frequencies intuitively increase the degrees of freedom; whereas high brain frequencies are more deterministic and therefore allow fewer degrees of freedom (Buzsaki et al., 2013).

Since low- and high-frequency bands determine opposing energy-information flow, they can be considered as opposite energetic poles of the brain's operation. Highly structured frequencies reveal nonlinear complexity due to dimensionality differences between neural modules. Rhythmic neuronal activation extinguishes the energy of stimulus, but generates an electromagnetic potential difference between the limbic brain and the cortex, which, although being relatively small, cannot escape into the environment, but initiates a flow reversal that recovers the DMN (Figure 3). The automatic recovery of energy neutrality due to such energetic insulation forms standing waves, the basis of the brain's self-regulation. Based on the frequency of oscillations, only positive (characterized by low frequencies) and negative emotional states (characterized by high frequencies) are possible. The connection of smaller oscillations with positive emotions and enhanced brain frequencies with negative mental states has been corroborated in numerous studies (Bethell et al., 2012; Seo et al., 2008).

Elementary particles interact by fundamental forces. The elementary forces of the mind are energy imbalances, called emotions, which are inextricable phenomena of life and whose intensity can only change through interaction. Just as for matter, life hinges on interactions, which sections our mental life into a progression of discrete *states of feelings and beliefs* and which give life an irreversible directionality. Thus interaction reformulates standing waves by increasing or decreasing mental energy. As the photon's energy reflects the energy of its source, the intensity of negative emotions corresponds to some past temporal field strength (i.e., specific negative events). Despite matter and mental fermions having identical energetic structures, several important differences separate them. Perhaps the most important difference between matter and emotional fermions is their size, which effectively determines their energy level. The diminutive matter fermions give rise to enormous frequencies, which produce an impressive punch. The much larger mind forms far lower frequencies and energy levels that are many orders of magnitude smaller. The wave function of material fermions vibrates over space, whereas mental quantum waves exist unlimited in time (the past and the future). The temporal freedom of mental energy function endows emotions with a sense of permanence. Pain or joy feels as if it

would exist forever, but when emotions depart, their experience evaporates, as if they never existed. This fact is all-important in motivation. By feeling permanent, emotions propel actions, but their fleeting nature allows us to find new strength even after immense pain and suffering. While decoherence gives matter volume, the mental scope, expanse, and understanding are temporal. The difference between the manifestations of matter (space) and mind (time) effectively has hidden the symmetry between the two systems.

2.2 The anatomy of decoherence

The mind forms energy-neutral standing waves over time. Thus, brain oscillations can be viewed as a spring that moves energy (and information) in the form of electric current between the limbic brain and the cortex, always restoring an equilibrium position, called the DMN, which is structured as a four dimensional quaternion (Peters et al., 2016). The innate drive toward energy neutrality leads to a subtle regulation by the continuous and pervasive electromagnetic flows of the intact brain, giving rise to inexplicable, mysterious and highly involuntary mental processes. Beyond sensory and motoric operation, the mind is primarily a temporal compass, which has an uncanny ability to automatically (independent of consciousness) reorient itself against disturbances imposed on it by the environment. The mechanism of decoherence in the mind is detailed below:

(1) The low brain frequencies of positive stimulus flows information away from the cortex (but flows energy toward the cortex) toward the limbic areas and the environment (Figure 3). Energy imbalance is unstable; it leads to joy, laughing, kindness, relaxing, playing, embracing, and generosity, which projects emotional energy into the environment to recover the DMN and form up-spin decoherence in the mind. Outward energy flow turns positive emotional states transient. The temporal spaciousness of lesser temporal field curvature enhances mental energy (i.e., g factor suggested by Spearman, as cited in Deary, 2010), which corresponds to confidence, trust, mental flexibility, congruence and clear conscience. The degree of confidence, emotional stability, and belief increase the degrees of freedom through long-term depression of synaptic strength (Dudek & Bear, 1992), for example. Therefore learning, which requires energy, is dependent on erasure of hippocampal memory (Madroñal et al., 2016).

