EPH - International Journal of Medical and Health Science
ISSN (Online): 2456-6063
Volume 03 Issue 02 June 2017

DOI:https://doi.org/10.53555/eijmhs.v4i3.39

SELF-CONTROLS BRAIN ACTIVITY BY INTERACTING WITH PREFRONTAL CORTEX: FMRI STUDY IN NORMALCY AND PSYCHIATRIC DISORDERS

Sung Jang Chung[1*]
[*1]*Morristown-Hamblen Healthcare System, Morristown, TN, USA Email: sung.chung@comcast.net*

[*]**Corresponding Address:-**
Email: sung.chung@comcast.net

Abstract:-
The relationship among self, mind and brain is not clearly known. Self's subjective experiences of perception and cognition of words, feelings, thoughts etc. is supported by the integrity of human brain. The relationship between the self and the human brain activity is not understood. Recent experimental evidence suggests that the neural correlate of consciousness is located in certain parts of the corticothalamic system. However, it is not known specifically which parts of the human brain are involved in the human cognitive activity. Functional magnetic resonance imaging (fMRI) has been used in the study of normalcy and psychiatric disorders. FMRI is applied in diagnosis and drug treatment of psychiatric disorders. In this study, the author analyzed results of published articles related to the above described fields to find the relationship among self, mind and body, and proposed the mechanism involved in the self, mind and brain in normalcy and psychiatric disorders.

Keywords: *Consciousness, fmri, Psychiatric Disorders, Depression, Confucian Philosophy, Jeong Yeok, Ultron-Logotron Theory, Theory of Everything.*

1. Introduction

The scientific relationship among self, mind and brain is not clearly known. “Self’s subjective experience of perception and cognition of words, feelings, thoughts etc. is supported by the integrity of the human brain.” The relationship between the self and the human brain is not understood. “Recent experimental evidence suggests that the neural correlate of consciousness is located in certain parts, cortical areas, layers or neuronal populations of the corticothalamic system. However, it is not known specifically which parts of the human brain are involved in the human cognitive activity” (Tononi, 2012; Tononi et al., 2016; Carter, 2014; Molina et al., 2017). Consequently, neuroscientists, psychologists, psychiatrists, medical scientists and philosophers have been investigating to find the scientific relationship between mind and brain, consciousness and quantum physics, and further among self, mind and brain.

1. 1. The Theory of Self, Mind and Body

The author (Chung 2012) published a theory regarding the scientific relationship among self, mind and body based on that a human individual, the self is composed of the inner true self (spirit) and the physical false self that would fade and disappear at death of the body. The inner self has free will, will power, cognition, reason, morality, conscience, creative power, mathematical computation, future plan and high goals, behavior control, emotion regulation, and memory retrieval, supervising the physical self/body that senses through sensory organ systems and responds to the external world. The inner true self is the independent and indestructible spirit in an individual. The physical self is dependent upon and associated with the brain and body, and is impulsive, behaving for pleasure-desire and instinct for living (Joseph, 2001). The inner self controls the physical self/body by interacting with the prefrontal cortex of human brain (Rilling and Insel, 1999). **T**he physical self has consciousness associated with the brain and stimuli coming from the external world. However, it lacks mind, and has no free will nor free choice. In contrast, the inner self has perception and cognition of stimuli coming from the external world and conscious mind with free will and free choice.

1. 2. Ultron-Logotron Theory (ULT)

Interactions between self and consciousness: mind and matter are not clearly understood in science. There seem to be, to my knowledge, no articles in the literature that clearly explain the relationship between self and consciousness: mind and matter, and further among self, mind and brain.In the author’s previous study, the relationship was investigated, and an attempt was made to explain it. The author reviewed modern quantum physics and the Eastern Confucian philosophy (Chung 2014b). On the basis of the review and authors’ personal experiences of valid precognitive dreams, the following theory was proposed (Chung, 2010, 2014a, 2014b, 2017a):

(1) The “ultrons” are the building blocks of matter of the universe. The”logotrons” are the building blocks of consciousness of human mind. The “logotrons” are virtual particles. The “ultrons” and “logotrons” interact each other with mental-force-carrying “mentalon” in neurons of human brain.

