Fundamental Particles of Yin- and Yang-Ultrons and Yin-Yang Neutrinos

in the Substructure of Leptons and Quarks

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Abstract
The deeper structure of leptons and quarks is still not experimentally and/or objectively clearly elucidated. No detailed accepted theory is yet established. Consequently, experimental and theoretical physicists have been investigating to find experimental or objective proofs related to the deeper structure of fundamental elementary particles in quantum physics. The author proposed a hypothesis of the “ultron”- “logotron” theory that might explain relationships between self and consciousness: mind and matter on the basis of his review of modern quantum physics and his personal experience of valid precognitive dreams, and further published an article that describes considerable parallels between Confucian philosophy and quantum physics from the ontological prospective. Ultrons are the building blocks of matter of the universe. Logotrons are the building blocks of conscious mind. The author published possible deeper structures of leptons and quarks: yin-and yang-ultron with mass of 0.16 eV, electric charge of – and +1.602176565x10\(^{-19}\) coulomb/ (3.19x10\(^{6}\) – 2k). Fermilab discovered the 4\(^{th}\) neutrino, possibly a new fundamental particle, sterile neutrino. In this study, the author reviewed reported articles related to sterile neutrinos and electron split to find possible new fundamental elementary particles in the substructure of leptons and quarks. On the basis of the review results and the author’s hypothesis of the ultron-logotron theory, the author proposed the yin- and yang-ultron, and yin-yang neutrino as the new fundamental particles that are the building blocks of matter of the universe.

Keywords: Leptons, Quarks, Neutrinos, Sterile Neutrinos, Standard Model, Ultron-Logotron Theory, Confucian Philosophy, Jeong Yeok, Theory of Everything, Probacent Model..

1. Introduction

The deeper structure of leptons and quarks are still not experimentally or objectively clearly elucidated. According to David Tong (2009), theoretical physicist at the University of Cambridge, “there is no experimental
evidence that string theory is the correct description of our world”. No detailed accepted theory is yet established (Caesar, 2014). Consequently, experimental and theoretical physicists have been investigating to find experimental and/or objective proofs related to the deeper structure of fundamental elementary particles in quantum physics. The author published a theory of the science of self, mind and body that was developed in the study of a mathematical “probacent” model (Chung, 2012). The self controls brain activity by interacting with the prefrontal cortex (Chung, 2018a, 2018b). On the basis of the theory of the science of self, mind and body (Chung, 2012) and Confucian philosophy, the author proposed a hypothesis of the ultron-logotron theory (Chung, 2014a, 2014b).

1.1. Ultron-Logotron Theory

1.1.1. “Ultron”

In Confucian philosophy, all things are created by power of the Creator, the Non-Ultimate, the Great Ultimate. The Great Ultimate created Two Forms, Yin and Yang, the two primary fundamental elementary particles that are represented by a solid line (—) and a broken line (- -). The author names Yin and Yang “yin-ultron” (U–), and “yang-ultron” (U+), respectively. All things of the universe are generated by movements of “ultrons” (Capra, 1999; Kim, 1885; Yi, 1992; Chung, 2009, 2010, 2015, 2017a, 2018a, 2018b).

Table 1 shows comparison of characteristic aspects of the ultron-logotron theory and quantum physics. Basic elementary particles, ultrons, would be analogous to strings of string theory. The ultrons are the building blocks of matter of the physical world. The yang- and yin-ultrons are positively and negatively charged, respectively.
Table 1. Comparison of characteristic aspects of the “ultron”-“logotron” theory and quantum physics.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>The &quot;ultron&quot;-&quot;logotron&quot;</th>
<th>Quantum physics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic elementary particle</strong></td>
<td>Yin- and yang-ultrons</td>
<td>Quarks and electrons</td>
</tr>
<tr>
<td><strong>Form</strong></td>
<td>A solid (-) and a broken (- -) line</td>
<td>An open (~) and a closed (0) string</td>
</tr>
<tr>
<td><strong>Movement</strong></td>
<td>Join, movement, stillness, advance, retreat, expansion and contraction</td>
<td>Split, fission, break, pinch, join, spin and oscillation</td>
</tr>
<tr>
<td><strong>Property</strong></td>
<td>Triple: particle, wave and consciousness</td>
<td>Triple: particle, wave and consciousness</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Force</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

If external force comes to a region of space, the regional space will be excited and pulsate, and then a hidden virtual pair of particle-antiparticle emerges in it, causing material actualization of real particle and antiparticle, creating matter.

