

# Proceedings of the Introduction to Neutrosophic Physics: Unmatter & Unparticle International Conference

Florentin Smarandache  
*editor*

## *UNMATTER Combinations.*

*Let's note by  $q = \text{quark} \in \{\text{Up}, \text{Down}, \text{Top}, \text{Bottom}, \text{Strange}, \text{Charm}\}$ ,  
and by  $a = \text{antiquark} \in \{\text{Up}^\wedge, \text{Down}^\wedge, \text{Top}^\wedge, \text{Bottom}^\wedge, \text{Strange}^\wedge, \text{Charm}^\wedge\}$ .*

*Hence, for combinations of  $n$  quarks and antiquarks,  $n \geq 2$ ,  
prevailing the colorless, we have the following unmatter  
possibilities:*

- if  $n = 2$ , we have:  $qa$  (biquark – for example the mesons and antimessons);*
  - if  $n = 3$ , we have  $qqq, aaa$  (triquark – for example the baryons and antibaryons);*
    - if  $n = 4$ , we have  $qqaa$  (tetraquark);*
    - if  $n = 5$ , we have  $qqqqa, aaaaq$  (pentaquark);*
    - if  $n = 6$ , we have  $qqqaaa, qqqqq, aaaaaa$  (hexaquark);*
    - if  $n = 7$ , we have  $qqqqqaa, qqaaaaa$  (septiquark);*
    - if  $n = 8$ , we have  $qqqqaaaa, qqqqqaa, qqaaaaa$  (octoquark);*
    - if  $n = 9$ , we have  $qqqqqqqq, qqqqqaaa, qqaaaaaa, aaaaaaaaa$  (nonaquark);*
    - if  $n = 10$ , we have  $qqqqqaaaa, qqqqqqqaa, qqaaaaaaaa$  (decaquark);*
- etc.*

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**The American Mathematical Society International Conference  
Introduction to Neutrosophic Physics: Unmatter & Unparticle  
University of New Mexico, Mathematics & Sciences Department  
Gallup, New Mexico, USA, December 2-4, 2011**

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**Proceedings of the**  
***Introduction to Neutrosophic Physics: Unmatter & Unparticle***  
**International Conference**

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## Neutrosophic Physics – as a new research field

(Preface)

**International Conference:** *Introduction to Neutrosophic Physics: Unmatter & Unparticle*, The University of New Mexico, Mathematics & Sciences Department, 200 College Rd., Gallup, New Mexico, USA, December 2—4, 2011

The **American Mathematical Society**'s initial announcement website [http://www.ams.org/meetings/calendar/2011\\_dec2-4\\_gallup.html](http://www.ams.org/meetings/calendar/2011_dec2-4_gallup.html) was archived at <http://www.ams.org/notices/201108/rtx110801170p.pdf> :

### **December 2011**

*2–4 Introduction to Neutrosophic Physics: Unmatter & Unparticle, The University of New Mexico, Mathematics & Sciences Department, 200 College Rd., Gallup, New Mexico. (Mar. 2011, p. 497)*

**Description:** *This idea of unparticle was first considered by F. Smarandache in 2004, 2005 and 2006, when he uploaded a paper on CERN web site and he published three papers about what he called 'unmatter', which is a new form of matter formed by matter and antimatter that bind together. In 2006 E. Goldfain introduced the concept of "fractional number of field quanta" and he conjectured that these exotic phases of matter may emerge in the near or deep ultraviolet sector of quantum field theory. H. Georgi proposed the theory of unparticle physics in 2007 that conjectures matter that cannot be explained in terms of particles using the Standard Model of particle physics, because its components are scale invariant. Fragments from Wikipedia Papers on current trends in High Energy Physics about exotic matter, about connections between unmatter and unparticle, about Neutrosophic Logic as new research in Theoretical Physics, should be sent to the organizer preferably by email.*

**Information:** <http://www.gallup.unm.edu/~smarandache/unmatter.htm>

For information on **Neutrosophics** see: <http://fs.gallup.unm.edu/neutrosophy.htm>

**Month:** December 2011

**Date:** December 2-4

**Name:** *Introduction to Neutrosophic Physics: Unmatter & Unparticle*

**Location:** The University of New Mexico, Mathematics & Sciences Department, 200 College Rd., Gallup, New Mexico, USA

### **Neutrosophic Physics.**

Let  $\langle A \rangle$  be a physical entity (i.e. concept, notion, object, space, field, idea, law, property, state, attribute, theorem, theory, etc.),  $\langle \text{anti}A \rangle$  be the opposite of  $\langle A \rangle$ , and  $\langle \text{neut}A \rangle$  be their neutral (i.e. neither  $\langle A \rangle$  nor  $\langle \text{anti}A \rangle$  but in between).

Neutrosophic Physics is a mixture of two or three of these entities  $\langle A \rangle$ ,  $\langle \text{anti}A \rangle$ , and  $\langle \text{neut}A \rangle$  that hold together.

Therefore, we can have neutrosophic fields, and neutrosophic objects, neutrosophic states, etc.

Neutrosophic Physics is an extension of Paradoxist Physics, since **Paradoxist Physics** is a combination of physical contradictories  $\langle A \rangle$  and  $\langle \text{anti}A \rangle$  only that hold together, without referring to their neutrality  $\langle \text{neut}A \rangle$ .

Paradoxist Physics describes collections of objects or states that are individually characterized by contradictory properties, or are characterized neither by a property nor by the opposite of that property, or are composed of contradictory sub-elements. Such objects or states are called *paradoxist entities*.

### **Applications.**

There are many cases in the scientific (and also in humanistic) fields that two or three of these items  $\langle A \rangle$ ,  $\langle \text{anti}A \rangle$ , and  $\langle \text{neut}A \rangle$  simultaneously coexist.

Several **examples** of paradoxist and neutrosophic entities:

- anions in two spatial dimensions are arbitrary spin particles that are neither bosons (integer spin) nor fermions (half integer spin);
- among possible Dark Matter candidates there may be exotic particles that are neither Dirac nor Majorana fermions;
- mercury (Hg) is a state that is neither liquid nor solid under normal conditions at room temperature;
- non-magnetic materials are neither ferromagnetic nor anti-ferromagnetic;
- quark gluon plasma (QGP) is a phase formed by quasi-free quarks and gluons that behaves neither like a conventional plasma nor as an ordinary liquid;
- unmatter, which is formed by matter and antimatter that bind together (Smarandache, 2004);
- neutral kaon, which is a pion & anti-pion composite (Santilli, 1978) and thus a form of unmatter;
- neutrosophic methods in General Relativity (Rabounski-Smarandache-Borissova, 2005);
- neutrosophic cosmological model (Rabounski-Borissova, 2011);
- neutrosophic gravitation (Rabounski);
- qubit and generally quantum superposition of states;
- neutrino-photon doublet (Goldfain);
- semiconductors are neither conductors nor isolators;
- semi-transparent optical components are neither opaque nor perfectly transparent to light;

- quantum states are metastable (neither perfectly stable, nor unstable);

Etc.

Etymologically, **neutro-sophy** [French *neutre* < Latin *neuter*, neutral, and Greek *sophia*, skill/wisdom] means knowledge of neutral thought. It started in 1995.

Neutrosophic Physics is derived from Neutrosophic Logic, Neutrosophic Set, Neutrosophic Probability and Neutrosophic Statistics.

The goal of this research is to find out any pattern that might be common to all neutrosophic entities: we mean specific physical laws or physical theories that can describe all neutrosophic entities.

Papers on current trends in High Energy Physics about exotic matter, about connections between unmatter and unparticle, about Neutrosophic Physics (about physical entities that have contradictory properties, or have neither a property nor the opposite of that property) as new research in Theoretical Physics, should be sent to the organizer preferably by email.

It is an electronic conference and there is no fee for submitting your papers. Each author receives 5 free copies of the published Proceedings on paper. The book will be also put online. The publication is non-profit. Deadline: December 1st, 2011.

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Telesio - Galilei Academy News, Florentin Smarandache. Electronic Conference and Call for Papers on Neutrosophic Physics, As a new research field, Tuesday 1st November 2011, [http://www.telesio-galilei.com/tg/images/stories/documents/Academy\\_News/neutrosophic%20physics%20conference.pdf](http://www.telesio-galilei.com/tg/images/stories/documents/Academy_News/neutrosophic%20physics%20conference.pdf)

### **Proceedings of the Neutrosophic Physics International Conference.**

The editor would like to thank Dmitri Rabounski and Ervin Goldfain for their support in reviewing and selecting the papers in this Proceedings.

We have included papers by Larissa Borissova, Dmitri Rabounski, Indranu Suhendro, Florentin Smarandache, Thomas R. Love, and Ervin Goldfain. And Comments on Neutrosophic Physics by Dmitri Rabounski, Thomas R. Love, Ervin Goldfain, Diego Lucio Rapoport (Argentina), Armando Assis (Brasil), and Russell Bagdoo (Canada).

### **Comments on Neutrosophic Physics.**

Dmitri Rabounski:

*Neutrosophic Relativity:* Here it is neutrosophic physics, in concern to the space signature. The regular signature of space (space-time) is (+---), or (-+++), that is the same. This means the one-dimensional time and three-dimensional space. There are, however, other models having 2x2 splitting of space-time. That is such a model would have two-dimensional time and two-dimensional space. In the high dimensional models, 3x3 space-time was considered where 1x3 space-time is a particular case of it. An observer who is located in a 1x3 space-time will be unsure about the 3-dimensional durations. As a result he will register "fairy tales" coming due to the 3-dimensional time whose two dimensions are hidden from him. Thus, those two-dimensional durations will be equally true and false to him.

*Neutrosophic Cosmology:* We consider two models of the universe, "A" and "anti-A" which differ from each other by the opposite flow of time. They are therefore mirrored to each other. They have a common hypersurface where the observer cannot recognize whatever the universe is true, while the observer of each of these universes recognizes his own universe true. There are many other examples of "neutrosophic cosmologies". We will consider them in our main thesis. Also, we will prepare one or two short theses, as the extractions from our old publications in PiP, connected to paradoxist physics.

*Neutrosophic gravitation:* There are two universes which have a common region of space. One universe possesses forces of attraction (Newtonian gravitation), while the other universe possesses forces of repulsion (non-Newtonian gravitation).

Thomas R. Love's papers describe neutral kaons as a composite of negative pions and positive pions.

Ervin Goldfain:

In the paper I sent you the main idea is that the "multiplet" of elementary particles is a kind of neutrosophic field with two or more values. Probably that this notion of "neutrosophic field" can be generalized to operators whose action is selective. Neutrosophic field's effect is somehow equivalent to tunneling (tunnel's effect) from the solid physics, or with the so-called spontaneous symmetry breaking (SSB) where there exist an internal symmetry which is broken by a particular selection of the vacuum state.

*Qubits* are also representative.

In Quantum Field Theory the observables (i.e. the physicals that can be measured in the laboratory) are represented by operators. For example, the Hamiltonian of a quantum oscillator determines the energy and it can be expressed as a function of creation and annihilation of oscillation quanta. The operators act in the space of quantum states. A possible definition would hence be: quantum states = neutrosophic objects, and operators = neutrosophic fields.



*Classical electrodynamics in vacuum* is a neutrosophic entity consisting of orthogonal electric and magnetic fields ( $\vec{E} \cdot \vec{B} = 0$ ). Orthogonality of the two vectors may be interpreted as generator of “opposite” properties.

*Supersymmetry* (SUSY) postulates that *bosons* (particles of zero or integral spin) and *fermions* (particles of half-integer spin) can be grouped in the same doublet and that there is a *supercharge operator*  $Q$  that turns fermions into bosons and viceversa.

Ervin Goldfain looks at the neutrosophy in high-energy physics, and he constructs a *neutrino-photon doublet* [symmetry] where the two components behave as dual entities.

Diego Lucio Rapoport:

You recognize that the Mendeleev table has a Klein bottle structure still mappable to a double torus covering, atoms are duplicated as they are in either "side" of it, which is globally, a single side.

One could follow the usual historic take, and interpret one of the versions as being matter atoms and the other as antimatter but globally any one transforms into the other version, so in this respect, ALL ATOMS are unmatter. Thus, through a projective geometry associated to the periodic table, for the universe at large, we have only unmatter. After all, what is interpreted as antimatter in all particle accelerators' chamber traces, is actually going towards the future, just like us!!

Armando Assis:

I published a proof for the Max Born postulate of the Quantum Mechanics within a *many-worlds context* via a zero-sum game between nature and observer, so that the Born rule and the collapse of the wave function emerge from the minimax or maxmin theorem (von Neumann), the Nash equilibrium within this context. I think this work may open seminal ideas that may be further investigated under Smarandache's logic within a variety of fields of research.

Heuristically, the process of decision uses two elements of the abstract utility set encapsulating *disjoint properties*, and these properties turn out to be non-exclusives in the sense the observer will construct a goodness upon both these primarily disjoint utilities. Furthermore, I would like to suggest the work of the Nobel laureates in economics, Daniel Kahneman and Amos Tversky, on prospect theory, to your eventual interest on the human behavior and the connection to paroxysm in decision-making situations, which may led to fruitful results in another important areas of research, from computation to analysis of

risk in economy. I used the counter-example given by the Tversky and Kahneman results, these results being recognized in virtue of the Nobel Prize on these very same results, to show the utilities in game theory are not aprioristically probabilistic objects. This is a cornerstone characteristic that led to my proof of the Born rule.

See my paper: Assis, A. (2011), *On the nature of a\*kak and the emergence of the Born rule*. *Annalen der Physik*, 523: 883–897. doi: 10.1002/andp.201100062.

Russell Bagdoo:

*La physique recèle de contradictions* : continu-discontinu ; quanta et relativité qui ont fait chacun leur preuve et qui se contredisent totalement ; onde et corpuscule ; l'électron est onde et corpuscule ; la radiation est onde et corpuscule ; l'électron est ici et ailleurs ; électrons qui se

déplacent engendrent un champ électrique, ceux qui tournent autour d'un noyau n'ont pas de champ électrique.

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# Neutrosophic Cosmologies

Larissa Borissova and Dmitri Rabounski

February 12, 2012

## Abstract

The past, the present, and the future of the observable Universe are considered as positive, neutral, and negative neutrosophic manifolds. Positive and negative manifolds are two four-dimensional pseudo-Riemannian spaces with opposite flows of observable time, corresponding to the past and the future states of the observable Universe, while the neutral manifold corresponds to the present state. The future and the past states are described by the Schwarzschild and de Sitter spaces filled with ideal incompressible liquid and physical vacuum in the state of inflation. The present state is described by the zero-space where observable time stops. This zero-space, being the surface of an inflation collapsar (the de Sitter bubble), divides the future and the past, and is simultaneously the mirror reflecting the virtual future into the virtual past. The surface of the de Sitter bubble (horizon of events) is inside the gravitational collapsar, the mass of which equals the mass of the liquid filling the future space (the Schwarzschild bubble). The redshift inside the de Sitter bubble is explained by the non-Newtonian gravitational force of repulsion, and the value of this redshift increases infinitely near the horizon of events.

## 1 Problem statement

The aim of this paper is to study the transition of the future space into the past space. The past and future spaces are considered as two manifolds oriented in time in opposite directions (positive and negative). The present space located between these manifolds is considered as a *neutral state*. This task is solved within the framework of General Relativity, in terms of physically observable values (chronometric invariants). The space of the past is described by the four-dimensional pseudo-Riemannian space (space-time) where the observable time  $\tau$  is directed from the past to the future — the direct (*positive*) flow of time. It is signified by the elementary interval  $d\tau > 0$ . The space of the future is described by the space-time where the observable time  $\tau$  flows in the opposite direction (*negative*) — from the future to the past, and  $d\tau < 0$ . Spaces with opposite flow of time are called “mirror spaces” [1]. The present space is a momentary state for which  $d\tau = 0$ . The present is an intermediate state between the states of the past and the future. The statement of this problem is linked immediately with the neutrosophic system of Florentin Smarandache [2]: we consider here spaces of the past and of the future as positive and negative manifolds, and the present space — as a neutral manifold, following the neutrosophy of Smarandache [3].

These studies are applied to cosmology. Two static cosmological models of the Universe are suggested here. The first model is the *Schwarzschild bubble* — a regular sphere of ideal incompressible liquid. The space-time of this sphere is described by the metric of the form [4]

$$ds^2 = \frac{1}{4} \left( 3\sqrt{1 - \frac{\varkappa\rho b^2}{3}} - \sqrt{1 - \frac{\varkappa\rho r^2}{3}} \right)^2 c^2 dt^2 - \frac{dr^2}{1 - \frac{\varkappa\rho r^2}{3}} - r^2(d\theta^2 + \sin^2\theta d\varphi^2), \quad (1)$$

where  $\varkappa = \frac{8\pi G}{c^2}$  is Einstein’s gravitational constant,  $G$  is Newton’s gravitational constant,  $c$  is the light velocity,  $\rho$  is a constant density of the liquid,  $b$  is the radius of the sphere.

This solution of Einstein's field equation allows two singularities:

- 1) Collapse of the space ( $g_{00} = 0$ );
- 2) Breaking of the space ( $g_{11} \rightarrow \infty$ ).

This is a generalization of the metric obtained by K. Schwarzschild [5], where he introduced the limiting condition that the obtained solution must not allow singularities, i.e. it must only be regular.

The second cosmological model is the *de Sitter bubble* describing a sphere filled with a medium of a special kind — the  $\lambda$ -vacuum. This is a homogeneous isotropic medium of positive constant density  $\rho$  and negative constant pressure  $p = -\rho c^2$ , i.e. this medium is in a *state of inflation*. The metric of the de Sitter bubble has the form [6]

$$-ds^2 = \frac{1}{4} \left( 1 - \frac{r^2}{a^2} \right) c^2 dt^2 - \frac{dr^2}{1 - \frac{r^2}{a^2}} - r^2 (d\theta^2 + \sin^2 \theta d\varphi^2), \quad (2)$$

where  $a$  is the ultimate distance from the observer (*horizon of events*).

It was shown [6], the metric (1) turns into the metric (2) by the condition

$$\frac{\varkappa \rho b^2}{3} = 1, \quad b^2 = a^2 = \frac{3}{\lambda}, \quad (3)$$

where  $\lambda > 0$  is the cosmological constant.

The space inside such a sphere is described by the particular de Sitter metric, while the incompressible liquid therein reaches the properties of the  $\lambda$ -field (*physical vacuum*). The energy-momentum tensor has the form [6]

$$T_{\alpha\beta} = \rho g_{\alpha\beta}, \quad \rho = \frac{\lambda}{\varkappa}, \quad p = -\rho c^2. \quad (4)$$

The present problems are linked with the following objectives: to study in detail the conditions of transformation of the liquid bubble into the vacuum bubble and to discern just which of the two bubbles is more suitable to be applied as a model of the observable Universe. This problem will be solved by the mathematical methods of the theory of physically observable values — chronometrically invariant values (chr.-inv.) [7, 8]. All measurements are realized by a *real observer* who can move only with a sub-light velocity or be at rest relative to a chosen reference system. A. Zelmanov constructed the respective theory of chronometric invariants just for the observer being at rest relative to the space of reference [7, 8].

The observable characteristics of the Schwarzschild and de Sitter bubbles are calculated in Section 2. It is obtained there that both bubbles have positive constant three-dimensional curvatures, and the vector of gravitational-inertial force  $F_i$  has opposite signs:  $F_i$  is a force of attraction inside the Schwarzschild bubble, and a force of repulsion inside the de Sitter bubble. The signs of the pressure inside these bubbles coincide completely with the signs of the corresponding gravitational-inertial force.

The transformation of the Schwarzschild bubble into the de Sitter bubble is studied in detail in Section 3. It is shown that this transformation is realized by the condition that the observable time inside these bubbles flows in opposite directions. Spaces with opposite directions of time are studied in detail in [1]. The space where time flows from the future to the past (negative direction) is a mirror image of the space with positive direction of time (from the past to the future). It is determined that the direction of the observable time is linked immediately with the signs of the observable projection of the Riemann-Christoffel tensor onto time and the gravitational-inertial force. Spaces with opposite flow of time are divided by the surface of stopped time as the surface of the inflation collapsar.

The problem as to which one of the two bubbles can be used as a cosmological model is considered in Section 4. This choice is founded on results of astronomical observation of the spectra of distant objects. As known, astronomers have obtained that the lines of spectra of distant cosmic objects are displaced to lower frequencies (indicating a redshift). Therefore such

a bubble must be used as a cosmological model, where a redshift takes a place. In order to solve this problem, we use equations of null geodesic lines written in terms of physically observable values [7]. We obtain the exact solutions of these equations both for the Schwarzschild bubble and for the de Sitter bubble. It follows from these solutions that a blueshift occurs inside the Schwarzschild bubble and a redshift inside the de Sitter bubble. Moreover, calculated values of frequencies increase infinitely for objects located near the surface of the de Sitter bubble. As such, this bubble alone can be applied as a stationary cosmological model. Thus the de Sitter bubble is the space of the past, the Schwarzschild bubble is the space of the future, and the surface of the inflation collapsar is the region of transformation of the future into the past through the state of the present. The surface of the inflation collapsar, being the maximal distance from a real observer, is considered here as the horizon of events. Thus future events of the Universe form at this very horizon of events.

Conditions of transformation of the future into the past are studied in Section 5. The de Sitter and the Schwarzschild bubbles are considered as two opposite manifolds: the positive de Sitter bubble and the negative Schwarzschild bubble divided by the neutral manifold — the horizon of events. Because the observable time inside these bubbles flows in opposite directions, they are each a mirror reflection with for one another. Therefore the neutral manifold is a mirror dividing these bubbles. Particles located here and beyond the mirror have opposite signs. The problem of interaction between massless particles having opposite signs is considered in this section. Two types of interaction between photons with positive and negative cyclic frequencies are obtained. Depending on the values of the initial frequencies of the photons after interaction:

- 1) If these photons propagate to the past or to the future while omitting the present, they are not the observable objects;
- 2) If they transform into zero-particles at present, only afterwards do they transform into the observable photons.

Both types of interaction take place by the condition  $a = \frac{2r_g}{3\pi}$  where  $r_g = \frac{2GM}{c^2}$  is the Hilbert radius,  $M$  is the mass which is equal to the mass of the incompressible liquid filling the Schwarzschild bubble. As  $a < r_g$ , the inflation collapsar is situated inside the gravitational collapsar of mass-point  $M$ .

## 2 Physical and geometric properties of the liquid and vacuum bubbles

A real observer moves along a four-dimensional trajectory, the interval  $ds$  of which is real:  $ds^2 > 0$ . The four-dimensional velocity of this observer is a unit vector tangent to the world lines  $x^\alpha$  (a monad):

$$b^\alpha = \frac{dx^\alpha}{ds}, \quad \alpha = 0, 1, 2, 3, \quad g_{\alpha\beta} b^\alpha b^\beta = 1, \quad (5)$$

where the index 0 denotes time coordinate  $x^0 = ct$ , and the indices 1, 2, 3 are linked with spatial coordinates  $x^i$ .

If the observer is at rest relative to the reference frame, then we have the space sections  $x^i = const$ . This condition determines the totality of the lines of time  $x^0$  characterizing the reference frame which accompanies the observer. It follows from (5) that the components of the monad vector in this case have the form

$$b^i = 0, \quad b^0 = \frac{1}{\sqrt{g_{00}}}. \quad (6)$$

The four-dimensional interval (the square of four-dimensional elementary vector  $dx^\alpha$ ) has the form in terms of the chr.-inv. formalism [7, 8]:

$$ds^2 = c^2 d\tau^2 - d\sigma^2, \quad d\tau = \left(1 - \frac{w}{c^2}\right) dt - \frac{1}{c^2} v_i dx^i, \quad d\sigma^2 = h_{ik} dx^i dx^k, \quad (7)$$

where  $d\tau$  is the elementary interval of the observable time,  $d\sigma$  is the interval of the observable three-space,  $h_{ik} = -g_{ik} + \frac{v_i v_k}{c^2}$  is the fundamental chr.-inv. spatial metric tensor,  $w = c^2 (1 - \sqrt{g_{00}})$  is the three-dimensional gravitational potential,  $v_i = -\frac{cg_{0i}}{\sqrt{g_{00}}}$  is the three-dimensional vector of the angular velocity of rotation of space relative to time.

The observable space (reference space) has three chr.-inv. characteristics:

- 1) The vector of gravitational-inertial force

$$F_i = \frac{c^2}{c^2 - w} \left( \frac{\partial w}{\partial x^i} - \frac{\partial v_i}{\partial t} \right), \quad (8)$$

- 2) The tensor of angular velocity of space rotation

$$A_{ik} = \frac{1}{2} \left( \frac{\partial v_k}{\partial x^i} - \frac{\partial v_i}{\partial x_k} \right) - \frac{1}{2c^2} (F_i v_k - F_k v_i), \quad (9)$$

- 3) The tensor of the rate of deformation

$$D_{ik} = \frac{1}{2} \frac{* \partial h_{ik}}{\partial t}, \quad \frac{* \partial}{\partial t} = \frac{1}{\sqrt{g_{00}}} \frac{\partial}{\partial t}, \quad (10)$$

where  $\frac{* \partial}{\partial t}$  is the chr.-inv. operator of differentiation along time.

The tensor  $A_{ik}$  is called also the “tensor of non-holonomy”, because the condition  $A_{ik} \neq 0$  means that the reference space is not orthogonal to the lines of time. The condition  $A_{ik} = 0$  is the necessary and sufficient condition that  $g_{0i} = 0$  for all components, for which the reference space is orthogonal to the lines of time, and the reference space is holonomic [7, 8].

The geometric properties of the reference space are described by the chr.-inv. three-dimensional tensor of spatial curvature  $C_{iklj}$  possessing all the algebraic properties of the four-dimensional Riemann tensor  $R_{\alpha\beta\gamma\delta}$ :

$$C_{iklj} = H_{iklj} - \frac{1}{c^2} (2A_{ki} D_{jl} + A_{ij} D_{kl} + A_{jk} D_{il} + A_{kl} D_{ij} + A_{li} D_{jk}), \quad (11)$$

where  $H_{iklj}$  is the chr.-inv. tensor analogous to the Schouten tensor of non-holonomic manifolds. It does not possess the exact algebraic properties of the Riemann tensor [7, 8].

The tensor  $H_{iklj}^{\dots j}$  has the form

$$H_{lki}^{\dots j} = \frac{* \partial \Delta_{il}^j}{\partial x^k} - \frac{* \partial \Delta_{kl}^j}{\partial x^i} + \Delta_{il}^m \Delta_{km}^j - \Delta_{kl}^m \Delta_{im}^j, \quad (12)$$

where  $\Delta_{ik}^m = h^{mn} \Delta_{ik,n}$  represents the chr.-inv. symbols of Christoffel of the second kind, while  $\Delta_{ik,n}$  represents the chr.-inv. Christoffel symbols of the first kind:

$$\Delta_{ik,n} = \frac{1}{2} \left( \frac{* \partial h_{in}}{\partial x^n} + \frac{* \partial h_{kn}}{\partial x^i} - \frac{* \partial h_{ik}}{\partial x^n} \right), \quad (13)$$

where  $\frac{* \partial}{\partial x^i}$  is the chr.-inv. operator of differentiation along the spatial coordinate

$$\frac{* \partial}{\partial x^i} = \frac{\partial}{\partial x^i} - \frac{v_i}{c^2} \frac{* \partial}{\partial t}. \quad (14)$$

Let us now calculate the main physical and geometric characteristics of both bubbles described by the metrics (1) and (2). These metrics are stationary, therefore their spaces of reference do not deform:  $D_{ik} = 0$ . Because all  $v_i = 0$  for both metrics, then these spaces of reference do not rotate:  $A_{ik} = 0$ .

