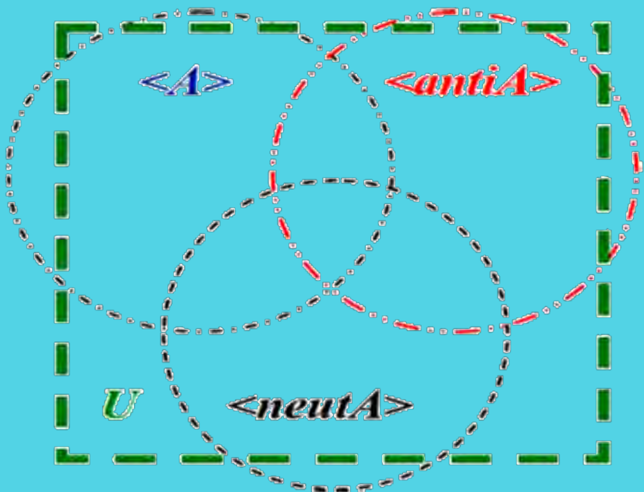
FLORENTIN SMARANDACHE

Unmatter Plasma, Relativistic Oblique-Length Contraction Factor, Neutrosophic Diagram and Neutrosophic Degree of Paradoxicity

Articles and Notes



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ISBN 978-1-59973-346-3

E-publishing:
Georgiana Antonescu
Pons asbl
Bruxelles, Quai du Batelage, 5, Belgium

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Articles and Notes

Pons Publishing
Brussels, 2015

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Contents

On the cover: *Example of a particular neutrosophic diagram*.

Foreword

This book has four parts. In the first part, we collected five recent papers, published before in *Progress in Physics*, but reviewed.

In the first paper, we approach a novel form of plasma, Unmatter Plasma. The electron-positron beam plasma was generated in the laboratory in the beginning of 2015. This experimental fact shows that unmatter, a new form of matter that is formed by matter and antimatter bind together (mathematically predicted a decade ago) really exists. That is the electron-positron plasma experiment of 2015 is the experimentum crucis verifying the mathematically predicted unmatter.

In the second paper, we generalize the Lorentz Contraction Factor for the case when the lengths are moving at an oblique angle with respect to the motion direction, and show that the angles of the moving relativistic objects are distorted.

In the third paper, using the Oblique-Length Contraction Factor, which is a generalization of Lorentz Contraction Factor, we show several trigonometric relations between distorted and original angles of moving object lengths in the Special Theory of Relativity.

In the fourth paper, after a short history of logics: from particular cases of 2-symbol or numerical valued logic to the general case of n-symbol or numerical valued logic, we show generalizations of 2-valued Boolean logic to fuzzy logic, also from the Kleene's and Lukasiewicz' 3-symbol valued logics or Belnap's 4-symbol valued logic to the most general numerical valued refined neutrosophic logic. Two classes of neutrosophic norm (n-norm) and neutrosophic conorm (n-conorm) are defined. Examples of applications of neutrosophic logic to physics are listed.

Finally, in the last paper, we discuss some paradoxes which we call "neutrosophic" since they are based on indeterminacy (or neutrality, i.e. neither true nor false), which is the third component in neutrosophic logic. We generalize the Venn diagram to a Neutrosophic Diagram, which deals with vague, inexact, ambiguous, ill-defined ideas, statements, notions, entities with unclear borders. We define the neutrosophic truth table, then we introduce two neutrosophic operators (neuterization and antonymization operators), and give many classes of neutrosophic paradoxes.

In the second and third parts of this book, we collected notes, abstracts, reviews, blogs and comments on different topics related to physics, e.g. neutrosophic physics as a new field of research, neutrosophic numbers in physics, neutrosophic degree of paradoxicity, unparticle and unmatter, multispace and multistructure, nucleon clusters, and others.

In the fourth part of the bok, we listed our contributions to American Physical Society, as also reflected by the Bulletin of American Physical Society at http://www.aps.org.

The Author

ARTICLES

1. Unmatter Plasma discovered

Unmatter Plasma is a novel form of plasma, exclusively made of matter and its antimatter counterpart. It was first generated in the 2015 experiment [1, 2] based on the 2004 considerations [3]. Unmatter is formed by combinations of matter and antimatter that bound together, or by long-range mixture of matter and antimatter forming a weakly-coupled phase.

The electron-positron beam plasma was generated in the laboratory in the beginning of 2015. This experimental fact shows that unmatter, a new form of matter that is formed by matter and antimatter bind together (mathematically predicted a decade ago) really exists. That is the electron-positron plasma experiment of 2015 is the experimentum crucis verifying the mathematically predicted unmatter.

1.1. Introduction

There are four fundamental states of matter: solid, liquid, gas, and plasma.

Plasma consists of positive ions and free electrons (negative particles), typically at low pressures, and it is overall almost neutral. Plasma is an ionized gas (as in fluorescent neon, in lightning, in stars, in nuclear reactors).

An ion is a positive or negative charged particle. A positive ion is called cation, while a negative ion is called anion. If the ion is an atom, then it may contain less electrons than needed for being neutrally charged (hence one has a cation), or more electrons than needed for being neutrally charged (hence one has an anion). Similarly, if the ion is a molecule or a group (of atoms or molecules).

The process of forming ions is called ionization. The degree of ionization depends on the proportion of atoms that have lost or gained electrons. By applying a strong electromagnetic field to a gas, or by heating a gas, one obtains plasma.

1.2. Definition of Unmatter

Unmatter [4-6] is formed by combinations of matter and antimatter that bind together, or by long-range mixture of matter and antimatter forming a weakly-coupled phase.

Binding and bound state means that the interaction is sufficiently strong to tie together the particles of a system, therefore hindering them from becoming free. For example, a usual liquid is a bound state of molecules, while a gas is an un-bounded where the molecules can move freely in successive collisions.

Weakly-coupled means that the interaction is too week to form a bound state, but it is not that week to let the particles be free. For example, the liquid molecules closer to the surface are weakly coupled and they can evaporate.

Long-range means that the interaction (either week or strong) between particles extends in space on long lengths. For example, the superconductive state in metals is based on pairs of electrons whose interactions are long-range, i.e. it is not confined into a limited spatial region.

Mixture means a collective state of particles: a combination of non-miscible particles for example.

Phase corresponds to the notion of phase of the matter.

For example, the electron-positron pair is a type of unmatter. We coined the word “unmatter” that means neither matter nor antimatter, but something in between.