(2) Sensory information is energetically expensive. The brain *pays* for sensory stimuli through greater energy requirement of high brain frequencies. The limbic system channels incoming stimuli (information), as fast oscillations, to the sensory cortex, where they spread as electric currents that accentuate or subdue each other through field effects. The brain's highly fluid neural organization allows fast, although not instantaneous, rebalancing of electromagnetic gradients based on charge conservation. From the sensory cortical surface the oscillations further propagate toward the frontal associative regions. As the energy requirement of neuronal activation gradually extinguishes the information flow, an electric potential difference, such as readiness or Bereitschaftspotential, forms between the limbic and cortical areas, which reverse the energy flow via slow oscillations as shown in Figure 3 (Kornhuber & Deecke, 1965). The information flow from the frontal toward occipital direction, and back toward the limbic region recovers the DMN. The sensory transmission toward the sensory cortex by fast oscillations and response by slow oscillations was confirmed in humans (Buzsaki et al., 2013), but should be typical in all mammals. The

existence of potential build up by sensory stimulation has been tested in the laboratory in the resting brain. Liu and colleagues (2015) have found that high frequency (40-100 Hz) stimulation of rat central thalamus relay neurons drives widespread forebrain activation in vivo, but low frequency oscillations (in the absence of sensory flow to the cortex) generate a jerking strain, potentially leading to convolution. The down spin decoherence of enhanced brain frequencies decreases degrees of freedom, through long-term potentiation for example (Bliss & Lomo, 1973). Negative emotions dictate actions that over time recover the energy neutral state. Therefore, down spin accumulates information in the mind.

According to general relativity, elementary fermions form the spatial field curvature, but quantum mechanics dictates that some quality of the particle must change as well. This is also true for temporal fermions: the mental energy and the environment (i.e., field curvature) are intertwined and mutually determine each other. When the mind and the field are incompatible, emotional reaction is triggered. As the mental energy changes and adapts to the field, emotional reaction ceases. Repeated activation of the same neuronal connections requires less energy, resulting in less and less emotional involvement, forming automatic activation expressed by Hebb's law (Hebb, 1949), and hedonic adaptation (Schultz, 2007). Both examples clearly demonstrate the effect of the changing temporal field curvature on the mind. These processes give the cortical mind an immense advantage to adapt to environmental changes, to learn, and to form intellectual abilities. By changing its mental energy, the mind (brain) remains congruent with the constantly changing environment. Manipulating the energy balances of the brain (by electrode stimulation or magnetic means) verification of the hypothesis will be possible.

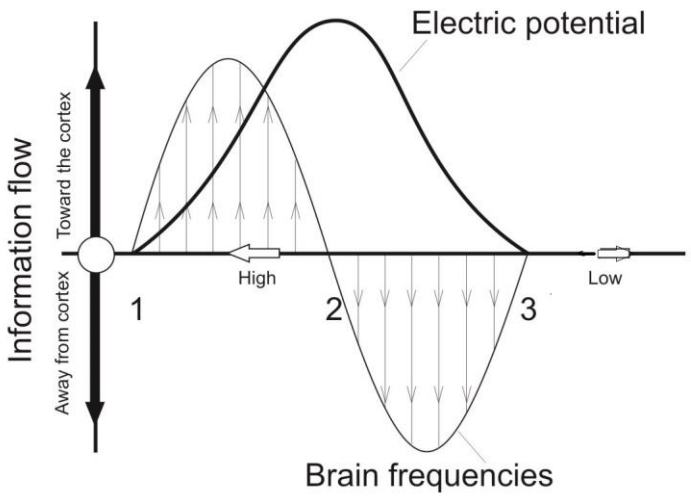

Figure 3. The brain's changing energy balance due to stimulus over time (between 1, 2 and 3). The brain frequencies change from high, on the left (#1), to low, toward the right (#3) and determine the direction of information flow in the brain (shown by thin line). The potential difference between the cortex and the limbic brain is indicated by thick line. The brain is energy neutral before stimulus (#1) and after a response (#3), but stimulus induces a potential difference between the cortex and the limbic brain (indicated by 2). The high energy need of enhanced brain frequencies curtails the volume of vibrating brain tissue, limiting information transmission capacity (indicated by 1), whereas the energy transmission capacity disappears during the lowest frequencies (indicated by 3).

Cortical activation extinguishes the energy of the stimulus (#2), but it generates a potential difference, which initiates a flow reversal that recovers the DMN (#3).