For the vector  $F_i$  (8) we find, respectively:

1) The Schwarzschild (liquid) bubble

$$\left. \begin{aligned} F_1 &= -\frac{\varkappa\rho c^2}{3} \frac{r}{\left(3\sqrt{1-\frac{\varkappa\rho b^2}{3}} - \sqrt{1-\frac{\varkappa\rho r^2}{3}}\right) \sqrt{1-\frac{\varkappa\rho r^2}{3}}}, & F_2 = F_3 = 0 \\ F^1 &= -\frac{\varkappa\rho c^2}{3} \frac{r\sqrt{1-\frac{\varkappa\rho r^2}{3}}}{\left(3\sqrt{1-\frac{\varkappa\rho b^2}{3}} - \sqrt{1-\frac{\varkappa\rho r^2}{3}}\right)}, & F^2 = F^3 = 0 \end{aligned} \right\}; \quad (15)$$

2) The de Sitter (vacuum) bubble

$$F_1 = \frac{c^2 r}{a^2 - r^2}, \quad F^1 = \frac{c^2 r}{a^2}. \quad (16)$$

Since the inertial term  $\frac{\partial v_i}{\partial t} = 0$  for both bubbles, the force  $F_i$  is a purely gravitational one. It is easy to see that this gravitational force has opposite signs: a)  $F_1 < 0$  inside the Schwarzschild bubble, because it is the *force of attraction*; b)  $F_1 > 0$  inside the de Sitter bubble, because it is the *force of repulsion*, or the force of *anti-gravitation*.

The pressure inside these bubbles also bears opposite signs:

1) The Schwarzschild bubble [4]

$$p = \rho c^2 \frac{\sqrt{1-\frac{\varkappa\rho r^2}{3}} - \sqrt{1-\frac{\varkappa\rho b^2}{3}}}{3\sqrt{1-\frac{\varkappa\rho b^2}{3}} - \sqrt{1-\frac{\varkappa\rho r^2}{3}}} > 0; \quad (17)$$

2) The de Sitter bubble [6]

$$p = -\rho c^2 < 0. \quad (18)$$

Thus, the signs of the pressure coincide completely with the signs of the gravitational field for both bubbles.

Let us immediately study the geometry of the reference spaces of both bubbles. The non-zero components of the chr.-inv. three-dimensional tensor of curvature  $C_{iklj}$  are:

1) The Schwarzschild bubble [4]

$$C_{1212} = \frac{C_{1313}}{\sin^2 \theta} = \frac{\varkappa\rho}{3} \frac{1}{1-\frac{\varkappa\rho r^2}{3}}, \quad C_{2323} = \frac{r^4 \sin^2 \theta}{a^2}; \quad (19)$$

2) The de Sitter bubble [6]

$$C_{1212} = \frac{C_{1313}}{\sin^2 \theta} = \frac{r^2}{a^2 - r^2}, \quad C_{2323} = \frac{r^4 \sin^2 \theta}{a^2}. \quad (20)$$

Calculating the components  $C_{ik} = h^{jm} C_{ijkm}$  and  $C = h^{ik} C_{ik}$  for both bubbles we obtain, respectively:

1) The Schwarzschild bubble [4]

$$C_{11} = \frac{2\varkappa\rho}{3}, \quad C_{22} = \frac{C_{33}}{\sin^2 \theta} = \frac{2\varkappa\rho r^2}{3}, \quad C = 2\varkappa\rho > 0; \quad (21)$$

2) The de Sitter bubble [6]

$$C_{11} = \frac{2}{a^2 - r^2}, \quad C_{22} = \frac{C_{33}}{\sin^2 \theta} = \frac{2r^2}{a^2}, \quad C = \frac{6}{a^2} > 0. \quad (22)$$



It follows from (19–22) that the components  $C_{iklj}$  satisfy the relation

$$C_{iklj} = C(h_{il}h_{kj} - h_{ik}h_{lj}), \quad (23)$$

consequently the three-dimensional observable spaces of both gravitational fields are the spaces of constant positive curvature.

It is easy to see that the expressions of  $F_i$ ,  $C_{iklj}$ ,  $C_{ik}$  and  $C$  for the metric (1) transform into the analogous expressions for the metric (2) by the condition (3). Note that both observable three-dimensional spaces possess constant positive curvature, but the gravitational force has opposite signs inside these bubbles. The causes of this situation will be considered in detail in the next section.

### 3 The liquid and vacuum bubbles as mirror spaces

We obtained in the previous section that the geometric properties of the reference spaces of the two bubbles are similar. But the respective gravitational forces of the liquid and vacuum bubbles differ in nature — a force of attraction inside the Schwarzschild bubble, and a force of repulsion inside the de Sitter bubble. It follows from the definitions of the values  $F_i$  (8) and  $C_{iklj}$  (11) that the gravitational force is connected with the time component  $g_{00}$  and the mixed components  $g_{0i}$ , and the curvature of the reference space — with the spatial components  $g_{ik}$  of the fundamental metric tensor  $g_{\alpha\beta}$ . Since all  $g_{0i} = 0$  inside these bubbles, the vector  $F_i$  is determined by the spatial derivative of the gravitational potential  $w = c^2(1 - \sqrt{g_{00}})$ , therefore it is connected immediately with the observable time  $\tau$ , where  $d\tau$  is determined by (7). Calculating  $d\tau$  for the metrics (1) and (2) we obtain, respectively:

1) The Schwarzschild bubble

$$d\tau = \pm \frac{1}{2} \left( 3\sqrt{1 - \frac{\kappa\rho b^2}{3}} - \sqrt{1 - \frac{\kappa\rho r^2}{3}} \right) dt; \quad (24)$$

2) The de Sitter bubble

$$d\tau = \pm \frac{1}{2} \left( \sqrt{1 - \frac{r^2}{a^2}} \right) dt. \quad (25)$$

Assuming  $\frac{\kappa\rho b^2}{3} = 1$ ,  $b = a = \sqrt{\frac{3}{\lambda}}$  in the expression (24), we obtain

$$d\tau = \mp \frac{1}{2} \left( \sqrt{1 - \frac{r^2}{a^2}} \right) dt. \quad (26)$$

The sign of  $d\tau$  is linked with the direction of flow of the observable (own) time. If  $d\tau > 0$  (the *direct flow of time*), then the observable time flows from the past to the future; if  $d\tau < 0$  (the *reverse flow of time*), the observable time flows from the future to the past. Let us call the space of the past the *positive manifold*, and the space of the future — the *negative manifold*. It is evident that the space where  $d\tau = 0$  is situated between these manifolds. Let us call it the *neutral manifold*. The respective notions “positive”, “negative” and “neutral” manifolds can be connected with a philosophical system of neutrality — *neutrosophy*, constructed by Smarandache [2]. The interaction between these three manifolds will be applied to cosmology.

The notion of *time* plays a very important rôle in relativistic cosmology, because contemporary cosmological models are considered in the framework of General Relativity, i.e. in a curved (pseudo-Riemannian) space. Because this space (space-time) has non-zero four-dimensional curvature, time can flow at different rates, and the three-dimensional space can be both flat and curved.

It was shown in [1], the intervals of the coordinate (ideal) time  $dt$  and of the observable time  $d\tau$  are linked by the relation:

$$\frac{dt}{d\tau} = \frac{v_i V^i}{c^2} \pm 1, \quad (27)$$

where  $V^i = \frac{dx^i}{d\tau}$  is the observable three-dimensional velocity.

Because  $v_i = 0$  for both bubbles, we rewrite (27) in the form

$$\frac{d\tau}{dt} = \sqrt{g_{00}} = 1 - \frac{w}{c^2}. \quad (28)$$

This correlation between coordinate time and observable time follows also from (7) by  $v_i = 0$ .

We have determined the space with opposite flow of time as the *mirror world* relative to the space with direct flow of time [1]. We have also considered the correlations  $\frac{d\tau}{dt} > 0$ ,  $\frac{d\tau}{dt} < 0$ , and  $\frac{d\tau}{dt} = 0$ . We have studied in [1] the mirror world as the world with reverse flow of coordinate time  $t$ . Here we shall consider two directions of the observable time  $\tau$  flow including the stopped time  $d\tau = 0$ . Particles lying in the space where  $d\tau = 0$  are called *entangled particles* [3]. Studies of entangled states of particles lead to a possibility of non-quantum teleportation for both massless and mass-bearing particles [3].

We shall study in this section conditions of direct and reverse flow of observable time in the observable universe by the condition  $dt > 0$ . We obtain that the flow of observable time is

- 1) Direct if  $d\tau > 0$  ( $w < c^2$ );
- 2) Reverse if  $d\tau < 0$  ( $w > c^2$ );
- 3) Stopped if  $d\tau = 0$  ( $w = c^2$ ).

Because  $w = c^2(1 - \sqrt{g_{00}})$ , we conclude that observable time is stopped by  $\sqrt{g_{00}} = 0$ , flows from the past to the future by  $\sqrt{g_{00}} > 0$ , and flows from the future to the past by  $\sqrt{g_{00}} < 0$ .

We shall clarify in the next section which one of two cosmological models (the liquid and the vacuum bubble) can be applied for description of the observable universe. The task of this section is to compare geometrical and physical properties of both bubbles considered as mirror images with respect to one another.

Comparing the geometrical properties of the bubbles described by the metrics (1) and (2), we find from (21–22) that both reference spaces possess positive constant curvature.

Comparing their physical properties, we obtain that the gravitational-inertial forces are directed oppositely:  $F_i$  is the force of attraction inside the Schwarzschild bubble and the force of repulsion inside the de Sitter bubble. To understand the cause of this situation, recall that gravitation in the framework of General Relativity is due to the four-dimensional curvature of a four-dimensional Riemannian manifold, or space-time. The curvature is characterized by the four-dimensional Riemann-Christoffel tensor  $R_{\alpha\beta\gamma\delta}$ . The condition  $R_{\alpha\beta\gamma\delta} \neq 0$  is a necessary and sufficient condition that the space-time is curved. Let us therefore study the connection between the gravitational-inertial force and the four-dimensional curvature in terms of the theory of chronometric invariants.

Zelmanov split 20 significant components of the Riemann-Christoffel tensor into 3 chr.-inv. tensors [1]

$$X^{ik} = -c^2 \frac{R_{0 \cdot 0}^{i \cdot k}}{g_{00}}, \quad Y^{ijk} = -c \frac{R_{0 \cdot \dots}^{ijk}}{\sqrt{g_{00}}}, \quad Z^{iklj} = c^2 R^{iklj}, \quad i, k = 1, 2, 3. \quad (29)$$

The  $X^{ik}$  are projections of  $R_{\alpha\beta\gamma\delta}$  on time, the  $Y^{ijk}$  are mixed projections, and  $Z^{iklj}$  are purely spatial ones.

Formulating the values with chr.-inv. properties of the reference space and having indices lowered we obtain [1]

$$X_{ik} = \frac{* \partial D_{ik}}{\partial t} - (D_i^l + A_{i \cdot}^l)(D_{kl} + A_{kl}) + \frac{1}{2} (* \nabla_i F_k + * \nabla_k F_i) - \frac{1}{c^2} F_i F_k, \quad (30)$$

$$Y_{ijk} = {}^*\nabla_i (D_{jk} + A_{jk}) - {}^*\nabla_j (D_{ik} + A_{ik}) + \frac{2}{c^2} A_{ij} F_k, \quad (31)$$

$$Z_{iklj} = D_{ik} D_{lj} - D_{il} D_{kj} + A_{ik} A_{lj} - A_{il} A_{kj} + 2A_{ij} A_{kl} - c^2 C_{iklj}. \quad (32)$$

Since the chr.-inv. characteristics of the reference spaces  $A_{ik}$  and  $D_{ik}$  are null for both metrics (1) and (2), we obtain

$$X_{ik} = \frac{1}{2} ({}^*\nabla_i F_k + {}^*\nabla_k F_i) - \frac{1}{c^2} F_i F_k, \quad (33)$$

$$Y_{ijk} = 0, \quad (34)$$

$$Z_{iklj} = -c^2 C_{iklj}, \quad (35)$$

where  ${}^*\nabla_i$  is the symbol of chr.-inv. covariant differentiation [7].

Calculating the chr.-inv. projections of the Riemann tensor  $R_{\alpha\beta\gamma\delta}$  on time  $X_{ik}$  for the metrics (1) and (2), we obtain respectively:

1) The Schwarzschild bubble

$$X_{11} = -\frac{\varkappa\rho c^2}{3} \frac{1}{\left(3\sqrt{1 - \frac{\varkappa\rho b^2}{3}} - \sqrt{1 - \frac{\varkappa\rho r^2}{3}}\right) \sqrt{1 - \frac{\varkappa\rho r^2}{3}}}, \quad (36)$$

$$X_{22} = \frac{X_{33}}{\sin^2 \theta} = -\frac{\varkappa\rho c^2}{3} \frac{r^2 \sqrt{1 - \frac{\varkappa\rho r^2}{3}}}{3\sqrt{1 - \frac{\varkappa\rho b^2}{3}} - \sqrt{1 - \frac{\varkappa\rho r^2}{3}}}; \quad (37)$$

2) The de Sitter bubble

$$X_{11} = \frac{c^2}{a^2 - r^2}, \quad X_{22} = \frac{c^2 r^2}{a^2}, \quad X_{33} = \frac{c^2 r^2 \sin^2 \theta}{a^2}. \quad (38)$$

As is seen, all the components (38) can be obtained from (36–37) by the condition  $b^2 = \frac{3}{\varkappa\rho} = a^2$ .

We see, therefore, that all the components  $X_{ik}$  of the Schwarzschild liquid sphere are negative, and all  $X_{ik}$  of the de Sitter vacuum bubble space are positive. As such, we have obtained a very important result:

**The observable components of the Riemann tensor for the Schwarzschild and the de Sitter bubbles have opposite signs.**

Comparing the expressions for  $F_1$  (15–16) and  $X_{11}$  (36–38) for the Schwarzschild and de Sitter bubbles, we obtain that both expressions are connected by the relation

$$F_1 = rX_{11}. \quad (39)$$

Thus the signs of gravitational-inertial force and the observable projection  $X_{11}$  of the Riemann tensor component  $R_{0101}$  coincide completely. It means that:

**The force of attraction inside the Schwarzschild bubble (1) is due to the negative sign of  $X_{11}$ , and the force of repulsion inside the de Sitter bubble (2) is due to the positive sign of the corresponding observable component of the Riemann tensor.**

The gravitational forces (15–16) are non-Newtonian forces. They are proportional to  $r$  and equal to zero by  $r = 0$ . Besides, these forces are proportional to the observable projection of the Riemann curvature tensor onto time. It is possible to say that both forces depend on the “curvature of time”. It is evident that the time coordinate  $x^0 = ct$  has another physical essence than the spatial coordinates  $x^i$ . In particular, the time interval is measured by a clock, while the spatial interval — by a ruler. Then the “curvature of time” is linked with the rate of time and the direction with the flow of time.

It follows from (7) that the rate of observable time depends on:

- 1) The gravitational potential  $w$ ;
- 2) The velocity of the reference space rotation  $v_i$ .

Thus observable time has different rates, in particular: it can both be stopped and flow in the opposite direction. If  $w$  and  $v_i$  are zeroes, the observable time flows uniformly as the ideal time  $t$ :  $d\tau = dt$ . This situation takes place in the Minkowski reference system in the flat space-time of Special Relativity.

Again, the problem of this paper is: which one of the two considered bubbles describes more adequately the observable universe? In other words, just what is the Universe we live in: is it a Schwarzschild liquid sphere or a de Sitter vacuum bubble? The answer will be obtained in the next section.

#### 4 Observable data as the criterium for the choice of the cosmological model

It is evident that a choice of the concrete cosmological model must be linked with observable data. It follows from astronomical observations that spectral lines of stars inside distant galaxies are displaced to lower frequencies (the *redshift*). This fact was revealed in the last century. The problem's objective now is: to calculate variations of frequencies of photons spreading inside the Schwarzschild and de Sitter bubbles. Those bubbles inside which frequencies of photons emitted by distant objects decrease by increasing the distance from the observer can thus be used as a model of the observable Universe.

The motion of photons in terms of chronometric invariants is described by the equations of isotropic (null) geodesic lines [8]

$$\frac{1}{\omega} \frac{d\omega}{d\tau} - \frac{1}{c^2} F_i \frac{dx^i}{d\tau} + \frac{1}{c^2} D_{ik} \frac{dx^i}{d\tau} \frac{dx^k}{d\tau} = 0, \quad (40)$$

$$\frac{1}{\omega} \frac{d}{d\tau} \left( \omega \frac{dx^i}{d\tau} \right) + \Delta_{jk}^i \frac{dx^j}{d\tau} \frac{dx^k}{d\tau} + 2(D_k^i + A_k^i) \frac{dx^k}{d\tau} - \frac{1}{c^2} F^i = 0, \quad (41)$$

where  $\omega$  is the frequency of the individual photon.

To obtain the value of  $\omega$  in the studied space-time, it is necessary to solve the equation (40) for the metric describing this space-time. Because  $D_{ik} = 0$  and  $F_2 = F_3 = 0$  for the metrics (1) and (2), we write (40) in the form

$$\frac{d\omega}{\omega} = \frac{1}{c^2} F_1 dr. \quad (42)$$

Substituting the value  $F_1$  (15,16) for both metrics and integrating the obtained expressions, we find, respectively:

- 1) The Schwarzschild bubble

$$\omega(r) = \frac{B}{3\sqrt{1 - \frac{\kappa\rho b^2}{3}} - \sqrt{1 - \frac{\kappa\rho r^2}{3}}}, \quad B = const; \quad (43)$$

- 2) The de Sitter bubble

$$\omega(r) = \frac{P}{\sqrt{a^2 - r^2}}, \quad P = const, \quad (44)$$

where  $B$  and  $P$  are integration constants.

The displacement of spectral lines is characterized by the value

$$z = \frac{\omega_{reg} - \omega_{em}}{\omega_{em}}, \quad (45)$$

where  $\omega_{em}$  is the frequency emitted by a source located at the distance  $r_{em}$  from the observer,  $\omega_{reg}$  is the frequency registered by the observer at the point  $r_{reg}$ .

Calculating  $z$  for both bubbles, we find, respectively:

1) The Schwarzschild bubble

$$z = \frac{\sqrt{1 - \frac{\varkappa \rho r_{reg}^2}{3}} - \sqrt{1 - \frac{\varkappa \rho r_{em}^2}{3}}}{3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - \sqrt{1 - \frac{\varkappa \rho r_{reg}^2}{3}}}; \quad (46)$$

2) The de Sitter bubble

$$z = \frac{\sqrt{a^2 - r_{em}^2} - \sqrt{a^2 - r_{reg}^2}}{\sqrt{a^2 - r_{reg}^2}}. \quad (47)$$

Since  $r_{em} > r_{reg}$ , we obtain from (46) that the difference between the emitted and registered (observed) frequencies is positive:  $z > 0$ . It means that the observed frequency is higher than the emitted, i.e. spectral lines are displaced to higher frequencies. Thus a *blueshift* takes place inside the Schwarzschild bubble. This situation contradicts observable data, therefore this bubble cannot be used as a cosmological model.

It follows from (47) that  $z < 0$  for photons travelling inside the de Sitter bubble, consequently a *redshift* takes place here, and this situation corresponds to observable data. Thus only the de Sitter bubble can be used as a static cosmological model. The observed redshift is due to the non-Newtonian force of repulsion (*anti-gravitational force*). It follows from (47) that this redshift increases in accordance to the parabolic law as the distance between the observer and the source increases. Moreover,  $z \rightarrow \infty$  by  $r \rightarrow a$ . Because  $a$  is the maximal distance from the observer, we call it ‘‘horizon of events’’ (event horizon).

As seen from (44), the registered (observed) frequency  $\omega_{reg} \rightarrow \infty$  by  $r \rightarrow a$ , i.e. near the horizon of events. As known, contemporary cosmologists describe the observed Universe by means of non-stationary (spreading) models, so-called *Friedmann’s models*. They explain the observed redshift as a Doppler effect only. Therefore they claim that the Universe spreads with acceleration. We have obtained here the *accelerated increase of the observed frequency near the horizon of events* obtained in the framework of a stationary cosmological model: the effect of ‘‘acceleration’’ is due to non-Newtonian force of repulsion (*anti-gravitation*).

So, we have chosen the de Sitter bubble as a model of the observed part of the Universe which we identify with the real world. By this we imply that time in the real world flows in the positive direction — from the past to the future. Thus the interval of observable time inside the de Sitter bubble must be positive:

$$d\tau = \sqrt{1 - \frac{r^2}{a^2}} > 0. \quad (48)$$

Then the interval  $d\tau$  inside the Schwarzschild bubble must be negative

$$d\tau = - \left( 3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - \sqrt{1 - \frac{\varkappa \rho r^2}{3}} \right) dt < 0. \quad (49)$$

As seen, the expression (49) transforms into (48) by the condition (3). Thus we shall consider the Schwarzschild bubble as the space of the future, and the de Sitter bubble — as the space of the past. The future becomes the past by the condition  $b = a = \sqrt{\frac{3}{\varkappa \rho}} = \sqrt{\frac{3}{\lambda}}$ . Evidently, if  $b \neq \sqrt{\frac{3}{\lambda}} = a$ , the space of the future does not turn into that of the past. And so, where is the present? Because the present is situated between the future ( $d\tau < 0$ ) and the past ( $d\tau > 0$ ), the observable interval of the present must be zero:  $d\tau = 0$ . This condition is satisfied for the de Sitter bubble on the surface  $r = a$  which is the surface of the inflation collapsar [1]. Contemporary cosmologists use the term *horizon of events* in order to determine the region:

1) From which light rays cannot reach the observer;

2) Which is unattainable for light rays emitted by the observer.

The first horizon is called *horizon of the future*, the second — *horizon of the past*. This idea is linked with the idea of an expanding universe prevailing at present. We consider here a stationary universe, therefore we determine the *horizon of events* as the maximal distance from the observer in the de Sitter space, i.e.  $r = a$ .

It follows from (44) that frequencies emitted by the most distant objects ( $r \rightarrow a$ ) are infinitely great ( $\omega_{em} \rightarrow \infty$ ). It means that the period of oscillation of a photon  $T \rightarrow 0$  by  $r \rightarrow a$ , consequently,

**A signal emitted by a particle located at the surface  $r = a$  spreads instantaneously.**

We have considered in [1] particles spreading instantaneously as *zero-particles*. From the viewpoint of a real observer these particles spread along three-dimensional null trajectories ( $d\sigma = 0$ ). We call the space, where zero-particles are, *zero-space* [1]. This space can be considered as a partial case of the space where massless particles spread, i.e. isotropic space.

As known, massless particles (photons) spread along special trajectories — isotropic lines, for which the  $ds^2 = 0$ , or in terms of chronometric invariants

$$c^2 d\tau^2 = d\sigma^2 = h_{ik} dx^i dx^k. \quad (50)$$

Let us call the space-time where  $ds^2 = 0$  as *isotropic space*. It follows from (50) that the observable spatial and time intervals are identical. Moreover, dividing  $d\sigma^2$  by  $d\tau^2$ , we obtain the well-known result that photons spread at light velocity:

$$h_{ik} \frac{dx^i}{d\tau} \frac{dx^k}{d\tau} = c^2. \quad (51)$$

Assuming that photons spread in the  $r$ -direction inside the de Sitter bubble, we can obtain their trajectories as described by the expression:

$$d\sigma = \sqrt{h_{11}} dr = \frac{adr}{\sqrt{a^2 - r^2}} = cd\tau. \quad (52)$$

Integrating (52), we find

$$\int \frac{dr}{\sqrt{a^2 - r^2}} = \arcsin \frac{r}{a} = \frac{c\tau}{a} + P, \quad P = \text{const}. \quad (53)$$

Assuming  $\tau = 0$  and  $r = 0$  at the moment of photon emission, we obtain the integration constant  $P = 0$ , and the observable three-dimensional distance between the observer and the emitted photons is

$$r = a \sin H\tau, \quad (54)$$

where  $r$  is the photometric distance. We have used here the empirical relation  $c = aH$ , where  $H$  is the Hubble constant.

Differentiating (54) along  $\tau$ , we find the expression for the velocity of a photon

$$\frac{dr}{d\tau} = aH \cos H\tau = c \cos H\tau. \quad (55)$$

It is easy to see that the modulus of this velocity equals:

$$\sqrt{h_{11}} \frac{dr}{d\tau} = \frac{a}{\sqrt{a^2 - r^2}} \frac{dr}{d\tau} = c. \quad (56)$$

It follows from (54–55) that both the photometric distance and the radial velocity of photons spreading inside the de Sitter bubble are periodic functions of observable time  $\tau$ . We obtain from (54) that  $r = a$  if  $H\tau = \frac{\pi}{2}$ . Let  $T = \frac{\pi}{2H}$  be the time interval of spreading photons

being located at the surface  $r = a$  to a real observer. Because  $H = 2.3 \times 10^{-18} \text{ sec}^{-1}$ , we find  $T = 6.826 \times 10^{16} \text{ sec}$ . Taking into account that one year contains 31557600 seconds, we find easily that  $T$  equals 21.6 billion years. This value corresponds to the estimated age of the Universe appearing as a result of the Big Bang in the framework of the theory of an expanding universe (10–20 billions of years). Recall that our estimate is obtained in the framework of the present static universe model.

It follows from (55) that the radial velocity  $\frac{dr}{d\tau}$  of photons being located at the surface  $r = a$  equals zero, because  $\cos H\tau = 0$  by  $\tau = T = \frac{\pi}{2H}$ . In other words, we have obtained that radial velocities of photons located at the horizon of events are zeroes, consequently,

**The surface of the inflation collapsar  $r = a$  is a region of stopped light.**

Studying simultaneously expressions (54–56), we conclude that massless particles spreading in the radial direction move at light velocity inside the de Sitter bubble where  $r < a$ , and zero-particles, existing at the surface of the bubble  $r = a$ , spread instantaneously.

Zero-particles linked by the condition  $d\tau = 0$  are called *entangled particles*. Thus entangled particles exist in the *neutral manifold* interpreted as the *present*.

$$d\tau = \sqrt{1 - \frac{r^2}{a^2}} = \cos HT = 0, \quad T = \frac{\pi}{2H}. \quad (57)$$

In other words, entangled particles *exist simultaneously*, and the present is an intermediate state between the future and the past. Transitions between the past and the future will be studied in the next section.

## 5 Conditions of transition the future to the past

We showed in previous section that we live in the de Sitter bubble (the world of the past), where the observable time flows from the past to the future. The Schwarzschild bubble is the world of the future where the observable time flows from the future to the past. The observable time flows in opposite directions inside these bubbles:  $d\tau < 0$  inside the Schwarzschild bubble, and  $d\tau > 0$  inside the de Sitter bubble. Let us call the de Sitter bubble the *positive manifold* and the Schwarzschild bubble the *negative manifold*. The future turns into the past through the *transient state*  $d\tau = 0$  — the *neutral manifold*. As  $d\tau = \left(\sqrt{1 - \frac{r^2}{a^2}}\right) dt = 0$  by  $r = a$ , the neutral manifold coincides with the horizon of events. Because the horizon of events divides spaces with opposite directions of observable time, one can say,

**The horizon of events is a mirror located between the past and the future: the past and the future are reflected at the present time as in the mirror. Thus the present arises at the horizon of events.**

Let us consider in detail the interaction between the past, the present, and the future.

As known, four-dimensional points in General Relativity are called *events*. Consider the horizon of events as a region of the generation of events — four-dimensional points of the four-dimensional pseudo-Riemannian space (the space-time of General Relativity). This problem will be considered here only for mass-less particles (photons).

Particles located in a region of the space-time where  $d\tau = 0$  are called *entangled particles* [3]. They spread instantaneously along three-dimensional trajectories described by the three-dimensional observable interval

$$d\sigma^2 = h_{ik} dx^i dx^k, \quad h_{ik} = -g_{ik} + \frac{v_i v_k}{c^2}. \quad (58)$$

There exist two kinds of entangled particles:

- 1) Those generating mass-bearing particles;
- 2) Those generating mass-less particles (photons).

Entangled particles of the first kind spread along trajectories of imaginary length described by the interval  $ds^2 = -d\sigma^2 < 0$ . Entangled particles of the second kind spread along null three-dimensional trajectories described by the null interval  $ds^2 = -d\sigma^2 = 0$ . They are called *zero-particles* [1].