The author infers that when a matter and antimatter collide and disappear, becoming virtual matter and antimatter, consciousness in the excited state superpositioning to each of the pair will disappear and become a virtual consciousness in the ground state. If the above is true, then it would
imply that particles of matter would have a triple property of particle, wave and consciousness (Bohm, 2006).

If a mental force is presumably created by the self, it will strike the regional space that could excite virtual consciousness in the ground state to become consciousness in the excited state, creating conscious mind (Chung, 2009). Mind and matter are interrelated and interconnected (Capra, 1999; Chung, 2009, 2012, 2015, 2018a, 2018b).

1. 1. 2. “Logotron”

Table 2 shows comparison of characteristic aspects of “ultrons” and “logotrons”. The author names “information” that is described by David Bohm in his quantum theory “logotron”. Logotrons in the study represent contents of consciousness of mind in humans such as thoughts, feelings, colors, sounds, concepts of all things of the universe that may be expressed by words (Greek: logos).

Logotrons are virtual particles, massless and have probably a triple property of particle, wave and consciousness, and have possessing inherent force, and having a property of spreading in space as well as remaining at an original, regional point in the holographic space. The wave propagation, if emitted from the logotron is postulated instantaneous in the non-local holographic space.
Table 2. Comparison of postulated characteristic aspects of "ultrons" and "logotrons".

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

The empty space is postulated to be not void but filled with invisible and intangible energy and force, virtual ultrons and logotrons (virtual matter and consciousness).

### 1.1.3. Interactions between Ultron and Logotron

Figure 1 illustrates Feynman’s space-time diagram of interactions between ultron and logotron. Mental-force-carrying “mentalon” exchanges between ultron and logotron, creating resonance-like effects, and perhaps exchanges between logotrons as graviton exchanges between ultrons of matter. The conscious mind of the inner self of an individual person has power to generate mentalon as well as logotrons with free will and free choice. Mentalon is virtual force like graviton; it has two states: the ground and excited states. The author infers that the quantum states result from the incoming neural stimulus in the neurons of human brain, then OR occurs (the quantum
wave function collapses) when the physical self and the inner self have conscious perception through quantum computations in the microtubule automata (Penrose & Hameroff, 2011). In the quantum state of the prefrontal cortex of human brain, the quantum wave function collapses when the inner self who is an observer and does conscious cognitive action with free will and free choice, and with attention, efforts, thoughts and planning in the inner self’s mind; then logotrons in the excited state are generated from the ground state, generating conscious cognition in the inner self’s consciousness (Fig. 1a) ((Stapp, 1999; 2013; Kafatos, Tanzi & Chopra, 2011; Schwartz et al., 2005; Ochsner et al., 2002). The self (the true inner self) has power in the conscious mind to choose logotron in the excited state from its ground state, changing the quantum state of the logotron with free will, free choice, attention and intention, guiding actions (Stapp, 1999; Chung, 2012). Ultrons in the excited state are generated by mentalon originated from the inner self’s conscious mind (Fig. 1b) (Schwartz et al. 2005; Ochsner et al. 2002). Figure 1b illustrates processes at the interface between mind/consciousness and brain. Existence of mentalons can be empirically recognized by their effects in the external world resulting from interactions between mind and matter in the PFC of human brain. In this matter-mind process, mentalons participate in generation of conscious mind (Fig. 1a) and vice versa (Fig. 1b). M line shows its origin on the left side with an apparent slightly upward right direction but is actually horizontal and parallel to the space axis, indicating instantaneous speed in space-time (Fig. 1a and 1b) (Penrose, Hameroff & Kak, 2011).
**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 – mental-force-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).

The author reviewed modern quantum physics and the Eastern Confucian philosophy. On the basis of the review and authors’ personal experiences of valid precognitive dreams, the following theory is proposed (Chung, 2014a, 2014b):

(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) There seem to be parallels between the “ultron”-“logotron” theory and quantum physics from the ontological perspective, 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, 1999, 2013) 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 composed of two selves, one, the inner self and one, the physical self.