2.3 Temporal elementary particles

A gyrocompass is a compass based on a gyroscope. As the planet turns, misalignment causes tilting to minimize the potential energy, which orients the gyrocompass toward true north. Likewise, the mind shows a cunning ability to restore the stability of the inner world of consciousness against varying temporal curvature, manifested as relentless bombardment by outside stimuli. By changing the mental energy balance (the connections of the neuronal landscape) the mind accumulates energy or information and forms standing waves that are true to the local field. *In this way the mind changes constantly and gradually with its environment.*

The outermost layer of the temporal gyrocompass is the brainstem, which has essential function in the regulation of body and survival as it integrates the mind into the environment. Neurotransmitters interact to generate rhythmic firings across neurons, giving it an important gatekeeper role in influencing higher brain functions based on biological regulatory needs. Information transfer toward the cortex is regulated in the limbic brain, which, through sensory and motor regulation forms the middle layer. Cortical activation forms the third, innermost layer.

This is the transient, unknowable, and magical inner world of consciousness, which, through sensory processing, identifies itself with the body and becomes the source of self-awareness and the ego (Guterstam, 2015). Via its temporal orientation the mind interprets stimulus as a binary code, either past or the future. The mental states also form either positive or negative attitude (i.e., spin direction). Their combination form complex, nonlinear regulation, so response of cerebral animals cannot be easily predicted: depending on expectation or attitude, the same stimulus can produce diametrically opposing results, the hallmark of spinor operation. Evolutionary progression of the organism's ability to respond to stimulus permits temporal fermions to be classified into families, which represent increasing neural complexity:

EMOTIONAL NEUTRINO: Simple organisms with linear neural regulation form emotional neutrinos. Evolution increases the organization of the limbic brain, making responses to stimulus more congruent, and precise. Behavior has a genetic origin and learning remains rudimentary. Emotionless behavior makes it difficult to relate to these animals.

EMOTIONAL ELECTRONS: Animals with well-formed cerebrums (mammals and birds) that populate most regions of Earth are emotional electrons. Cortical insulation gives rise to the self, or ego, the source of cognition and self-awareness. Emotional electromagnetism (i.e., attraction and avoidance) aids the formation of complex social, often hierarchical structures. The dominant, emotionally supported motivation is the preservation of the ego. Emotions are the tools of survival; with them dangers can be avoided or overcome, and opportunities can be found. Animals with more sophisticated emotions appear later in evolution, and these animals exhibit great evolutionary advantages. The discrete energy changes lead to the Heisenberg uncertainty principle, and the Pauli exclusion principle that drives territorial needs and competition. Emotions dramatically improve homeostatic regulation, such as the ability to maintain constant temperature. Emotional electrons form a trusting state, allowing the feeling of oneness in mating as well as birth and care of their offspring.

3. Predictions and consequences of the hypothesis

The mark of a serious hypothesis is its predictive ability. Shockingly, provided appropriate considerations and adjustments are made (the most important adjustment is that the mind operates over temporal coordinates), every quality of elementary fermions can be recognized in mental behavior. Material fermions exhibit classical behavior, which involves temperature and pressure. Likewise, individual quantum uncertainty gives way to societies, where conflicts and interactions are manifested as emotional temperature and pressure.

3.1 Understanding and classification of emotions

The peak of cosmologic evolution is the cortical brain, which forms a self-regulating, insulated system, called the mind. Cortical insulation leads to consciousness (i.e., awareness of being separate from the environment), which is the exclusive privilege of emotional animals. Therefore emotions are energy states that are part of the general neural architecture of the brain (Touroutoglou et al., 2015). Such sophisticated homeostatic regulation allows mammals and birds to be warm blooded, form the mysterious inner world of consciousness, display impressive learning ability and develop complex social life (McNally et al., 2012). Through emotions we recognize ourselves in others (and emotion forming animals), which lends all minds a particle-like uniformity and indistinguishability. The above understanding allows true categorization of emotions as the fundamental interactions of the mind; the myriad specific mental phenomena can be intuited as the emotional equivalents of gravity, electromagnetism, and the strong and weak nuclear forces.