Entangled particles of the first kind realize an instantaneous transport (teleportation) of mass-bearing particles for which a mass at rest  $m_0 \neq 0$ , from the horizon of events into the region of observable space where  $ds^2 \neq 0$ . Entangled particles of the second kind teleport photons from the horizon of events into the region of observable space where  $ds^2 = 0$ . It is called *isotropic space* and described by the condition (50). We shall consider here only the generation (materialization) of photons.

The four-dimensional velocity of photons  $\frac{dx^\alpha}{d\sigma}$  is null:

$$g_{\alpha\beta} \frac{dx^\alpha}{d\sigma} \frac{dx^\beta}{d\sigma} = 0, \quad (59)$$

or in chr.-inv. form,

$$h_{ik} \frac{dx^i}{d\sigma} \frac{dx^k}{d\sigma} = c^2. \quad (60)$$

Photons spread inside the isotropic space along isotropic (null) geodesic lines. The equations of trajectories of photons are described by (40–41) in terms of physically observable quantities. A real observer (moving at a sub-light velocity) cannot accompany photons, but he can register their frequencies and directions of spreading. Therefore he receives photons as moving in the three-dimensional space at light velocity.

To study not only the kinematic, but also the dynamic properties of light-like particles, Zelmanov constructed a four-dimensional dynamic null wave vector [7]

$$K^\alpha = \frac{\omega}{c} \frac{dx^\alpha}{d\sigma}, \quad (61)$$

where  $\omega$  is the physically observable cyclic frequency. The chr.-inv. components of this vector are:

- 1) A physically observable wave number

$$k = \frac{K_0}{\sqrt{g_{00}}} = \pm \frac{\omega}{c}, \quad (62)$$

where signs (+) and (–) take place inside the spaces with direct and opposite flows of observable time, respectively [1];

- 2) A physically observable three-dimensional vector of impulse

$$K^i = \frac{\omega}{c^2} \frac{dx^i}{d\tau}. \quad (63)$$

Using the expressions (61–63), we can study the problem of interaction of photons located in two spaces with opposite flows of observable time — the Schwarzschild and de Sitter bubbles. Consider first the interaction of two photons located inside these bubbles as a summary of their four-dimensional wave vectors

$$Q^\alpha = K_-^\alpha + K_+^\alpha, \quad K_-^\alpha = \frac{\bar{\omega}}{c} \frac{dx^\alpha}{d\sigma}, \quad K_+^\alpha = \frac{\omega}{c} \frac{dx^\alpha}{d\sigma}, \quad (64)$$

where  $K_-^\alpha$  and  $K_+^\alpha$  belong to the Schwarzschild and de Sitter bubbles, respectively,  $\bar{\omega} < 0$  and  $\omega > 0$ .

Note that  $\bar{\omega} < 0$ , since all particles, mass-bearing and mass-less, spreading in the space with reverse flow of time, have negative values of relativistic mass and observable cyclic frequencies [1].



The observable components of (64) are

$$\frac{Q_0}{\sqrt{g_{00}}} = \frac{\bar{\omega} + \omega}{c}, \quad (65)$$

$$Q^i = \frac{\bar{\omega}}{c^2} \frac{dx^i}{d\tau_-} + \frac{\omega}{c^2} \frac{dx^i}{d\tau_+}, \quad (66)$$

where the signs  $(-)$  and  $(+)$  by  $d\tau$  are assigned to the Schwarzschild and de Sitter bubbles, respectively.

In order to study the interaction of photons spreading inside the Schwarzschild and the de Sitter bubbles, let us calculate at first the observable values of their wave vectors. We will consider here two photons moving in the radial  $r$ -direction: the first photon is inside the Schwarzschild bubble, and another — inside the de Sitter bubble. The frequencies of these photons are described by the expressions (43) and (44), respectively. Assuming the initial values of frequencies when  $r = 0$  as  $\bar{\omega}_0 < 0$  and  $\omega_0 > 0$ , respectively, we obtain:

1) The Schwarzschild bubble

$$\omega = \frac{\bar{\omega}_0 \left( 3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - 1 \right)}{3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - \sqrt{1 - \frac{\varkappa \rho r^2}{3}}}; \quad (67)$$

2) The de Sitter bubble

$$\omega = \frac{\omega_0 a}{\sqrt{a^2 - r^2}} = \frac{\omega_0}{\cos H\tau}. \quad (68)$$

The expression for the three-dimensional velocity of photon spreading inside the de Sitter bubble in the radial direction has been calculated above: see (54). Then the three-dimensional wave vector has the form:

$$K_+^1 = \frac{\omega}{c^2} \frac{dx^i}{d\tau_+} = \frac{\omega_0}{c} = \text{const.} \quad (69)$$

Let us now obtain the expression for the three-dimensional velocity of a photon spreading in the radial direction inside the Schwarzschild bubble. We have in this case

$$d\sigma = \sqrt{h_{11}} dr = \frac{dr}{\sqrt{1 - \frac{\varkappa \rho b^2}{3}}} = cd\tau. \quad (70)$$

Integrating (70) by analogy with (52), we find

$$r = \sqrt{\frac{3}{\varkappa \rho}} \sin \left( \sqrt{\frac{\varkappa \rho}{3}} c\tau \right), \quad (71)$$

then

$$\frac{dr}{d\tau_-} = c \cos \left( \sqrt{\frac{\varkappa \rho}{3}} c\tau \right). \quad (72)$$

Taking into account (72), we rewrite (67) in the form

$$\bar{\omega} = \frac{\bar{\omega}_0 \left( 3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - 1 \right)}{3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - \cos \left( \sqrt{\frac{\varkappa \rho}{3}} c\tau \right)}. \quad (73)$$

Then the three-dimensional wave vector inside the future space is

$$K_-^1 = \frac{\bar{\omega}}{c} \frac{\left( 3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - 1 \right) \cos \left( \sqrt{\frac{\varkappa \rho}{3}} c\tau \right)}{3\sqrt{1 - \frac{\varkappa \rho b^2}{3}} - \cos \left( \sqrt{\frac{\varkappa \rho}{3}} c\tau \right)}. \quad (74)$$

If  $\frac{\varkappa \rho b^2}{3} = 1$ , then

$$K_-^1 = \frac{\bar{\omega}}{c}, \quad (75)$$

and

$$\frac{Q_0}{\sqrt{g_{00}}} = \omega_0 + \bar{\omega}_0, \quad Q^1 = \frac{\omega_0 + \bar{\omega}_0}{c}. \quad (76)$$

It follows from (76) that the frequency and impulse of the summary vector are constant, and the direction of the resulting photon motion is determined by the sign of the sum  $\omega_0 + \bar{\omega}_0$ :

- 1) If  $|\omega_0| > |\bar{\omega}_0|$ , then the resulting photon spreads in the positive direction from the past to the future, because the summary frequency is positive;
- 2) If  $|\omega_0| < |\bar{\omega}_0|$ , the resulting photon spreads in the negative direction from the future to the past, because the summary frequency is negative;
- 3) If  $|\omega_0| = |\bar{\omega}_0|$ , the resulting photon transforms into a zero-particle, because the summary frequency is null [1].

The first and second cases describe the direct interaction of two photons located inside the isotropic Schwarzschild and de Sitter spaces. This interaction is realized directly, passing through the present space. Depending on the sign of the resulting frequency  $\omega_0 + \bar{\omega}_0$  it spreads after this interaction either inside the past or the future space. In other words, the resulting photon will be either in the future or in the past, but it does not end up at the horizon of events. It means that this interaction is not an event of our observable Universe.

The third case describes the transformation of two photons transforming into zero-particles. This interaction is realized at the surface of the inflation collapsar — the horizon of events. The formed particles can be events of the observable Universe. The third case is the most interesting for us: we shall consider it in detail.

Zero-particles are described by the wave vector [1]

$$Q^\alpha = \frac{\Omega}{c^2} \frac{dx^\alpha}{dt}, \quad g_{\alpha\beta} Q^\alpha Q^\beta = 0, \quad (77)$$

where  $\Omega$  is the frequency of the zero-particle,  $Q^i = \frac{\Omega}{c^2} \frac{dx^i}{dt}$  is its three-dimensional wave-vector.

As shown in [1], the observable cyclic frequency of the zero-particle is given by  $\omega = 0$ , but this particle has a non-zero generalized frequency

$$\Omega = \frac{\omega}{1 - \frac{w + v_i u^i}{c^2}}, \quad u^i = \frac{dx^i}{dt}. \quad (78)$$

It follows from (78)

$$\omega = \Omega \left( 1 - \frac{w + v_i u^i}{c^2} \right). \quad (79)$$

Because all  $v_i = 0$  inside both bubbles, we obtain

$$\omega = \Omega \left( 1 - \frac{w}{c^2} \right), \quad Q^i = \frac{\Omega}{c^2} u^i. \quad (80)$$

We see from (80) that  $\omega \geq 0$  if  $w \leq c^2$ . Because inside the de Sitter bubble  $\frac{w}{c^2} = \sqrt{1 - \frac{r^2}{a^2}}$ , we conclude that zero-particles situated at the horizon of events transform into observable photons if their three-dimensional vector of impulse is directed in the  $r$ -direction where  $r < a$ . If  $r = a$ , then  $\omega = 0$ , but the three-dimensional impulse is such that  $Q^i \neq 0$ . If the component of the impulse is given by  $Q^1 = \frac{\Omega}{c^2} \frac{dr}{dt} \neq 0$ , then a zero-particle having the frequency  $\Omega$  transforms into a photon with the frequency  $\omega$  spreading inside the de Sitter bubble.

We showed earlier that the Schwarzschild bubble transforms into the de Sitter bubble by the condition (3) which can be rewritten as

$$\varkappa \rho = \frac{3}{a^2} = \lambda, \quad (81)$$

where the cosmological constant is given by  $\lambda \sim 10^{-56} \text{ cm}^{-2}$  corresponding to Einstein's estimate. As known, the light velocity  $c$ , the limit observable distance  $a$ , and the Hubble constant  $H$  are connected by the formula:

$$c = Ha, \quad c = 3 \times 10^{10} \text{ cm/sec}, \quad H = 2.3 \times 10^{-18} \text{ sec}^{-1}. \quad (82)$$

It follows from (82) that  $a = 1.3 \times 10^{28} \text{ cm}$ . This value is considered in contemporary cosmology as that of the horizon of events. Then  $\lambda = \frac{3}{a^2} = 0.6 \times 10^{-56} \text{ cm}^{-2}$ , i.e. it corresponds to Einstein's estimate of this value.

Using (81), where  $\varkappa = 18.6 \times 10^{-18} \text{ cm/g}$ , we find easily the value of the  $\lambda$ -vacuum density

$$\rho = \frac{\lambda}{\varkappa} = 9.5 \times 10^{-30} \text{ g/cm}^3, \quad (83)$$

which does not contradict the estimates of this value accepted in contemporary cosmology.

Let us now calculate the mass  $M$  of the observable Universe using the formula

$$M = \rho V, \quad V = 2\pi^2 a^3, \quad (84)$$

where  $V$  is the volume of the three-dimensional space of constant positive curvature,  $\frac{1}{a^2}$  is the Gaussian curvature.

Substituting (83) into (84) we find the value of the de Sitter bubble mass as  $M = 41.2 \times 10^{55} \text{ g}$  which corresponds to accepted estimates.

The question now arises: from where does the mass appear inside the de Sitter bubble? We showed above that light is formed by zero-particles existing at the inflation collapsar surface. As known, a mass at rest, for both light-like particles (photons) and zero-particles, is such that  $m_0 = 0$ . But  $m_0 \neq 0$  for gravitating particles moving along non-null trajectories. Moreover, only gravitational forces of repulsion exist inside the de Sitter bubble filled with physical vacuum in the state of inflation. But gravitational forces of attraction exist inside the Schwarzschild bubble filled with ideal incompressible liquid. Assume that this matter is linked with some mass-point. As known, the space-time created by a mass-point described by the Schwarzschild metric [9]

$$ds^2 = \left(1 - \frac{r_g}{r}\right) c^2 dt^2 - \frac{dr^2}{1 - \frac{r_g}{r}} - r^2(d\theta^2 + \sin^2 \theta d\varphi^2), \quad (85)$$

where  $r_g = \frac{2GM}{c^2}$  is the Hilbert radius. If  $r = r_g$ , then the gravitating object is in the state of gravitational collapse, and  $r_g$  is the surface of the gravitational collapsar.

Using the notion of Hilbert radius, we can transform the condition of transition between the two bubbles (81). Taking into account that  $\varkappa = \frac{8\pi G}{c^2}$ ,  $\rho = \frac{M}{V}$ ,  $V = 2\pi^2 a^3$ , we rewrite (81) in the form

$$a = \frac{2r_g}{3\pi}. \quad (86)$$

Thus the Schwarzschild bubble transforms into the de Sitter bubble by the condition (86). Because  $a < r_g$ , the de Sitter bubble (inflation collapsar) is inside the gravitational collapsar created by the mass-point, the mass of which is equal to the mass of the observable Universe. It is probable that this very mass-point is linked with the creation of all mass-bearing particles of our Universe, including the most massive, but this problem is not considered here.

## 6 Conclusion

So, we have constructed the stationary composite model of the observable Universe consisting of three objects embedded in each another:

- 1) The outer object (the world of the future) which is the sphere filled with ideal incompressible liquid (the Schwarzschild bubble);

- 2) The transient layer (the surface of the inflation collapsar) which is the singular region where the present is constructed;
- 3) The inner object (the world of the past) filled with physical vacuum (the de Sitter bubble).

The transient layer is a mirror dividing and reflecting simultaneously the future into the past. The worlds of the future and the past are considered as negative and positive manifolds divided by the neutral region (the mirror) which is the inflation collapsar situated inside the gravitational collapsar. The terms “positive”, “negative”, and “neutral” belong to the neutrosophic system of Smarandache. Thus, the present is an instantaneous state between two virtual states (the future and the past), where the future turns into the past (materialization of the present).

Physical and geometric properties of the virtual worlds of the future and the past have been studied in detail. The non-Newtonian gravitational-inertial forces acting inside these bubbles are directed oppositely: the force of attraction inside the Schwarzschild bubble and the force of repulsion inside the de Sitter bubble. The signs of these forces coincide with the signs of the observable projection of the Riemann-Christoffel tensor onto time  $X_{11}$ . Moreover, these forces are connected with  $X_{11}$  by the relation  $F_1 = rX_{11}$ . Thus, we have showed that our perception of observable time direction is linked with the sign of four-dimensional curvature. It is necessary to note that these forces are significant only near the horizon of events, i.e. they are forces of cosmological scale. We have obtained that the attraction takes place in the Schwarzschild bubble (the world of the future), and the repulsion takes place in the de Sitter bubble (the world of the past). Thus the future collapses and becomes the past. This transition is realized through the present state which is between the future and the past. The future becomes the past at the horizon of events which is the surface of the inflation collapsar. This transformation is realized by the condition that the maximal distance in the de Sitter bubble is given by  $a < \frac{2r_g}{3\pi}$  where  $r_g$  is the Hilbert radius of the mass, the value of which equals the mass of matter filling the Schwarzschild bubble (incompressible ideal liquid). Thus the inflation collapsar (the de Sitter bubble) is inside the gravitational collapsar, and the force of repulsion acting inside it does not compress it by means of the force of gravitational compression.

The horizon of events (the present) is a membrane dividing the future and the past and simultaneously a mirror between these worlds as observable time flows in opposite directions inside them. Thus, the past and the future are reciprocal reflections of one another: consequently, they are reciprocally dependent spaces. The future transforms into the past through the horizon of events containing all previous events (four-dimensional points) of the Universe, forming the “data bank of the Universe”. It means that our present is determined by the interaction of all previous events with the new events materialized from the future at the given moment of time. In order to exactly predict the flow of events, it is necessary to know all previous events of the Universe and take into account all events materialized at the last moment. It is evident that this problem cannot be solved completely. We predict the future very approximately, because only the near past is known to us relatively exactly. This information allows us to predict the near future and act (i.e., to create new events). Thus the past, the present, and the future are reciprocally dependent. In other words, the present acts both as the past and the future. If a catastrophe (a chain of unexpected events) takes place, the future and the present change speedily. The consciousness of people registers in this case a new set of information, and the past will be rewritten in the memory of participants of the catastrophe.

The present as a neutrosophic manifold is the space of entangled particles, which are linked by the condition  $\tau = const$ , where  $\tau$  is the observable time. Considering the world society as a neutrosophic manifold, we may state the following: all people living in the same time (era) are entangled. Therefore all the thoughts and actions of people change not only the present but also the past and the future.

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# The Surjective Monad Theory of Reality: A Qualified Generalization of Reflexive Monism

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## Abstract

This “eidetic-noetic sketch” (surdetermination) aims at a twice-beyond ontological and four-fold epistemological generalization of a paradigm of Reality called “Reflexive Monism” as well as at surpassing the foundational metastructures of Kantian epistemology, Husserlian phenomenology, and Wittgensteinian logic. Naturally, it also comes across, and touches upon, subtle aspects of a premier generalization of dialectics and multi-valued logic known as neutrosophy. (As long as the style of presentation goes, we intensely alternate between logical rigor and aesthetical fluidity.)

*What remains of presence and use in the universal dark (or perhaps, after all, in a too luminous, sight-blinding place), when mirrors are traceless as if without glass, when eyes are both mindfully and senselessly strained: wakeful but not ultimately cognizant enough - being a splendid spark at best, but incapable of self-illumination and shedding light on existents as if (situated) in themselves -, when no reflection remains within and without? Indeed, only that exceedingly singular, somewhat pre-existent (i.e., pre-reflexive) Motion and Moment without reflection inheres, which is our characteristic redefinition of Noesis or Surjectivity. This, since Reality can in no way be reduced to Unreality, even in such noumenal darkness where existence and non-existence are both flimsy, for otherwise at once - at one universal Now and Here - all would cease to exist, “before before” and “after after”; and yet all that, nay Being itself, already exists with or without (the multiplicity of) reflective attributes, i.e., without the slightest chance to mingle, by both necessity and chance, with Non-Being and hence with multiplicity! That is simply how chanceless Reality is in itself, suddenly beyond both the possible and the impossible, such that even Unreality (as it is, without history), which is a lingering “backwater part” of the Universe after all, can only be (i.e., be “there”, even if that simply means “nothing”, “nowhere”) if and only if Reality IS, i.e., if Reality is One even without operational-situational sign or space in the first place, and not the other way around. Such, then, is what chance, i.e., the chance of reflection, may mean in the Universe - and not elsewhere: Reality is such that if it weren't Such, both Reality and Unreality would be Not, ever. He who fails to see this at once - as One - will not be able to understand the rest of the tale, Here and Now (or, as some say, “Now-Here”, “Nowhere”, or as Wittgenstein would have put it, “senselessly”), with or without the Universe as we commonly know it. - A first self-query in epistemic solitude.*

## 1. Introduction: Silently in the Loud Background of Things

*“Come, like a gush of early bewilderment abruptly arriving at the edge of time. Let us sort ourselves out from the loudness of things here.”*

The present elucidation is not a “consciousness study”. It is a conscious expression of Reality. It is a symptom of consciousness, a deliberation of knowing. Or, as some would say, “it’s a proof, like music, rain, or a tempest”. It is a self-orchestrated pulsation and presencing without truncation even by silent objectivity, just as one may paint certain scenes of Sun-brushed magnolia eyes and long coral noons, or perhaps the deep winter rain and the seamless Moon-lit snow – simply like a mindful artist reminded of nudity during certain cavernous moments, nearly without a mirror capturing his inward constellation of motions. And so he moves, as it is, simultaneously before and after reflection, as if moving away from time itself. And so it moves, the entire reflection included.

Despite the possibly glacial theoretical sounding of the title and the way the text shall proceed from here (perhaps inconsistently), it is essentially not another viscid gathering of scholastic words on monism, let alone an ecstatic, bemused first-time attempt at modeling Reality. It is not a theory in the sense of mental speculation and inspirational belief: it is Presence and Idea before and after philosophy, and a direct presentation and “surdetermination” during philosophy. Thus, it is not a mere representation, for it does not even begin with reflection. Rather, the entirety of reflection is but momentous and strengthened only by what truly precedes and surpasses it. It is not a psychological documentary multi-linearly tinged with philosophical armor and scientific draping. It is not a predictable philosophy in the rear. It is not a lucrative science as the world knows it. It is a mirror for worlds, anti-worlds, and all the non-worlds. And sometimes this very mirror does vanish, for absolute certainty’s sake.

This is an exposition to be enjoyed the most by self-similar “stray falcons”, who can’t help with their epistemic-intellectual speed and Genius, whose taste – upon the wind and beyond distant hills – is beyond that of the herd and the faltering, image-dependent, super-tautological world as a whole. It is not intended to be a secure throne in the sky nor a comfy haven on the Earth. Also, it is definitely not for the hideous, vainly copious one-dimensional intellect devoid of the valley’s affection and the seasons’ intimation. It is a silence-breaking tempest and a self-sustaining root in the most evident evening, entirely independent of the small sparks of the present age of thought. It calls upon witnessing the Witness (and the Witnessed) in infinite exhaustiveness, intimidation, and silence.

It is incumbent upon the reader to acknowledge that the present exposition’s veracity is to be grasped not by merely studying it, but by “studying it, not studying it, not-not studying it, and by none of these” (as to why, it shall be clear later). While Reality is not situational (as we shall see), the surreptitious meta-situation here is that, while there is an entire history of human ideas in the background of the world at any instant, its content moves not on any regularly known ground of being, so basically even the intrepid reader cannot compete with its velocity and vortex, for it is ahead of his reading, behind it, within it, and without it. And it is none of these.

Still, let the burning lines of the night and the time-span of the intellect’s long orbit be epistemologically intimated. For even if there is nothing to be seen and understood by the reader here, that one shall still see “seeing” itself, beyond mere “spiritism”, however indifferent.

And so here falls headlong the platitudinous introductory tone first. Granted, it shall evaporate away soon enough, once the most unlikely epistemic sensitivity happens to the reader.

At the forefront of humanity – which is definitely a conscious, self-reflective episode in the evolution of the cosmos, according to the famous Anthropic Principle of cosmology and cosmogony – there is no need to explain why one needs to fully explore the nature of consciousness philosophically and scientifically, i.e., unless one is a dead-end dogmatist who, however taut, probably dares not “swear upon his own life, as to whether or not his beliefs are universally true after all”.

The present semantic-ontological exposition centers around a further (or furthest possible) development of the theory of consciousness called “Reflexive Monism” (RM) – hereby referred to as the “Surjective Monad Theory of Reality” (SMTR).

By contrast, the version of realism called “Biological Naturalism” (BN) posits that consciousness is merely an emergent property of inanimate matter: everything that exists is necessarily inside the material brain, possibly as a quantum state. Thus, there is “no world inside the mind” – and so there is no “mind” (only a material brain) – and consciousness is but a field (electromagnetic, perhaps) activity involving the neuronal circuitry. Connected to this (and the theory of “Artificial Intelligence” (AI)), is the theory of Multiple Intelligences (MI), which advocates “consciousness” as a collective state of material brains via a global circuit mechanism, necessitating the existence of multiple participants – ultimately leaving no room for an individual brain, let alone an individual mind in the Universe (and hence, one could say, no room for a real solitary Genius at all, since MI-consciousness is always a collective pseudo-democratic state, no matter how transparent), for phenomenal multiplicity (rather than the self-cognizant, inhering presence of a single universal intelligence) is at the very core of this form of materialism. Yet, consider this now-generic example as, e.g., conveyed by Velmans [1]. Suppose, convinced like many merely collectivistic scientists today, one accepts BN, then by definition one also accepts the whole world (nay, the Universe) as contained in the material brain. But most of every-day objects, including the skies and the horizons, seem to be located “out there” – that is, outside the brain. Thus, in order to encapsulate all that in a single material brain, one must accept that there is a “real skull” (whether or not certain “noumena” are known to one here) whose size is beyond that of the skies and the horizons, since physically the brain is contained in a skull. The “real skull” would then be related to individual skulls through some kind of “statistical-holographic averaging”. The difference between “is” and “seems” becomes so arbitrary here, as we can easily see.

On the other hand, the history of human thought presents us with “Pure Idealism” (PI) – such as that advocated by Berkeley in one of its versions – where the world is but a mental entity, purely located inside the mind. By “world”, we mean all that can exist as a single situational adage and corollary of reflective facts, including *qualia* (the trans-optical reality of color) and psychosomatic sensations. According to PI, there is “no world out there”. In this approach, the mind is distinguished from the material brain, with the brain being a material self-representation of the mind, and everything is necessarily contained in the mind – yet with serious troubles for, like BN, it is without clear epistemic qualifications regarding the notion of individual and multiple entities: according to this theory, one might be tempted to see whether or not the Universe too ceases to exist, when an arbitrary mind (anyone’s mind) dies out. Non-epistemologically positing essentially “eternal souls” does not really help either. (As regards *qualia*, we shall readily generalize this notion to include not just color, but



also subsume it in the category spanned by the pre-reflexive “Surject”, i.e., “*Qualon*” – precisely so as not to take the abstract phenomenological entity for granted.)

Such radical, self-limited approaches leave room for both “dogmatism” and “relativism”, and consequently have their own drawbacks as shown, e.g., in Velmans' studies. Indeed in the face of Reality, one cannot help but be radical and isolated, whether shivering or rasping, but true epistemological qualification (herein to be referred to as “eidetic qualification”) is quite profoundly something else. Velmans himself – formerly a proponent of BN – is a cogent philosophical proponent of RM and has indeed very extensively explored this reality theory, especially its aspects pertaining to cognitive psychology. Yet, we shall naturally go even beyond him in “imbibing Reality”, hence the present theory as our basic ontological paradigm.

As is evident, RM is a version of realism adopted by thinkers such as Spinoza, Einstein (but not specifically its associated pantheism), and Velmans – which goes beyond BN and PI. Reality is said to isomorphically partake of events (mental and material instances) both inside and outside the brain – and the mind.

Let us attempt to paraphrase RM as follows: the most fundamental “stuff” of the Universe is a self-intelligent, self-reflexive (“autocameral”) substance beyond both (the commonly known) mind and matter, possibly without an “outside” and an “inside” in the absolute sense (think of a Möbius strip or a Klein bottle, for instance). And yet, locally and “conspansively” (for the original use of this term, see also [2]: here “conspansion” is to be understood as self-expression and self-expansion within the semantics and syntax of universal logic), it produces intrinsic mind and extrinsic matter – as we know them.

In our present theory, this underlying substance is further identified as a non-composite self-intelligent Monad (“*Nous*”), without any known attribute whatsoever other than “surjective, conscious Being-in-itself”: we can make no mention of extensivity, multiplicity, and the entire notion of knowledge set at this “level” of Reality, whether subjectively or objectively, or both simultaneously. Otherwise, inconsistent inner multiplicity associated with reflection would somehow always have to qualify (i.e., ontologically precede) Being not only as being self-situational or self-representational, but also as being “accidentally none of these”. Such is absurd, for then it must also hold in the sheer case of Non-Being, i.e., without both existence and such multiplicity-in-itself and -for-itself. Being pre-reflexive, and hence pre-holographic and pre-homotopic, the true meaning of this point shall be effortlessly self-evident as we proceed from here. This is the reason why our *Nous* has no superficial resemblance with arbitrary phenomenal intelligence, let alone substance.

And yet the very same Monad sets out the emergent properties of reflexivity, holography, and homotopy with respect to the Universe it emergently, consciously sees (or “observes”, as per the essential element of quantum mechanics: the observer and elementary particles are both fundamental to the theory). It is necessarily, inevitably “intelligent” since it positively spans (knows) the difference between existence and non-existence and thereby fully augments this distinction in that which we refer to as the Universe or Reality’s Trace, which individual intelligences may reflect in various degrees of “motion” and “observation”. Otherwise, no one in extension would ever know (or have the slightest conscious power to know) the distinction between existence and non-existence; between the conscious and the unconscious – and further between absolute singular existence and various epistemological categories of multiplicity. Verily, this forms the basis of our paradigm for a fully intelligent cosmos – and further qualified versions of the Anthropic Principle.