Mentalon exchanges between logotron and logotron or logotron of self’s consciousness and logotron of consciousness superpositioned to particles of matter.

(2) Quantum entanglement could be explained by mental-force-carrying mentalon that exchanges between two entangled virtual quantum logotrons in particles or logotron in conscious mind and logotron in particles of matter at quantum levels.

(3) There seem to be parallels between the “ultron”-“logotron” theory and quantum physics from the ontological prospective, and a close agreement between the “ultron”-“logotron” theory and the Penrose-Hameroff ‘s Orch-OR theory (Penrose and Hameroff, 2011) or the von Neumann-Heisenberg’s orthodox quantum mechanics (Stapp, 2011) that seem to be correct descriptions and applicable to both the inner self and the physical self/body of humanity, respectively on the basis of the human individual self that is composed of two selves, one, the inner self and one, the physical self.

The physical world, the consciousness world and the spiritual world of our universe coexist in superposition and represent the macro-cosmos of the Creator God. The superpositioned worlds, the macro-cosmos of the Creator of our universe, the Self, seem to be analogous to the physical body, the conscious mind and the inner spiritual self in superposition that represent the microcosmos of the co-creator, the self of the humanity. The spiritual world is invisible but real. The spiritual world and the human world would unite in the coming kingdom of heaven on Earth where goodness will be boundless according to Jeong Yeok, the Book of Right Change of Confucius philosophy (Kim, 1885; Yi, 1992; Chung 2010) as the Bible predicts it. Virtual particles are in essence virtual logotrons (information) that are the archetype of real particles. Annihilation and creation of ultrons (matter) are secondary to action of underlying virtual logotrons in the Cosmic Consciousness (mind). This seems to suggest that the ultron-logotron theory possibly leads to the Theory of Everything (ToE). The ultron-logotron-associated mental force, mentalon, is postulated to act on space in four different, undetermined ways, resulting in and generating four physical forces, gravitational force, electromagnetic force, and strong and weak nuclear forces.

The four physical forces could be four different manifestations of the ultron-logotron-associated mentalon that would result in four differently distorted or shaped space of undetermined patterns.

Table 1. Comparison of characteristic aspects of the "ultron"-"logotron" theory and quantum physics.

Characteristic aspects	The "ultron"-"logotron" theory	Quantum physics
Basic elementary particle	Yin- and yang-ultrons	Quarks and electrons
Form	A solid (-) and a broken (--) line	An open (~) and a closed (0) string
Movement	Join, movement, stillness, advance, retreat, expansion and contraction	Split, fission, break, pinch, join, spin and oscillation
Property	Triple: particle, wave and consciousness	Triple: particle, wave and conscious-ness
Energy	Yes	Yes
Force	Yes	Yes

Table 2. Comparison of postulated characteristic aspects of "ultrons" and "logotrons".

Characteristic aspects	Ultrons	Logotrons
Element of	Physical matter	Conscious mind
Nature	Physical	Conscious (spiritual)
Creation	Created by the Creator	Created by the Creator and co-creator
Property	Triple: particle, wave and consciousness	Triple: particle, wave and consciousness
State	Real and virtual	Virtual
Interaction between themselves	Graviton, electromagnetic force, weak and strong nuclear forces	Mental-force-carrying mentalon
(Speed of transmission)	(Maximum speed of light)	(Instant)