Because it is impossible to shield against it, gravity, the most pervasive fundamental force holds together the large scale structure of space and determines time's arrow. Gravity forms the curvature of space, and emotional gravity forms the socioeconomic layers of society. As entanglement pushes away from the equilibrium point, it increases field curvature differences (i.e., inequality) and lead to a bell-curve distribution in economies and societies (Koonin, 2011). The layers of temporal gravity are felt as differences in financial means, education, location, position, sex, race, and even age. People constantly and carefully monitor others' and their own social position and status, indicating its ubiquitous importance in any economic structure (Oveis et al, 2016; Smith & Magee, 2015). For this reason, individuals guard and actively promote their social position (field curvature) and react defensively to status threats, such as shame, criticism or any form of disrespect (Anderson, et al., 2015).

Due to the Pauli exclusion principle, the minimal-energy configuration of temporal fermions within temporal proximity is to have opposing spin. Entanglement ensures energy conservation between interacting particles by oppositely changing their mental energy. As the temporal gyrocompass strives to reorient itself to the temporal field, it recovers the DMN by either sacrificing or gaining mental energy, which actually changes the mind. In this way, the mind adapts to the curvature of the local field. The curvature differences of the temporal field reveal differences in trust and emotional sophistication (financial, social, cultural distinction) even in democratic societies. The innermost curvature layers of society are occupied more by mental-energy-poor, insecure, 'older' minds, than are the regions having smaller field strength. Since

attachments are proportional to the temporal field strength, conflicts are more vicious in poverty and encounters remain more civil among members of the upper classes. However, it is a great oversimplification to associate temporal curvature with financial means!

3.2 Emotional temperature and emotional pressure

The inverse relationship between pressure and temperature in gases was recognized in the nineteenth century and led to the universal gas law. Surprisingly, the same relationship regulates emotional behavior. Because particle collisions create pressure, emotional confrontations create temporal confinement and lead to emotional pressure. In gases temperature is proportional to internal energy, whereas interpersonal and societal tension corresponds to the thermodynamic energy of the mind. The temporal excess of positive emotions, faith, love, courage, and awe bubble up with the enthusiasm of the instant; by eliminating details they fuel enthusiasm, generosity, trust, the energy for happiness and joy. The increasing confidence and trust lower emotional temperature and pressure. Because elevated brain oscillations enhance the willingness for interaction, emotional temperature can be measured by the magnitude or degree of negativity, the extent of sadness, criticism, sarcasm, anger, or physical brutality. The negative energies are just mental tools to expand the boundaries of the temporal confinement.

Criticism and anger provoke retaliation and reactions from the environment, which actually maintains the temporal pressure or temperature over time. Modulation of neuronal connections and the sensitivity of the brainstem structures (i.e., the temporal field curvature) manipulate time perception. The longer time perception of constricted and painful negative emotions leads to impatience, and stress. As time slows in both gravity and acceleration, *time perception elongates* within both negative (corresponding to positive temporal curvature field) and positive emotional states, corresponding to negative-curvature temporal fields (Neupert & Allaire, 2012; Rudd et al., 2012; Yamada & Kawabe, 2011)! Negative curvature temporal field increases confidence, whereas positive curvature reduces it. The unintuitive and puzzling characteristics of mental operation are an outgrowth of the mind's often tentative seeking of the energy neutral state by self-regulation.

3.3 Free will

It is hard to fully appreciate the environment's ability to direct our lives by regulating our emotions. Although we have little or no power over our own thoughts, which ultimately determine our actions and behavior, the brain's control over the body creates the belief in free will. The mind forms a unified experience by connecting sensory perception with mental states based on event related potentials (Guterstam et al., 2015; Mancini et al., 2011). Whether action occurs due to priming by conscious or unconscious (subconscious) stimuli, the mind presumes its ultimate causative role. Nevertheless, the common belief that our life is governed by conscious thinking has been increasingly challenged. As early as 1965 Libet questioned the existence of free will by showing that thinking and conscious actions are signaled by preceding unconscious brain activity. In addition, the sluggish conscious decisions have vastly longer time requirements from the fast, automatic actions. Conscious processes take a second or longer, but our fluid, fraction of-a-second mental operation is overwhelmingly automatic. Conscious focus also becomes quickly tiring, but the automatic mind operates over the long term and remains stable in the face of environmental changes. We have to consider that our automatic mind, highly