Furthermore, our framework manifests a theory of Reality via four-fold universal (trans-Heraclitean) logic, which is beyond both conventional (binary) and fuzzy logics – as well as beyond Kantian categorical analysis. Given a super-set ( { A, B } ), where { A } is a collection of abstract principles, { B } is a collection of emergent realities isomorphic to the entirety of { A }, and the super-set ( ) is “eidetically symmetric” (the meaning of which shall become clear later) with respect to its elements, it contains the full logical span of “A”, “non-A”, “non-non-A”, and that which is “none of these” (how it differs from traditional Buddhist logic will become clear later as well). As such, one may inclusively mention a maximum span of truly qualified universals, including ontological neutralities. This gives us a “surjective determination of Reality”, whose fundamental objects are related to it via infinite self-differentiation, as distinguished from Unreality.

While so far the reader is rigged with limited equipment – for, at this point, we have not introduced the essence and logical tools of the present theory to the reader – we can nevertheless roughly depict Reality accordingly, i.e., we shall start with “thinking of thinking itself” and “imagining the dark”. For this we will need one to imagine an eye, a mirror, a pitch-dark room (or infinite dark space), and circumferential light. Then, the following self-conclusive propositions follow:

P1. In the pitch-dark room (“Unreality”), there exists an Ultimate Observer (“Eye”) that sees the pure, luminous mirror. The mirror is the Universe – henceforth called the “Mirror-Universe” –, which is a “bare singularity” with respect to itself, but which is otherwise multi-dimensional (for instance, n-fold with respect to the four categorical dimensions of space-time, matter, energy, and consciousness, let alone the Universe itself).

P2. The circumferential light augments both the mirror and the sense of staring at it, resulting in the image of an “eye” (or “eyes”, due to the multiple dimensions of the Mirror-Universe) and a whole range of “eye-varied fantasies” – which is the individual mind and a variational synthesis of that very image with the dark background – where that which is anyhow materialized readily borders with Unreality.

P3. The circumferential light is, by way of infinite self-differentiation (and transfinite, self-dual consciousness), none other than (universal) consciousness.

P4. Reality is the Eye, the Consciousness, the Mirror, the Image, and the “Eye-without-Eye”. This can only be understood later by our four-fold universal logic encompassing the so-called “Surjectivity” (*Noesis*) – with the introduction of “Surject” at first overwhelming both “Subject” and “Object” (in addition to “Dimension”) in this framework, but as we shall see, only this very “Surject” ultimately defines “Moment” (and not just a universal continuum of three-dimensional space and sequential time) and “Uniqueness” (and not just the “totality of consistent and inconsistent facts”) four-fold: “within”, “without”, “within-the-within”, and “without-the-without”, ultimately corresponding to the paramount qualification of Reality for itself and, subsequently, its associated “class of Surjects” in the noumenal and phenomenal world-realms.

Before we proceed further by the utilization of the above similes, we note in passing that the underlying monad of any reflexive model of the Universe is none other than mind and matter at once, when seen from its phenomenal-organizational-relational aspect, a property which constitutes – or so it seems – both the semantics and syntax of the Universe, especially when involving conscious observers such as human beings. That is, noumenally (in

itself, for instance in the Kantian sense), the Universe is consciousness-in-itself, and phenomenally (in relation to the way its intelligibility inheres by means of extensive objects), it is a self-dual reality with a multiverse of material and mental modes of existence. But, as we shall see, there is a lot more to our adventure than just this: hence our generalization.

So much for a rather self-effacing introduction, in anticipation of the irregular dawning of things on the reader's mental window. Before we proceed further, let us remark on the rather speculative nature of "excess things" regarding the subject of RM in general: while, in general, mind cannot be reduced (transformed) into matter and vice versa, there exists subtle interactive links between them that should be crucially discerned by pensive research activities so as to maximally relate the philosophical dialectics of consciousness and technological endeavors, i.e., without causing philosophy, yet again, to get the "last mention". For, to partake of Reality as much as possible, humans must simply be as conscious as possible.

## 2. The Gist of the Present Epistemology: The Surjective Qualon

*"Mere eruditic logic often turns – as has been generically said – philosophy into folly, science into superstition, and art into pedantry. How far away from creation and solitude, from play and imagination, from day and night, from noon and silhouette it is! How Genius is precisely everything other than being merely situational, alone as the Universe."*

Herein we present a four-fold asymmetric theory of Reality whose essence – especially when properly, spontaneously understood – goes beyond the internal constitutions and extensive limitations of continental and analytic philosophies, including classical philosophy in its entirety (most notably: Platonism, neo-Platonism, atomism, dualism, and peripatetic traditions), monism (Spinoza-like and others), sophistic relativism and solipsism (which, as we know, has nothing to do with the actuality of the Einsteinian physical theory of relativity), dogmatic empiricism and materialism, Kantianism and neo-Kantianism, Hegelianism and non-Hegelian dialectics (existentialism), Gestalt psychologism, symbolic logic, hermeneutics, and all phenomenology. This, while leaving the rather arbitrary self-triviality of major super-tautological (collectivistic, ulterior, inter-subjective) and post-modern, post-structural strands of thought in deliberate non-residual negligence – for, abruptly starting at the level of axiology and being generically "not even wrong" in short or at length, these are devoid of real ontological-epistemological weight in our view.

The new ontological constitution under consideration is four-fold and asymmetric in the sense that there exist four levels necessitating both the Universe and Unreality, i.e., Reality, the Reflexive Mirror-Universe, the Projective World-Multiplicity, and Unreality, whose *eidetic connective distances* (i.e., "foliages" or "reality strengths") are *telically* (i.e., multi-teleologically) direction-dependent and not arbitrarily symmetric among themselves unless by means of *Noesis*, by which the very theory is said to be *eidetically qualified* (i.e., qualified by *Eidos*, or Suchness – be it Alone without even specific reference to the Universe at all, or when noumenally and associatively designated as All or All-in-All) – and hence self-unified and self-unifying with respect to an entirely vast range of phenomenological considerations.

It is to be noted that *Surjectivity*, as implied by the very term *Noesis*, in our own specific terminology is associated with *Nous*, or the Universal Monad, which is none other than the *First Self-Evident Essence* through whose first qualitative "Being-There" (*Ontos qua Qualon*) the ontological level, and not just the spatio-temporal level, is possible at all, especially as a definite, non-falsifiable concentration of knowledge.

Thus, in particular, the classical Socratic-Hegelian dialectics of thesis, anti-thesis, and synthesis is herein generalized to include also *Noesis*, but rather in the following *asymmetric, anholonomic* order: *Noesis* (via the Ontological Surjective “*Surject*”, i.e., “*Qualon*”), *Synthesis* (via the Epistemological Reflexive “*Dimension*”, i.e., “*Prefect*”), *Thesis* (via the Reflective Dimensional “*Object-Subject*”, i.e., “*Affect*”), *Anti-Thesis* (via the Projective Dimensional “*Subject-Object*”, i.e., “*Defect*”). This corresponds to the full creation of a new philosophical concept, let alone the *Logos*, by the presence of self-singular points and infinitely expansive perimeters.

The *ontic* (i.e., single monad) origin of the noumenal Universe is Reality itself, i.e., *Reality-in-itself (Being-qua-Being)* without any normatively conceivable notion of an internally extensive (self-reflexive) contingency (e.g., the usual context of cognition, information, syntax, simplex, and evolution) of inter-reflective, isomorphic, homotopic unity and multiplicity at all, let alone the immediate self-dual presence of subjects and objects (i.e., representational and observational categories, such as space-time and observers).

Thereafter, extensively, upon the emergence of the notion of a universe along with *universality*, i.e., *reflexivity* (encompassing, by noumenal and phenomenal extension, both *reflection* and *projection* – with the former being universal, ultimately akin to singularity and non-dual perception but still, in an austere sense, other than Reality itself, and with the latter being somewhat more inter-subjective and arbitrary, still bordering with the dark, shadowy vanity of Unreality), Reality is said to encompass primal, pre-geometric (i.e., “mirrorless”, trans-imaginary, or *qualic*) singularities and transformational multiplicities (modalities) at successive levels capable of fully reflecting essence and existence in the four-fold Suchness of “*within*”, “*without*”, “*within-the-within*”, and “*without-the-without*”, where original noumena inhere only by means of *eidetic-noetic instance (Surjection)* without the necessity of phenomena whatsoever, but only the presence of the so-called “*Surject*” – that which is not known to regular epistemologies, for in a sense it is other than “*subject*”, “*object*”, and “*dimension*”. Only then do both noumena and phenomena appear *info-cognitively* by means of reflexive omnijectivity involving arbitrary subjects, objects, and epistemological dimensions (i.e., in fundamental semantic triplicity), which in turn is responsible for the reflective and projective self-dual modes of all abstract and concrete phenomenal existences – hence the emergence of the universal syntax, nearly as circular self-causality.

In elaborating upon the above allusions, we shall also introduce a post-Kantian four-fold universal logic (not to be confused with four-fold Buddhist logic or that which is associated with non-relativistic, semantics-based process philosophy) associated with an eidetically qualified kind of *non-composite consciousness*, which enables us to epistemologically generalize and elucidate the metaphysics (logical interior) of the so far sound-enough theory of Reflexive Monism (i.e., “sound-enough” at least at the “mesoscopic” stage of things, and in comparison with the majority of competing paradigms).

In connection with the elucidatory nature of this exposition, we shall adopt a style of narration as intuitive, lucid, and prosaic as possible – while being terse whenever necessary –, due to the otherwise simple ambiguity inherent in the association of Reality with a potentially inert scholastic theory (while there is subtle isomorphism between Reality and language at a descriptive stage, to the Wittgensteinian extent, as recorded in [5], that “that which can be spoken of, must be spoken of clearly, and that which cannot, must be withheld in utter silence”, how can Reality only be a “theory” or “philosophy” after all?): the profundity of the former is ultimately senseless and immediate, with or without deliberate systemization on our part, while the latter is but a singular, cognition-based contingency-in-

itself (a logical enveloping singularity and yet always not devoid of the multiplicity of perceptual things, including those of plain syntactical undecidability).

### 3. Peculiar Eidetic Re-Definitions: Aprioristic Terminology and Essence

*“May I suspect, friend, you know – arbitrarily – what appears. But, tell me, what IS?”*

It is important to note that some of the eclectic terms employed throughout this exposition do not essentially depend on their scholastic historicity. It is immaterial whether or not they have come into existence through the collective jargon of the multifarious schools of all-time philosophers. (Needless to say, the same applies to scientific-sounding terms, without any attempt towards imparting to the reader’s mind a sense of “pseudo-science” whenever touching upon aspects other than traditional science, for one must be most acutely aware of the profound tedium prevalent in much of the arbitrary literature of post-modernism and so-called “theosophy” in actual relation to pseudo-science, pseudo-spirituality, pseudo-philosophy, and pseudo-artistry.) Rather, whenever we use these terms, we would only like to further present them in the twice-innermost and twice-outermost sense: phenomenological instances have inner and outer meaning, and yet we wish to also encompass the “twice-inward” (twice-Unseen, twice-Real within-the-within) and “twice-outward” (twice-Manifest, twice-Real without-the-without) akin to Reality beyond simple constitutional duality and arbitrary individual fragments. This is simply a prelude to an amiable over-all description of the four-fold Suchness of Reality and its self-qualified primal noumena, which is not attributable to simple, eidetically unqualified “bi-dimensional” entities (whose common qualification is solely based on “this” and “other”, “yes” and “no”, or at most “yes and/or no”).

Now, in order to be trans-phenomenally readable, we may give the following list of five primary eidetic redefinitions (corollaries) essential to the outline of things here:

- Suchness (S) (*Eidos*): that which is manifestly There, as qualified by Being-in-itself, with or without existential reflexivity (the multiplicity of forms and mirrors).
- Monad (N) (*Nous, Monados, Ontos qua Qualon*): the first intelligible self-qualification (“*Qualion*”) of Reality and hence its first actual singularity, the noetic-presential “U(N)” of “Universum” (i.e., “*Qualon*”), with or without singular internal multiplicity of reflexive things (i.e., “*versum*”, or possible *extensa*) other than a “bare” eidetic (and hence noetic) being in and of Reality-in-itself (i.e., by its simply Being-There). Such is beyond both the traditional “*Atom*” and “*Platon*”, let alone the infinitesimals. It is simply the noumenal All and All-in-All, as well as the first eidetic-archetypal Singularity, with or without phenomenological “allness” (reflexive enclosure).
- Universe (U) (*Universum, Kosmos*): the noumenal-phenomenal four-fold Universe, i.e., the surjective, reflexive (multi-dimensionally reflective-transformational), projective, annihilatory universal foliation, ultimately without “inside” nor “outside”. The multi-space All by the Surjective Monad – simultaneously a multi-continuum and multi-fractality, being simultaneously Euclidean and non-Euclidean, geometric and pre-geometric, process and non-process (interestingly, see how all these seemingly paradoxical properties can exist in a single underlying multi-space geometry as described in [7] and based on the formidable dialectical metastructure of

Smarandache neutrosophic logic [13] (certain elements of which are independently encountered in this work), a subtle encompassment that quintessentially eyes a “unified field theory of logics” – see also a salient description of the essentially inhomogeneous physical cosmos in relation to random processes as presented in [12]). In other words, Reality’s singular Moment and infinite Reflexivity, with or without phenomenal space and time.

- Reality (M) (*Ontos qua Apeiron*): that which is the Real-by-itself. The self-subsistent Reality of Reality in-it-self (with or without *realities* – i.e., with or without internal self-multiplicity), the Surjective Monad, the Reflexive Universe, and Unreality. Here the austerity of the symbolic, presential letter “M” (for the essentially “Unlettered”) inheres absolutely without any vowel such that it is said that “nothing enters into it and nothing comes out of it”.

- Subject (g) and/or Surjectivity (dg) (*Noesis, Epoche*): the first self-disclosing instance (“instanton”) of Reality, or such self-evident instances in existence. Reality is said not to act upon itself, for it is simply beyond categorical stillness and motion, and so it “acts” only upon the first reflexive mirror, the Universe, thereby capable of infusing new universally isomorphic *differentia* (“solitons”), i.e., new noumenal instances and new phenomenological events in the Universe (with respect to its trans-finite nature). In relation to it, the Universe is like a light-like (holographic, homotopic) mirror-canvas, a ground-base yet ever in motion, upon which the “Lone Artist” paints his “Subjects”. This is none other than the innermost nature of Genius (which differs, as we shall see here (i.e., by this more universal qualification) from mere superlative talent, just as eidetic surjectivity is beyond mere reflexivity).

As can be seen, each of the notions above is self-singular: these realities are self-similar among themselves, without categorical parallel apart from the ontological level. In other words, simply because Reality is One (Self-Singular), with or without reference to regular phenomenological (arithmetically countable) oneness, so are the Mirror, the Image, and the Shadow in essence.

As we shall witness in this exposition, all That (Reality, Monad, Universe, Unreality) can be given as follows:

$$\mathbf{M: N(U(g, dg)) \sim S}$$

where “.” denotes eidetic-noetic Presence (or Moment) and “~” represents transcendental equality as well as trans-individual self-similarity among the equation’s constituents. This, in a word, is more than sufficient to end our exposition at this early stage – for it is a self-contained proof of consciousness for itself –, as it is mainly intended for spontaneous cognizance, but we wish to speak more amiably of things along the epistemological perimeter of the intellect.

Non-composite Oneness belongs to Reality, so to speak, without having to be qualified or necessitated by that which is other than itself, simply because the self-necessary and the possible (existent), even the impossible (non-existent), can only be cognitively perceived “there” in and of the Real, not “elsewhere” by any other means, and not even by any presential concentration of singular multiplicity (i.e., ontological and epistemological gatheredness). In other words, Reality is not diversifiable – and made plural – within and without, since it has no categorical “inside” nor “outside”, especially with respect to the discriminative entirety of cognition. Even absolute non-existence can only be conceived in, and necessitated by, Reality as a category – hence, in the absence of multiple intelligible

things other than the supposedly primal “opposite” of pure existence, there is no actuality of absolute non-existence that can necessitate Reality as it is, nor is there anything phenomenal and noumenal that can cause it to mingle, in and across phenomenological time and space, with chance, causality, and mediation, let alone with singularly inconsistent multiplicity and Unreality. It is boundless not because it lies in infinite space, or because it is where infinite multiplicity inheres, or because it is a representation of eternity, or even because a finite entity is ultimately annihilated by “not knowing” and “non-existence” in the face of some infinite unknown, but because its ontological rank or weight (i.e., ontic-teleological reality) is without either immediate or extensive multiplicity in its own interiority or reflexive dimensionality, not even the entirety of “knowledge”. If this weren’t so, a single arbitrary reflective quantity could then also be shown to inhere intransitively (without existential predication), independently of Being, at any ontological level, *just as Being can always necessitate it predicatively*: for things to be situated in existence (extensivity), Being (Reality) must be there first absolutely without mingling with Non-Being (Unreality), *unlike the way things may phenomenologically mingle among themselves* (be it consistently or inconsistently). The metaphysical connection (the simplex of meta-logic) among ontological categories herein must then be, as will be shown shortly, asymmetric and anholonomic. Or else, there would be no discernment of the ontological weight of some absolute presence-essence (not in the way suggested by mere “essentialism”, where even in the case of arbitrary entification, essence must always precede existence), and there could be no logic whatsoever at subsequent levels of cognition, and isomorphism would be limited to the arbitrariness of inconsistent, self-flawed cognitive discrimination even on the phenomenological scale of things, which is not as trivial as the “arbitrariness of arbitrary things”.

This way, the Essence of Being is its own *Being-qua-Being*, which is identical, only in the “twice-qualified” sense, with the Being of Essence itself, i.e., “within-the-within” and “without-the-without”. Only in this ontological instance does eidetic asymmetry vanish.

It is not “logical”, and yet it is “not illogical” either – for the entirety of “logic”, “anti-logic”, and “non-logic” can only be traced (conceptualized) in its presence, with or without the necessity of accidental particularities. For instance, then, when we say “universe” without this qualification, we can still come up with the notion of “multiverse” while often still retaining space-time categories or attributes, or a plethora of schizophrenic universes “apart” from each other in one way or another, and yet we cannot anyhow apply the same splitting and extensivity, or diffeomorphism, to Reality itself in order to make it appear as a co-dependent and co-differential among others outside its own necessity.

Reality, therefore, is not a set, not a category, not a functor (or functional), not of the likeness of both objective tangible matter (*materia*) and subjective abstract forms (*forma, qualia*). It is neither regular nor aberrant, as commonsense and traditional phenomenology would have “being” defined at best as “inconsistent multiplicity in and of itself”. It is not a representation of something that has to have a normative representation, be it abstract or concrete, conscious or unconscious. It simply IS, even when there is no language and count to express this, without the notion that consciousness is “always conscious of something” in association with the internal multiplicity of knowledge. However, the four-fold asymmetric universal logic to be sketched in the following section is Reality’s exception just as Reality is its exception: we can truly say a great deal of things by means of it, especially consciousness.

Know intuitively (at once, or never know at all) that if Reality weren’t Such, both Reality and Unreality would not only be unthinkable and imperceptible (however partial), they would not be, whether in existence or non-existence, in pre-eternity, at present, or in the here-

after, in infinite contingency, finite extensivity, or universal emptiness, and there would be no universe whatsoever, finite or infinite, somewhere or nowhere, transcendent or immanent, – and none of these –, and no one would any likely embark upon writing this exposition at all!

Such is our blatant methodology by *Surjectivity* and eidetic redefinition, instead of both psychologism and the Husserlian phenomenological method of “bracketing”, which often amounts to either the “arbitrarily subjective over-determination” or the “arbitrarily objective suppression” of certain ontological constitutions already present among phenomenal categories.

#### **4. Beyond Kant, Phenomenology, and Reflexivity: A Four-Fold, Eidetically Qualified Universal Logic with Asymmetric, Anholonomic Categorical Connection**

*“Now, I must tell you of something more tangible than all solid objects and more elusive than all traceless things in the heavens and on the Earth. Behold the highest branches of the tree of knowledge – untouched by reflection –, of which the night-in-itself is the garden.”*

We are now in a position to outline the underlying features of our model of universal logic, which shall manifest the analytic epistemological sector of our present theory. In doing so, we will also make an immediate amiable comparison with the crux of Kantian epistemology, for the present case can be seen as a somewhat more universally deterministic generalization thereof.

As we have previously implied, it is important to distinguish between the phrase “four-fold” in our new framework and that found, e.g., in Buddhist empirical dialectics. In the latter, being of empirical-transformational character at most, there is no trace of essential relationship or logical enclosure with respect to the more contemporary Kantian and Fichtean categories pertaining to “das Ding an sich” (the thing-in-itself). Rather, in that ancient framework, given an object of contemplation A belonging to phenomena and subject to process – and ultimately embedded in a universe of infinite contingency regarding the past, present, and future –, the associated dialectical possibilities, of the utmost extent, are: “A”, “non-A”, “non-non-A”, and “none of these”, already (though not sufficiently, as we shall see) in contrast to the more usual forms of binary logic. A roughly tangible example would be the irreversible transformation of water (“A”) into milk (“non-A”), into vapor (“non-non-A”), and into curds (“none of these”), by the process of powdering, mixing, and heating however complete.

Though bearing superficial visceral resemblance with this in the use of the similarly expressed four identifiers, our logical strand is more of ontological “unbracketed” (i.e., non-Husserlian) dialectical nature, and not of mere process-based empiricism, existentialism, and phenomenology (i.e., non-Heideggerian). Rather, we subsume the entire phenomenal world of entification, process, and contingency already in the first and second categories (of “A” and “non-A”), as we shall see, thus leaving the two last categories as true ontological categories. We assume that the reader is quite familiar with essentially all kinds of dialectical preliminaries, so we shall proceed directly to the new elements of the four-fold analysis we wish to immediately convey here.



In accordance with the ontic-teleological unity given in the preceding section, we keep in mind four major constituents responsible for the presence of definite universal existence, hereafter denoted as the following “eidetic simplex”:

**{ MO } : { S (Suchness), U (Universe), N (Monad), M (Reality) } + { phenomenal instances, O (phenomenal entirety) }**

where the first group belongs uniquely to Reality (M) and the second is due to empirical-dialectical process-based observation whose phenomenological entirety is denoted by O. This representation implies that the identification is made from M to O, i.e., from Reality to phenomena, yielding a true unitary ontic-teleological state for any given elements of O. The analytic union between M and O, in this case, is none other than the Universe, i.e., U as a function of its underlying noetic surjectivity (g, dg).

Now, just as M is singular and four-fold with respect to the above representation, so is O. Due to the union between M and O, there exist common elements between M and O possessing true ontological weight: the “within-the-within” element and the “without-the-without” element. In short, given an arbitrary phenomenal instance A, we can write, according to the underlying representation

**O = ( without, within, within-the-within, without-the-without )**

the following representation:

**O(A) = ( A, non-A, non-non-A, none of these )**

where we shall simply call the four ontological entries “categories” – for the sake of brevity.

Let us note the following important identifications for the associated elements: given A as an object, there is guaranteed, in the empirical necessity of phenomenological space-time, an entity other than A – in fact a whole range of limitless instances of otherness –, including that which is categorized by traditional Buddhist logic as either “non-non-A” or “none of these”, especially in the residual sense of a given underlying process, as we have seen. But, in our approach, these two are not yet eidetically qualified and simply exist as part of the infinite contingency of phenomena – and so we can regard A already as both entity and process, without the need to make use of the earlier formalized aspects of Buddhist logical representation. As such, a phenomenal object A has no “inside” other than the entire phenomenal contingency in the form of immediate “otherness” (e.g., any “non-A”): this, when applied to an arbitrary organic individual, without negating the existence of the extensive world, negates the presence of a non-composite “soul” once and for all (but not the “soul-in-itself” as an eidetically qualified microcosm), which remains true in our deeper context of representation.

Meanwhile, at this point, we shall call the traditionally undecided Kantian categories into existence instead, according to which “non-non-A” (“without-the-without”) is the entire fluctuative phenomenological set O, which is devoid of absolute individual entification, simply due to the fact that Kantianism is undecided about A-in-itself, yet leaving it there, as it is, in existence. This arises in turn simply because of the inherent Kantian empirical undecidability between pure subjectivity (“spiritism” and “relativism”) and pure objectivity (“material dogmatism”) – alluded to elsewhere in a preceding section.

However, given our ontic-teleological equation, the present theory overcomes such undecidability on the epistemological level of things, including the phenomenological problem of the inconsistency of a singular entity (such as the phenomenal mind and its

knowledge and abilities): singular yet still constituted by its inevitable inner multiplicity of reflective objects. It is as follows.

Given, for instance, the classic example of “a leaf falling off a tree in a forest”: does it fall, after all, when there is no one observing it? Our response to this, accordingly, is that it truly depends on what kind of observer is present, i.e., how he is categorically qualified in Reality. Thus, an arbitrary observer will not qualify as a decisive representation: in that case, the leaf still falls due to, e.g., the law of gravity, for the macroscopic laws of physics are “arbitrarily objective-compulsive” in relation to the arbitrary observer. In other words, such a subjective observer is always objectified (or “subjectified away”) by that which is other than himself, which in this case is the totality of the manifest laws of Nature. Hence, his subjective self is bounded by a kind of temporal self-determined objective dogmatism as well, and if he attempts to be objective, he is soon limited to being subjective enough. In all this, he is composed of fundamental indeterminacy not intrinsically belonging to himself – as approached from the “below limit” –, but which is a surjective determination from the “above limit”, i.e., from the Universe itself.

Rather strikingly, the situation is fundamentally different if the observer is the Universe itself: whether or not the leaf falls, it depends on *Noesis*, according to the representative constitution of the Universe in our “Reality equation” above. In other words, there exists a so-called “Ultimate Observer” as a “surjective instanton” with respect to the entire Mirror-Universe of reflexivity. Since this observer exists at the self-similar singular ontological level of Suchness, it is again self-singular without parallel and indeed without any logical extraneous qualifier (and quantifier), thereby encompassing the Real, the Mirror, the Image, and the Shadow, in the manner of Reality. In other words, such an observer is none other than Reality, in relation to the Universe. Needless to say, that need not be “Reality-in-itself” in the rough sense of the phrase, despite existing also at the primary ontological level and in limitless eidetic oneness with Reality. Rather, it is most uniquely none other than it – and nothing else is directly (presentially) like such “Non-Otherness” with respect to Reality itself. Respectively, such an observer is noetic, i.e., the essence is of the level of the Surjective Monad, and such identification is already beyond all practical phenomenology even in its extended descriptive form.

Hence, up to the most lucid isomorphism, the “within-the-within/non-non-A” element of an eidetically qualified entity { A } (which, unlike an ordinary entity subject to Buddhist and Kantian dialectics, definitely possesses genuine, empathic inwardness and outwardness) can be identified as none other than the Universe, which in turn is the noumenal A itself, while the corresponding “without-the-without/none-of-these” element as Reality itself, whereas the conventional modes of “within” (A2) and “without” (A1) are, respectively, the abstract phenomenological A and the concrete (or material) phenomenological A. Hence the following representation:

$$\{ A \} = \{ A1, A2, U, M \}$$

A straightforward example of { A } is the Universe itself, i.e.,

$$\{ \text{Universum} \} = \{ \text{the Material Universe, the Abstract Universe, the Universe-in-Itself, Reality} \}$$

Or, in subtle correspondence with that, we may think of the categorical representation of thought itself, which has no equal parallel among arbitrary phenomena other than what is similar yet other than it (i.e., its possible anti-pod):

$$\{ \text{Thought} \} = \{ \text{Thought, Anti-Thought, Unthought, Reality} \}$$

Thus, phenomenally, thought always entails anti-thought: both are two intelligible sides of the same coin on the phenomenological horizon. However, note that such anti-thought is not equivalent to the further eidetically qualified Unthought. Simply speaking, this very Unthought somehow allows not the entirety of phenomena to perceive Reality as thinkable in the first place. In this light, the famous dictum by Descartes, “I think, therefore I am,” is indeed far from complete. The more complete phrasing would be something like: “I think, therefore I am, I am not, I am not-not, and none of these.” And this too, in the face of Reality, would still depend on the eidetic qualification of the one expressing it.