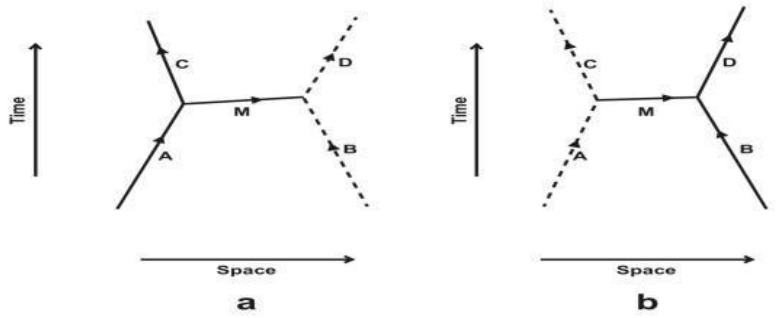

Fig. 1

1.3. Functional Magnetic Resonance Imaging (fMRI) Study in Neuroscience

Functional magnetic resonance imaging (fMRI) has been used to study brain activity induced by specific sensory stimulation, motor or cognitive performance (Wise and Tracey, 2006; Leppă et al., 2006). On the basis of review of findings and data reported in recent functional magnetic resonance imaging (fMRI) studies (Carter, 2014; Mason et el., 2009), the following conclusion is proposed from the prospective of the author's hypothesis of the ultron-logotron theory (ULT):

(1) The semantic map ('Words Atlas') in human cerebral cortex developed by Gallant and his coworkers (Huth et al., 2016) is inferred to provide an evidence of tree-pattern, four-dimensional images (architectures) of ultron- and logotron-complex in human cognitive comprehension of words.

(2) Any injury, infection, degeneration and abnormal excitement or suppression state of certain parts of cerebral regions (ROI or voxel) will result in clinical disorders such as aphasia, hearing loss, blindness, hallucination, amnesia, depression, bipolar disorder, Alzheimer's disease, coma and so on due to modulation of the matrix pattern of the brain activity, resulting in a modulated ultron-complex that is transmitted to and/or within the prefrontal cortex (PFC), and subsequently giving rise to an abnormal logotron-complex, generating abnormal perception and cognition of the self's conscious mind, and producing clinical disorders. Dissociation between the PFC and the "PRS" results in unconsciousness.

(3) Noxious stimuli are related to specific cerebral regions (ROIs, voxels) of human brain, giving rise to pain feeling.

(4) Analgesics modulate the pain-related voxels of brain, actually the tree-pattern ultron-complex, suppressing generation of matching pain-logotron-complex.

(5) Cognition of stimulus from the external world is dependent upon the processes as follows:

- A stimulus coming from the external world via the corresponding sense organ is transmitted through the peripheral nerve, the spinal cord and reach multiple regions of the prefrontal-rear system ('PRS'), the other brain areas prior to reaching the PFC.

- The stimulus information is then transmitted through the functional connections, FC (trunk) that is the neural path connecting the 'PRS' and PFC to the prefrontal cortex.
- The PFC receives the incoming stimulus information from the 'PRS'. The PFC seems to correspond to the root of the tree-pattern image. Any damage or distortion in any parts of the above processing of information would result in clinical diseases and disorders.

(6) Anesthetics suppress functional connections(FC) between the 'PRS' and the PFC, resulting in unconsciousness.
(7) Sleep state would possibly give rise to perception-related dreams associated with ultroncomplexes stored and/or activated in the 'PRS' (Carter, 2014; Benca et al, 2009).
(8) The inner self interacts with the PFC, and perceives and cognizes the incoming information with the matching logotron-complex.
(9) The conclusive findings in the functional magnetic resonance imaging studies seem to provide evidence for the ultron-logotron theory applicable to the relationship between mind and brain, consciousness and matter, and further dualistic existence of self and non-self in human individuals.
(10) There seems to be a considerable agreement and mutual support between the Ultron-Logotron Theory (ULT) and the Integrated Information Theory (IIT) of Tononi.

Further research would be needed for verification of the above described conclusion.