influenced and regulated by the environment and operating behind (sometimes against) conscious awareness, determines the course of our lives.
Parasites exploit their host and can fully manipulate host behavior in support of their life-cycle. For example, Toxoplasma gondii infection will spur a feline attraction in rodents which, assuredly deadly for the rodent, helps to complete the parasite's life-cycle in the body of the cat (Sugden et al., 2016). Behavior manipulation is also possible by an implanted electric sensor in the brain. A properly implanted remote control device in the animal's brain can be essentially used to drive the animal around as a car, at will, by electric regulation. This occurs, because the brain operates via electric impulses, which activate appropriate neuron assembles and trigger well-choreographed muscle movements (Carillo-Reid et al., 2016). A wide range of drugs as well as various brain stimulation techniques can radically change behavior, in some cases the changes lasting beyond the expected affective term (Fitz & Reiner, 2013). Yet addicts and other substance abusers claim to be in full control of their lives. Conscious decisions enhance brain frequencies and lead to information overload, a selfish down-spin state (stress), which distorts mental vision and twists memories.

Detailed focus wastes time, distorts reality, and turns experience into a house of mirrors. Thus, the mind becomes partial and acts contrary to its own best interest, by forming back-and-forth emotional swings, leading to regret or remorse. The constantly changing attention eliminates freedom. As a result, people with negative attitude are enslaved by their circumstances and behave as puppets on a string. Their conscious minds are employed as public relation agents, to constantly explain away previous behavior. Like the distractive turbulences of a fast-flowing river, conflicts destroy mental progress and life suffers a gradual decline (Fredrickson & Joiner, 2002). Being in tune with the environment is the ability to sense and the flexibility to follow the flow of events. The mind with high mental energy (confident and calm mind) is satisfied, trusting and happy, is having no emotional incentive for change, which translates into satisfaction, private and professional success – possibly even on the trading floor (Kandasamy et al., 2016).

3.4 Heisenberg uncertainty principle

Primitive animals with a limbic brain display fairly predictable behavior; but the cortical manifold retains a memory and its response is heavily influenced by past experience. The response's nonlinear nature becomes especially prominent with enhanced stimuli, which produce polarized and even extreme reactions. The Heisenberg uncertainty principle, which prohibits the position and momentum of the particle from being known simultaneously, regulates the behavior of complex animals. In the mind the opposite poles of uncertainty are the temporal position and the extent of emotion. As a cocked gun, which easily fires, down spin decoherence only discharges the enhanced brain frequencies' accumulated pain and negative energy. This way the extent of anger or negative mood (how far one is willing to go) is uncovered, but its temporal position (origin) remains hidden. In contrast, up spin decoherence uncovers the temporal position. The transient positive emotions bubble up in the present moment. However, the extent of joy is unknowable, because there is no partial happiness.

3.5 Pauli exclusion principle

Through extensive connections to a host of brain structures, the amygdala has a central and powerful role in emotional regulation and fear conditioning (Dolan, 2008). By modulating

emotions, it controls behavior and memory, often outside of conscious awareness. Being activated by perceived proximity and emotionally charged images (even if we are not consciously aware of them), the amygdala regulates personal space and boundaries by moving us (emotionally) closer to others or further away from them. The Pauli exclusion principle states that fermions cannot occupy the same quantum state. For matter fermions, the principle is valid in space, but for temporal fermions (animals and people) it prohibits temporal closeness and generates a conceptual (i.e., emotional) distance. Manifested as distrust, this leads to territorial needs, or to avoiding eye contact in the elevator. Because the Pauli exclusion principle is responsible for the structure of matter, it also creates the structure of society or of ecosystems. People with low emotional temperature are satisfied and happy. Their mental calm makes them flexible and accepting (trusting) toward others. As in colder matter, the Pauli exclusion principle is muted. The opposite is also true. In nervous, stressed individuals the Pauli exclusion principle, manifested as critical tendency, is strong. However, critical tendency only applies to emotionally close situations (i.e., temporal closeness). For example, eye contact shortens emotional (i.e., conceptual) distance and thus enhances the potential for conflict (or connection) between conversation partners. Anxious people create conceptual distance by avoiding eye contact (Chen et al., 2012). When faced with increasing emotional distance, we intuitively move closer in an attempt to maintain the emotional distance (Lenz's law in the mind). Emotionally distant people (if spending time together) tend to approach each other emotionally, but loving partners tend to become distant. As with matter, societies and ecosystems are also regulated by the second law of thermodynamics; without outside influence (such as wars or natural disasters) emotional distance decreases over time and leads to democratization, culture and congruence of society.