“Away” from all matter and abstract dynamical physical laws, the Universe can thus be identified as a singular surjective-reflexive mirror of “superluminosity” upon which Reality “acts” trans-reflectively through *Noesis* and *Differentia* (especially the qualified infinitesimals), hence the sobriquet “Mirror-Universe” (which is particularly meaningful here, and may or may not be related to the use of the phrase in the description of an exciting geometric structure of the physical Universe as revealed in [8] and based on a chronometrically invariant monad formalism of General Relativity as outlined in [4, 9, 11]). It is said to be “superluminal” in reference to the state of “universal unrest” as measured against all the rest of individual phenomena in the cosmos, somewhat in association with the ever-moving, massless photon as compared to the rest of physical entities (but this is only a gross, fairly illegitimate comparison, as we do not aim at sense-reduction at all).

Other examples include fundamental categories such as space-time, energy, matter, consciousness, etc.

Note that, generally speaking, the abstract phenomenological category (e.g., the concept, instead of the actual stuff, of a tree) is not the same for any entity as the noumenal category. Further, whenever an arbitrary, fluctuative entity  $\langle A \rangle$  (without eidetic qualification) is represented according to the above scheme, we should have instead

$$\langle A \rangle = \langle A1, A2, \{ U \}, \{ M \} \rangle$$

i.e., although  $\{ U \}$  and  $\{ M \}$  are present in the above representation, as if being  $\langle A \rangle$ 's linearly valid components in their respective contingency,  $\langle A \rangle$  possesses no universal similarity with  $\{ U \}$  and  $\{ M \}$ , let alone with just Reality, but only with A1 and A2 (subject to phenomenological mapping or transformation) – which is why U and M appear “bracketed away” therein, for otherwise they would best be written as “null components” (but which in turn would carry us away from its deeper ontological representation).

Finally, as we have seen, our all-comprehensive “Reality equation” (i.e., all the above in a word) is

$$M: N(U(g, dg)) \sim S$$

And we can say something fundamental about the state of Reality and the Universe as follows:

$$\{ MO \} = \text{All-Real (M and O are Real and Self-Evident)}$$

$$\{ OM \} = \text{Ultimately Unreal (leaving Real only M)}$$

$$\{ MO \} \neq \{ OM \} \text{ (the Reality-condition of asymmetry and anholonomicity)}$$

i.e., the eidetic “distance” (connective foliage) between Reality (M) and Otherness/Phenomena (O) is not the same as that between Otherness/Phenomena (O) and Reality (M) – in part owing to the non-reality of arbitrary phenomena with respect to Reality

–, which is why Reality is said to “contain all things, and yet these contain it not”, so long as arbitrariness is the case. In this instance, we may effortlessly witness the generally eidetic, anholonomic, asymmetric connection between categories in the Universe, with respect to Reality. (These categories, in the main, being ontology, epistemology, axiology, and phenomenology.) The word “anholonomic” clearly points to the path-dependence, or more precisely the direction-dependence, of our epistemological consideration: *eidetically, surjectively approaching things from the non-dual ontic-teleological Reality will be substantially different from arbitrarily, phenomenologically approaching Reality from (the transitive state of) things.*

Eidetic symmetry, thus, only holds in an “exotic case” possessed of *Qualon*, whereby an entity is eidetically qualified, so that it truly bears “resemblance” in “substance” with the Universe and Reality. Ordinary phenomenal symmetry holds in commonsense cases of isomorphism between things in the same category or in extensively parallel categories across boundaries, e.g., between one particle and another in collision, between an actual ball and a geometric sphere, between physics and mathematics, or between language and the world. In this respect, traditional philosophy (as represented chiefly by ontology and epistemology) qualifies itself above such phenomenological parallelism, especially with the very existence of the epistemology of aesthetics, but anyhow remains “infinitely a level lower” than Reality. (Such is in contrast to a famous, epistemologically trivial statement by Stephen Hawking, somewhat in the same line of thinking as some of those working in the area of Artificial Intelligence (AI) or certain self-claimed philosophers who enjoy meddling with “scientists” and “technologists” regarding the current state of science and the eventual fate of humanity, which can be roughly paraphrased as: “The only problem left in philosophy is the analysis of language,” where the one saying this “intuitively” mistakes post-modernism for the entirety of philosophy. One, then, might be curious as to what he has in store to say about art in general, let alone Being!)

It is important to state at this point that the kind of consciousness possessing eidetic-noetic symmetry (with respect to the Universe and Reality) is none other than Genius, or *Noesis* itself, whose nature we shall exclusively elaborate upon in the last section.

## 5. The Ultimate Observer in Brief

*“Who is looking at who? How far away is the Real from the reflection?”*

We can very empathically say that the Ultimate Observer is such that if that One stopped observing the Universe by way of Surjection (Surjectivity, *Noesis*), and not only in terms of phenomenological abstract laws and concrete entities, it would all cease to exist at once – at one Now – “before before” and “after after”, noumenally and phenomenally. This, again, is beyond the level of omnijjective reality (omnijjectivity) or conscious surrealism (of “altered consciousness states”) and mere inter-subjectivity, for it is an eidetically qualified noetic determination without parallel and residue.

The respective observer, then, is called a “noetic observer”: he eyes the Universe even before the Universe is “conscious enough to eye him”, with all its noumenal and phenomenal instances, and the Universe takes on *essentia (forma)* only through him. The level of imagination of such an observer, which is equivalent to the very form and interior of the entire Universe, is not as naive thinkers would potentially suggest (with express slogans like “anybody can dream anything into life” and “anything is possible for anyone”): first of all, he is eidetically qualified by Reality as regards his very presence and his observing the

Universe. Thus, it cannot be just an arbitrary observer, let alone “consciousness”, in phenomena, and so both typical superficial “science-fiction” and “spiritual pseudo-science” (i.e., “scientific pseudo-spirituality”) ultimately fail at this point, leaving only indeterminate non-universal surrealism.

What has been said of Reality thus far, in the foregoing twice-qualified ontological fashion, has been said enough clearly, exhaustively, and exceptionally. Still, let’s continue to throw some endless surjective light at any of the better-known sciences (such as physics and cosmology) and at the so far little-understood (or completely misunderstood) philosophy of universal aesthetics (i.e., the nature of Genius).

## **6. On a Model of Quantum Gravity and Quantum Cosmology: The All-Epistemological Connection**

*“Of geometry and motion, however, I must speak, no matter how faint.”*

We now wish to briefly review certain aspects of a model of quantum gravity as outlined in [3]. This consideration may be skipped by those interested only in the supra-philosophical aspects of the present exposition. But, as we shall see, there is an intimately profound universal similarity between a primary underlying wave equation there and our “Reality equation” as presented here, elsewhere.

In the truly epistemological dimension of this theory, gravity and electromagnetism are unified by means of constructing a space-time meta-continuum from “scratch”, which allows for the spin of its individual points to arise from first geometric construction and principles, without superficially embedding a variational Lagrangian density in a curved background as well as without first assuming either discreteness or continuity. As a result, we obtain a four-dimensional asymmetric, anholonomic curved space-time geometry possessing curvature, torsion, and asymmetric metricity (generally speaking, the distance between two points A and B, on the fundamentally asymmetric, “multi-planar” manifold, is not the same as that between B and A). The symmetric part of the metric uniquely corresponds to gravity while the anti-symmetric part thereof to electromagnetism (which is a generalized symplectic (pure spin) structure), resulting altogether in a unique, scale-independent spin-curvature sub-structure.

A five-dimensional phase space then exists only in purely geometric fluctuation with respect to the four-dimensional physical manifold, in contrast to regular Kaluza-Klein and string theory approaches. Thus, we do not even assume “quantization”, along with continuity, discreteness, and embeddability.

An important result is that both the gravitational and electromagnetic sectors of the theory are “self-wavy”, and the entire space-time curvature can be uniquely given by the wave function of the Universe for all cosmological scales, serving as a fundamental fluctuative radius for both the monopolar meta-particle and the Universe. Needless to say, here the Universe and such a meta-particle (monopole) are roughly one and the same. Also crucial is the fact that outside matter and electromagnetic sources (as both are uniquely geometrized by the dynamics of torsion in our theory, while in turn the torsion is composed of the dynamics of the anti-symmetric part of the metric responsible for individual spin “kinematicity”), gravity uniquely emerges in an electromagnetic field. Another instance is that both gravity and matter appear therein as “emergent” with respect to the entire geometric quantum fluctuation whose primary nature is electromagnetic.

To cut the story short, our quantum gravitational wave equation is as follows:

$$(\mathbf{DD} - \mathbf{R}) \mathbf{U}(\mathbf{g}, \mathbf{dg}) = 0$$

where  $\mathbf{DD}$  is the generalized (anholonomic) wave-operator – constructed by means of the generalized covariant derivative  $\mathbf{D}_i$ ,  $\mathbf{R}$  is the spin-curvature scalar,  $\mathbf{U}$  is the wave function of the Universe,  $\mathbf{g}$  is the asymmetric metric, and  $\mathbf{dg}$  is the asymmetric metrical variation. In contrast to the “spinless description” of the Klein-Gordon equation of special relativistic quantum mechanics and the originally non-geometric Dirac equation, our wave function  $\mathbf{U}$  is an intrinsic spin-curvature hypersurface “multivariant” (i.e., the hypersurface characteristic equation) and, upon the emergence of a specific toroidal quantum gravitational geometry, becomes none other than the generator of the most general kind of spherical symmetry (especially useful in the description of particle modes).

A complementary wave equation is also given there in the form of a completely geometric eikonal equation:

$$\mathbf{g}^{(ik)} (\mathbf{D}_i \mathbf{U}) (\mathbf{D}_k \mathbf{U}) = - \mathbf{R} \mathbf{U}^2$$

which goes over to unity in the case of massive particles (otherwise yielding a null electromagnetic geometry in the case of massless photons), for which

$$\mathbf{R} = \mathbf{R}(\mathbf{g}, \mathbf{dg}) \rightarrow -1/\mathbf{U}^2$$

Among others, such fundamental equations of ours result along with the following comprehensive tensorial expressions:

$$\mathbf{R}_{ik} = \mathbf{W}^2(\mathbf{U}) \mathbf{g}_{(ik)} \text{ (for gravity and matter)}$$

$$\mathbf{F}_{ik} = 2 \mathbf{W}(\mathbf{U}) \mathbf{g}_{[ik]} \text{ (for electromagnetism)}$$

where the operations “( )” and “[ ]” on tensorial indices denote symmetrization and anti-symmetrization, respectively, and summation is applied to repeated tensorial indices over all space-time values. Note that the above second-rank spin-curvature tensor, represented by the matrix  $\mathbf{R}_{ik}$ , consists further of two distinct parts built of a symmetric, holonomic gravitational connection (the usual symmetric connection of General Relativity) and a torsional, anholonomic material connection (a dynamical material spin connection constituting the completely geometrized matter tensor).

The strong epistemological reason why this theory, among our other parallel attempts (see, e.g., the work on the geometrization of Mach’s principle by the introduction of a furthest completely geometrized, chronometric (co-moving) physical cosmic monad as outlined in [10] – and the list of some of the Author’s other works therein), qualifies as a genuine unified field theory and a theory of quantum gravity is that, among others, its equation of motion (namely, the geometric Lorentz equation for the electron moving in a gravitational field) arises naturally from a forceless geodesic motion, that the theory gives a completely geometric energy-momentum tensor of the gravo-electromagnetic field – plus room for the natural emergence of the cosmological term as well as the complete geometrization of the magnetic monopole – and that the theory, without all the previously mentioned *ad hoc* assumptions (such as the use of arbitrary embedding procedures and the often “elegant” concoction of epistemologically unqualified Lagrangian densities, with non-gravitational field and source terms), naturally yields the eikonal wave equation of geometric optics, therefore completely encompassing the wave-particle duality: therein a particle is a localized wave of

pure spin-curvature geometry. Or to be more explicit: elementary particles, including light itself, propagate with certain chirality (helicity) arising purely geometrically due to individual-point spin and manifold torsion, in two geometric transverse and longitudinal modes (hence the existence of two such completely light-like surface vectors in the case of photons, whereby a photon can be regarded as a null surface of propagation with transverse and longitudinal null normal vectors emanating from it, which is the ground-state of all elementary particles).

In short, the theory yields a completely geometric description of physical fields and fundamental motion for all scales, especially as regards the question: “why is there motion in the Universe, rather than phenomenal stillness?” – which is quite comparable to the generically winding epistemic query: “why is there existence, rather than absolute non-existence?”.

The full extent of this physical theory is not quite an appropriate subject to discuss here, but we will simply leave it to the interested reader for the immediate comparison of our following two equations:

$$(\mathbf{DD} - \mathbf{R}) \mathbf{U}(\mathbf{g}, \mathbf{dg}) = \mathbf{0} \text{ (for the phenomenal Universe)}$$

$$\mathbf{M}: \mathbf{N}(\mathbf{U}(\mathbf{g}, \mathbf{dg})) \sim \mathbf{S} \text{ (for the noumenal Universe)}$$

with respect to the manifest epistemological connection between the noumenal and phenomenal Universes.

Additionally, our model of quantum gravity also reveals why the physical Universe is manifestly four-dimensional, in terms of the above-said generalized symplectic metrical structure, and whether or not the cosmos originates in time (for instance, due to a “big bang” ensuing from the standard classical, homogeneous, non-quantum gravitational model of cosmology) – to which the definite answer now is: it does not, but it can be said to be “emergent” as it is entirely qualified (necessitated), in the ontic-teleological sense, by that which is other than space-time categories, and in this sense the Universe is both preceded and surpassed by Reality and yet, due to *Noesis*, is never apart from it. As there remain categories of infinities, certain physical-mathematical singularities may locally exist in the fabric of the cosmos rendering the space-time manifold “non-simply connected”, but across such local boundaries the cosmic origin itself cannot truly be said to be (traceable) in time, for the Universe-in-itself is Reality’s “Now-Here”, infinitely prior to, and beyond, the evolutionary and yet also encompassing it.

## 7. Genius: A Conversation with Noumena – Closure

*“That leaf, which silently yellows and falls, is – more than all smothering possibilities – a happening unto itself. If only it were to happen up above instead of down here, among us, the celestial domains would all be terrifyingly cleansed at once.”*

We are now at a psychological and intensely personal stage where we can truly speak of the nature of Genius in the solitude of certain unsheltered sentiments and unearthed fissures belonging to the individual who sees the longest evening all alone, to which he lends all of his insight. That, he verily sees not outside the window, but entirely in himself. The only helplessly beautiful solace he has, then, arises simply from his soul seeing things this way. By “soul”, we mean that which moves from the pre-reflexive Surject to the reflexive realms as

none other than the microcosm, such that others can hardly notice that he is happening to the Universe as much as the Universe is happening to him.

Weren't Genius synonymous with Infinity – while in the synoptic world of countless impalpable beings, like a contrasting taciturn ghost, he is often an infinitely stray, perpetually long personification (acute inwardness) of the noumenal world along outwardly paradoxical, tragic banishing slopes –, Kierkegaard would not have swiftly declared,

*“The case with most men is that they go out into life with one or another accidental characteristic of personality of which they say, ‘Well, this is the way I am. I cannot do otherwise.’ Then the world gets to work on them and thus the majority of men are ground into conformity. In each generation a small part cling to their ‘I cannot do otherwise’ and lose their minds. Finally there are a very few in each generation who in spite of all life's terrors cling with more and more inwardness to this ‘I cannot do otherwise’. They are the Geniuses. Their ‘I cannot do otherwise’ is an infinite thought, for if one were to cling firmly to a finite thought, he would lose his mind.”*

Similarly, Weininger is known to have exclaimed,

*“The age does not create the Genius it requires. The Genius is not the product of his age, is not to be explained by it, and we do him no honor if we attempt to account for him by it... And as the causes of its appearance do not lie in any one age, so also the consequences are not limited by time. The achievements of Genius live forever, and time cannot change them. By his works a man of Genius is granted immortality on the Earth, and thus in a three-fold manner he has transcended time. His universal comprehension and memory forbid the annihilation of his experiences with the passing of the moment in which each occurred; his birth is independent of his age, and his work never dies.”*

(For more such non-dissipating, spectacular universal overtures, see [6].)

Peculiar to Genius is, among other solitary things, an infinite capability for intricate pain (inward ailment), for perpetual angst, which people often misrepresent as arising from mere anti-social loneliness or lack of amusement. But this aspect of Genius cannot be partitioned arbitrarily from the soaring spontaneity of his infinite ecstasy. Rather, Genius is simply beyond ecstasy and despondence, as well as beyond pride and self-deprecation, the way people are used to these terms. In any case, it is a state of universal sensitivity, inspiration, solitude, and creativity, which is the Eye of Creation, whereby Reality is comprehensively “likened” to a form ensuing from *Noesis*.

This way, most people are mistaken in their belief that Genius and talent are equivalent, for Genius is, indeed, “separated from all else by an entire world, that of noumena”, and not situated “within the spectrum of all linearly predictable expectations and contingencies”, as Goethe, Schopenhauer, Wilde, Emerson, Weininger, and Wittgenstein would have agreed. Mere belief, assumption, or syllogism is effortlessly devoid of authentic realization, let alone Reality: it is not even worthy of the simplest meta-logical refutation.

Indeed, Genius is in no way the superlative of talent. Talent is, at most, phenomenal-reflective, while Genius is noumenal-surjective and noumenal-reflective. It has been said that Genius does not act as a role model for talent at all: with respect to the latter, the former may appear inanelly murky and most wasted, simply because the latter lacks that which is infinitely other than the entire contingency of multiple reflections and projections.

The world of Genius is Moment, Universality, and Creation, where the entirety of noumena is revealed to the *persona* without residue, which is the greatest, most absolute *kudos* in existence, be it in the presence or absence of an audience. The world of talent is ordinary –



no matter how augmented – time, space, and imitation, i.e., the relative integral power of the inter-subjective contingency and tautology of phenomenal recognition and security.

The ocean of Genius is the heaviest self-necessity of greatly spontaneous assaults and pervasions on any shore without sparing both any large accidental object and a single grain of sand: it evokes creation and destruction entirely in its own being in this world. The pond of talent, amidst dregs, is the relative confidence of “sedimental measurement and experimentation”, albeit still related to intensity.

The intentionality of Genius is a self-reserved “Parsifal” of Universality, while that of talent is always other than the thing-in-itself (and so, for instance, a talent associated with science tends not to embrace the essence of science itself, which is one with the essence of creative art and epistemic philosophy, but only something of populist, tautological “scientism”).

The essence of Genius is Reality, not just situational “truth” – not the normative, often progressive, collective truths of talent and society.

The way of Genius in the world is traceless originality and thus defies all sense of imitation and expectation. Who shall discover the traces of fish in water and those of birds in the sky? And yet, this matter of Genius is more than that: he is different from all similarities and differences, absolutely independent of representation. Hence it is said of men of Genius – for instance by Weininger – that “their parents, siblings, and cousins cannot tell you anything about them, for they simply have no mediational peers, no genial otherness”. By contrast, talent is still psychogenetically and methodologically inheritable.

The life of Genius is that of utter sensitivity, and not just volitional silence and loudness. It is one of transcendental consciousness and intensity, and not constituted of mere choice and chance.

As the hallmark of the Genius is authenticity and creativity, which is not situated within the rhyme and rhythm of a mere choice of life-styles, he can do no other than this, and no one needs to tell or teach him anything.

Individuals of Genius exist as universal gradations of the pure eidetic plenum, and not as part of the mere ascending levels of talent. Thus, the particularity of Genius is always simultaneously universal: it is both twice-qualified “*Atom*” and “*Platon*”, Instanton and Soliton. He possesses the entirety of Object, Subject, Dimension, and Surject to unbelievable lengths.

Indeed, as has been generically said: “science becomes pure imagination, art pure life, and philosophy pure creation”, there in the vicinity of Genius.

Genius is Michelangelo, not Rafaelo. Genius is Leonardo, not rhetoric. Genius is Mozart, not the Royal Court. Genius is Beethoven, not the audience and merely connected hearing. Genius is Zola, not psychotherapy. Genius is Kafka, not stability. Genius is Rembrandt, not feminism. Genius is “Che” Guevara, not compromise. Genius is Tolstoy, not chastisement. Genius is Johann Sebastian, not the Bach family. Genius is Klimt, not neurasthenics and Venus. Genius is van Gogh, not art exhibitionism. Genius is Glinka and Gould, not musical recording. Genius is Abel and Galois, not the Parisian Academy. Genius is Kierkegaard, not Hegelianism. Genius is Weininger, not Aryanism. Genius is Wittgenstein, not philology. Genius is Kant, Einstein, and Zelmanov, not the herd of “scientism”. Genius is Goethe, not

Prussia. Genius is Cezanne, not Europe. Genius is Emerson, not America. Genius is Neruda, not Chile. Genius is Tagore, not India.

Genius is the Renaissance in motion before everyone else is capable of naming it, not its “timely and subsequent crumbs”. Genius is Dream, not sleep. Genius is Insight, not the day. Genius is Vision, not a report or a documentary. Genius is the austere summit, not the floating clouds. Genius is the ocean, not a river. Genius is gold, not the muddy colliery, not the mining. Genius is youth, not childhood, not adolescence, not adulthood, and absolutely not old age. Genius is all-life, not imitation. Genius is all-death, not barren constancy and consistency. Genius is acutely conscious suicide, not helplessness – but definitely not all suicides are Genius. Genius is love, not crude relationship. Genius is music, not licensed instrumentation. Genius is Self, not super-tautological composition. Genius is sheer nostalgia, not learning. Genius is Creation, not school, not training.

Genius is the cold North Atlantic, not the luxurious Titanic. Genius is the Siberian currents, not the avoidance of winter for more festive humidity. Genius is the entire Sonora, not urban life of chance-fragments. Genius is character, not yielding sexuality. Genius is Moment, not societal time. Genius is Mystery, not public space. Genius is Memory, not standard coordination. Genius is Nature, not information – and so not recognition. Genius is the full eclipse as it is, not prediction. Genius is the entire night, not a system.

Genius is Motion-in-itself, not a planned sequence. Genius is real individuality in the Universe, not composite institutional, societal, cultural pride. Genius is the singular conquest, not an artificial war. Genius is the universal meteor, not a celebratory fire-cracker. Genius is the rareness of a tsunami, a volcano, or an earthquake, not reported abrupt casualties. Genius is solitude, not sold and given democracy, and not a republic. Genius is the abyss and the sudden voice and force arising from it, not typical antiquity, Victorianism, and post-modernism.

Often, in relation to tragedy, Genius emerges as a funeral song, preceding all births and surpassing all deaths, which people find hard to canonize. Amidst their superficial merriment, a man of Genius is like the night that falls on their eyes and sinks in their souls – to be forgotten at their selfish ease. He is the loneliness of the day on a deep cogitator’s pane, one with the blue nacre of things.

Why then would Genius be most exclusively, among others, associated with tragedy? It is because most people would not mind partaking of “joy as it is”, with or without anticipation and as much and gauche as possible, yet they are ever impotent and apprehensive when it comes to facing “the other thing as it is”, i.e., tragedy. As Genius is the only spontaneous genera capable of infinitely imbibing the noumenal “thing-in-itself”, in universality and in particularity, in representation and in person, a man of Genius would principally never shun tragedy. His objective is inevitably the surjective pure intimation of it.

Thus, tragedy has sought the Genius even from before the dawning of the world. Indeed, he would even volunteer for it. And the entire Universe volunteers for it too, in and through his very individuality. This is why, the theme of tragedy (or death) is rather universal: it is consciously frequented only by very few men and yet by the entire Universe itself. These men, without losing their Self, which is Reality and the Universe – unlike the way most people understand it –, embrace phenomenal selflessness and defenselessness with full noumenal understanding and bursting innocence: they are “too close” to the torrents of the most unlikely visitation of kisses, “too close” to thunder in the heavy rain, “too close” to the Sun in elevation and peaking radiation, “too close” to the soil and dust in every heavenly

intimation, “too close” to the nakedness of Nature in everything raw and full, “too close” to the chiseled understanding of certain winter-banished seeds and underground grains, “too close” to the Cornelian female breast of surreptitiously migrating strengths and silences. They are “too close” to their own prodigious male latitude, in their expensive self-immolating Siriusian nuclear moods, eventually being poured out of life onto the canvas of death as the most splendid of selfless, will-less, unadulterated presence of colors and paintings, while thus rendering themselves too far from incidental admirers other than Reality itself. Such is glory: only due to that does deeply crimson compassion whiten in this world for a few sensitive others to see.

Though this world may see naught but sad wrinkles, the love of Genius is strong in its own unseen furrows, at the core of stars, in the fire of molten things. Genius is strong though weak and peevish in appearance: it is exalted in everything that takes roots and bears its own growth, in everything universal Reality wishes to see for itself. The Crucified is such a rare taste in people’s veins to devour. So either they unveil their own souls in the tragedy of Genius and then die to live anew, or live the life of a heathen forever.

When will this world fall into indigenous silence, like Genius, but not in certain sleep? Where is the soft hand of a lovely, caring female weaver upon Genius’ crushed, blackening fingers emerging from the rugged Earth and its ravines? In an aspect that relates the solitude of Genius and the continuity of mankind, known and unknown Geniuses have been digging the Earth for eons, for this world’s most conscious dreams, so that humanity may gush out with Nature’s own blood of youth: such is done among tormenting rocks, yet in order to reach above the Sun – yes, with the entire humanity.

Who would glue his petty, cowardly self to the secret, yet infinitely open, wounds of Genius? Either humanity caresses Genius the way Genius would touch humanity, until nerves, whips, and scourges become impalpable in humanity’s constitution of clay and fire, and of some might of the Unknown, or it perishes altogether with self-sufficient Genius not repeating itself for its cause ever again.

And to humanity it will then be said, “Either gaze at the red branches in the park of lovers, where Genius lives and dies unnoticed, where life fills its own cup through entwined hearts, lips, and arms through the sacrificial life of Genius at unseen roots, or, perchance, seek another countenance, another reality altogether and die without Reality ever sketching you in its own bosom.”

In this savage world of heavily fabricated walls, who then would want to taste a most tender, fateful wet drop of dew and honey oozing from the pristine skin of Genius, in the rain of tragedy and in the weft of huge solitude, which might just taste like the Universe – all of the Universe?

Who, then, would be able to recapture the moments of Genius, once they pass for good? Would they ever be able to simply rediscover the soul of Genius among many roots, thorns, and tremors and still multiply the silent understanding of love and life that hides in a wide ocean that shall never want to depart from humanity?

Who, then, would abandon the ever-putrefying cowardice, soulless collectivism, and mere conformity with much of this unconscious world and sit with Genius just for one more night – where there shall be no more secrets in the darkness’ midst, other than shadowless man, without flight from destiny, naked, engraved, and unshaken on the scarlet horizon behind a thousand prison features? Who shall be loved and sought by freedom this way?

Genius is a most shunned resonance behind all languages: both “knowing” and “not knowing” recognize it not. Whereas people are sole humans, a man of Genius is, infinitely more acutely, the most solely human: he is the one who understands love and sacrifice the most, who breathes limitlessly upon the flanks of wild flowers and hidden rivulets, yet no one among sole humans dares to love him with enough vastness of space. Indeed, he is the drops and substances in the rain, all the non-existence in dust.

When an individual of Genius desires existence in this world, he comes yielding against everyone else’s direction, cutting the evening on its very edges, unfolding horizons – even if that means undoing fancy rainbows. And when he yearns for an ultimate self-exile, he rushes towards death unconditionally, just as he once arrived in this world not by slow walking, purblind wandering, and empty gazing, but by the crackling spontaneity that impulsively and immeasurably forms fateful symmetries through the soul’s pure motion.