Besides matter and antimatter there may exist unmatter (as a new form of matter) in accordance with the neutrosophy theory that between an entity and its opposite there exist intermediate entities.

1.3. Definition of Unmatter Plasma

Unmmatter Plasma is a novel form of plasma, exclusively made of matter and its antimatter counterpart.

The 2015 experiment [1, 2] on matter-antimatter plasma (or unmatter plasma, in terms of the neutrosophic logic and statistics) was recently successful at the Astra Gemini laser facility at the Rutherford Appleton Laboratory, Oxford, United Kingdom.

The 2015 experiment has produced electron-positron plasma. The positron is the antimatter of the electron, having an opposite charge of the electron, but the other properties are the same.

1.4. The Neutrosophic Triplets

The neutrosophic triplets also reflect the matter, unmatter, and antimatter. They are defined as follows [7]:

Let N be a set together with a binary operation $*$. Then N is called a neutrosophic triplet set if for any $a \in N$, there exist a neutral of "a" called $neut(a)$, different from the classical algebraic unitary element, and an opposite of "a" called $anti(a)$, with $neut(a)$ and $anti(a)$ belonging to N, such that:

$$a * neut(a) = neut(a) * a = a,$$

and

$$a * anti(a) = anti(a) * a = neut(a).$$

The elements a, $neut(a)$ and $anti(a)$ are collectively called as neutrosophic triplet and we denote it by $(a, neut(a), anti(a))$. By $neut(a)$, we means *neutral* of a and apparently, a is just the first coordinate of a neutrosophic triplet and not a neutrosophic triplet.

For the same element *"a"* in *N*, there may be more neutrals to it *neut(a)* and more opposites of it *anti(a)*.

1.5. Verifications of Unmatter

"The meson is a clear example of "Unmatter" whose configuration includes a pair quark-antiquark. "Unmatter" is mostly expected to emerge in exotic states outside the boundaries of the Standard Model for particle physics (for example in the Dark Matter sector) and in the regime of high-energy astrophysical objects" [8].

1.6. Verification of Unmatter Plasma

“It is definitely a jet of unmatter, because a plasma consisting of the electrons and the positrons is neither matter nor antimatter in the same time. This experiment is the truly verification of unmatter as the theoretical achievements of fuzzy logics and statistics. This experiment is a milestone of both experimental physics and pure mathematics” [9].

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Originally published in PROGRESS IN PHYSICS. (Letters to The Editor), Volume 11 (2015), Issue 3 (July), p. 246. Reviewed.

2. Oblique-Length Contraction Factor in the Special Theory of Relativity

In this paper one generalizes the Lorentz Contraction Factor for the case when the lengths are moving at an oblique angle with respect to the motion direction. One shows that the angles of the moving relativistic objects are distorted.

2.1. Introduction

According to the Special Theory of Relativity, the Lorentz Contraction Factor is referred to the lengths moving along the motion direction. The lengths which are perpendicular on the direction motion do not contract at all [1]. In this paper one investigates the lengths that are oblique to the motion direction and one finds their *Oblique-Length Contraction Factor* [3], which is a generalization of the Lorentz Contraction Factor (for $\theta = 0$) and of the perpendicular lengths (for $\theta = \pi/2$). We also calculate the distorted angles of lengths of the moving object.

2.2. Length-Contraction Factor

Length-Contraction Factor *C(v)* is just Lorentz Factor:

$$C(v) = \sqrt{1 - \frac{v^2}{c^2}} \in [0,1] \text{ for } v \in [0, c]. \qquad (2.1)$$

$$L = L' \cdot C(v), \qquad (2.2)$$

where L = non-proper length (length contracted),

L' = proper length.

C(0) = 1, meaning no space contraction {as in Absolute Theory of Relativity (ATR)}.

C(c) = 0, which means according to the Special Theory of Relativity (STR) that if the rocket moves at speed "*c*" then the rocket length and laying down astronaut shrink to zero!

This is unrealistic.

2.3. Time-Contraction Factor

Time-Dilation Factor *D(v)* is the inverse of Lorentz Factor:

$$D(v) = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \in [1, +\infty] \text{ for } v \in [0, c] \quad (2.3)$$

$$\Delta t = \Delta t' \cdot D(v) \quad (2.4)$$

where Δt = non-proper time and

$\Delta t'$ = proper time.

$D(0) = 1$, meaning no time dilation {as in the Absolute Theory of Relativity (ATR)};

$D(c) = \lim_{v \to c} D(v) = +\infty$,

which means, according to the Special Theory of Relativity (STR), that if the rocket moves at speed "c", then the observer on earth measures the elapsed non-proper time as infinite, which is unrealistic.

v = c is the equation of the vertical asymptote to the curve of D(v).

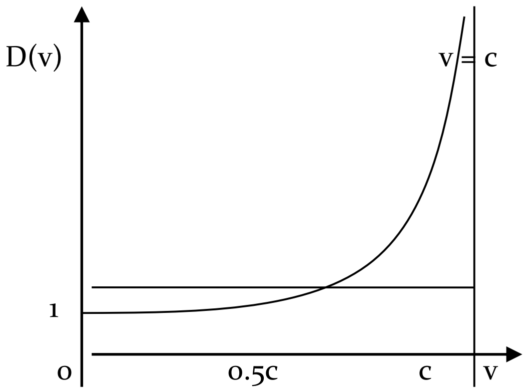

Fig. 2.1. The graph of the Time-Dilation Factor

2.4. Oblique-Length Contraction Factor

The Special Theory of Relativity asserts that all lengths in the direction of motion are contracted, while the lengths at right angles to the motion are unaffected. But it didn't say anything about lengths at oblique angle to the motion (i.e. neither perpendicular to, nor along the motion direction), how would they behave?

This is a generalization of Galilean Relativity, i.e. we consider the oblique lengths.

The length contraction factor in the motion direction is:

$$C(v) = \sqrt{1 - \frac{v^2}{c^2}}. \tag{2.5}$$

Suppose we have a rectangular object with width *W* and length *L* that travels at a constant speed v with respect to an observer on Earth.