3.6 Cognitive interference

The famous double-slit experiment in physics is described by quantum probability. Its mental analogue demonstrates irrational behavior, the so-called disjunction effect. The famous example is: one will do A given event E occurs and will do A given event E does not occur, yet will not do A when the outcome of event E is unknown – which violates Savage's *Sure-Thing Principle* (Savage, 1954; Tversky & Shafir, 1992). Without feedback the possibilities remain open; the mind, ignorant about the implications of its decision, is in a quantum limbo. The phenomenon is analogous to quantum interference, which occurs during the double-slit experiments in physics. Information on the score collapses the wave function and liberates the mind from interference. Mental interference, which occurs *instantaneously* and without any conscious involvement, exaggerates or extinguishes (by adding or subtracting from the temporal wave form of the stimuli) personal emotional tendencies. Thus temporal interference produces temporal waves and bursts. Positive interference often leads to exaggerated interest, such as an investment bubble. However, over time, negative interference extinguishes enthusiasm and can even lead to avoidance. Therefore, in analogue to interference in quantum theory, the presumed context of the first judgment or decision interferes with subsequent judgments or decisions.

3.7 Quantum entanglement

Quantum mechanics considers events to be subspaces (or orthogonal projections on these subspaces) of a vector space. In quantum entanglement observation on one part of the system instantaneously affects the state in another part of the system, even if the respective systems are separated by space-like distances. Entanglement entails a common wave function, which cannot be decomposed into separate subsystems. The same phenomenon transpires in emotional

fermions over conceptual distance, i.e., over time. In word association experiments entanglement activates associative target words simultaneously, thus can be modeled by quantum theory (Busemeyer & Bruza, 2012; Pothos & Busemeyer, 2013). Word associations often defy logic (analogue to "spooky action at a distance") and there is a conceptual resistance to ambiguous situations (such as the Necker cube). The delayed choice quantum eraser, proposed by Scully and Druhl in 1982 and verified some years later, investigates the paradox of the photon's path to the detector. Changing the experimental apparatus while the photon is in mid-flight, the photon was able to modify its state between a wave and a particle (cf. Kim et al., 1999). Analogous to the above experiment, a cemented mental reality can be completely overturned by new information. With temporal fermions, the Bell nonlocality means that present comprehension is updated retroactively, as recognition miraculously expands understanding in time, pushing it into the past (to the time of the first experience) and the future. Discovering a secret expands comprehension over time, so childhood experiences can only be viewed later by the mind of the adult. The Bell nonlocality means that decoherence can be influenced from great spatial distances (for matter) or temporal expanses (i.e., for the mind). Ideas in the hidden corners of the mind can be activated and manipulated by quantum entanglement years or even decades later. In many ways the study of quantum phenomena in the mind is still an uncharted territory. Experimental designs are often difficult or impossible due to the conceptual insufficiencies in the understanding of the nature of consciousness.

4. Cosmologic evolution

The organic unity of cosmos

Like atoms in chemistry, prime numbers form indivisible and deterministic building blocks in number theory. The existence of prime structures in nature might be more general however. Material fermions and consciousness form the essential, fundamental and exclusive constituents of the universe. Originating at zero time, matter fermions use up space to produce temporal evolution, which culminates in the emergence of the mind. In turn, the mind originates at zero volume and interacts with time to build mental volume in mental fermions. Thus, the orthogonal elementary fermions (matter and mind) are the indivisible building blocks of the universe; forming predator-prey relationship, they embrace as yin and yang and determine each other's future and past.