1. 2. Possible Deeper Structure of Leptons and Quarks

Findings and discoveries in modern quantum physics and theoretical physics regarding fundamental elementary particles are reviewed. The following hypothesis related to possible deeper structures of leptons and light quarks, and some properties of ultrons are proposed on the
basis of reported data in particle physics and the author’s hypothesis of the “ultan”-“logotron”

(1) A neutrino (√) is composed of an equal number of yin-ultron (U⁻) and yang-ultron (U⁺), and is
assumed to be composed of a yin-ultron and a yang-ultron.

(2) Yin- and yang- ultron mass is 0.16 eV.

(3) Electric charge of yin-ultron, U⁻ and yang-ultron, U⁺:

Electric charge of yin-ultron = -1.602176565x10⁻¹⁹ C/(3.19x10⁶ – 2k)

Electric charge of yang-ultron = 1.602176565x10⁻¹⁹ C/(3.19x10⁶ – 2k)

C denotes coulomb and k a number of neutrinos in a lepton.

(4) Ultron size is close to and less than Planck length of 1.616199 x 10⁻³⁵ m.

(5) A possible total number (N) of ultrons in the deeper structure of leptons and light quarks are
as follows:

Neutrino N = 2

Electron N = 3.19 x 10⁶

Positron N = 3.19 x 10⁶

Up quark N = 14.37 x 10⁶

Down quark N = 30 x 10⁶

Strange quark N = 593.75 x 10⁶
Lehman and Persinger (2015) described in their article that the author (Chung, 2015, 2017b) integrated aspects of quantum physics with Confucian philosophy.

1. 3. Electron Split in a New Form of Matter

It has been recently discovered that electron split into two separate parts: a spinon carrying its spin (a neutral magnet behaving as a tiny compass needle) and an orbiton carrying its electrical motion (negative electrical charge) around the nucleus (Palus, 2017; Piazza, 2014; Schlappa et al., 2012).

1. 4. Sterile Neutrinos

Fermilab, Illinois conducted the MiniBooNE experiments that shot a beam of neutrinos into a spherical container filled with 818 tons of mineral oil. The neutrinos interacted with the carbon atoms in the oil. Those interactions produced a particular signal, suggesting evidence for a new fundamental particle, a sterile neutrino (Palca, 2018; Wikipedia, 2018).

2. Materials and Methods

2. 1. Materials

The researchers at Paul Scherrer Institute (PSI), Switzerland (Schlappa et al. 2012) reported that an electron has been observed to decay into two separate parts, each carrying a particular property of the electron: a spinon carrying its spin (the property making the electron behave as a tiny compass needle), and an orbiton carrying its orbital motion (which arises from the electron’s motion around the nucleus) (Hill, 2012; Abada, 2014).

The MiniBooNE experiment at Fermi National Laboratory has detected a particular type than ordinary active neutrinos, a new elementary particle, “a sterile neutrino” (an inactive neutrino).
This finding would finally break the Standard Model of particle physics (Abada et al, 2014; Boyanovsky, 2014; Wikipedia, 2018; Hand, 2010; Conover, 2018).

The results reported in the above articles are analyzed to find new fundamental particles in particle physics, and further to examine the applicability of the author’s hypothesis of the ultron-logotron theory (ULT).

2. 2. Methods

Findings and data reported in recent researches of particle physics are reviewed and reexamined from the prorspective of the ultron-logotron theory (ULT) (Chung, 2015, 2017a). Reasoning, comparison, intuition, deduction and imagination are carried out to reasonably and possibly explain the results, findings and data reported in the relevant articles.