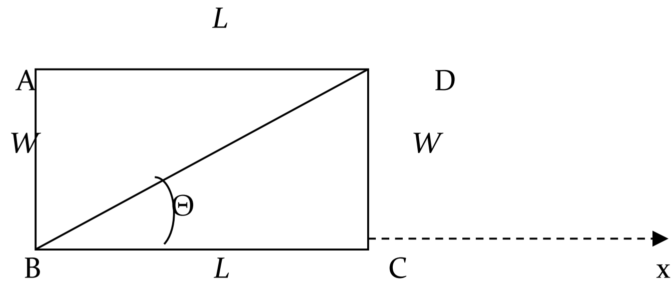

Fig. 2.2. A rectangular object moving along the x-axis

Then its lengths contract and its new dimensions will be *L'* and *W'*:

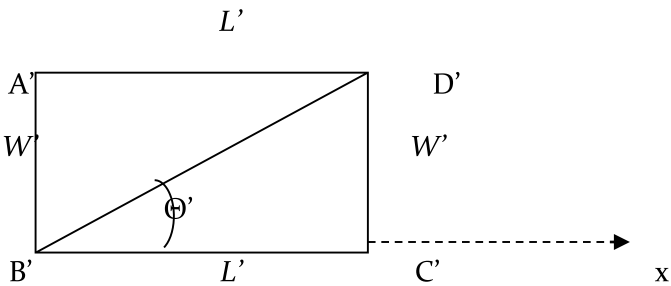

Fig. 2.3. Contracted lengths of the rectangular object moving along the x-axis

where $L' = L \cdot C(v)$ and $W' = W$.

The initial diagonal of the rectangle ABCD is:

$$\delta = |AC| = |BD| = \sqrt{L^2 + W^2} = \sqrt{L^2 + L^2 tan^2 \theta}$$

$$= L\sqrt{1 + tan^2 \theta} \qquad (2.6)$$

while the contracted diagonal of the rectangle A'B'C'D' is:

$$\delta' = |A'C'| = |B'D'| = \sqrt{(L')^2 + (W')^2} =$$
$$\sqrt{L^2 \cdot C(v)^2 + W^2} = \sqrt{L^2 C(v)^2 + L^2 tan^2\theta} =$$
$$L\sqrt{C(v)^2 + tan^2\theta} \quad (2.7)$$

Therefore, the lengths at oblique angle to the motion are contracted with the oblique factor

$$OC(v,\theta) = \frac{\delta'}{\delta} = \frac{L\sqrt{C(v)^2+tan^2\theta}}{L\sqrt{1+tan^2\theta}} = \sqrt{\frac{C(v)^2+\tan^2\theta}{1+\tan^2\theta}}$$
$$=\sqrt{C(v)^2 cos^2\theta + sin^2\theta}, \quad (2.8)$$

which is different from C(v).

$$\delta' = \delta \cdot OC(v,\theta), \text{ where } 0 \le OC(v,\theta) \le 1. \quad (2.9)$$

For unchanged constant speed v, the greater is θ in $\left(0,\frac{\pi}{2}\right)$ the larger gets the oblique-length contradiction factor, and reciprocally.

By oblique length contraction, the angle

$$\theta \in (0,\frac{\pi}{2}) \cup (\frac{\pi}{2},\pi) \quad (2.10)$$

is not conserved.

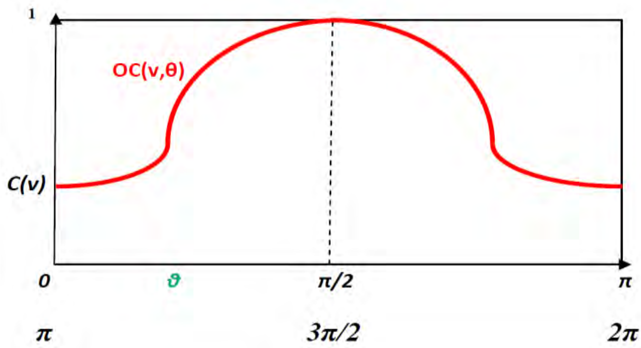

Fig. 2.4. Graph of the Oblique-Length Contraction Factor $OC(v,\theta)$

In Fig. 4 the horizontal axis represents the angle θ, while the vertical axis represents the values of the Oblique-Length Contraction Factor $OC(v,\theta)$ for a fixed speed v. Hence C(v) is thus a constant in this graph.

The graph, for *v* fixed, is periodic of period π, since:

$$OC(v,\pi+\theta)=\sqrt{C(v)^2cos^2(\pi+\theta)+sin^2(\pi+\theta)}$$

$$=\sqrt{C(v)^2[-cos(\theta)]^2+[-\sin\theta]^2}$$

$$=\sqrt{C(v)^2cos^2\theta+sin^2\theta}=OC(v,\theta). \tag{2.11}$$

More exactly about the $OC(v,\theta)$ range:

$$OC(v,\theta)\in[C(v),1], \tag{2.12}$$

but since $C(v)\in[0,1]$, one has:

$$OC(v,\theta)\in[0,1]. \tag{2.13}$$

The Oblique-Length Contractor

$$OC(v,\theta)=\sqrt{C(v)^2cos^2\theta+sin^2\theta} \tag{2.14}$$

is a generalization of Lorentz Contractor *C(v)*, because: when $\theta=0$, or the length is moving along the motion direction, then $OC(v,0)=C(v)$. Similarly

$$OC(v,\pi)=OC(v,2\pi)=C(v). \tag{2.15}$$

Also, if $\theta=\pi/2$, or the length is perpendicular on the motion direction, then $OC(v,\pi/2)=1$, i.e. no contraction occurs. Similarly $OC\left(v,\frac{3\pi}{2}\right)=1$.

2.5. Angle Distortion

Except for the right angles (π/2, 3π/2) and for the 0, π, and 2π, all other angles are distorted by the Lorentz transform.

Let's consider an object of triangular form moving in the direction of its bottom base (on the x-axis), with speed v, as below:

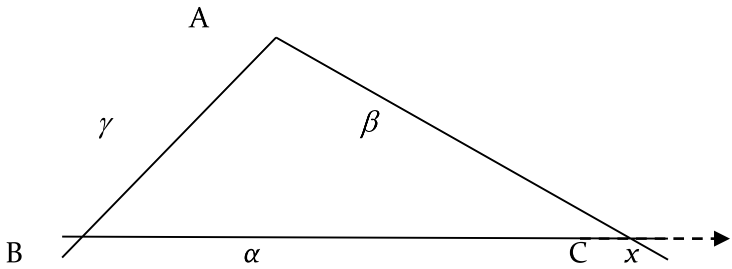

Fig. 2.5

The side $|BC| = \alpha$ is contracted with the contraction factor $C(v)$ since BC is moving along the motion direction, therefore $|B'C'| = \alpha \cdot C(v)$.