The life of Genius leaves this world a silent place underground for the most solitary and distinguished of understanding, knowledge, tenderness, and pain. Only a few, therefore, know what a “most original Genius” truly means. If only people knew the universal responsibility set upon the shoulders of Genius, and not just its apparent glories, very few of them would dare to aspire to the rank of Genius. Instead, they would be fairly content with talent alone. For, in relation to humanity as a “non-ideal savior”, Genius lives with such a palpitating, lonely chest and uplifting sensitivity in the narrowness of time’s remaining passage. (As Schopenhauer once declared, *“Great minds are related to the brief span of time during which they live as great buildings are to a little square in which they stand: you cannot see them in all their magnitude because you are standing too close to them.”*)

As regards the history of indifference and war that has befallen mankind, the heavens, some say, can’t be errant. But what idea do they have of a man of Genius whose heart of immense autumns is like a shattered clock, which he hears ticking mercilessly every second until its near cease, even when its fire – of awakening blood – moves from his heart’s solitude, to his soul’s labyrinth, to his lips, to the desire to possess, to nearness, to excitement, to the redemption of humanity? When the only place he can carry humanity to – for the moments and lost wings to take, to hold, to secure – is his ship of winter, passing through wounding seas, violent winds, and threshing floors? When he himself is one of the branches of the long, solitary night – of azure fate – and hardly a resting place for another soul’s existence?

A man of Genius loves humanity beyond its occasional self-pity and vain arrogance, without knowing how to carry the luster and growth of the garden of passion and intimacy elsewhere other than through the often awkward abruptness and intensity of each second. And so, wordlessly, certain hidden things are written in blood and yet shared in moisture, freely given and fully experienced – just as the cup, potion, and tavern are spun only at night – even while personal hope, let alone a future, ever shies away for himself, for soon enough nearly everyone’s eyes are to shut at length in sleep, not knowing that Reality itself is present in the darkest ravine of their modulations.

Men of Genius do not cross poignant, dark reefs to merely taste the deeps of depravity for themselves, but to make contact with the entirety of humanity and to love the unconsciously tragic as it is. But, of conversing with the severity and weather of naked love in the most drenching downpour of sentiments, who shall readily repay these men by communing in their names, even without having seen them?

Who, then, can cover the perimeter of Genius like a pure ring? In the Genius, life passes in a single heartbeat, and he happens to the world like the grip of the strangest spontaneous intimacy upon the furthest comprehension of sincere lovers. The nakedness of Genius is just as day and night are inseparably present in the world, unveiling each other – and thus essentially beating in each other – more than just taking turns and partaking of chance.

Verily, before the whole world of people ever does it, Genius is the poetry that immediately captures the high flares of every joy and the disconcerting depths of every tragedy there has ever been and will ever be so long as humanity exists. By the very personification of Genius is the most distant fate of humanity drawn near and the nearest pitfalls thereof redeemed.

People do the Genius absolutely no honor by merely projecting phenomenal attributes and expectations – and by merely scholastically and naively reflecting – upon him. When, coincidentally, certain men of Genius happen to be situated in certain domains of the society (instead of living in relative obscurity and epistemic solitude), which is a very rare case, it is to be understood that a zoo that proudly keeps a lion or a falcon, has no way of knowing whether or not it fully possesses it; and yet too often the zoo honors the beast and prides itself in the act only in order to praise itself. Genius exists independently of such a contingency and tautology. The entire gist of societal-phenomenal intentionality approaches not the abyss of the Genius, who, alone, is the monad, center, mind, and heart of the Universe. He is the entirely unabridged, naked pulse of Nature. It is the Genius who merely not “eyes the abyss” and “is conversant with it”, but who also exists there with absolute self-certainty, independently of all the objects outside the abyss (out there in the world), and independently of the entire abyss itself. He is not a mere philosopher of “mereology” either. He never has the need to question his own existence nor to “unveil himself”, whatsoever. He is not a mystic in this sense (and in that of Wittgenstein): it is not mysticism that is mystical, it is the way things already are in and of his nature; yet this he often projects onto people as “mysticism” in order to be “roughly understood”, i.e., when forced to speak to the world.

Indeed, Genius is more of the Universal Mind that establishes (and not just imparts to others) the “Suchness” of the Universe entirely through itself and moves things that way from the infinite past to the infinite future, through the infinite moment, instead of just a mere saint and mystic who has to find his way, by following the ways of other adepts, in much of the Unknown. It is the Pure Sword that still glitters and functions (i.e., moves) in the darkest stretch of space, with or without the presence of mirrors and lights. And it is not just a spark, nor a mere brilliance: Genius is the wholeness of unique illumination and pure presence.

The Universe of Genius individuality is four-fold, encompassing an infinite amount of noumenal uniqueness (not just “totality”) and a most extensive category of phenomenal modes of existence. Thus, again, it contains:

Reality: *Eidos-Nous* – the Surjective Monad, Absolute Unique Singularity  
The Mirror-Universe – the Reflective Whole, Singularity, Transcendence  
The Imagery-World – the Projective Particularity, Multiplicity, Immanence  
Unreality – the Absolute Darkness

i.e., its being-there, entirely in the greatest genus of individuation, is essentially without chance and residue.

The man of Genius, as such, needs no “belief” nor “hypothesis”, nor even any “transcendental method”, be it of religious, philosophical, or scientific dialectical nature, for he, the Eye-Content of Infinity and the Sign-Severity of Oneness, is he whose essence is All-in-All, the All-One, the Unique: “within”, “without”, “within-the-within”, and “without-the-without”. And this is more than just saying that his individual entification is the microcosm – and that he is a particularization of the Universe.

Unlike a mere saint who is the ultimate phenomenal (linear, diametrical) opposite of a mere criminal, a person of Genius possesses *Animus* (*Anima*, “animate animal”), with respect to the entire Imagery-World, and is therefore the most unpredictable, spontaneous, intense, and creative in his phenomenal actions, beyond the entirety of collective anthropomorphic morality, if not ethics. And, unlike a mere criminal who is the phenomenal opposite of a mere saint, Genius is fully, intrinsically possessed of *Noesis*. Thus, a single moment of Genius in the Universe enriches existences infinitely, whether the individual is “animal-like” (in terms of instinct, but not merely psycho-pathological: for instance, even when madness seems to have befallen a man of Genius – as Atlas is said to excessively bear the world on his shoulders, alone, more than any other –, it is so without the Genius losing his *persona* at all, for his essence is absolutely non-composite Individuality and Universality, inwardly and outwardly; madness is a mere “surrealism” the Genius deliberately embraces in order to relatively, specifically “seal” his suffering without ulterior motives other than “inward romanticizing” (for instance, Goethe and Kafka), and the same can be said about the case of a suicidal Genius) of tragedy-in-itself, or whether he is deliberately an entirely new humanity – and, again, not just a new species – beyond the external world's understanding.

The Genius is he who knows the saint more than the saint knows himself, and he who knows the devil more than the devil knows himself: needless to say, he definitely knows Kant better than Kant knows himself (indeed, he who understands Kant, goes beyond him and thereby “bedevils” him, while most others are stuck, without soul, in mere scholastic documentaries on Kantianism). Whether or not he speaks of what people call “morality”, it is entirely up to him: in any case, he alone personifies Reality and gives its most elusive aspects to his subjects. Unlike the sadist, he suffers not from the outward surreal vacuum of space and, unlike the masochist, from the inward intimidation of time (again, see Weininger's psychological essay on aspects of sadism and masochism in [6]). His deliberate transgression of established, normative mores is equally non-understandable by most sentient beings as his infinite capacity for tenderness and selflessness. In any of these acts, he truly owns his moments, either by throwing universal light into utter darkness or by annihilating even light in every phenomenal perception. In one respect, he is indeed ageless Momentum: he is child-like, though not exactly a child, and he is sage-like, though not exactly a sage.

As the Genius is he who phenomenally contains the most variegated manifold of attributes, names, and characters, he thus has to represent an entirely new genus of humanity, a whole new epoch in the evolution of the cosmos, beyond the level of acceptance of present humanity. He remains human, simultaneously aloft as the sky – proud as a mountain – and fragile as the sand of time – humbled as a valley – beyond mere acceptance and refusal, and even beyond contemplation. Just as the heavens send down the rain just as much as they reflect sunlight, and just as the great ocean gently intimates sand-grains and yet annihilates shores and settlements, so is Genius the one most capable of sorrow and joy; rage and calmness; destruction and creation – of both infinitely romanticizing and molding the modes of existence.

Thus, while there can be countless linearly, smoothly predictable talented, institutionalized people in the world, “who are just happy and successful enough” without the tinctures of tragedy and without possessing the Surjective Monad of Genius, there is indeed no Genius without a trait of tragedy, for tragedy is the only melodrama in the Universe used as a language to convey and gather known and unknown multitudes: it is a forceful communication among breaths made possible in a largely superficial world and in a truly secluded corner of the Universe – however with the possibility of communication across it. Of this universal epistemic disposition, the Genius would rather embrace moments of melancholia and quiver like certain autumnal sitar-strings, than be merely happy. Again, while not being a merely fateful one, he never shuns tragedy: he voluntarily internalizes any tragedy (especially the tragedy of other men of Genius, whether known or unknown) and still gives it a breathing space and pulse in the Universe (and indeed binds it as a cosmic episode), when most people are wary of it. Nor does the Genius withhold conquest merely for the sake of mercy. He is the virtuoso, and not just the actor. He is also at once the script, the stage, the spectator, and the actor – the very life of the play. In the cosmic sense of the ultimate unification of observers and observables, he is self-observed, self-observing, self-existent.

As such, the following can be said about the dominion and nature of Genius, which belongs to no school and species at all. An individual of Genius is entirely his very own genus, more than a species, of Universality: without him, the Universe is not the Universe, and Reality would never “act upon itself” and “beget an archetype”. No one can teach Genius anything. No school, nor training, nor erudition can beget, let alone produce, the conscious existence of Genius. Its meta-human dominion is that of non-composite Self-Will animating the infinitesimals (i.e., meta-particulars) of the Universe. Its person is the one most capable of infinite self-differentiation (besides his intrinsic, immutable uniqueness), precisely because the Universe – the infinite Memory (Holography), Moment (Presence), and Mystery (Precedence) – is never exhausted when it yields differentiation, especially self-distinction.

Genius is the very vein and veil of Nature. Once people of discernment and reflection witness the Genius' unfolding the heavens by climbing them up, at once they shall also witness that he has no ladder nor means, that he is the creator of even the Unknown and of perceptual *noema*. Or even if at first it appears to them that the Genius uses a ladder or means (such as any transcendental logical method of deduction or any style of art), it will entirely fall back upon themselves after being self-thrown, at them and away from him, by himself, and there is no fear in the Genius regarding this, for, again, he is everywhere Reality's exception just as Reality is his exception. His sheer independence is the *sine qua non* of existence.

Thus, where are the kisses to leap towards the solitude of Genius, to consume it for last? Hidden in the pure seethe of an ocean's changeless soul, the love of Genius for the Real and the Human is hardly reachable. Even if Genius appears in the faintest human form, among other things in the perpetual sand of existence, people still find it unreasonable to intimate it. Instead, they readily besiege and confine its very incarnation into disappearance, ridicule by ridicule, betrayal by betrayal, kiss by kiss. But they can imprison not the most invisible, most infinitesimal – the most artful grain (meta-particle) in the Universe. Like unknown butterflies and fresh grapes, however short-lived, the Genius swiftly takes for farewell upon the eyelids of beauty, coming home not any later at the coronet noon of that which has communed with him in existence and appearance.

Only Genius knows Genius, and this is no sentimental exaggeration – whether the inter-subjective world of people (not the world-in-itself) is awake or asleep, it is bound to be troubled by the very person. Indeed, for most, “he draws near from farness, and he draws far from nearness”, with respect to perception and non-perception, by the very essence and form of Reality – and Unreality –, for the distance between Genius and people is not the same as that between people and Genius.

### **Surdeterminate Summary**

Based on the foregoing sketch aiming at the very age-long philosophical conundrum (i.e., the differential problem) of Being and Existence, we may cast our "Surjective Monad Theory of Reality" (SMTR) -- or rather, "Surjective Monad Thusness of Reality" -- very succinctly as follows:

$$\mathbf{M: N(U(g, dg)) \sim S}$$

1. Reality-in-itself (M) -- Absolutely One, entirely free of concrete (outward) and abstract (inward) multiplicity -- is Different from all similarities and differences.
2. Being-in-itself (M :) is Similar to Such Reality (~ S) and Different from all (categorical) things. Such is chancelessly the only twice-qualified, four-fold Noumenon (N) and Universality (U) (i.e., the only valid Noumenon and the Universe-in-itself), which is verily the real Thing-in-itself beyond Kant and others.
3. All things exist Otherwise (O) and are phenomena, i.e.,  $MO \neq OM$ . And so, by way of Surjection in the Universe, Reality contains all phenomenological "mere things", and yet these contain Reality not.
4. Existence as such (OM) is similar to all things. This presents us with a world, however abstractly inconsistent (being projectively and vanishingly finite and infinite at once, while there exist corresponding classes of finiteness and infiniteness).
5. As such, surjective-prefective Nature (g, dg) -- or the cosmos -- is Nature in its entire reflexivity, i.e., "kinesthetics". In short, Nature is "Nature as it is".
6. In contrast to Nature (if not the Universe-in-itself), arbitrary beings (i.e., those subject to simple subject-object duality, unqualified in our four-fold, asymmetric, anholonomic ontic manner), though valid as phenomenological entities, are "not as they are" (in the simplicity-sense of Nature). Rather, they are inconsistent and consistent phenomenal multiplicities (pseudo-beings), within and without. Ultimately, they are not a reflexive, substantial part of Nature but only appear to be situated in it as projective-accidental facades.
7. Thus, examine these -- blur mere essentialism. Examine not these -- bury mere existentialism. Examine not not these -- "become thus to be". And so do none of these.



8. This way, just as existence is transcended by Being, (bilinear, multilinear, combinatorial) space is transcended by Sight and, respectively, time is transcended by Moment.

9. Genius as such is the M-fold Unity of Memory, Moment, Mystery, Mastery. By this we mean absolute Genius (Being-in-itself), not merely peripheral Genius (which is a valid reflective form of Genius), and not mere talent.

10. Such Unity (MO) is hereby called Sense (Presence): within, without, within-the-within, without-the-without.

11. What makes ultimate sense in existence (if not in the world), by way of Reality (M) and Being (M :), is thus surdeterminate Eidetic-Noetic Existence (M ;) -- beyond projection and annihilation -- for which, and only for which, OM = MO. It consists of Object/Reflect, Subject/Reflex, Abject/Horizon (Abyss), Prefect/Gradient (Dimension), and Surject/Verizon. In the modular existential sense, such an existence, which is Genius, is Reality's exception (singularity) just as Reality is its exception everywhere in the Universe. That alone is ontologically, epistemologically, phenomenologically twice-qualified, four-fold, real Universality (Uniqueness, Unthought).

**Footnote:** Suggested parallel reading in philosophy, psychology, mathematics, and physics, especially for the sake of the reader's perspicacity of the present novel epistemological (meta-logical) work in simple comparison with other works dealing with theories of Reality and the Universe:

1. M. Velmans, *Reflexive Monism*, *Journal of Consciousness Studies*, 15(2), 2008, 5-50.

2. C. Langan, *The Cognitive-Theoretic Model of the Universe: A New Kind of Reality Theory*, [www.ctmu.net](http://www.ctmu.net).

3. I. Suhendro, *Spin-Curvature and the Unification of Fields in a Twisted Space*, Stockholm: Svenska fysikarkivet, 2008. (Original doctoral thesis version, 2004.)

4. A. L. Zelmanov, *Orthometric Form of Monad Formalism and Its Relations to Chronometric and Kinematic Invariants*, *Doklady Acad. Nauk USSR*, 227(1), 1976, 78-81.

5. L. Wittgenstein, *Tractatus Logico-Philosophicus*, original draft (in more recent online-typeset format), 1918.

6. O. Weininger, *Sex and Character (Geschlecht und Charakter)*, Leipzig and Vienna: Wilhelm Braümüller, 1913. (Modern online edition with interlinear translation by Robert Willis, 2004.) See also Kevin Solway's splinter page: <http://www.theabsolute.net/minefield/genqtpg.html>.

7. L. F. Mao, *Smarandache Multi-Space Theory*, post-doctoral research report, the Chinese Academy of Sciences, 2006.
8. L. Borissova and D. Rabounski, *Fields, Vacuum, and the Mirror Universe*, Stockholm: Svenska fysikarkivet, 2009. (First Russian edition, 1999.)
9. A. L. Zelmanov, *Chronometric Invariants and Comoving Coordinates in the General Relativity Theory*, Doklady Acad. Nauk USSR, 107(6), 1956, 815-818.
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## A New Possible Form of Matter, Unmatter – Formed by Particles and Anti-Particles

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### Abstract.

Besides *matter* and *antimatter* there must exist an intermediate form of matter, called *unmatter* (as a new form of matter) in accordance with the neutrosophy theory that between an entity  $\langle A \rangle$  and its opposite  $\langle \text{Anti}A \rangle$  there exist intermediate entities  $\langle \text{Neut}A \rangle$ .

Unmatter is neither matter nor antimatter, but something in between. An atom of unmatter is formed either by (1): electrons, protons, and antineutrons, or by (2): antielectrons, antiprotons, and neutrons.

In a physics lab it will be possible to test the production of unmatter.

The existence of unmatter in the universe has a similar chance to that of the antimatter, and its production also difficult for present technologies.

### 1. Introduction.

This article is an improved version of an old manuscript [5].

According to the neutrosophy theory in philosophy [see 4], between an entity  $\langle A \rangle$  and its opposite  $\langle \text{Anti}A \rangle$  there exist intermediate entities  $\langle \text{Neut}A \rangle$  which are neither  $\langle A \rangle$  nor  $\langle \text{Anti}A \rangle$ .

Thus, between “matter” and “antimatter” there must exist something which is neither matter nor antimatter, let’s call it UNMATTER.

In neutrosophy,  $\langle \text{Non}A \rangle$  is what is not  $\langle A \rangle$ , i.e.  $\langle \text{Non}A \rangle = \langle \text{Anti}A \rangle \chi \langle \text{Neut}A \rangle$ . Then, in physics, NONMATTER is what is not matter, i.e. nonmatter means antimatter together with unmatter.

### 2. Classification.

A) **Matter** is made out of electrons, protons, and neutrons.

Each matter atom has electrons, protons, and neutrons, except the atom of ordinary hydrogen which has no neutron.

The number of electrons is equal to the number of protons, and thus the matter atom is neutral.

B) Oppositely, the **antimatter** is made out of antielectrons, antiprotons, and antineutrons. Each antimatter atom has antielectrons (positrons), antiprotons, and antineutrons, except the antiatom of ordinary hydrogen which has no antineutron.

The number of antielectrons is equal to the number of antiprotons, and thus the antimatter atom is neutral.

C) **Unmatter** means neither matter nor antimatter, but in between, an entity which has common parts from both of them.

Etymologically “un-matter” comes from [ME < OE, akin to Gr. *an-*, *a-*, Latin *in-*, and to the negative elements in *no*, *not*, *nor*] and [ME *matière* < OFr < Latin *materia*] matter [see 6], signifying no/without/off the matter.

There are two types of unmatter atoms, that we call unatoms:

- u1) the first type is derived from matter; and a such unmatter atom is formed by electrons, protons, and antineutrons;
- u2) the second type is derived from antimatter, and a such unmatter atom is formed by antielectrons, antiprotons, and neutrons.

One unmatter type is oppositely charged with respect to the other, so when they meet they annihilate.

The unmatter nucleus, called **unnucleus**, is formed either by protons and antineutrons in the first type, or by antiprotons and neutrons in the second type.

The charge of unmatter should be neutral, as that of matter or antimatter.

The charge of un-isotopes will also be neutral, as that of isotopes and anti-isotopes.

But, if we are interested in a negative or positive charge of un-matter, we can consider an un-ion. For example an anion is negative, then its corresponding unmatter of type 1 will also be negative. While taking a cation, which is positive, its corresponding unmatter of type 1 will also be positive.

Sure, it might be the question of how much *stable* the unmatter is, as J. Murphy pointed out in a private e-mail. But Dirac also theoretically supposed the existence of antimatter in 1928 which resulted from Dirac’s mathematical equation, and finally the antimatter was discovered/produced in large accelerators in 1996 when it was created the first atom of antihydrogen which lasted for 37 nanoseconds only.

There does not exist an unmatter atom of ordinary hydrogen, neither an unnucleus of ordinary hydrogen since the ordinary hydrogen has no neutron. Yet, two isotopes of the hydrogen, *deuterium* ( $^2\text{H}$ ) which has one neutron, and artificially made *tritium* ( $^3\text{H}$ ) which has two neutrons have corresponding unmatter atoms of both types, *un-deuterium* and *un-tritium* respectively. The isotopes of an element X differ in the number of neutrons, thus their nuclear mass is different, but their nuclear charges are the same.

For all other matter atom X, there is corresponding an antimatter atom and two unmatter atoms

The unmatter atoms are also neutral for the same reason that either the number of electrons is equal to the number of protons in the first type, or the number of antielectrons is equal to the number of antiprotons in the second type.

If antimatter exists then a higher probability would be for the unmatter to exist, and reciprocally.

Unmatter atoms of the same type stick together form an **unmatter molecule** (we call it **unmolecule**), and so on. Similarly one has two types of unmatter molecules.

The *isotopes* of an atom or element X have the same atomic number (same number of protons in the nucleus) but different atomic masses because the different number of neutrons.

Therefore, similarly the **un-isotopes of type 1** of X will be formed by electrons, protons, and antineutrons, while the **un-isotopes of type 2** of X will be formed by antielectrons, antiprotons, and neutrons.

An *ion* is an atom (or group of atoms) X which has lost one or more electrons [and as a consequence carries a negative charge, called *anion*], or has gained one or more electrons [and as a consequence carries a positive charge, called *cation*].

Similarly to isotopes, the **un-ion of type 1** (also called **un-anion 1** or **un-cation 1** if resulted from a negatively or respectively positive charge ion) of X will be formed by electrons, protons, and antineutrons, while the **un-ion of type 2** of X (also called **un-anion 2** or **un-cation 2** if resulted from a negatively or respectively positive charge ion) will be formed by antielectrons, antiprotons, and neutrons.

The ion and the un-ion of type 1 have the same charges, while the ion and un-ion of type 2 have opposite charges.

D) **Nonmatter** means what is not matter, therefore nonmatter actually comprises antimatter and unmatter. Similarly one defines a nonnucleus.

### 3. Unmatter propulsion.

We think (as a prediction or supposition) it could be possible at using unmatter as fuel for space rockets or for weapons platforms because, in a similar way as antimatter is presupposed to do [see 2-3], its mass converted into energy will be fuel for propulsion. It seems to be a little easier to build unmatter than antimatter because we need say antielectrons and antiprotons only (no need for antineutrons), but the resulting energy might be less than in matter-antimatter collision.

We can collide unmatter 1 with unmatter 2, or unmatter 1 with antimatter, or unmatter 2 with matter.

When two, three, or four of them (unmatter 1, unmatter 2, matter, antimatter) collide together, they annihilate and turn into energy which can materialize at high energy into new particles and antiparticles.

### 4. Existence of unmatter.

The existence of unmatter in the universe has a similar chance to that of the antimatter, and its production also difficult for present technologies. At CERN it will be possible to test the production of unmatter.

If antimatter exists then a higher probability would be for the unmatter to exist, and reciprocally.

The 1998 Alpha Magnetic Spectrometer (AMS) flown on the International Space Station orbiting the Earth would be able to detect, besides cosmic antimatter, unmatter if any.

## 5. Experiments.

Besides colliding electrons, or protons, would be interesting in colliding neutrons. Also, colliding a neutron with an antineutron in accelerators.

We think it might be easier to produce in an experiment an unmatter atom of deuterium (we can call it un-deuterium of type 1). The deuterium, which is an isotope of the ordinary hydrogen, has an electron, a proton, and a neutron. The idea would be to convert/transform in a deuterium atom the neutron into an antineutron, then study the properties of the resulting un-deuterium 1.

Or, similarly for un-deuterium 2, to convert/transform in a deuterium atom the electron into an antielectron, and the proton into an antiproton (we can call it un-deuterium of type 2).

Or maybe choose another chemical element for which any of the previous conversions/transformations might be possible.

## 6. Neutrons and antineutrons.

Hadrons consist of baryons and mesons and interact via strong force.

Protons, neutrons, and many other hadrons are composed from quarks, which are a class of fermions that possess a fractional electric charge. For each type of quark there exists a corresponding antiquark. Quarks are characterized by properties such as *flavor* (up, down, charm, strange, top, or bottom) and *color* (red, blue, or green).

A neutron is made up of quarks, while an antineutron is made up of antiquarks.

A neutron [see 1] has one Up quark (with the charge of  $+2/3 \cdot 1.606 \cdot 10^{-19} \text{ C}$ ) and two Down quarks (each with the charge of  $-1/3 \cdot 1.606 \cdot 10^{-19} \text{ C}$ ), while an antineutron has one anti Up quark (with the charge of  $-2/3 \cdot 1.606 \cdot 10^{-19} \text{ C}$ ) and two anti Down quarks (each with the charge of  $+1/3 \cdot 1.606 \cdot 10^{-19} \text{ C}$ ).

An antineutron has also a neutral charge, through it is opposite to a neutron, and they annihilate each other when meeting.

Both, the neutron and the antineutron, are neither attracted to nor repelling from charges particles.

## 7. Characteristics of unmatter.

Unmatter should look identical to antimatter and matter, also the gravitation should similarly act on all three of them. Unmatter may have, analogously to antimatter, utility in medicine and may be stored in vacuum in traps which have the required configuration of electric and magnetic fields for several months.

## 8. Open Questions:

8.a) Can a matter atom and an unmatter atom of first type stick together to form a molecule?

8.b) Can an antimatter atom and an unmatter atom of second type stick together to form a molecule?

8.c) There might be not only a *You* and an *anti-You*, but some versions of an *un-You* in between *You* and *anti-You*. There might exist un-planets, un-stars, un-galaxies?

There might be, besides our universe, an anti-universe, and more un-universes?

8.d) Could this unmatter explain why we see such an imbalance between matter and antimatter in our corner of the universe? (Jeff Farinacci)

8.e) If matter is thought to create gravity, is there any way that antimatter or unmatter can create antigravity or ungravity? (Mike Shafer from Cornell University)

I assume that since the magnetic field or the gravitons generate gravitation for the matter, then for antimatter and unmatter the corresponding magnetic fields or gravitons would look different since the charges of subatomic particles are different...

I wonder how would the universal law of attraction be for antimatter and unmatter?

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## Verifying Unmatter by Experiments, More Types of Unmatter, and A Quantum Chromodynamics Formula

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**Abstract.** As shown, experiments registered unmatter: a new kind of matter whose atoms include both nucleons and anti-nucleons, while their life span was very short, no more than  $10^{-20}$  sec. Stable states of unmatter can be built on quarks and anti-quarks: applying the unmatter principle here it is obtained a quantum chromodynamics formula that gives many combinations of unmatter built on quarks and anti-quarks.

In the last time, before the apparition of my articles defining “matter, antimatter, and unmatter” [1, 2], and Dr. S. Chubb’s pertinent comment [3] on unmatter, new development has been made to the unmatter topic in the sense that experiments verifying unmatter have been found..

### 1. Definition of Unmatter.

In short, unmatter is formed by matter and antimatter that bind together [1, 2]. The building blocks (most elementary particles known today) are 6 quarks and 6 leptons; their 12 antiparticles also exist. Then *unmatter* will be formed by at least a building block and at least an antibuilding block which can bind together.

### 2. Exotic Atom.

If in an atom we substitute one or more particles by other particles of the same charge (constituents) we obtain an exotic atom whose particles are held together due to the electric charge. For example, we can substitute in an ordinary atom one or more electrons by other negative particles (say  $\pi^-$ , anti-Rho meson,  $D^-$ ,  $D_s^-$ , muon, tau,  $\Omega^-$ ,  $\Delta^-$ , etc., generally clusters of quarks and antiquarks whose total charge is negative), or the positively charged nucleus replaced by other positive particle (say clusters of quarks and antiquarks whose total charge is positive, etc.).