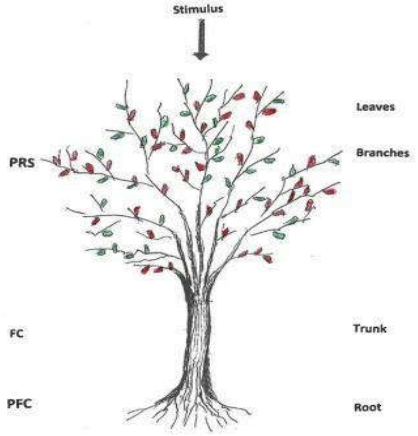

Fig. 2

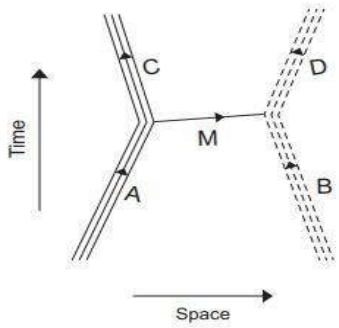

Fig. 3 1.4. fMRI Study in Psychiatric Disorder,

Depression fMRI has been used as a biomarker of psychiatric disorder, depression for diagnosis, assessment of treatment efficacy and response to specific drugs (Carter, 2014; Mason et al., 2009; Gur et al., 2009; Savitz and Drevets, 2009). Ironside and his coworkers (2016) reported that the prefrontal cortex (PFC) regulates amygdala response to threat in anxiety.

2. Materials and Methods

Salerian and Altar (2012) reported that the prefrontal cortex influences over subcortical and limbic regions, and antidepressant response by N/(M+R); where H represents cortical (prefrontal, orbitofrontal) influence, R represents subcortical (hippocampus, parahippocampal gyrus) influence and M represents limbic (amygdala) influence. The normalcy N, depression $N_{d,}$ and remission Nr are compared. $N_d < N$ in depression and $N_r = N$ in remission are found in comparison of reported results, respectively. Salerian (2012a, b) reported the sensitive dependence of mental function on the prefrontal cortex, and the neuroimaging evidence for the prefrontal cortex that governs normalcy and psychiatric illness. The results reported in the above articles are analyzed to find the relationship among self, mind and brain, and further to study the applicability of the author's hypothesis of the ultron-logotron theory (ULT) in normalcy and psychiatric disorders.

2.2. Methods

Findings and data reported in recent fMRI study in psychiatric depression are reviewed and reexamined from the prospective of the author's hypothesis of the tree-pattern image of brain activity indicated by BOLD (blood-oxygen-level-dependent) response (Chung, 2018) and the ultron-logotron theory (ULT). Reasoning, comparison, postulation, intuition and imagination are carried out to reasonably and possibly explain results and data reported in fMRI study of the normalcy and psychiatric depressive disorders.

3. Results

3. 1. Depression and Antidepressant

Salerian and Altar (2012) conducted "literature search from October -December 2011, using the National Institute of health PubMed database to identify peer-reviewed studies of adolescents and adults with major depressive disorder (MDD), for any year covered by the database. The following terms were used to define brain areas: frontal cortex, cortical, amygdala or limbic. These were searched for association with antidepressant, depression, anxiety, treatment efficacy, remission or response for specific drugs and drug classes used to treat depression, such as desipramine, deemethylimipramine or a selective norepinephrine uptake inhibitor. The studies used functional magnetic imaging (fMRI), including blood-oxygen-level-dependent (BOLD) fMRI and positron emission tomography (PET) imaging methodologies. They reviewed the evidence for relationships between metabolic activity of cortical, subcortical and limbic brain regions in depression and the efficacy of antidepressant agents". "These influences of regions can be described by an algebraic equation, $N = H/(M+R)$, where N represents a homeostatic level of executive function**,** H represents prefrontal (Brodmann areas, 9, 10, 11, 12, 46) and M represents cingulate activity and R represents limbic (amygdala) influences". They proposed a hypothesis on the basis of their findings indicated by fMRI and /or PET in the review of literature search that depressed prefrontal cortex and enhanced amygdala and hippocampus metabolism are cause of MDD, and that the remission from antidepressant treatments is the results of normalization of the above changes to restore the metabolism indicated by neuronal imaging in depression.In normal subjects, $N = H/(M+R)$, in depression, $N_d < N$, and in remission, $N_r = N$, respectively are found in the results of their review of treatment results.

The conclusive findings in their comprehensive review are as follows:

1. In depression, dorsolateral prefrontal and orbitofrontal cortices function decline and influence over PFC function by limbic and subcortical regions is heightened ($N_d < N$).

Diminished prefrontal activity and overactive subcortical and limbic regions in depression are associated with depression.