But the oblique sides AB and CA are contracted respectively with the oblique-contraction factors $OC(v, \measuredangle B)$ and $OC(v, \measuredangle \pi\text{-}C)$, where $\measuredangle B$ means angle B:

$$|A'B'| = \gamma \cdot OC(v, \measuredangle B) \tag{2.16}$$

and $|C'A'| = \beta \cdot OC(v, \measuredangle \pi\text{-}C) = \beta \cdot OC(v, \measuredangle A+B)$, (2.17)

since $\measuredangle A + \measuredangle B + \measuredangle C = \pi$. (2.18)

Triangle ABC is shrunk, distorted to $A'B'C'$ as below:

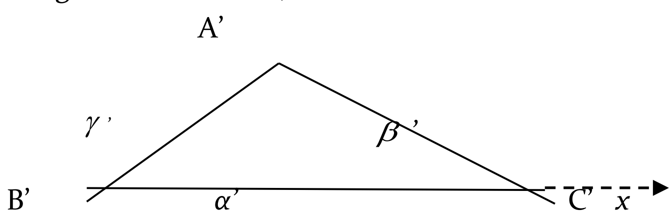

Fig. 2.6

Hence one gets:

$$\alpha' = \alpha \cdot C(v)$$
$$\beta' = \beta \cdot OC(v, \measuredangle A+B) \tag{2.19}$$
$$\gamma' = \gamma \cdot OC(v, \measuredangle B)$$

In the resulting triangle *A'B'C'*, since one knows all its side lengths, one applies the Law of Cosine in order to find each angle $\measuredangle$A', $\measuredangle$B', and $\measuredangle$C'.

Therefore:

$$\measuredangle A' = \arccos \frac{-\alpha^2 \cdot C(v)^2 + \beta^2 \cdot OC(v, \measuredangle A+B)^2 + \gamma^2 \cdot OC(v, \measuredangle B)^2}{2\beta \cdot \gamma \cdot OC(v, \measuredangle B) \cdot OC(v, \measuredangle A+B)}$$

$$\measuredangle B' = \arccos \frac{\alpha^2 \cdot C(v)^2 - \beta^2 \cdot OC(v, \measuredangle A+B)^2 + \gamma^2 \cdot OC(v, \measuredangle B)^2}{2\alpha \cdot \gamma \cdot C(v) \cdot OC(v, \measuredangle B)}$$

$$\measuredangle C' = \arccos \frac{\alpha^2 \cdot C(v)^2 + \beta^2 \cdot OC(v, \measuredangle A+B)^2 - \gamma^2 \cdot OC(v, \measuredangle B)^2}{2\alpha \cdot \beta \cdot C(v) \cdot OC(v, \measuredangle A+B)}$$

(2.20)

As we can see, the angles $\measuredangle$A', $\measuredangle$B', and $\measuredangle$C' are, in general, different from the original angles $\measuredangle$*A*, $\measuredangle$*B*, and $\measuredangle$*C* respectively.

The distortion of an angle is, in general, different from the distortion of another angle.

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Originally published in PROGRESS IN PHYSICS,
Volume 1 (2013), Issue 1 (January), p. 60-62. Reviewed.

3. Relations between Distorted and Original Angles in STR

Using the Oblique-Length Contraction Factor, which is a generalization of Lorentz Contraction Factor, one shows several trigonometric relations between distorted and original angles of moving object lengths in the Special Theory of Relativity.

3.1. Introduction

The lengths at oblique angle to the motion are contracted with the *Oblique-Length Contraction Factor* $OC(v,\theta)$, defined as [3-4]:

$$OC(v,\theta) = \sqrt{C(v)^2 cos^2\theta + sin^2\theta} \tag{3.1}$$

where $C(v)$ is just *Lorentz Factor*:

$$(v) = \sqrt{1 - \frac{v^2}{c^2}} \in [0,1] \text{ for } v \in [0,c]. \tag{3.2}$$

Of course,

$$0 \leq OC(v,\theta) \leq 1. \tag{3.3}$$

The Oblique-Length Contraction Factor is a generalization of Lorentz Contractor *C(v),* because: when $\theta = 0$, or the length is moving along the motion direction, then *OC(v,* 0) $= C(v)$. Similarly,

$$OC(v,\pi) = OC(v,2\pi) = C(v). \tag{3.4}$$

Also, if $\theta = \pi/2$, or the length is perpendicular on the motion direction, then $OC(v, \pi/2) = 1$, i.e. no contraction occurs. Similarly $OC\left(v, \frac{3\pi}{2}\right) = 1$.

3.2. Tangential Relations between Distorted Acute Angles vs. Original Acute Angles of a Right Triangle

Let's consider a right triangle with one of its legs along the motion direction.

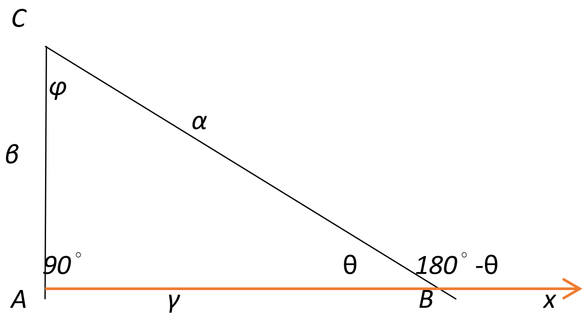

Fig. 3.1

$$tan\,\theta = \frac{\beta}{\gamma} \tag{3.5}$$

$$tan\,\left(180° - \theta\right) = -tan\,\theta = \frac{\beta}{\gamma}. \tag{3.6}$$

After contraction of the side *AB* (and consequently contraction of the oblique side *BC*) one gets:

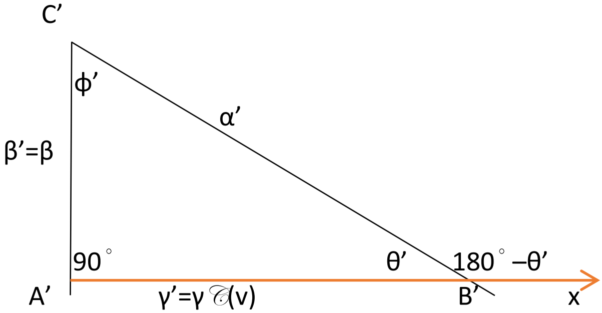

Fig. 3.2

$$\tan\left(180^\circ-\theta'\right) = -\tan\theta' = -\frac{\beta'}{\gamma'} = -\frac{\beta}{\gamma\mathscr{C}(v)} \tag{3.7}$$