3. Results

It has been recently discovered that electrons split into two separate parts: a spinon carrying its spin (a neutral magnet behaving as a tiny compass needle) and an orbiton carrying its electron motion (negative electrical charge) around the nucleus (Palus, 2017; Piazza, 2014; Paul Scherrer Institute, 2012). The spinon and orbiton seem to correspond to the neutral part of yin- and yang-ultrons composite and the negative part of yin-ultron predicted in the ultron-logotron theory, respectively (Chung, 2015, 2017a, 2017b). Equations (1) and (1UL) express the above findings and prediction. Yin- and yang-ultrons in a spinon are postulated to line up in a tiny series magnet arrangement with a south and a north pole in one direction that can generate spin (Chung, 2015, 2017a, 2017b; Shee, 2017). The substructure of electron suggests that positrons are likewise composed of two separable particles: the magnetic, neutral yin-and yang-ultrons composite and the positive part of yang-ultron.
The researchers of PSI reported that X-rays split the electron into a spinon and an orbiton, two new particles from the carbon atom in SrCuO$_3$ (Hill, 2012).

Fermilab conducted a new study, using a large tank of mineral oil lined with sensitive light detectors, MiniBooNE to look for small flashes of light produced in electron neutrino antineutrino interactions with atomic nuclei inside of the oil. The researchers observed 2,437 interactions, about 460 more than predicted. The excess potentially hints at the existence of a new type of sterile neutrino particle. Experimental data revealed the three ordinary neutrinos plus the 4th sterile neutrino. Sterile neutrinos have been proposed as a possible candidate for what makes up dark matter of the universe (Conover, 2018; Hand, 2010). The author postulates that sterile neutrinos are composed of yin- and yang-ultron composites (the author names them “yin-yang neutrinos”) as the fundamental elemental particles in quarks and leptons.

Abada and his coworkers (2014) reported observable sterile neutrinos in leptonic and semileptonic (mesonic) decays.

Data on sterile neutrino mass ($m_s$) are reported in relevant articles as follows:

(1) Possible range of $m_s$: less than one eV to $10^{15}$ GeV (Drewes, 2015).

8 MeV to 390 MeV (Kusenko et al., 2005).

160 MeV to 1 GeV (Gronau, 1983).

200 MeV to 1.25 GeV (Aguilar-Arevalo (2018)).

Postulated range of sterile neutrino mass ($m_s$) on the basis of data on the range of quark mass,

2.2 MeV ($m_u$) to 173.1 GeV ($m_b$):

(2) the range of sterile mass ($m_s$): 2.2 MeV to 173.1 GeV (Wikipedia, 2018).
Postulated sterile neutrino mass \( (m_s) \) on the basis of meson mass:

(3) the range of sterile mass \( (m_s) \): 140 MeV to 500 MeV (Boyanovsky, 2014).

135.0 MeV to 11.0 GeV (Olive et al., 2014).

Possible sterile neutrino mass \( (m_s) \) on the basis of lepton mass \( (m_e) \), 0.51 MeV:

(4) The sterile mass: 0.51 MeV (NIST, 2010).

Possible sterile neutrino mass \( (m_s) \) on the basis of electron neutrino mass \( (m_{\nu}) \), 0.32 eV:

(5) The sterile mass: 0.32 eV (Planck Collaboration, 2014).

(6) The above reported ranges of sterile neutrino mass suggest the probable range of sterile neutrino mass \( (m_s) \) is 2.2 MeV to 173.1 GeV.

(7) On the basis of the above data (1) to (6), the author postulates the range of the yin-yang neutrino and sterile neutrino to be 0.32 eV to 173.1 GeV.

The following equations (1) – (7) describe decay processes of leptons, mesons and quarks reported in the articles of particle physics (Abada, 2014; Boyanovsky, 2014; Aguilar-Arevalo, 2018; Drewes, 2015; Wikipedia, 2018; Morfin, 2012; Best, 2015; Cook, 2012; Wilkinson, 2017; Wikipedia, 2017; Shee, 2017; Chung, 2015, 2017b).

A. Electron decay

\[
e^{-} \rightarrow \text{spinon} + \text{orbiton} \quad (1)
\]

\[
\text{a neutral} \quad \text{a negative}
\]

\[
\text{magnetic} \quad \text{electrical}
\]

\[
\text{particle} \quad \text{particle}
\]

\[
e^{-} \rightarrow \Sigma \, U^+ U^- \quad + \quad \Sigma \, U^-
\quad (1UL)
\]
where $U^- = \text{yin-ultron}$ and $U^+ = \text{yang-ultron}$. $\Sigma$ represents yin- and yang-ultron composites.