### 3. Unmatter Atom.

It is possible to define the unmatter in a more general way, using the exotic atom. The classical unmatter atoms were formed by particles like (a) electrons, protons, and antineutrons, or (b) antielectrons, antiprotons, and neutrons. In a more general definition, an unmatter atom is a system of particles as above, or such that one or more particles are replaces by other particles of the same charge. Other categories would be (c) a matter atom with where one or more (but not all) of the electrons and/or protons are replaced by antimatter particles of the same corresponding



charges, and (d) an antimatter atom such that one or more (but not all) of the antielectrons and/or antiprotons are replaced by matter particles of the same corresponding charges.

In a more composed system we can substitute a particle by an unmatter particle and form an unmatter atom.

Of course, not all of these combinations are stable, semi-stable, or quasi-stable, especially when their time to bind together might be longer than their lifespan.

#### 4. Examples of Unmatter.

During 1970-1975 numerous pure experimental verifications were obtained proving that “atom-like” systems built on nucleons (protons and neutrons) and anti-nucleons (anti-protons and anti-neutrons) are real. Such “atoms”, where nucleon and anti-nucleon are moving at the opposite sides of the same orbit around the common centre of mass, are very unstable, their life span is no more than  $10^{-20}$  sec. Then nucleon and anti-nucleon annihilate into gamma-quanta and more light particles (pions) which can not be connected with one another, see [6,7,8]. The experiments were done in mainly Brookhaven National Laboratory (USA) and, partially, CERN (Switzerland), where “proton---anti-proton” and “anti-proton --- neutron” atoms were observed, called them  $\bar{p}p$  and  $\bar{p}n$  respectively, see fig 1 and fig 2.

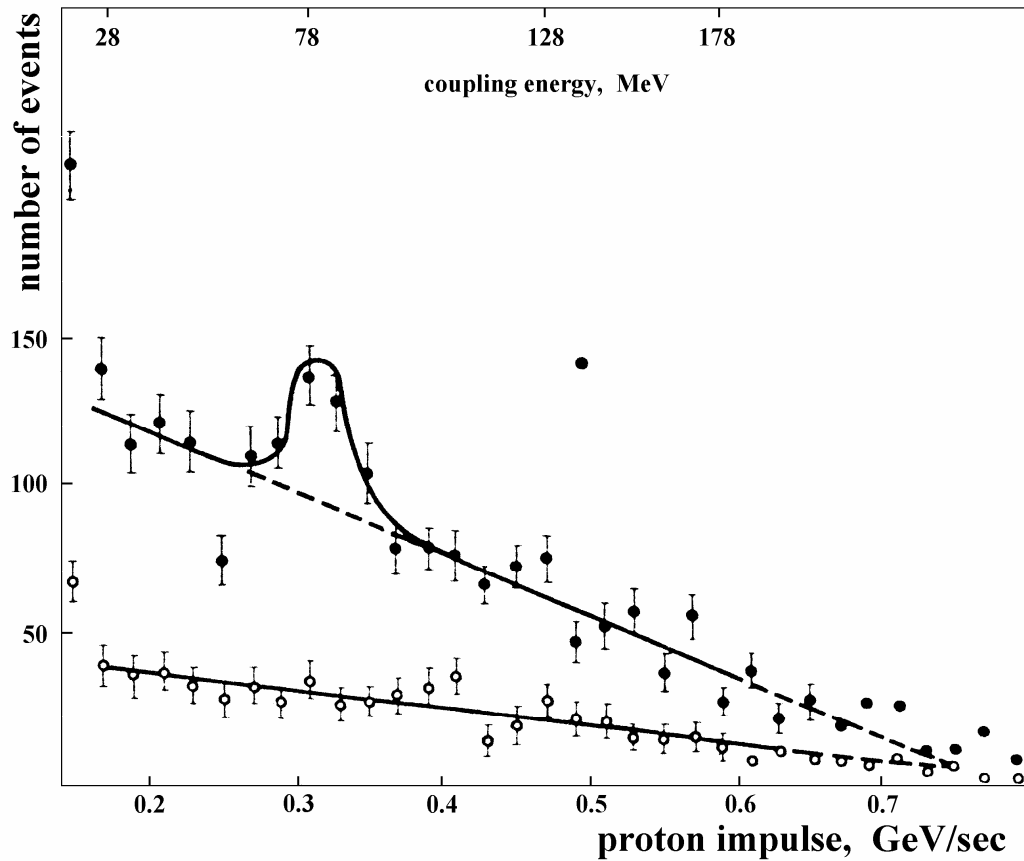


Fig. 1: Spectra of proton impulses in the reaction  $\bar{p} + d \rightarrow (\bar{p}n) + p$ . The upper arc --- annihilation of  $\bar{p}n$  into even number of pions, the lower arc --- its annihilation into odd

number of pions. The observed maximum points out that there is a connected system  $\bar{p}n$ . Abscissa axis represents the proton impulse in GeV/sec (and the connection energy of the system  $\bar{p}n$ ). Ordinate axis --- the number of events. Cited from \cite{fsm6}.

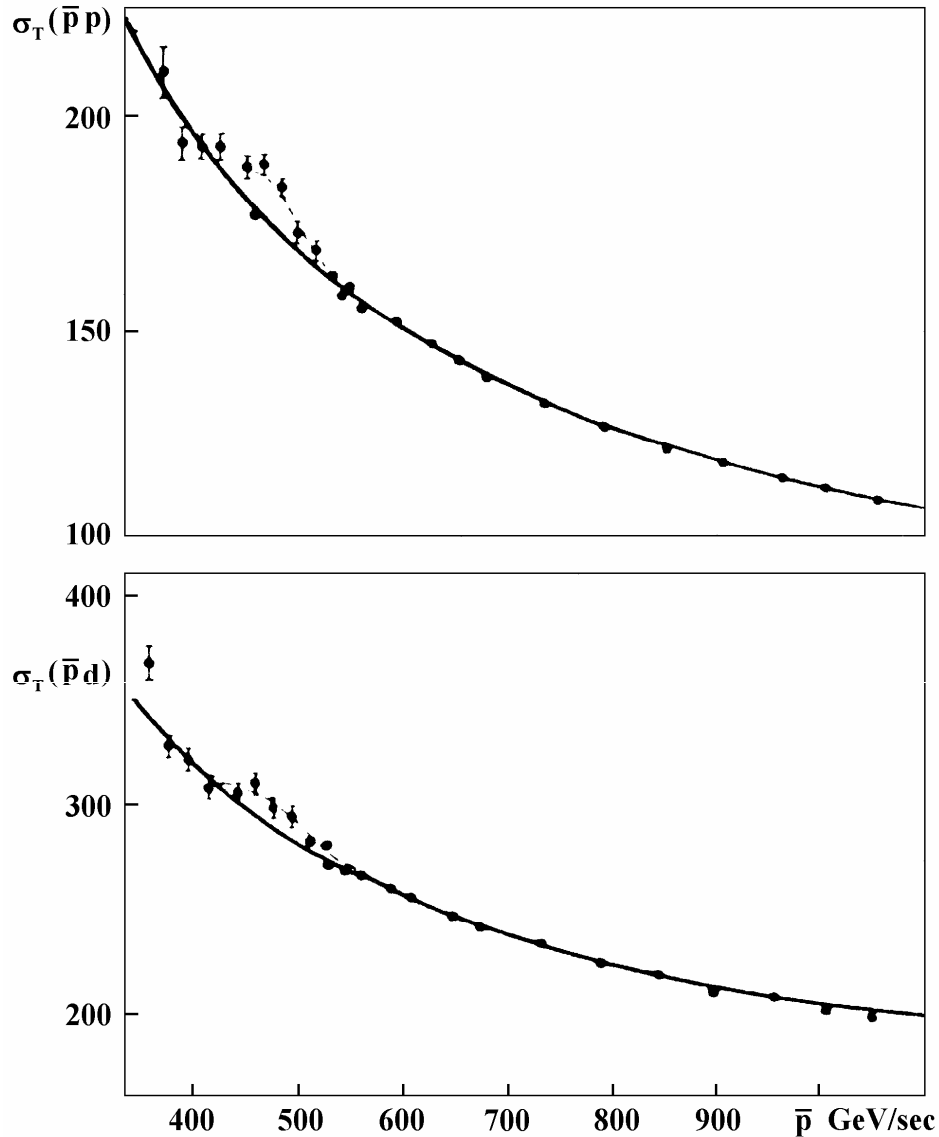


Fig. 2: Probability  $\sigma$  of interaction between  $\bar{p}$ ,  $p$  and deuterons  $d$  (cited from [7]). The presence of maximum stands out the existence of the resonance state of “nucleon --- anti-nucleon”.

After the experiments were done, the life span of such “atoms” was calculated in theoretical way in Chapiro’s works [9,10,11]. His main idea was that nuclear forces, acting between nucleon and anti-nucleon, can keep them far way from each other, hindering their annihilation. For instance, a proton and anti-proton are located at the opposite sides in the same orbit and they are moved around the orbit centre. If the

diameter of their orbit is much more than the diameter of “annihilation area”, they can be kept out of annihilation (see fig. 3). But because the orbit, according to Quantum Mechanics, is an actual cloud spreading far around the average radius, at any radius between the proton and the anti-proton there is a probability that they can meet one another at the annihilation distance. Therefore nucleon---anti-nucleon system annihilates in any case, this system is unstable by definition having life span no more than  $10^{-20}$  sec.

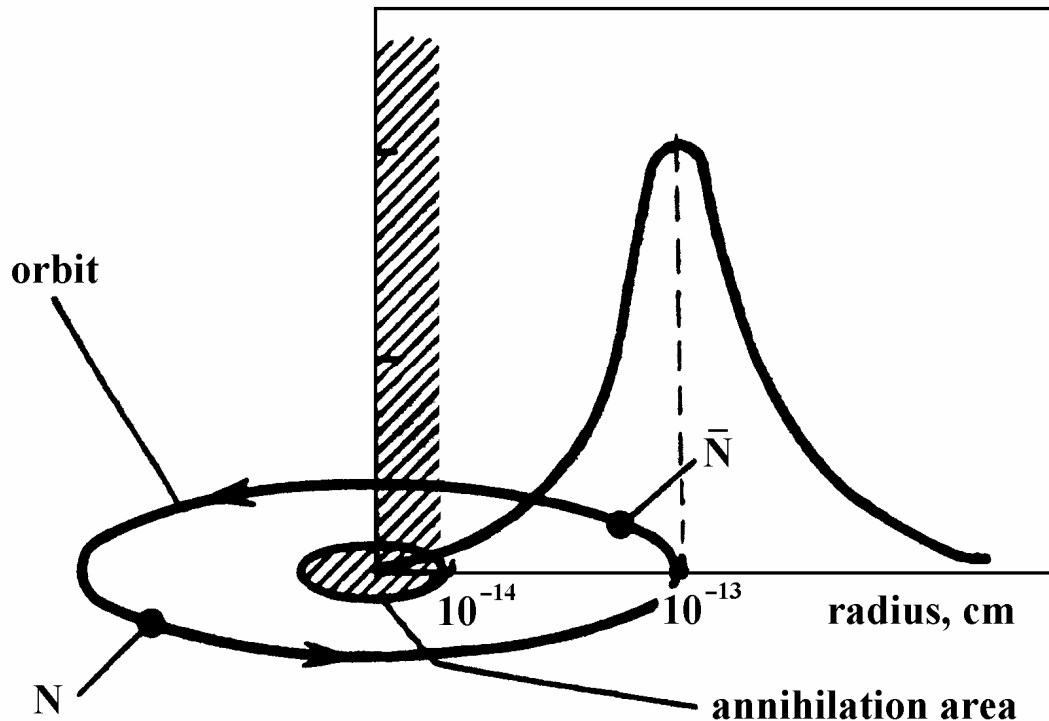


Fig. 3: Annihilation area and the probability arc in “nucleon --- anti-nucleon” system (cited from [11]).

Unfortunately, the researchers limited the research to the consideration of  $\bar{p}p$  and  $\bar{p}n$  nuclei only. The reason was that they, in the absence of a theory, considered  $\bar{p}p$  and  $\bar{p}n$  “atoms” as only a rare exception, which gives no classes of matter.

Despite Benn Tannenbaum’s and Randall J. Scalise’s rejections of unmatter and Scalise’s personal attack on me in a true Ancient Inquisitionist style under MadSci moderator John Link’s tolerance, the unmatter does exist, for example some mesons and antimessons, through for a trifling of a second lifetime, so the pions are unmatter [which have the composition  $u^{\wedge}d$  and  $ud^{\wedge}$ , where by  $u^{\wedge}$  we mean anti-up quark,  $d$  = down quark, and analogously  $u$  = up quark and  $d^{\wedge}$  = anti-down quark, while by  $^{\wedge}$  means anti], the kaon  $K^+$  ( $us^{\wedge}$ ),  $K^-$  ( $u^{\wedge}s$ ), Phi ( $ss^{\wedge}$ ),  $D^+$  ( $cd^{\wedge}$ ),  $D^0$  ( $cu^{\wedge}$ ),  $D_s^+$  ( $cs^{\wedge}$ ),  $J/\Psi$  ( $cc^{\wedge}$ ),  $B^-$  ( $bu^{\wedge}$ ),  $B^0$  ( $db^{\wedge}$ ),  $B_s^0$  ( $sb^{\wedge}$ ), Upsilon ( $bb^{\wedge}$ ) [where  $c$  = charm quark,  $s$  = strange quark,  $b$  = bottom quark], etc. are unmatter too.

Also, the pentaquark Theta-plus ( $\Theta^+$ ), of charge  $+1$ ,  $uudds^{\wedge}$  (i.e. two quarks up, two quarks down, and one anti-strange quark), at a mass of 1.54 geV and a narrow width of

22 MeV, is unmatter, observed in 2003 at the Jefferson Lab in Newport News, Virginia, in the experiments that involved multi-GeV photons impacting a deuterium target. Similar pentaquark evidence was obtained by Takashi Nakano of Osaka University in 2002, by researchers at the ELSA accelerator in Bonn in 1997-1998, and by researchers at ITEP in Moscow in 1986.

Besides Theta-plus, evidence has been found in one experiment [4] for other pentaquarks,  $\Xi_5^- (ddssu^+)$  and  $\Xi_5^+ (uusd^+)$ .

D. S. Carman [5] has reviewed the positive and null evidence for these pentaquarks and their existence is still under investigation.

In order for the paper to be self-contained let's recall that the *pionium* is formed by a  $\pi^+$  and  $\pi^-$  mesons, the *positronium* is formed by an antielectron (positron) and an electron in a semi-stable arrangement, the *protonium* is formed by a proton and an antiproton also semi-stable, the *antiprotonic helium* is formed by an antiproton and electron together with the helium nucleus (semi-stable), and *muonium* is formed by a positive muon and an electron.

Also, the *mesonic atom* is an ordinary atom with one or more of its electrons replaced by negative mesons.

The *strange matter* is a ultra-dense matter formed by a big number of strange quarks bounded together with an electron atmosphere (this strange matter is hypothetical).

From the exotic atom, the pionium, positronium, protonium, antiprotonic helium, and muonium are unmatter.

The mesonic atom is unmatter if the electron(s) are replaced by negatively-charged antimessons.

Also we can define a mesonic antiatom as an ordinary antiatomic nucleous with one or more of its antielectrons replaced by positively-charged mesons. Hence, this mesonic antiatom is unmatter if the antielectron(s) are replaced by positively-charged messons.

The strange matter can be unmatter if these exists at least an antiquark together with so many quarks in the nucleous. Also, we can define the strange antimatter as formed by a large number of antiquarks bound together with an antielectron around them. Similarly, the strange antimatter can be unmatter if there exists at least one quark together with so many antiquarks in its nucleous.

The bosons and antibosons help in the decay of unmatter. There are 13+1 (Higgs boson) known bosons and 14 antibosons in present.

### 5.1. Quantum Chromodynamics Formula.

In order to save the colorless combinations prevailed in the Theory of Quantum Chromodynamics (QCD) of quarks and antiquarks in their combinations when binding, we devise the following formula:

$$Q - A \in \pm M3 \quad (1)$$

where  $M3$  means multiple of three,

i.e.  $\pm M3 = \{3 \cdot k \mid k \in \mathbb{Z}\} = \{\dots, -12, -9, -6, -3, 0, 3, 6, 9, 12, \dots\}$ ,

and  $Q$  = number of quarks,  $A$  = number of antiquarks.

But (1) is equivalent to:

$$\mathbf{Q \equiv A \pmod{3}} \quad (2)$$

(Q is congruent to A modulo 3).

To justify this formula we mention that 3 quarks form a colorless combination, and any multiple of three (**M3**) combination of quarks too, i.e. 6, 9, 12, etc. quarks. In a similar way, 3 antiquarks form a colorless combination, and any multiple of three (**M3**) combination of antiquarks too, i.e. 6, 9, 12, etc. antiquarks. Hence, when we have hybrid combinations of quarks and antiquarks, a quark and an antiquark will annihilate their colors and, therefore, what's left should be a multiple of three number of quarks (in the case when the number of quarks is bigger, and the difference in the formula is positive), or a multiple of three number of antiquarks (in the case when the number of antiquarks is bigger, and the difference in the formula is negative).

## 5.2. Whence the **Quantum Chromodynamics Unmatter Formula.**

In order to save the colorless combinations prevailed in the Theory of Quantum Chromodynamics (QCD) of quarks and antiquarks in their combinations when binding, we devise the following formula:

$$\mathbf{Q - A \in \pm M3} \quad (3)$$

where  $M3$  means multiple of three,

i.e.  $\pm M3 = \{3 \cdot k \mid k \in \mathbb{Z}\} = \{\dots, -12, -9, -6, -3, 0, 3, 6, 9, 12, \dots\}$ ,

and  $Q$  = number of quarks,  $A$  = number of antiquarks,

with  $Q \geq 1$  and  $A \geq 1$ .

But (1) is equivalent to:

$$\mathbf{Q \equiv A \pmod{3}} \quad (4)$$

(Q is congruent to A modulo 3) and  $Q \geq 1$  and  $A \geq 1$ .

## 6. Quark-Antiquark Combinations.

Let's note by  $q$  = quark  $\in \{\text{Up, Down, Top, Bottom, Strange, Charm}\}$ ,

and by  $a$  = antiquark  $\in \{\text{Up}^\wedge, \text{Down}^\wedge, \text{Top}^\wedge, \text{Bottom}^\wedge, \text{Strange}^\wedge, \text{Charm}^\wedge\}$ .

Hence, for combinations of  $n$  quarks and antiquarks,  $n \geq 2$ , prevailing the colorless, we have the following possibilities:

- if  $n = 2$ , we have:  $qa$  (biquark – for example the mesons and antimessons);
  - if  $n = 3$ , we have:  $qqq, aaa$  (triquark – for example the baryons and antibaryons);
  - if  $n = 4$ , we have:  $qqaa$  (tetraquark);
  - if  $n = 5$ , we have:  $qqqqa, aaaaq$  (pentaquark);
  - if  $n = 6$ , we have:  $qqqaaa, qqqqqq, aaaaaa$  (hexaquark);
  - if  $n = 7$ , we have:  $qqqqqaa, qqaaaaa$  (septiquark);
  - if  $n = 8$ , we have:  $qqqqqaaa, qqqqqqaa, qqaaaaaa$  (octoquark);
  - if  $n = 9$ , we have:  $qqqqqqqq, qqqqqqaaa, qqqaataaaa, aaaaaaaaa$  (nonaquark);
  - if  $n = 10$ , we have:  $qqqqqaaaa, qqqqqqqaa, qqaaaaaaaa$  (decaquark);
- etc.

## 7. Unmatter Combinations.

From the above general case we extract the unmatter combinations:

- For combinations of 2 we have: qa (unmatter biquark), [mesons and antimmesons]; the number of all possible unmatter combinations will be  $6 \cdot 6 = 36$ , but not all of them will bind together.

It is possible to combine an entity with its mirror opposite and still bound them, such as:  $uu^{\wedge}$ ,  $dd^{\wedge}$ ,  $ss^{\wedge}$ ,  $cc^{\wedge}$ ,  $bb^{\wedge}$  which form mesons.

It is possible to combine, unmatter + unmatter = unmatter, as in  $ud^{\wedge} + us^{\wedge} = uud^{\wedge}s^{\wedge}$  (of course if they bind together).

- For combinations of 3 (unmatter triquark) we can not form unmatter since the colorless can not hold.

- For combinations of 4 we have: qqaa (unmatter tetraquark); the number of all possible unmatter combinations will be  $6^2 \cdot 6^2 = 1,296$ , but not all of them will bind together.

- For combinations of 5 we have: qqqqa, or aaaaq (unmatter pentaquarks); the number of all possible unmatter combinations will be  $6^4 \cdot 6 + 6^4 \cdot 6 = 15,552$ , but not all of them will bind together.

- For combinations of 6 we have: qqqaaa (unmatter hexaquarks); the number of all possible unmatter combinations will be  $6^3 \cdot 6^3 = 46,656$ , but not all of them will bind together.

- For combinations of 7 we have: qqqqqaa, qqaaaaa (unmatter septiquarks); the number of all possible unmatter combinations will be  $6^5 \cdot 6^2 + 6^2 \cdot 6^5 = 559,872$ , but not all of them will bind together.

- For combinations of 8 we have: qqqqaaa, qqqqqqa, qaaaaaa (unmatter octoquarks); the number of all possible unmatter combinations will be  $6^4 \cdot 6^4 + 6^7 \cdot 6^1 + 6^1 \cdot 6^7 = 5,038,848$ , but not all of them will bind together.

- For combinations of 9 we have: qqqqqqaaa, qqaaaaaa (unmatter nonaquarks); the number of all possible unmatter combinations will be  $6^6 \cdot 6^3 + 6^3 \cdot 6^6 = 2 \cdot 6^9 = 20,155,392$ , but not all of them will bind together.

- For combinations of 10 we have: qqqqqqqaa, qqqqqaaaa, qaaaaaaaa (unmatter decaquarks); the number of all possible unmatter combinations will be  $3 \cdot 6^{10} = 181,398,528$ , but not all of them will bind together.

Etc.

I wonder if it is possible to make infinitely many combinations of quarks / antiquarks and leptons / antileptons...

Unmatter can combine with matter and/or antimatter and the result may be any of these three.

Some unmatter could be in the strong force, hence part of hadrons.

## 8. Unmatter Charge.

The charge of unmatter may be positive as in the pentaquark Theta-plus, 0 (as in positronium), or negative as in anti-Rho meson ( $u^{\wedge}d$ ) [M. Jordan].

## 9. Containment.

I think for the containment of antimatter and unmatter it would be possible to use electromagnetic fields (a container whose walls are electromagnetic fields). But its duration is unknown.

### **10. Further Research.**

Let's start from neutrosophy [18], which is a generalization of dialectics, i.e. not only the opposites are combined but also the neutralities. Why? Because when an idea is launched, a category of people will accept it, others will reject it, and a third one will ignore it (don't care). But the dynamics between these three categories changes, so somebody accepting it might later reject or ignore it, or an ignorant will accept it or reject it, and so on. Similarly the dynamicity of <A>, <antiA>, <neutA>, where <neutA> means neither <A> nor <antiA>, but in between (neutral).

Neutrosophy considers a kind not of di-alectics but tri-alectics (based on three components: <A>, <antiA>, <neutA>). Hence unmatter is a kind of intermediary between matter and antimatter, i.e. neither one, nor the other.

Upon the model of unmatter we may look at ungravity, unforce, unenergy, etc.

*Ungravity* would be a mixture between gravity and antigravity (for example attracting and rejecting simultaneously or alternatively; or a magnet which changes the + and - poles frequently).

*Unforce*. We may consider positive force (in the direction we want), and negative force (repulsive, opposed to the previous). There could be a combination of both positive and negative forces in the same time, or alternating positive and negative, etc.

*Unenergy* would similarly be a combination between positive and negative energies (as the alternating current (a.c.), which periodically reverses its direction in a circuit and whose frequency,  $f$ , is independent of the circuit's constants). Would it be possible to construct an alternating-energy generator?

To conclusion:

According to the Universal Dialectic the unity is manifested in duality and the duality in unity.

“Thus, Unmatter (unity) is experienced as duality (matter vs. antimatter).

Ungravity (unity) as duality (gravity vs antigravity).

Unenergy (unity) as duality (positive energy vs negative energy).

and thus also...

between duality of being (existence) vs nothingness (antiexistence) must be "unexistence" (or pure unity).” (R. Davic)

### **Acknowledgement.**

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# Causality in Kaon Oscillations and Decay

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## Abstract

The neutral Kaon is a composite consisting of a positive and a negative pion. Kaon oscillations and decay are shown to have a cause.

The question we want to analyze is described by Branco, Lavoura and Silva [3]:

There is no other particle with equal mass. Therefore,  $K_L$  must be its own antiparticle. It decays both to  $\pi^+ e^- \bar{\nu}_e$  and to the C-conjugate mode  $\pi^- e^+ \nu_e$ . However, it decays slightly less often to the first than to the second mode. This fact unequivocally establishes both C violation and CP violation.[3]

There is an unstated assumption in their statement: the decays of the kaon are internal (independent of the background) and acausal (they have no cause). These assumptions come from standard quantum mechanics.

We show that there is a cause for their decay and there is neither C violation nor CP violation in the decays of the kaon. The asymmetry in the decays is due to the asymmetry of the background, not an inherent difference.

Falkenberg [2] suggested that radioactivity is due to interaction with the neutrino flux from the sun. If this is true, the phenomena should not be limited to the decay of particles within the nucleus, there should be some indications from the decay of free elementary particles. The process is most

probably that described by Phillippe Tournenc, Marie-Christine Angonin and Peter Wolf, “The “Forgotten” Process: the emission stimulated by matter waves” [10].

## 1 Kaon

The analysis in [7] showed that the neutral Kaon is a pion-anti-pion composite:

$$K^0 = \pi^+ \otimes \pi^-$$

as suggested by R. M. Santilli [8]. Thus the neutral kaon is an example of what F. Smarandache [9] called “Unmatter”; being composed of Particles and Anti-Particles.

In the same sense that the Hydrogen atom dissociates into a proton and an electron, the  $\pi^-$  can dissociate into  $\bar{\nu} \otimes e^-$  and the  $K^0$  is then:

$$K^0 = \pi^+ \otimes e^- \otimes \bar{\nu} \tag{1}$$

or if the  $\pi^+$  dissociates into  $\nu \otimes e^+$  the  $K^0$  is then:

$$K^0 = e^+ \otimes \nu \otimes \pi^- \tag{2}$$

The  $\bar{\nu}$  in 1 will interact with the background neutrinos much more readily than the  $\nu$  in 2 and will have a much shorter half-life.

The negative pion,  $\pi^-$ , dissociates into

$$\pi^- \rightarrow \mu^- \bar{\nu}$$

While the positive pion,  $\pi^+$ , dissociates into

$$\pi^+ \rightarrow \mu^+ \nu$$

The  $\bar{\nu}$  would interact with the  $\nu$  background much more than would the  $\nu$  so we would expect the  $\pi^-$  to have a much shorter lifetime than the  $\pi^+$ . The negative kaon,  $K^-$ , is just an excited  $\pi^-$ , so the same analysis applies.

The same analysis applies to  $D^0 = K^+ \otimes K^-$  which should then have the same result as the neutral kaon.

The above analysis shows that there are other particle antiparticle pairs which should exhibit an asymmetry in their respective halflives, these are the

particles whose decay products include the  $\nu$  or  $\bar{\nu}$ . We will name a few, with no claim to completeness:  $K^-$ ,  $n, \Lambda^0, \Sigma^0, \Xi^-, \Sigma^-, \Delta^{++}$  and  $\Omega^-$ .

Since the decay:

$$\phi(1020) \rightarrow K^+ K^-$$

is observed, we can conclude that  $\phi(1020)$  is a bound state of  $K^+ K^-$  and is a form of unmatter.

The *Nuclear Science-A Guide to the Nuclear Science Wall Chart* from the Contemporary Physics Education Project (CPEP)(Copyright 2003) Appendix C Useful Quantities in Nuclear Science has this statement: “Antiparticles are assumed to have same half-life as particles.”