Then:

$$\frac{\tan\left(180^\circ-\theta'\right)}{\tan\left(180^\circ-\theta\right)} = \frac{-\dfrac{\beta}{\gamma\mathscr{C}(v)}}{-\dfrac{\beta}{\gamma}} = -\frac{\beta}{\gamma\mathscr{C}(v)}\left(-\frac{\gamma}{\beta}\right) = \frac{1}{\mathscr{C}(v)} \tag{3.8}$$

Therefore

$$\tan\left(\pi-\theta'\right) = \frac{\tan\left(\pi-\theta\right)}{\mathscr{C}(v)} \tag{3.9}$$

and consequently

$$\tan\theta' = \frac{\tan\theta}{\mathscr{C}(v)} \tag{3.10}$$

or

$$\tan B' = \frac{\tan B}{\mathscr{C}(v)} \tag{3.11}$$

which is the Angle Distortion Equation, where is the angle formed by a side travelling along the motion direction and another side which is oblique on the motion direction.

The angle θ is increased {i.e. $\theta' > \theta$}.

$$tan\,\varphi = \frac{\gamma}{\beta} \text{ and } tan\,\varphi' = \frac{\gamma'}{\beta'} = \frac{\gamma\mathscr{C}\quad v}{\beta}$$

(3.12)

whence:

$$\frac{tan\,\varphi'}{tan\,\varphi} = \frac{\dfrac{\gamma\mathscr{C}\quad v}{\beta}}{\dfrac{\gamma}{\beta}} = \frac{\gamma\mathscr{C}\quad v}{\beta}\cdot\frac{\beta}{\gamma} = \mathscr{C}\quad v \qquad (3.13)$$

So we get the following *Angle Distortion Equation*:

$$tan\,\varphi' = tan\,\varphi\cdot\mathscr{C}\quad v \qquad (3.14)$$

or

$$tan\,C' = tan\,C\cdot\mathscr{C}\quad v \qquad (3.15)$$

where φ is the angle formed by one side which is perpendicular on the motion direction and the other one is oblique to the motion direction.

The angle φ is decreased (i.e. $\varphi' < \varphi$). If the traveling right triangle is oriented the opposite way

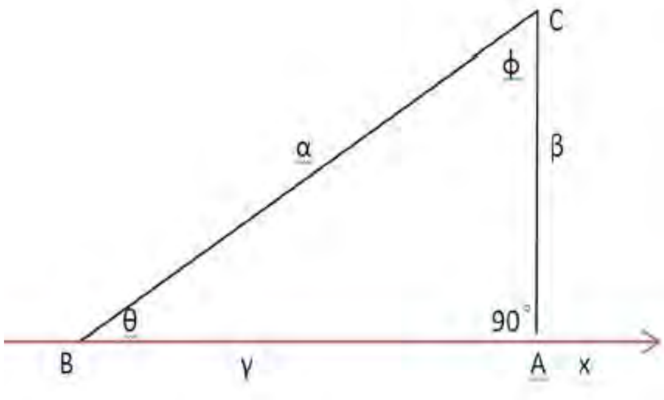

Fig. 3.3

$$tan\,\theta = \frac{\beta}{\gamma} \text{ and } tan\,\varphi = \frac{\beta}{\gamma} \tag{3.16}$$

Similarly, after contraction of side AB (and consequently contraction of the oblique side BC) one gets

$$tan\,\theta' = \frac{\beta'}{\gamma'} = \frac{\beta}{\gamma\mathcal{C}\ \ v} \tag{3.17}$$

and

$$tan\,\varphi' = \frac{\gamma'}{\beta'} = \frac{\gamma\mathcal{C}\ \ v}{\beta} \tag{3.18}$$

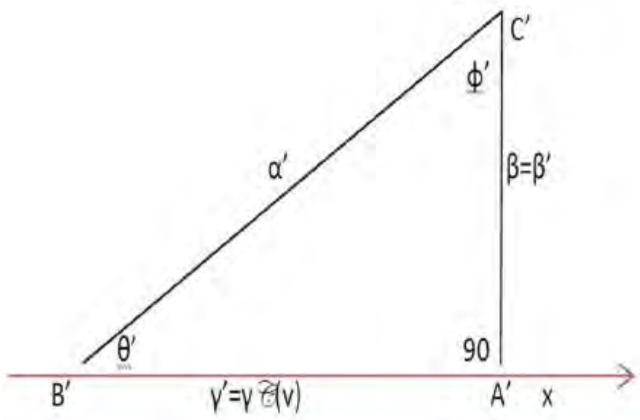

Fig. 3.4

$$\frac{tan\,\theta'}{tan\,\theta} = \frac{\dfrac{\beta}{\gamma\mathcal{C}\ \ v}}{\dfrac{\beta}{\gamma}} = \frac{1}{\mathcal{C}\ \ v} \tag{3.19}$$

or

$$tan\,\theta' = \frac{tan\,\theta}{\mathcal{C}\ \ v} \tag{3.20}$$

and similarly

$$\frac{\tan\varphi'}{\tan\varphi} = \frac{\dfrac{\gamma\mathscr{C}\ \ v}{\beta}}{\dfrac{\gamma}{\beta}} = \mathscr{C}\ \ v \qquad (3.21)$$

or

$$\tan\varphi' = \tan\varphi \cdot \mathscr{C}\ \ v \qquad (3.22)$$

Therefore, one got the same Angle Distortion Equations for a right triangle traveling with one of its legs along the motion direction.

3.3. Tangential Relations between Distorted Angles vs. Original Angles of a General Triangle

Let's suppose a general triangle $\Delta\, ABC$ is travelling at speed v along the side BC as bellow

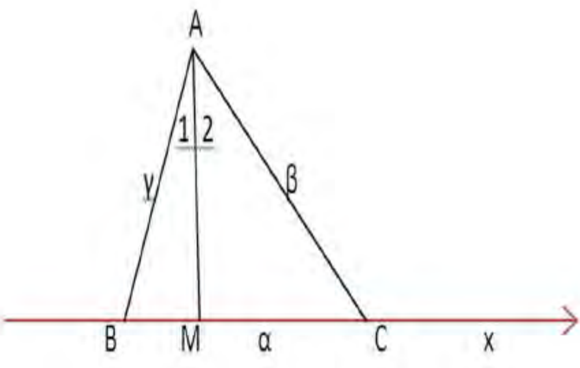

Fig. 3.5

The height remains not contracted: $AM \equiv A'M'$.