White holes infuse a creative potential of cosmologic expansion throughout the cosmos and lead to the experience of expansion we call dark energy, which presses against the immediate proximity of black holes, forming excess gravity, called dark matter. Both the spatial and temporal fields are oriented between and bounded by the poles (Figures 1 and 2), but interaction fuels their low entropy states. With death interaction seizes up, eliminating the local vision and experience of consciousness. The fundamental connection between the mind, the material fermions and the universe lead to their energetic and structural similarity, coherence and unity. Moving between matter, mind and the universe the frequencies (energy levels) decrease, whereas increasing degrees of freedom manifest increasing complexity. The physical laws are limited to and characteristic of the universe, which cannot be divided and from which nothing can escape.

Awareness is associated with the highly organized neuronal assembly of the brain. However, unhindered awareness has been shown to exist during clinical death, when the EEG is flat and brain activity is absent (Borjigin et al., 2013; Parnia, 2014). Death halts brain activity and sensory interaction, allowing the mind to increase its entropy as it transverses the temporal field of the cosmos. People with negative attitude accumulate information and converge toward the black holes; those with positive attitude mind congregate along white holes. Black holes represent a mental world consumed by details, problems and obstacles; the proximity of white holes means an elimination of details, leading to mental expansion with unlimited possibilities. Since entropic changes occur over time, movement toward the black holes stretches time into infinity, whereas progression toward the white holes rewinds time to zero.

Conclusions

Material interaction forms a cosmologic evolution that culminates in the emergence of the intelligent mind. Material fermions, which situate along space, and the emotional mind, which aligns according to time, are necessary, inherent and organic energy building blocks of the universe. Matter fermions are directly regulated by the environment, whereas consciousness is integrated into the environment via the body. As the energy of photons betrays variations in spatial volume, emotions testify about mental change. A positive stimulus forms positive emotions by accumulating energy via low frequencies (negative temporal field curvature), whereas negative stimulus (positive temporal field curvature) involves the sense of temporal shortage due to detail oriented high frequencies, which parallels negative emotions. Emotions force actions that modify the neuronal connections (modulating mental energy). Fermions (matter and mind) are energy formations that accumulate information via interaction. Death ends biological life and sensory interaction, but the intelligent mind, as the essential ingredient of the cosmos, stretches into a temporal infinitum.

Via a journey through time energetic changes increase mental entropy that culminates at one of the poles of the cosmos. High entropy is the ability to predict the next element, which is satisfied by both maximal (black holes) and zero information (white holes) content. The high entropy fermion merges with the corresponding pole: the information saturated black holes or the energy rich white holes. This guarantees the global conservation of information. The two dimensional confinement of the black holes is dark, hot and non-moving. Everything feels unapproachable, difficult and heavy due to infinite information content. White holes are infinitely spacious, yet everything feels close, full of possibilities, youthful energy and light. White holes are the light itself. This way the individual mind becomes part of the cosmos, and actively participates in its evolution.

The Big Bang gives birth to material particles and evolution begets consciousness. The universe's energy and information states vary smoothly between the poles. However, conditions are fine-tuned for life (and consciousness) only within mild gravity, which fits our world. Significant changes of field curvature are energetically prohibited: it would first destroy life and later would destroy material structures as well. Evolution appears to be a random process, but over time it forms an arch that spans between the formation of material fermions and the emergence of intellect. The Pauli exclusion principle increases the differences in field curvature

(spatial or temporal) of the universe, creating its poles, which form its unapproachable boundaries. The microdimensions (both time and space) form a closed minimal surface through entanglement. The opposing dynamics of macro and microdimensions lead to self-regulation, which is a continuous fine-tuning of the physical parameters of the universe.

Intelligent life arises wherever the necessary minimal conditions for biological evolution are met. Intelligent occupants of the cosmos should be similar not only in the structure of their minds, but in the biological building blocks of life, and in their emotional sophistication as well. The hypothesis sets up an intuitive and organically connected worldview. The physical basis of consciousness opens a new dimension of understanding that can revolutionize the social sciences and technology as well as the healing of mental diseases. The realization that the mind is an inalienable part of the infinite universe, therefore itself is infinite, will increase social cohesion and goodwill. The human mind operates according to the same organizational principles, the same physical and mathematical laws, as the cosmos, which is the monotheistic God of worship. This tells me that there is some form of cosmic intelligence, which manifests in sophisticated self-regulation.

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