2. Antidepressant treatments normalize metabolic function indicated by fMRI or PFC and limbic and subcortical regions ($N_r = N$).

BOLD responses in fMRI are postulated to indicate the physicochemical metabolism in brain activity of voxels, including dopamine, norepinephrine, serotonin neurotransmitter, and further suggesting ultron-complexes in brain activity. In MDD, tree-pattern, four-dimensional ultron-complexes give rise to matching abnormal logotron-complexes in neurons of human brain. Antidepressant treatments restore the normal ultron-complexes and subsequently normal logotron-complexes in neurons brain activity, resulting in remission or recovery in depression. The self cognizes the normal or abnormal, psychiatric depression in conscious mind, interacting with the PFC.

3.2. Prefrontal Cortex (PFC) and Depression

Salerian (2012) reported results of review of articles related to fMRI studies in normalcy and psychiatric illness with suggestion that the sensitive dependence of mental function on the prefrontal cortex and that the prefrontal cortex governs normalcy and psychiatric illness. Neuroimaging and clinical evidence of diminished PFC influence in psychiatric disorders that include attention deficit disorder (ADD), generalized anxiety disorder (GAD), obsessive compulsive disorder (OCD), addictions, bipolar disorder,schizophrenia,psychosis,dementia, depression and chronic pain. Tables of the two Salerian's articles strongly suggest that the self, the inner true self of individual subjects controls the physical self/body by interacting with the PFC, and further that psychiatric-illness-related

ultron-complexes are dependent on transmission of information from the prefrontal rear system (PRS) to PFC in brain activity**,** indicating an importance of connectivity between the PRS and the PFC **(Figure 2).**

4. Discussion

Executive function of the PFC is diminished in depression and obsessive compulsive disorder. Executive function of the PFC improves in remission and complete recovery of depression with restoration of normal executive function of the PFC. A reciprocal relationship between metabolic activities of the PFC and the limbic brain is well established in human depression as shown in Table 1 of the article of Salerian and Altan (2012). The limbic regions include amygdala, hippocampus, para-hippocampal gyrus that are hyperactive in depression in fMRI study (Salerian and Altar, 2012; Savitz and Drevets, 2009; Carter, 2014). Normalcy and remission are associated with normal homeostasis (N) by the predominant influence of the PFC over subcortical and limbic functions (N_r = N). Depression and relapse are associated with diminished prefrontal metabolic activity, decline of executive function of the PFC and increased subcortical and limbic activity (N_d < N).BOLD responses in fMRI are considered to indicate the metabolism in voxels of human brain activity that include chemical processes of dopamine, norepinephrine, serotonin neurotransmitter, and further reflect the tree-pattern image of ultron complexes as correlates of brain activity.Antidepressants normalize adrenergic-dopaminergic and metabolic function to reinstate PFC dominance over limbic and subcortical regions (Salerian and Altar, 2012). Remission from depression normalizes hypofunctioning in frontal, prefrontal and orbitofrontal regions while it reduces activity in paralimbic, parietal-temporal regions including amygdala, hippocampus and parahippocampal gyrus. Any disruption of communication between PFC and other brain regions would represent diminished influence of PFC as prescribed in the author's recent article (Chung, 2018). There seems to be a remarkable agreement between Salerian's hypothesis and the author's hypothesis (Chung, 2018) regarding the function of the PFC in normalcy and psychiatric disorders. The tree-pattern, four-dimensional depression-related ultron-complexes give rise to matching logotron-complexes in neurons of human brain, resulting in depression. Antidepressant treatments restore the normal ultron-complexes and subsequent matching normal logotron- complexes, resulting in remission or recovery. Antidepressant treatments include drugs such as venlafaxine, ketamine, amphetamine, fluoxetine; direct current stimulation (DCS), electroconvulsive treatment (ECT), transcranial magnetic stimulation (TMS). The self, the true inner self cognizes the normalcy or abnormal, psychiatric disorders in conscious mind, interacting with the PFC.