We can split this figure into two traveling right sub-triangles as bellow:

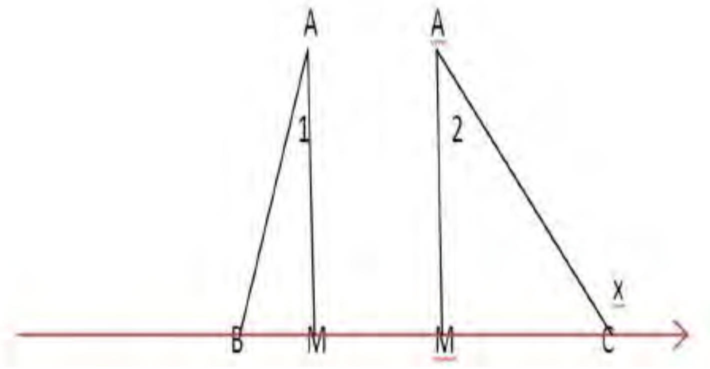

Fig. 3.6

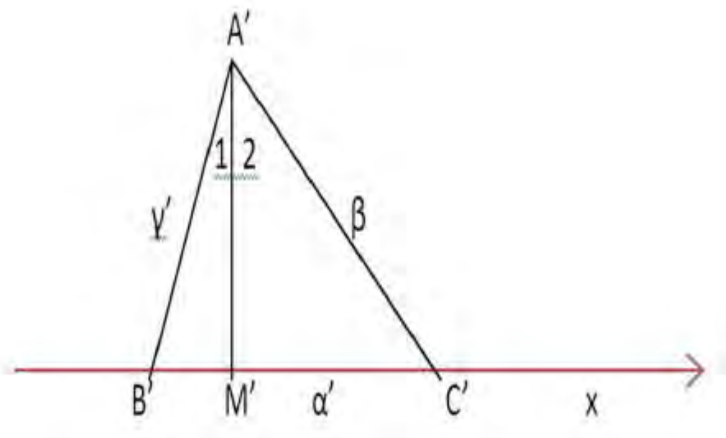

Fig. 3.7

Similarly, we can split this figure into two traveling right sub-triangles as below:

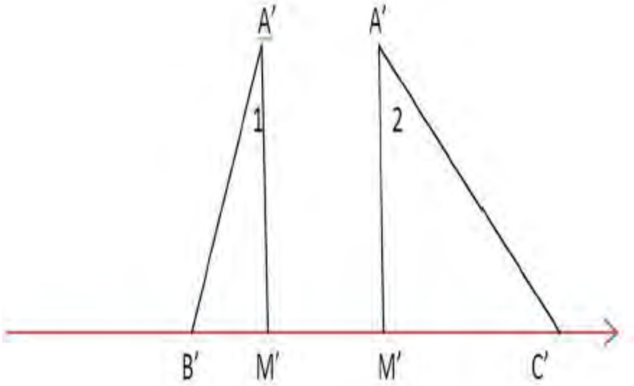

Fig. 3.8

In the right triangles $\Delta\, A'M'B'$ and respectively $\Delta\, A'M'C'$ one has

$$tan\, B' = \frac{tan\, B}{\mathscr{C}\quad v} \text{ and } tan\, C' = \frac{tan\, C}{\mathscr{C}\quad v} \tag{3.23}$$

Also

$$tan\, A_1' = tan\, A_1 \mathscr{C}\quad v \text{ and } tan\, A_2' = tan\, A_2 \mathscr{C}\quad v \tag{3.24}$$

But

$$\begin{aligned}
\tan A' &= \tan(A_1' + A_2') = \frac{\tan A_1' + \tan A_2'}{1 - \tan A_1' \tan A_2'} \\
&= \frac{\tan A_1 C(v) + \tan A_2 C(v)}{1 - \tan A_1 C(v) \tan A_2 C(v)} \\
&= C(v) \cdot \frac{\tan A_1 + \tan A_2}{1 - \tan A_1 \tan A_2 C(v)^2} \\
&= C(v) \cdot \frac{\frac{\tan A_1 + \tan A_2}{1 - \tan A_1 \tan A_2} \cdot (1 - \tan A_1 \tan A_2)}{1 - \tan A_1 \tan A_2 C(v)^2} \\
&= C(v) \cdot \frac{\tan(A_1 + A_2)}{1} \cdot \frac{1 - \tan A_1 \tan A_2}{1 - \tan A_1 \tan A_2 C(v)^2}.
\end{aligned} \tag{3.25}$$

We got

$$tan\ A' = tan\ A \cdot \mathscr{C}\ \ v\ \ \cdot \frac{1 - tan\ A_1\ tan\ A_2}{1 - tan\ A_1\ tan\ A_2 \mathscr{C}\ \ v\ \ ^2} \tag{3.26}$$

3.4. Other Relations between the Distorted Angles and the Original Angles

A) Another relation uses the Law of Sine in the triangles *ΔABC* and respectively *ΔA'B'C'*:

$$\frac{\alpha}{sin\ A} = \frac{\beta}{sin\ B} = \frac{\gamma}{sin\ C} \tag{3.27}$$

$$\frac{\alpha'}{sin\ A'} = \frac{\beta'}{sin\ B'} = \frac{\gamma'}{sin\ C'} \tag{3.28}$$

After substituting

$$\alpha' = \alpha \mathscr{C}\ \ v \tag{3.29}$$

$$\beta' = \beta \mathscr{O}\mathscr{C}\ \ v, C \tag{3.30}$$

$$\gamma' = \gamma \mathscr{O}\mathscr{C}\ \ v, B \tag{3.31}$$

into the second relation one gets:

$$\frac{\alpha \mathscr{C}\ \ v}{sin\ A'} = \frac{\beta \mathscr{O}\mathscr{C}\ \ v, C}{sin\ B'} = \frac{\gamma \mathscr{O}\mathscr{C}\ \ v, B}{sin\ C'} \tag{3.32}$$