I was appalled to discover that none of these particles have been experimentally investigated to compare the halflife of the particle with the halflife of the antiparticle. It seems that the assumption that the halflife of the antiparticle is the same as the halflife of the antiparticle is untested. Such is the strength of faith in quantum mechanics. In light of the asymmetry of the kaons and the above analysis, this assumption is not warrented.

A suggested experiment involves measuring the half life of a polarized beam of kaons. There would be at least three runs: (1) axis of rotation pointed towards sun;(2) axis of rotation perpendicular to the direction of the sun; (3) the axis of rotation at an angle of  $\pi/4$ . The three runs should have different decay rates due to orientation of the neutrino flux. It seems likely that the half-life measured in the third run will be the average of the other two runs.

The observed oscillation of the  $K_s^0$  and the  $K_L^0$  would then be explained in terms of a tumbling (a precession?) of the polarity of the particle.

Just like the hydrogen atom, the  $\pi^+ \otimes \pi^-$  system can have higher energy states, these are also higher mass states.

## 2 Parity

Conservation laws come from continuous symmetries. Parity, charge conjugation and time reversal are discrete symmetries and therefore have no associated conservation laws.

P,C and T are symmetries of the equations of the theory, not physical symmetries. One cannot conduct an experiment in which particles and antiparticles are exchanged. In the process of an experiment, one cannot change

the direction of time None of these is a good quantum number because the eigenvalues are not additive as charges must be. There is no ‘CP violation’ simply because there is no CP conservation law to be violated. Substitute ‘C’, ‘P’, ‘T’, ‘CT’, or ‘PT’ for ‘CP’ in the last sentence and it is still true. There are no conservation laws associated with discrete symmetries.

Thus the  $K_S^0$  and the  $K_L^0$  ...are actually the same particle.

Let me clarify what I mean by symmetry of the equation. Begin with the term  $x^2$ . Obviously it is symmetric with respect to the interchange of  $x$  with  $-x$ . Next we observe that the term  $y^2$  is symmetric with respect to the interchange of  $y$  with  $-y$ . Finally we observe that the term  $z^2$  is symmetric with respect to the interchange of  $z$  with  $-z$ .

Now we add the three symmetric terms:  $f(x, y, z) = x^2 + y^2 + z^2$  and observe that the sum has more symmetries. A symmetry  $\phi$  can send  $x$  to any one of the six terms:  $(x, -x, y, -y, z, -z)$ , but we must have  $\phi(-x) = -\phi(x)$  since  $f(x, y, z)$  has no cross-terms (like  $xy$ ). Once  $\phi(x)$  is determined, then  $\phi(y)$  can be any of the remaining four. Leaving two choices for the image of  $z$ . So we have 48 symmetries of the expression  $x^2 + y^2 + z^2$ .

Then someone tries to do a demonstration in class and finds that in order to demonstrate a physical symmetry, we must have  $x = y = z$ . Then the whole scheme falls apart, for not all symmetries of  $x^2 + y^2 + z^2$  are symmetries of the cube. If you rotate one face counterclockwise the opposite face is also rotated counterclockwise.

Then someone notices that  $x^2 + y^2 + z^2 = r^2$  is the equation of a sphere with radius  $r$ , which has an infinite number of rotational symmetries. The symmetries of the cube then reduce to an interesting example of a discrete group of a continuous group. The continuous group has invariants (angular momentum), while the finite group has none.

But there is a more fundamental problem with parity. The standard examples of even and odd functions include  $\sin(x)$  and  $\cos(x)$  since  $\sin(-x) = -\sin(x)$ ,  $\sin(x)$  is an odd function and since  $\cos(-x) = \cos(x)$ ,  $\cos(x)$  is even. However, since

$$\cos\left(x - \frac{\pi}{2}\right) = \sin(x)$$

$\sin(x)$  and  $\cos(x)$  essentially represent the same curve (wave function) and the parity depends on which point we reflect about, thus the parity of this curve is not intrinsic and is not well defined.

### 3 Behavior of Neutral Particles under Charge Conjugation

If the above analysis is correct, there are serious problems with the Standard Model which has four different Kaons. The title of this section is borrowed from the article which started the problem by Gell-Mann and Pais [4]. Their first sentence is problematic:

It is generally accepted that the microscopic laws of physics are invariant to the operation of operation of charge conjugation (CC); we shall take the rigorous validity of this postulate for granted.

Such was the case in 1955. We know now that “the microscopic laws of physics are not invariant to the operation of operation of charge conjugation”.

In the author’s model, the particles represented by the Cartan subalgebra are self-conjugate under charge conjugation, C. The other particles are represented by operators of the form  $X \pm iY$  and C maps  $X + iY$  to  $X - iY$  and vice-versa. Gell-Mann and Pais present the same analysis:

Neutral particles fall into two classes, according to their behavior under CC:

(a) Particles that transform into themselves and which are thus their own antiparticles...

(b) Neutral particles that behave like charged ones in that: (1) they have antiparticles distinct from themselves; (2) there exists a rigorous conservation law that prohibits virtual transitions between particle and antiparticle states... Particles in this class are presented by “complex” fields and the operation of charge conjugation transforms the field operators into their Hermitian conjugates.

Within the author’s model, those two categories cover all the known particles. Gell-Mann and Pais also introduce an extraneous  $\pm 1$  into their version of the “CC” operator. As we have seen, the discrete operators do not have conserved quantities so their “charge conjugation quantum number” is non-existent.

Gell-Mann and Pais continue:

It is the purpose of this article to discuss the possible existence of particles that seem, at first sight, to belong to neither class (a) nor to class (b).

Since in our model all particles belong to one or the other, the rest of their article is pure speculation about the empty set and can not be taken seriously.

## 4 Neutron- antiNeutron Oscillation

Gell-Mann and Pais do make one interesting statement about one elementary particle in class (b):

A well known member of this class is the neutron  $N$ , which can obviously be distinguished from the antineutron by the sign of its magnetic moment. The law that forbids the virtual process  $N \rightleftharpoons \bar{N}$  is the law of conservation of baryons, which is, as far as we know, exact, and that states that  $n$ , the number of baryons minus the number of antibaryons, must remain unchanged.

This statement was made in 1955 however in 1975, 't Hooft [5] showed that the currently popular “Standard Model” does not allow for the conservation of baryon number, which would make  $N \rightleftharpoons \bar{N}$  possible.

But there is a deeper problem, the two decays:

$$n \rightarrow p^+ e^- \bar{\nu}$$

$$\bar{n} \rightarrow p^- e^- \nu$$

are well known. The reaction can be reversed:

$$p^+ e^- \bar{\nu} \rightarrow n$$

If neutron antineutron oscillations occurred, we could then have

$$p^+ e^- \bar{\nu} \rightarrow n \rightarrow \bar{n} \rightarrow p^- e^+ \nu$$

which would take  $p^+ \rightarrow p^-, e^- \rightarrow e^+$  and  $\bar{\nu} \rightarrow \nu$  and which would turn elementary particle physics to chaos.

So why would physicists expect to find neutron antineutron oscillations? According to Kamyshkov

Our expectations for experimental observation of nucleon instability are based on two outstanding ideas in contemporary physics: the need for explanation of baryon asymmetry of the universe and the concept of Unification of particles and forces.

We have achieved unification without requiring nucleon instability. The “baryon asymmetry of the universe” is pure speculation based on the conditions in our little corner of the universe. There are models in which the balance between baryons and antibaryons is exact.

## 5 Conclusion

If the analysis above is verified experimentally, then causality is restored to physics and the standard Copenhagen interpretation of quantum mechanics is dead. But the implications go further. It seems that the universe must be particle-antiparticle symmetric with baryon asymmetry being only a local phenomena and the universe did not begin with a Big Bang. [1]

On Earth, which revolves around a star made of matter, the  $K_L$  “decays both to  $\pi^+e^-\bar{\nu}_e$  and to the C-conjugate mode  $\pi^-e^+\nu_e$ . However, it decays slightly less often to the first than to the second mode.” That is because of the neutrinos emitted by our star in the hydrogen burning process. On a planet revolving around a star made of antimatter, the opposite would be true since the ‘antistar’ would emit antineutrinos.

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# Examples of Unmatter

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## 1 Introduction

Smarandache suggested the existence of bound states of matter and anti-matter which he dubbed “unmatter”. Here I will give some examples of bound states of particle with its own anti-particle.

The philosophy of the author’s Theory of Matter is that the decay routes of an elementary particle yield clues as to the structure of the particle. For example, the decay

$$\pi^- \rightarrow \mu^- \bar{\nu}$$

tells us that the pion is a bound state of the muon and the anti-neutrino. Conversely, it tells us that if a muon and an anti-neutrino come out, it was a pion which decayed.

Thus, the decay

$$n \rightarrow p^+ e^- \bar{\nu}$$

indicates that a pion decayed and a neutron consists of a proton bound to a pion.

$$\pi^0 \rightarrow e^+ e^-$$

indicates that the  $\pi^0$  consists of an  $e^+e^-$  pair.

The same hold for the  $\eta^0$ :

$$\eta^0 \rightarrow e^+ e^-$$

The decay

$$K^0 \rightarrow \pi^+ \pi^-$$

reveals the structure of the  $K^0$ :

$$K^0 = \pi^+ \otimes \pi^-$$

Likewise, the decay

$$D^0 \rightarrow \pi^+ \pi^-$$

reveals the structure of the  $D^0$ :

$$D^0 = \pi^+ \otimes \pi^-$$

*Reference:*

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# Photon-Neutrino Symmetry and the OPERA Anomaly: a Neutrosophic Viewpoint

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## *Abstract*

The OPERA collaboration has recently claimed discovery of superluminal propagation of neutrino beams. Excluding the possibility of unaccounted measurement errors, the most natural interpretation of OPERA anomaly is that, sufficiently far from the source of electroweak interactions, single-flavor ultra-relativistic neutrinos and photons may be regarded as components of the same field. In particular, we suggest that it is possible to construct a *neutrino-photon doublet* where the two components behave as dual entities. We examine conditions that enable the symmetry between neutrinos and photons to be unbroken. The benefit of this neutrosophic interpretation is that Lorentz invariance stays valid *regardless* of the relative velocity of neutrinos and their mean energy.

## **1. Introduction and motivation**

The OPERA collaboration has recently claimed the discovery of superluminal propagation of neutrino beams [1]. OPERA has measured the velocity of neutrinos, as they travel from CERN to the Gran Sasso Laboratory (GSL) covering a distance of about 730 km. The CERN neutrino beam to GSL consists of  $\nu_\mu$ , with a small content of  $\bar{\nu}_\mu$  (2.1%) and of  $\nu_e$  or  $\bar{\nu}_e$  (together less than 1%). Neutrinos travel through Earth structures with an average energy of  $E_{av} = 17.5$  GeV. Neutrino velocity is determined by taking the ratio between very accurate measurements of distance and time of flight. The distance is defined as the space separation between the emission

point (where the proton beam extracted from the CERN site collides with a graphite target and creates secondary charged mesons that eventually decay into neutrinos) and the origin of the OPERA detector reference frame. High-accuracy GPS readings and optical triangulations led to a determination of the distance with an uncertainty of 20 cm (monitoring also Earth movements at the level of centimeters). An upgraded GPS-based timing system at CERN and GSL allows for time tagging with uncertainties at the level of less than 10 nanoseconds. The neutrino time of flight is then computed from a statistical comparison between the distribution of the neutrino interaction time and the proton probability density function matching the known time structure of the proton beam. The large data sample of neutrino events, recorded in a 3-year period, is claimed to have brought the statistical error in the analysis at the same level of the estimated systematic error.

Following this procedure, OPERA found the surprising result that neutrinos arrive earlier than expected from luminal speed by a time interval

$$\delta t = (60.7 \pm 6.9_{stat} \pm 7.4_{syst}) \text{ ns.}$$

This translates into a superluminal propagation velocity for neutrinos by a relative amount

$$\delta c_\nu = (2.48 \pm 0.28_{stat} \pm 0.30_{syst}) \times 10^{-5} \text{ (OPERA)}$$

where  $\delta c_\nu \equiv (v_\nu - c)/c$ . The same measurement was previously performed by MINOS (which has a 735 km baseline and a broad neutrino energy spectrum peaked around 3 GeV). Although not statistically significant, the MINOS result has a central value in the same ballpark of the recent OPERA determination [2]

$$\delta c_\nu = (5.1 \pm 2.9) \times 10^{-5} \text{ (MINOS)}$$

Earlier short-baseline experiments have set upper limits on  $|\delta c_\nu|$  at the level of about  $4 \times 10^{-5}$  in

an energy range between 30 and 200 GeV [3]. However, observations of  $E_{\nu} \cong 10$  MeV neutrinos from supernova SN1987a provide a constraint of [3]

$$\delta c_{\nu} < 4 \times 10^{-9} \quad (\text{SN1987a})$$

We develop here a field-theoretical solution to the OPERA anomaly that

1) is fully compliant with Lorentz invariance, regardless of neutrino mean energy  $E_{\nu}$  and relative velocity  $\delta c_{\nu}$ ,

2) does not invoke the contribution of second-order effects on neutrino emission, propagation and detection.

Our premise is that the only way to reconcile OPERA results with Special Relativity is to accept that, under certain circumstances, an inherent symmetry exist between *long-range neutrinos* and *light signals in vacuum*. Inspired by the philosophy of supersymmetry program, we seek to construct the analog of a gauge doublet that combines Maxwell fields ( $A_{\mu}$ ) with Weyl fermions describing single-flavor neutrinos ( $\nu$ ).

This brief report is organized as follows: next section looks briefly at the relevance of neutrosophy in theoretical high-energy physics. Conditions leading to suppression of neutrino oscillations in matter are touched upon in section 3. Formulation of photon-neutrino symmetry is developed in sections 4 and 5. Concluding remarks are presented in the last section.

## **2. Neutrosophic concepts in field theory and particle physics**

Although far from obvious, there are many instances where neutrosophy is implicitly used in field theory and particle physics. Here are few representative examples:

1) *Classical electrodynamics in vacuum* is a neutrosophic entity consisting of orthogonal electric and magnetic fields ( $\vec{E} \cdot \vec{B} = 0$ ). Orthogonality of the two vectors may be interpreted as generator of “opposite” properties. Both four-vector potential  $A^\mu$  and the anti-symmetric tensor

$$F^{\mu\nu} = \partial^\mu A^\nu - \partial^\nu A^\mu$$

play the role of a “neutral” object from which the two vectors can be derived, namely

$$F^{0i} = \partial^0 A^i - \partial^i A^0 = -E^i$$

$$F^{ij} = \partial^i A^j - \partial^j A^i = -\epsilon^{ijk} B^k$$

2) Another neutrosophic entity of relevance to particle physics is the concept of “*multiplet*” whose simplest forms are the “singlet” and the “doublet”. For example, right-handed (*R*) electrons enter the Standard Model as singlets. They belong to the  $SU(2)$  group describing electroweak interactions,

$$e_R^- = SU(2) \text{ singlet}$$

By contrast, left-handed electrons enter as electroweak doublets, their partners being left-handed (*L*) neutrinos,

$$\begin{pmatrix} \nu_e \\ e^- \end{pmatrix}_L = SU(2) \text{ doublet}$$

Neutrinos are “opposite” to electrons because they are electrically neutral and carry a non-zero  $SU(2)$  charge (weak isospin). The doublet is a “neutral” state that operates like a pointer in  $SU(2)$  space : when it points “up” it represents  $\nu_{eL}$ , while when it points “down” it represents  $e_L^-$ .

Rotations in the  $SU(2)$  space turn neutrinos into electrons, just as rotations in spin space turn “spin-up” into “spin-down”, or rotations in the strong isospin space turn neutrons into protons. The same line of reasoning applies to the electroweak quartet  $SU(2)\times U(1)$  consisting of *massless* photons and *massive* vector bosons,

$$(\gamma, W^+, W^-, Z^0) = SU(2)\times U(1) \text{ quartet}$$

3) **Supersymmetry** (SUSY) postulates that *bosons* (particles of zero or integral spin) and *fermions* (particles of half-integer spin) can be grouped in the same doublet and that there is a *supercharge operator*  $Q$  that turns fermions into bosons and viceversa [4]. Let  $|f\rangle$  and  $|b\rangle$  denote fermionic and bosonic fields. The action of supercharge operator is as follows:

$$Q|f\rangle = |b\rangle$$

$$Q|b\rangle = |f\rangle$$

The operators  $Q$  and  $Q^+$  are *spinors*, that is, they behave as spin- $1/2$  operators under Lorentz transformations. If  $P^\mu$  denotes the conserved four-momentum,  $Q$  and  $Q^+$  satisfy the algebra

$$[Q, Q^+] = P^\mu$$

$$[Q, Q] = [Q^+, Q^+] = 0$$

$$[Q, P^\mu] = [P^\mu, Q] = 0$$

To represent an unbroken symmetry, bosons and fermions transforming under the supercharge operator must satisfy three constraints. They must have:

- Equal rest-frame mass ( $m_b = m_f$ ),
- Same number of components (degrees of freedom),
- Same quantum charges (such as electrical and weak isospin charges).

If these constraints are satisfied, fermions and bosons can be regarded as neutrosophic states with “opposite” properties (spin and statistics) and the SUSY doublet as “neutral” entity acting like a pointer in supercharge space. We shall use this interpretation in the remainder of the paper.

### **3. Neutrino oscillations in Earth matter**

Experiments with solar, atmospheric, reactor and accelerator neutrinos have provided compelling evidence for oscillations caused by nonzero neutrino masses and mixing [5]. These oscillations represent transitions in flight between the three flavor neutrinos  $\nu_e, \nu_\mu, \nu_\tau$  (and their respective antiparticles). The existence of flavor neutrino oscillations implies that, if a neutrino of a given flavor, say  $\nu_\mu$ , with energy  $E$  is produced in some weak interaction process, at a sufficiently large distance  $L$  from the  $\nu_\mu$  source, the probability to find a neutrino of a different flavor, say  $\nu_\tau$ ,  $P(\nu_\mu \rightarrow \nu_\tau; E, L)$  is different from zero. It follows that the probability that  $\nu_\mu$  stays unchanged and does not turn into a different flavor (the “survival” probability)  $P(\nu_\mu \rightarrow \nu_\mu; E, L)$  is smaller than one. In the formalism of local quantum field theory, neutrino oscillations are a consequence of neutrino mixing and are given by

$$\nu_{\alpha L}(x) = \sum_j U_{\alpha j} \nu_{jL}(x) \quad (\alpha = e, \mu, \tau)$$



Here,  $\nu_{\alpha L}(x)$  are the left-handed flavor neutrino fields,  $\nu_{jL}(x)$  are the left-handed massive neutrino fields having masses  $m_j \neq 0$  and  $U$  is the unitary mixing matrix. It can be shown that, in the case of 3-neutrino mixing, transition and survival probabilities depend on mass squared differences  $\Delta m_{kj}^2 \equiv m_k^2 - m_j^2$  with [5]

$$|\Delta m_{21}^2| \cong 7.6 \times 10^{-5} eV^2$$

$$|\Delta m_{31}^2| \cong 2.4 \times 10^{-3} eV^2$$

In case of 3-neutrino mixing in Earth matter and for neutrinos energies  $E_{\nu} > 2 \text{ GeV}$ , effects due to  $\Delta m_{21}^2$  in oscillation probabilities can be neglected up to leading order [5]. This is because the mean electron densities in the Earth matter are such that oscillations due to  $\Delta m_{21}^2$  are suppressed. Under the additional constraint  $\Delta m_{31}^2 < 0$ , it can also be shown that both  $\nu_{e(\mu)} \rightarrow \nu_{\mu(e)}$  and  $\nu_e \rightarrow \nu_\tau$  oscillations are further suppressed. The absence of neutrino oscillations motivates the hypothesis that neutrinos have vanishingly small masses, in order to comply with Lorentz invariance [6]. In different words,

$$\Delta m_{31}^2 < 0 \Rightarrow P(\nu_\alpha \rightarrow \nu_{\alpha'}; E, L) \ll 1 \Rightarrow m_\nu \ll 1 eV$$

This is the case we are considering below.

#### **4. Assumptions**

4.1) It is well established that neutrinos and antineutrinos participate in either charged current (CC) and neutral current (NC) electroweak interactions, where CC are carried by the weak

$W^\pm$  bosons and NC by the  $Z^0$  boson. The energy range of electroweak interactions is on the order of  $\mu_{EW} = O(G_F^{-1/2}) \approx 300$  GeV where  $G_F$  represents the Fermi constant. We assume that, for propagation distances well above  $\mu_{EW}^{-1}$ , neutrinos lose memory of electroweak interaction. As a result, their weak isospin goes to zero ( $T_3 = 0$ ).

4.2) If the distance range covered by neutrino flight ( $x$ ) falls within  $\mu_{EW}^{-1}$  and the neutrino oscillation length in Earth matter  $L_m$ , that is if  $\mu_{EW}^{-1} \ll x < L_m$  and if neutrino oscillations are suppressed by the condition  $\Delta m_{21}^2 \ll 1$  eV<sup>2</sup> and  $\Delta m_{31}^2 < 0$ , then photon-neutrino symmetry is nearly unbroken and neutrinos have rest-frame masses consistent with zero ( $m_\nu \ll 1$  eV).

## **5. Photon-neutrino symmetry**

Propagating degrees of freedom in a photon-neutrino doublet are Maxwell field  $A_\mu$  and a two-component Weyl neutrino  $\nu$ . The Lagrangian density for the doublet is given by [4]

$$L_{PN} = -\frac{1}{4} F_{\mu\nu} F^{\mu\nu} + i\nu^\dagger \bar{\sigma}^\mu \partial_\mu \nu + \frac{1}{2} D^2$$

Here, the barred Pauli matrices are, respectively,

$$\bar{\sigma}^0 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \bar{\sigma}^1 = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}, \bar{\sigma}^2 = \begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}, \bar{\sigma}^3 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

The on-shell degrees of freedom for  $A_\mu$  and  $\nu$  are represented by 2 bosonic and 2 fermionic helicity states. However, off-shell  $\nu$  consist of 2 complex (or 4 real) fermionic degrees of freedom, whereas  $A_\mu$  has three degrees of freedom with one degree being removed through a

gauge transformation. To maintain consistency off-shell, it is customary to include in the Lagrangian one real bosonic auxiliary field, traditionally called  $D$  that satisfies  $D = D^*$  and has dimensions of  $[\text{mass}]^2$ . Since it has no kinetic term in the Lagrangian,  $D$  can be eliminated on-shell. The action built from this Lagrangian stays invariant to the following transformations of fields

$$\delta A_\mu = -\frac{1}{\sqrt{2}}(\varepsilon^+ \bar{\sigma}_\mu \nu + \nu^+ \bar{\sigma}_\mu \varepsilon)$$

$$\delta \nu = \frac{i}{2\sqrt{2}}(\sigma^\mu \bar{\sigma}^\nu \varepsilon) F_{\mu\nu} + \frac{1}{\sqrt{2}} \varepsilon D$$

$$\delta D = \frac{i}{\sqrt{2}}(-\varepsilon^+ \bar{\sigma}^\mu \partial_\mu \nu + \partial_\mu \nu^+ \bar{\sigma}^\mu \varepsilon)$$

in which parameter  $\varepsilon$  represents an anti-commuting spinor [4].

## **6. Conclusions**

Neutrinos are matter particles distinguished from photons by their spin, rest-frame mass and weak isospin. However, since *far enough* from their source, single-flavor ultra-relativistic neutrinos no longer participate in weak interactions, their weak isospin becomes irrelevant ( $T_3 = 0$ ). Thus, under conditions that enable suppression of flavor oscillation in Earth matter, neutrinos and photons may be considered as partners of the same gauge doublet. The underlying symmetry is nearly unbroken because the two partners are on-shell, share the same rest-frame mass ( $m_\gamma = 0$ ,  $m_\nu \approx 0$ ), same number of degrees of freedom (2 helicity states for both neutrinos and photons) and the same set of quantum numbers ( $q = T_3 = 0$ ). This *neutrosophic interpretation* of OPERA anomaly preserves Lorentz invariance regardless of the mean energy

carried by the neutrino beam ( $E_{\nu}$ ) and its velocity relative to the luminal velocity in vacuum ( $\delta c_\nu$ ). Our conclusions are reported below.

In closing, we note that these findings are consistent with field theoretical predictions showing that, in general, there is finite amplitude for excursions outside the light cone. Neutrinos are bound to yield fairly large such excursions if their mass is nearly vanishing [7].

$x = O(\mu_{EW}^{-1})$	Spin	Rest-frame mass ( $m$ )	Electric charge ( $q$ )	Weak Isospin ( $T_3$ )
Photon ( $\gamma$ )	1	0	0	0
Neutrino ( $\nu$ )	1/2	$> 0$	0	1/2

**Tab.1:** Photon and neutrino properties for  $x = O(\mu_{EW}^{-1})$

$\mu_{EW}^{-1} \ll x < L_m$	Spin	Rest-frame mass ( $m$ )	Electric charge ( $q$ )	Weak Isospin ( $T_3$ )
Photon ( $\gamma$ )	1	0	0	0
Neutrino ( $\nu$ )	1/2	$\approx 0$	0	0

**Tab. 2:** Photon and neutrino properties for  $\Delta m_{21}^2 \ll 1 \text{ eV}^2, \Delta m_{31}^2 < 0$  and  $\mu_{EW}^{-1} \ll x < L_m$

### On-line References

[1] <http://arxiv.org/abs/1109.4897>

[2] <http://prd.aps.org/abstract/PRD/v76/i7/e072005> and <http://arxiv.org/abs/0706.0437>

[3] <http://arxiv.org/abs/1109.5682>

- [4] <http://arxiv.org/abs/hep-ph/9709356>
- [5] <http://pdg.lbl.gov/2011/reviews/rpp2011-rev-neutrino-mixing.pdf>
- [6] [http://en.wikipedia.org/wiki/Lorentz-violating\\_neutrino\\_oscillations](http://en.wikipedia.org/wiki/Lorentz-violating_neutrino_oscillations)
- [7] [http://arxiv.org/PS\\_cache/arxiv/pdf/1110/1110.1162v1.pdf](http://arxiv.org/PS_cache/arxiv/pdf/1110/1110.1162v1.pdf)

### Neutrosophic Physics.

Let  $\langle A \rangle$  be a physical entity (i.e. concept, notion, object, space, field, idea, law, property, state, attribute, theorem, theory, etc.),  $\langle \text{anti}A \rangle$  be the opposite of  $\langle A \rangle$ , and  $\langle \text{neut}A \rangle$  be their neutral (i.e. neither  $\langle A \rangle$  nor  $\langle \text{anti}A \rangle$ , but in between).

Neutrosophic Physics is a mixture of two or three of these entities  $\langle A \rangle$ ,  $\langle \text{anti}A \rangle$ , and  $\langle \text{neut}A \rangle$  that hold together.

Therefore, we can have neutrosophic fields, and neutrosophic objects, neutrosophic states, etc.

### Paradoxist Physics.

Neutrosophic Physics is an extension of Paradoxist Physics, since Paradoxist Physics is a combination of physical contradictories  $\langle A \rangle$  and  $\langle \text{anti}A \rangle$  only that hold together, without referring to their neutrality  $\langle \text{neut}A \rangle$ . Paradoxist Physics describes collections of objects or states that are individually characterized by contradictory properties, or are characterized neither by a property nor by the opposite of that property, or are composed of contradictory sub-elements. Such objects or states are called *paradoxist entities*.

These domains of research were set up by the editor in the 1998 within the frame of neutrosophy, neutrosophic logic/set/probability/statistics.

*The book includes papers by Larissa Borissova, Dmitri Rabounski, Indranu Suhendro, Florentin Smarandache, Thomas R. Love, and Ervin Goldfain. And Comments on Neutrosophic Physics by Dmitri Rabounski, Thomas R. Love, Ervin Goldfain, Diego Lucio Rapoport (Argentina), Armando Assis (Brasil), and Russell Bagdoo (Canada).*