B. Muon decay

\begin{align*}
\mu^- & \rightarrow e^- + \text{anti-}\nu_e + \nu_\mu \hspace{1cm} (2) \\
\mu^+ & \rightarrow e^+ + \nu_e + \text{anti-}\nu_\mu \hspace{1cm} (3)
\end{align*}

anti-muon anti-neutrino muon neutrino

muon neutrino anti-muon neutrino

\begin{align*}
\mu^- & \rightarrow [\Sigma U^+ U^- + \Sigma U^-] + \text{anti-}U^+ U^- + \Sigma U^+ U^- \hspace{1cm} (4UL) \\
\mu^+ & \rightarrow [\Sigma U^+ U^- + \Sigma U^+] + U^+ U^- + \Sigma \text{anti-}U^+ U^- \hspace{1cm} (4UL)
\end{align*}

C. Strange and up quark decay

\begin{align*}
s & \rightarrow u + e^- + \text{anti-}\nu_e \hspace{1cm} (5) \\
\text{strange} & \quad \text{up quark} & \quad \text{anti-electron neutrino}
\end{align*}

quark

\begin{align*}
s & \rightarrow u + \Sigma U^+ U^- + \Sigma U^- + \text{anti-}U^+ U^- \hspace{1cm} (5UL) \\
u & \rightarrow d + e^+ + \nu_e \hspace{1cm} (6) \\
\text{down quark} & \quad \text{positron} & \quad \text{electron neutrino}
\end{align*}

\begin{align*}
u & \rightarrow d + [\Sigma U^+ U^- + \Sigma U^+] + U^+ U^- \hspace{1cm} (6UL)
\end{align*}

D. Meson decay
\[ [b + d] \rightarrow [s + d] + \mu^+ + \mu^- \rightarrow [s + d] + e^+ + e^- + \nu_e + \bar{\nu}_e + \nu_\mu \]  
\text{(7)}

**B meson K meson muon anti-muon**

\[ \rightarrow [s + d] + [\Sigma U^+U^- + \Sigma U^+] + [\Sigma U^+U^- + \Sigma U^-] + U^+U^- + \text{anti-U}^+U^- \]  
\text{(7UL)}

where b=bottom quark, s=strange quark, and d=down quark.

**E. Baryon decay**

\[ \nu + P^+ \rightarrow N^0 + e^+ \]  
\text{(8)}

\[ \nu + N^0 \rightarrow P^+ + e^- \]  
\text{(9)}

Energy (>1.8 MeV) + P^+ \rightarrow N^0 + e^+ + \nu_e \quad \text{(10)}

\[ \nu + P^+ \rightarrow N^0 + [\Sigma U^+U^- + \Sigma U^+] \]  
\text{(8UL)}

\[ \nu + N^0 \rightarrow P^+ + [\Sigma U^+U^- + \Sigma U^-] \]  
\text{(9UL)}

Energy (>1.8 MeV) + P^+ \rightarrow N^0 + [\Sigma U^+U^- + \Sigma U^+] + U^+U^- \quad \text{(10UL)}

The above experimental results in decay of leptons, quarks, mesons and baryons shown in

**Equations (1) – (10)** and the **equations (1UL) - (10UL)** predicted on the basis of the ultron-logotron theory are very suggestive of evidence that yin- and yang-ultrons are building blocks of leptons and quarks in their substructures. In the decays of protons or neutrons, expressed by

**Equations (8), (9)** and **(10)**, electron e^- or positron e^+ originates from yin-ultrons or yang-ultrons in the quarks inside nuclei of the proton or the neutron. The mass of heavy sterile neutrinos and the light (active) neutrinos as well as the yin-yang neutrinos would be within the range between
0.32 eV and 173.1 GeV, agreeing with the author's postulated range (7) of 0.32 eV to 173.1 GeV above described.

Juan Collar and his team of the University of Chicago recently published the world's smallest portable neutrino detector that is 100 times more sensitive than previous technology. "New discoveries could be in stores as the detector now checks other features of neutrinos, including their electromagnetic properties." The ultron-logotron theory reasonably predicts that a neutrino is made of a yin- and yang-ultron composite.