Then we divide term by term the previous equalities:

$$\frac{\dfrac{\alpha}{sin\ A}}{\dfrac{\alpha \mathscr{C}\ \ v}{sin\ A'}} = \frac{\dfrac{\beta}{sin\ B}}{\dfrac{\beta \mathscr{O}\mathscr{C}\ \ v, C}{sin\ B'}} = \frac{\dfrac{\gamma}{sin\ C}}{\dfrac{\gamma \mathscr{O}\mathscr{C}\ \ v, B}{sin\ C'}} \tag{3.33}$$

whence one has:

$$\frac{\sin A'}{\sin A \cdot \mathcal{C}(v)} = \frac{\sin B'}{\sin B \cdot \mathcal{OC}(v, C)} = \frac{\sin C'}{\sin C \cdot \mathcal{OC}(v, B)}. \tag{3.34}$$

B) Another way:

$$A' = 180° - (B' + C') \quad \text{and} \quad A = 180° - (B + C) \tag{3.35}$$

$$\tan A' = \tan\left[180° - (B' + C')\right] = -\tan(B' + C') = -\frac{\tan B' + \tan C'}{1 - \tan B' \tan C'} =$$

$$= -\frac{\dfrac{\tan B}{\mathcal{C}(v)} + \dfrac{\tan C}{\mathcal{C}(v)}}{1 - \tan B \cdot \tan C \cdot \mathcal{C}(v)^2} = -\frac{1}{\mathcal{C}(v)} \cdot \frac{\tan B + \tan C}{1 - \tan B \cdot \tan C \cdot \mathcal{C}(v)^2} =$$

$$= -\frac{\tan(B + C)}{\mathcal{C}(v)} \cdot \frac{1 - \tan B \tan C}{1 - \tan B \tan C \mathcal{C}(v)^2} =$$

$$= -\frac{-\tan\left[180° - (B + C)\right]}{\mathcal{C}(v)} \cdot \frac{1 - \tan B \tan C}{1 - \tan B \tan C \mathcal{C}(v)^2} =$$

$$= \frac{\tan A}{\mathcal{C}(v)} \cdot \frac{1 - \tan B \cdot \tan C}{1 - \tan B \cdot \tan C \cdot \mathcal{C}(v)^2} \tag{3.36}$$

We got

$$\tan A' = \frac{\tan A}{\mathcal{C}(v)} \cdot \frac{1 - \tan B \cdot \tan C}{1 - \tan B \cdot \tan C \cdot \mathcal{C}(v)^2} \tag{3.37}$$

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Originally published in PROGRESS IN PHYSICS,
Volume 3 (2013), Issue 3 (July), p. 21-24. Reviewed.

4. n-Valued Refined Neutrosophic Logic and Its Applications to Physics

We present a short history of logics: from particular cases of 2-symbol or numerical valued logic to the general case of n-symbol or numerical valued logic.

We show generalizations of 2-valued Boolean logic to fuzzy logic, also from the Kleene's and Lukasiewicz' 3-symbol valued logics or Belnap's 4-symbol valued logic to the most general *n-symbol* or *numerical valued refined neutrosophic logic*.

Two classes of neutrosophic norm *(n-norm)* and neutrosophic conorm *(n-conorm)* are defined. Examples of applications of neutrosophic logic to physics are listed in the last section. Similar generalizations can be done for n-Valued Refined Neutrosophic Set, and respectively n-Valued Refined Neutrosophic Probability.

4.1. Two-Valued Logic

4.1.1. The Two Symbol-Valued Logic

It is the Chinese philosophy: *Yin and Yang* (or Femininity and Masculinity) as contraries:

Fig. 4.1

It is also the Classical or *Boolean* Logic, which has two symbol-values: truth T and falsity F.

4.1.2. The Two Numerical-Valued Logic

It is also the Classical or Boolean Logic, which has two numerical-values: truth 1 and falsity 0. More general it is the *Fuzzy Logic*, where the truth (T) and the falsity (F) can be any numbers in [0,1] such that $T + F = 1$.

Even more general, T and F can be subsets of [0,1].

4.2. Three-Valued Logic

4.2.1. The Three Symbol-Valued Logics

1. *Lukasiewicz 's Logic*: True, False, and Possible.

2. *Kleene's Logic*: True, False, Unknown (or Undefined).

3. Chinese philosophy extended to: Yin, Yang, and Neuter (or Femininity, Masculinity, and Neutrality) - as in Neutrosophy.

Neutrosophy philosophy was born from neutrality between various philosophies. Connected with *Extenics* (Prof. Cai Wen, 1983), and *Paradoxism* (F. Smarandache, 1980). Neutrosophy is a new branch of philosophy that studies the origin, nature, and scope of neutralities, as well as their interactions with different ideational spectra.

This theory considers every notion or idea <*A*> together with its opposite or negation <*antiA*> and with their spectrum of neutralities <*neutA*> in between them (i.e. notions or ideas supporting neither <*A*> nor <*antiA*>). The <*neutA*> and <*antiA*> ideas together are referred to as non *A*.

Neutrosophy is a generalization of Hegel's dialectics (the last one is based on <*A*> and <*antiA*> only). According to this theory every idea <*A*> tends to be neutralized and balanced by <*antiA*> and <*nonA*> ideas - as a state of equilibrium. In a classical way <*A*>, <*neutA*>, <*antiA*> are disjoint two by two. But, since in many cases the borders between notions are vague, imprecise, Sorites, it is possible that <*A*>, <*neutA*>, <*antiA*> (and <*nonA*> of course) have common parts two by two, or even all three of them as well.

Such contradictions involve Extenics. Neutrosophy is the base of all neutrosophics and it is used in engineering applications (especially for software and information fusion), medicine, military, airspace, cybernetics, physics.

4.2.2. The Three Numerical-Valued Logic

1. *Kleene's Logic:* True (1), False (0), Unknown (or Undefined) (1/2), and uses "min" for ∧, "max" for ∨, and "1-" for negation.

2. More general is the *Neutrosophic Logic* [Smarandache, 1995], where the truth (*T*) and the falsity (*F*) and the indeterminacy (*I*) can be any numbers in [0, 1], then $0 \le T + I + F \le 3$. More general: Truth (*T*), Falsity

(F), and Indeterminacy (I) are standard or nonstandard subsets of the nonstandard interval $]^{-}0, 1^{+}[$.

4.3 Four-Valued Logic

4.3.1 The Four Symbol-Valued Logic

1. It is *Belnap's Logic:* True (T), False (F), Unknown (U), and Contradiction (C), where T, F, U, C are symbols, not numbers. Below is the Belnap's conjunction operator table:

∩	F	U	C	T
F	F	F	F	F
U	F	U	F	U
C	F	F	C	C
T	F	U	C	T

Fig. 4.2

Restricted to T, F, U, and to T, F, C, the Belnap connectives coincide with the connectives in Kleene's logic.