5. Conclusion

On the basis of review of findings and data reported in recent functional magnetic resonance imaging studies in the psychiatric depressive disorder, the following conclusion is proposed from the author's hypothesis of the ultron-logotron theory (ULT) and the tree-pattern image of neural correlate of consciousness (Chung, 2018):

(1) The prefrontal cortex controls the brain activity in normalcy and psychiatric disorders. The self, the inner/super true self controls the physical self/body by interacting with the prefrontal cortex (PFC).

(2) A tree-pattern architecture of the cerebral neural substrate (**Figure 2**) is proposed in cognitive understanding of words, feelings, and thoughts on the basis of the author's hypothesis of the ultronlogotron theory to explain the neural correlate of consciousness.

Cognition of stimulus from the external world is dependent upon the three processes as follows:

- A stimulus coming from the external world via the corresponding sense organ is transmitted through the peripheral nerve, the spinal cord and reach multiple regions of the prefrontal-rear system ('PRS') (leaves and branches in **Figure 2**).
- The stimulus information is then transmitted through the functional connection, FC (trunk) that is the neural path connecting the 'PRS' and the PFC, to the prefrontal cortex.
- The PFC receives the incoming stimulus information from the 'PRS'. The PFC seems to correspond to the root of the tree-pattern image. Any damage or distortion in any parts of the above processing of information would result in clinical diseases and disorders. The inner self interacts with the PFC and perceives and cognizes the incoming information with the matching logotroncomplex.

Any injury, infection, degeneration and abnormal excitement or suppression state of certain parts of cerebral regions (ROIs or voxels) will result in clinical diseases and disorders such as aphasia, hearing loss, blindness, hallucination, amnesia, depression, bipolar disorder, Alzheimer's disease, coma and so on due to modulation of the matrix pattern of the brain activity, resulting in a modulated ultron-complex that is transmitted to and/or within the prefrontal cortex (PFC), and subsequently giving rise to an abnormal logotron-complex, generating abnormal perception and cognition of the self's conscious mind, and resulting in clinical diseases and disorders. Dissociation between the PFC and the PRS results in unconsciousness. The inner true self interacts with the PFC. The physical false self is associated with the PRS.

(3) The conclusive findings in this functional magnetic resonance imaging study and the author's previous study (Chung 2018) seem to provide evidence for the ultron-logotron theory applicable to the relationship between mind and brain, consciousness and matter, the relationship among self, mind and brain, and further dualistic existence of self and non-self in human individuals. The self is of inherent wisdom and power.

(4) A remarkable agreement is present between the conclusions proposed in the Salerian's articles and that of the author's study (current and 2018) regarding the mechanism involved in the PFC and other brain regions in normalcy and psychiatric disorders.

Further research would be needed for verification of the above described conclusion.

References

[1]. Benca, R. M.; Cerelli, c.; and Tononi, G. (2009). Basic science of sleep. In: B. J. Sadock, V A. Sadock and P. Ruiz (Eds.), Kaplan & Sadock's Comprehensive Textbook of Psychiatry (9th Ed.) (pp: 351-375). Philadelphia, PA: Lippincott Williams & Wilkins.

[2]. Carter, R. (2014). The Human Brain Book (2nd Ed.). London: DK. Chung, S. J. (1960). Studies on a mathematical relationship between stress and response in biological phenomena. *Journal of the National Academy of Sciences, Republic of Korea*, 2, 15-62.

[3]. Chung, S. J. (1995). Formulas expressing life expectancy, survival probabilityand death rate in life table at various ages in US adults. *International Journal of Biomedical Computing,* 39, 209-217.

[4]. Chung, S. J. (2007). Computer-assisted predictive formulas expressing survival probability and life expectancy in US adults, men and women, 2001. *Computer Methods and Programs in Biomedicine*, 86, 197-209. Chung, S. J. (2009). *Seeking a New World: A New Philosophy of Confucius and Kim Hang.* iUniverse, Bloomington, IN.

[5]. Chung, S. J. (2010). *The Book of Right Change, Jeong Yeok* 正易*: A New* Philosophy *of Asia*. iUniverse, Bloomingto, IN.