Superstring theory is a theory unifying bosons (force-carrying particles) and fermions (leptons and quarks), indicating mutual transformation, fermion to boson; boson to fermion.

\[
\text{fermion} \rightleftharpoons \text{boson}
\]

\[
^{14}\text{C} \rightarrow ^{14}\text{N} + e^- + \sqrt{37}
\]

\[
\sqrt{37}\text{Cl} \rightleftharpoons ^{37}\text{Ar} + e^-
\]

(11)

(12)

The above experimental results in beta and inverse beta reactions expressed by Equations (8) - (12) are suggestive of evidence of yet unknown, more fundamental building blocks as their common building blocks of particles in their deeper structure of leptons and quarks, and probably further that the common building blocks might be the ultrons proposed in the ultron-logotron theory. Neutrinos are inferred to be composed of yin- and yang-ultron composites (Morfin, 2012; Best, 2015). Sterile neutrinos are postulated to originate from leptons and quarks, and to be actually composed of yin-yang composite, “yin-yang neutrinos”.

In string theory, the extremely small size of Planck length is expected to be close to the string length (Louis et al, 2007). The ultron length is postulated to be close to and/or less than the Planck length (Riordan, 1986).
In the ultron-logotron theory, a point-like region of space has infinite depth as suggested by the author’s “mononary” system of mathematics (Chung, 2015) that seems to be analogous to compactification in string theory that allows extra dimensions (5, 10, 11 to 26 dimensions) (Louis et al., 2007).

The ultron is postulated to move and oscillate in various ways like the string does in string theory and would give rise to different quantum states. Logotrons are also postulated to exist in superposition to ultrons.

Logotrons are virtual particles in Cosmic Consciousness world that is inferred to be timeless and nonlocal, and dimensionless or of zero dimension to infinite dimension as suggested by the author’s “mononary” system of mathematics (Chung, 2015). Extra dimensions, 5, 10-dimension of superstring theory, and 11-dimension of M-theory seem to be possibly understandable. Virtual particles of matter in quantum physics seem to be essentially virtual logotron particles. Virtual particles cannot be observed directly, only when a physical particle is formed that we can observe indirectly. Photons of electromagnetic wave are observed by detecting with physical devices. However, graviton or gluon of virtual, force-carrying particles is observable only through their effect in the physical world. Logotrons are also similarly cognized through their effects.

For the strong nuclear force, gluons clump together into tubes when linking quarks to quarks or to anti-quarks. For the weak nuclear force, photons spherically surround electrons, forming a spherically symmetric shell and responsible for nuclear decay (Best, 2015).

Different quantum states and movements (oscillation) of the ultron-logotron composites with mentalon give rise to different physical forces, electromagnetism, weak and strong nuclear forces and gravitational force with maximum speed of light of transmission in the physical world, and
mental force with instantaneous speed of transmission in the consciousness world. In string theory, different modes of string oscillation give rise to different physical forces (Best, 2015).

All particles of the universe mutually exchange physical force and mental force particles and respond in various degrees. In this respect, everything of Nature is interrelated and interconnected (Lehman and Persinger, 2015; Capra, 1999; Chung, 2014a, 2014b, 2015).

Four virtual physical forces of Nature, electromagnetic force, weak and strong nuclear forces and gravitational force are postulated to be different manifestations of mental-force carrying “mentalon” particles associated with ultron-logotrons in superposition from the prospective of the hypothesis of the ultron-logotron theory (Chung, 2014a, 2014b, 2015). Logotrons are inferred to be the archetype of ultrons (real particles of matter) and the source of forces. The ultron-logotron theory might lead to the Theory of Everything (ToE).