[6]. Chung, S. J. (2012). The science of self, mind and body. *Open Journal o Philosophy*, 2, 171-178. URL http://www.scirp.org/journal/ojpp

[7]. Chung, S. J. (2013). Mathematical relationship of "probacent"-probability Equation among exogenous stressor, stress and response in biological phenomena. *International Journal of Education and Research,* 1, 1-32.

[8]. Chung, S. J. (2014a). Self and consciousness: mind and matter. *International Journal of Education and Research*, 2, 1-28. URL http://www.ijern.com/journal/March-2014/35.pdf

[9]. Chung, S. J. (2014b). Parallels between Confucian philosophy and quantum physics. *Open Journal of Philosophy*, 4, 192-206. URL http://scirp.org/journal/ojpp

[10]. Chung, S. J. (2017a) Comparison of mathematical equations applicable to tolerance of total body irradiation in humans and decay of isotopes: differences and similarity. *Journal of Biomedical Science and Engineering*,10, 273-286. URL http://www.scirp.org/journal/jbise

[11]. Chung, S. J. (2017b). A review of the ultron-logotron theory: Consciousness and quantum physics.International Journal of Humanities and Social Science, 7, 15-32.

[12]. Chung, S. J. (2018). A review of the relationship among self, mind and brain in functional magnetic imaging study: Tree-pattern image of semantic map in human brain viewed from the ultron- logotron theory. Open Journal of Philosophy, 8, -

[13]. Gur, R. E. and Gur, R. C. (2009). Functional brain imaging in schizophrenia. In: B. J. Sadock, V. A.

[14]. Sadock and P. Ruiz (Eds.), Kaplan & Sadock's Comprehensive Textbook of Psychiatry (9th Ed.) (pp: 1507-1519).. Philadelphia, PA: Lippincot Williams Wilkins.

[15]. Huth, A. G.; de Heer, W. A.; Griffiths, T. L.; Theunissen, F. E.; Gallant, J. L. (2016). Natural speech reveals the semantic maps that tile the human cerebral cortex. Nature, 532, 453-468.

[16]. Ironside, M.; Browning,M.; Ansari, T. L.; Harvey, C. J.; Sekyi-Djan, M. N., et al. (2016). Prefrontal corex regulates amygdala response to threat in trait anxiety. Meeting of the Society of Biological Psychiatry, Atlanta, Georgia, USA, May 12th-14th, 2016.

[17]. Joseph, R. (2001). The limbic system and the soul: Evolution and the neuroanatomy of the religious experience. Zygon: The Journal of Religion and Science, 36, 105-136.

[18]. Kim, H. (1885). Jeong Yeok , 金恒, 正易, 정역. The original Chinese Text with the text translated in Korean by Jeong Ho Yi. Seoul, Korea: The Asian Culture Press, 1990.

[19]. Leppǎ, M., Korvenoja, A.; Carlson, S.; Timonen, P.; Martinkauppi, S. et al. (2006). Acute opioid effects on human brain as revealed by functional magnetic resonance imaging. NeuroImage, 31, 661-669.

[20]. Mason, G. F.; Krystal, J. H.; and Sanacora, G. (2009). Nuclear magnetic resonance imaging snd spectroscopy: basic principles and recent findings in neuropsychiatric disorders. In: B. J. Sadock,

[21]. V.A. Sadock and P. Ruiz (Eds.), Kapla & Sadock's Comprehensive Terxbook of Psychiatry (9th Ed.) (pp: 248-273). Philadelphia, PA: Lippincott Wlliams Wilkins.

[22]. Molina, J.; Amaro, E.; Sanches da Rocha, L. G.; Jorge, L.; Santos, F. H. and Len, C. A. (2017). Functional resonance magnetic imaging (fMRI) in adolescents with idiopathic musculoskeletal pain: a paradigm of experimental pain. Pediatric Rhematology, 15, 81-90.
[23]. Penrose, R. and Hameroff, S. (2011). Consciousness in the universe: Neuroscience, quantum Space- time geometry and Orch OR theory, In Consciousness and the Universe: Quantum Physics, Evolution, Brain and Mind. Cambridge, MA: Cosmology Science Publishers,
[24]. Rilling, J. K. & Insel, T. R. B. J. (1999). The primate neocortex in comparative perspective using magnetic resonance imaging. Journal of Human Evolution, 37, 191-223.
[25]. Salerian, A. J. and Altar, C. A. (2012a). The prefrontal cortex influence over subcortical and limbic regions governs antidepressant response by $N=H/(M+R)$. Psychiatry Research: Neuroimaging, 204, 1-12.
[26]. Salerian, A. J. (2012b). Sensitive dependence of mental function on prefrontal cortex. Journal of Psychology & Cliical Psychology, 2, 00053.
[27]. Salerian, A. J. (2012). Prefrontal cortex governs normalcy and psychiatric illness: Neuroimaging evidence. Journal of Psychology & Clinical Psychiatry, 3, 000125.
[28]. Savitz, L. B. and Drevets, W. C. (2009). Brain circuits in major depressive disorder and bipolar disorder. In: B. J. Sadock, V. A. Sadock and P. Ruiz (Eds.), Kaplan & Sadock's Comprehensive Textbook of Paychitry (9th Ed.), (pp. 1675-1686). Philadelphia, PA: Lippincott Williams Wilkins.
[29]. Stapp, H. (2011), Mindful universe. http://www.thedivineconspiracy.org/25256H.pdf .
[30]. Tononi, G. (2012). Integrated information theory of consciousness: an updated account. Archives Italiennes de Biologie, 150, 290-326.
[31]. Tononi, G.; Boley, M.; Marcello, M. and Koch, C. (2016). Integrated information theory: from consciousness to the physical substrate. Nature Review Neuroscience, 17, 450-461. https://www.researchgate.net/publication/3035551101
[32]. Wise, R. G. and Tracey, I. (2006). The role of fMRI in drug discovery. Journal of Magnetic Resonance Imaging, 23, 862-876.
[33]. Yi, J. H. (1992). The Third Yeok Hak, 第三의易學 (the author's note: Jeong Yeok as The Third Yeok) (text in Korean). Seoul, Korea: The Asian Culture Press.

Caption of Figure 1.

Figure 1. Feynman's spacetime diagram of interactions between "ultron" and "logotron".

a: A – Real ultron in the excited state in the neuron of the prefrontal cortex caused by incoming stimulus. C – Real ultron in the ground state after collapse of the quantum wave function when the self-controls (observes). B – Virtual logotron in the ground state in the neuron of the prefrontal cortex. D – Virtual logotron in the excited state when the self observes and cognizes. M – mentalforce-carrying "mentalon" exchanging between ultron and logotron.

b: A – Virtual logotron in the excited state in the self's conscious mind in the neuron of the prefrontal cortex. C – Virtual logotron in the ground state after exchanging mentalon between the logotron and ultron in the neuron. B – Real ultron in the ground state in the neuron of the prefrontal cortex. D – Real ultron in the excited state in the neuron after exchanging mentalon between logotron and ultron. M – mentalon. (see text).

Caption of Figure 2.

Figure 2. Tree-pattern image of ultron- and logotron-complex in human brain. Leaves represent cell bodies of neurons, branches dendrites and axons of neurons, and the trunk neural connections (functional connections, FC) between the prefrontal cortex (PFC) and the other brain areas (the author names the areas 'the prefrontal-rear system, PRS'), respectively. The root represents the prefrontal cortex (PFC). (see text).

Caption of Figure 3.

Figure 3. Feynman's space-time diagram of ultron- and logotron-complex in human brain. Each solid and dashed line represents ultron- and logotron unit, respectively. A – Real Ultron-complex in the excited state in the neurons of the prefrontal cortex caused by incoming stimulus. C − Real ultron-complex in the ground state after collapse of the quantum wave function when the self-controls (observes). B − Virtual logotron-complex in the ground state in the neurons of the prefrontal cortex. D − Virtual logotron-complex in the excited state when the self observes and cognizes. M − mental-force-carrying 'mentalon' exchanging between ultron- and logotroncomplex.