The relationship between yin-ultron and yang-ultron is not like electron and positron, i.e. matter and antimatter. The relationship among yin-ultron, yang-ultron and neutrino seem to be analogous to that among electron, proton and neutron. When yin- and yang-ultrons meet, there would be no annihilation but a birth of a yin-yang neutrino (composite). When high-energy electron and positron collide, they annihilate and produce pure high energy that can give birth to other particles and antiparticles such as muons, mesons or quarks with subsequent hadronization. According to quantum field theory, all particles can be transmuted into other particles, and they can be created from energy and can vanish into energy (Riordan, 1986; Capra, 1999, Best, 2015).

\[
e^- + e^+ \rightarrow \gamma \rightarrow \text{hadrons}
\]

\[
e^- + e^+ \rightarrow q + \text{anti-q} \rightarrow \text{hadrons}
\]
The results of high-energy electron-positron collision and neutrino scattering experiments at SLAC, SPEAR, HEPL, NAL, PETRA, Fermilab, CERN, DESY, etc. suggest existence of elementary particles, possibly yin- and yang-ultrons in the deeper structure of leptons and quarks. The existence of quark is known but quarks are never directly observed or found in isolation; they can be found only within hadrons (Best, 2015; Riordan, 1986; Cabbibo & Gatto, 1961; Kaye, 1983). It is inferred that ultrons and neutrinos are arrayed in specific, geometrical features in the deeper structure of leptons and quarks.

4. Discussion.

David Gross, Nobel Laureate in Physics, describes in his Theory of Everything that “the electron is not a fundamental, point-like particle. It must have a structure to provide its dipole magnetic field. There must be orbital motion of charges within the electron….”. “The most collapsed form of matter is the neutrino, which has a vanishing small mass. However, the neutrino must contain all of the charges required to form two particles – a particle and its anti-particle (a weak electric dipole).” “The same model applies to the proton and the neutron. This model satisfies Einstein’s view that there must be some lower level of structure in matter to cause resonant quantum effects” (Gross, 2006). There seems to be an agreement among the recent findings in electrons, The Theory of Everything of Gross and the ultron-logotron theory.

The substructure of electron suggests that a quark in a proton is likewise composed of two separable particles, a magnetic particle of yin- and yang-ultrons composite and an electrical particle of yin- or yang-ultrons, further that a proton made of three quarks would have its spin potentially from the quark spins and its electrical charge of the sum of the quark electrical charges.
Both LSND (Liquid Scintillator Neutrino Detector) at Los Alamos National Laboratory and MiniBooNE at Fermilab carefully counted how many neutrinos of each type strike the detector. Both experiments involve firing beams of neutrinos behind an insulator to block out all other radiation. Both experiments have now reported more neutrino detections than The Standard Model’s description of neutrino oscillation can explain. That suggests that the neutrinos are oscillating into hidden heavier “sterile” neutrinos that the detector can’t directly detect before oscillating back into the detectable realms. MiniBooNE and LSND combined represent a 6.1-sigma result (meaning more than one in-500 million odds of being a fluke) (LiveScience, 2018).

“Sterile neutrinos may be responsible for a number of unexplained phenomena in physical cosmology and astrophysics, including dark matter, baryogenesis, leptogenesis and dark radiation”, and further for “a possible decay of heavy sterile neutrino into light (active) neutrinos” (Drewes, 2015; Wikipedia, 2018).

“Neutrinos are the only matter particles in the Standard Model of particle physics that have only observed with left handed chirality to date. If right handed neutrinos exist, they could be responsible for several phenomena that have no explanation within the Standard Model, including neutrino oscillation, the baryon asymmetry of the universe, the dark matter and dark radiation” (Drewes, 2015).

5. Conclusion

On the basis of review of findings in recent researches in the field of fundamental particles of particle physics, the author attempted to find new fundamental particles in the substructure of leptons and quarks. The following conclusion is proposed from the author’s hypothesis of the ultron-logotron theory:
1. Yin- and yang-ultron are the fundamental particles in the substructure of leptons and quarks, and the building blocks of matter of the universe.

2. Yin- and yang-ultron and yin-yang neutrino would be a new family of physical particles beyond the Standard Model.

3. Dark matter is postulated to be the yin-yang-neutrinos. Sterile neutrinos originate from leptons and quarks; they are actually composed of yin-yang neutrinos.

4. Yin- and yang-ultrons, and yin-yang neutrinos are involved in leptogenesis and baryogenesis as well as in lepton decay and baryon decay.

5. The results of this study seem to provide evidence for the Ultron-Logotron Theory (ULT).

Further research would be needed for verification of the conclusion.

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