2. Let G = *Ignorance*. We can also propose the following two 4-Symbol Valued Logics: (T, F, U, G), and (T, F, C, G).

3. *Absolute-Relative 2-, 3-, 4-, 5-, or 6-Symbol Valued Logics* [Smarandache, 1995]. Let T_A be truth in all possible worlds (according to Leibniz's definition); T_R be truth in at last one world but not in all worlds; and similarly let I_A be indeterminacy in all possible worlds; I_R be indeterminacy in at last one world but not in all worlds; also let F_A be

falsity in all possible worlds; F_R be falsity in at last one world but not in all worlds; Then we can form several Absolute-Relative 2-, 3-, 4-, 5-, or 6-Symbol Valued Logics just taking combinations of the symbols T_A, T_R, I_A, I_R, F_A, and F_R. As particular cases, very interesting would be to study the Absolute Relative 4-Symbol Valued Logic (symbols T_A, T_R, F_A, F_R), as well as the Absolute-Relative 6-Symbol Valued Logic (T_A, T_R, I_A, I_R, F_A, F_R).

4.3.2 Four Numerical-Valued Neutrosophic Logic

Indeterminacy I is refined (split) as U = Unknown, and C = contradiction. T, F, U, C are subsets of [0, 1], instead of symbols; This logic generalizes Belnap's logic since one gets a degree of truth, a degree of falsity, a degree of unknown, and a degree of contradiction. Since $C = T \wedge F$, this logic involves the Extenics.

4.4. Five-Valued Logic

1. *Five Symbol-Valued Neutrosophic Logic* [Smarandache, 1995]: Indeterminacy I is refined (split) as U = Unknown, C = contradiction, and G = ignorance; where the symbols represent:

T = truth;

F = falsity;

U = neither T nor F (undefined);

$C = T \wedge F$, which involves the Extenics;

$G = T \vee F$.

2. If T, F, U, C, G are subsets of [0, 1] then we get: a *Five Numerical-Valued Neutrosophic Logic*.

4.5. Seven-Valued Logic

1. Seven Symbol-Valued Neutrosophic Logic [Smarandache, 1995]: *I* is refined (split) as *U, C, G*, but *T* also is refined as T_A = absolute truth and T_R = relative truth, and F is refined as F_A = absolute falsity and F_R = relative falsity, where:

U = neither (T_A or T_R) nor (F_A or F_R) (i.e. undefined);

$C = (T_A \text{ or } T_R) \wedge (F_A \text{ or } F_R)$ (i.e. Contradiction), which involves the Extenics;

$G = (T_A \text{ or } T_R) \vee (F_A \text{ or } F_R)$ (i.e. Ignorance).

All are symbols.

2. But if $T_{\mathrm{A}}, T_{\mathrm{R}}, F_{\mathrm{A}}, F_{\mathrm{R}}, U, C, G$ are subsets of [0, 1], then we get a Seven Numerical-Valued Neutrosophic Logic.

4.6. n-Valued Logic

4.6.1. n-Symbol-Valued Refined Neutrosophic Logic

In general [Smarandache, 1995]: T can be split into many types of truths: $T_1, T_2, \ldots, T_p$, and I into many types of indeterminacies: $I_1, I_2, \ldots, I_r$, and F into many types of falsities: $F_1, F_2, \ldots, F_s$, where all $p, r, s \geq 1$ are integers, and $p + r + s = n$. All subcomponents T_j, I_k, F_l are symbols for $j \in \{1, 2, \ldots, p\}, k \in \{1, 2, \ldots, r\}$, and $l \in \{1, 2, \ldots, s\}$.

If at least one $I_k = T_j \wedge F_l$ = contradiction, we get again the Extenics.

4.6.2. n-Numerical-Valued Refined Neutrosophic Logic

In the same way, but all subcomponents T_j, I_k, F_l are not symbols, but subsets of [0,1], for all $j \in \{1, 2, \ldots, p\}$, for all $k \in \{1, 2, \ldots, r\}$, and for all $l \in \{1, 2, \ldots, s\}$. If all sources of information that separately provide neutrosophic values for a specific subcomponent are independent sources, then in the general case we consider that each of the subcomponents T_j, I_k, F_l is independent with respect to the others and it is in the non-standard set $]^-0; 1^+[$.

Therefore, per total, we have for crisp neutrosophic value subcomponents T_j, I_k, F_l, that:

$$^-0 \leq \sum_{j=1}^{p} T_j + \sum_{k=1}^{r} I_k + \sum_{l=1}^{s} F_l \leq n^+ \tag{4.1}$$

where of course $n = p + r + s$ as above. If there are some dependent sources (or respectively some dependent subcomponents), we can treat those dependent subcomponents together. For example, if T_2 and I_3 are dependent, we put them together as $^-0 \leq T_2 + I_3 \leq 1^+$.

The non-standard unit interval Ȼ⍰o;1+[, used to make a distinction between absolute and relative truth/ indeterminacy/falsehood in philosophical applications, is replaced for simplicity with the standard (classical) unit interval $]^-0, 1^+[$ for technical applications.

For at least one $I_k = T_j \wedge F_l$ = contradiction, we get again the Extenics.

4.7. n-Valued Neutrosophic Logic Connectors

4.7.1. n-norm and n-conorm defined on combinations of t-norm and t-conorm

The *n-norm* is actually the neutrosophic conjunction operator, NEUTROSOPHIC AND ($\wedge n$); while the *n-conorm* is the neutrosophic disjunction operator, NEUTROSOPHIC OR ($\vee n$).

One can use the *t-norm* and *t-conorm* operators from the fuzzy logic in order to define the ***n-norm*** and respectively ***n-conorm*** in neutrosophic logic:

$$\begin{aligned} & n-norm((T_j)_{j=\{1,2,\dots,p\}}, \\ & (I_k)_{k=\{1,2,\dots,r\}}, (F_l)_{l=\{1,2,\dots,s\}}) \\ & = ([t-norm(T_j)]_{j=\{1,2,\dots,p\}}, \\ & \quad [t-conorm(I_k)]_{k=\{1,2,\dots,r\}}, \\ & \quad [t-conorm(F_l)]_{l=\{1,2,\dots,s\}}) \end{aligned} \tag{4.2}$$

and

$$\begin{aligned} & n-conorm((T_j)_{j=\{1,2,\dots,p\}}, (I_k)_{k=\{1,2,\dots,r\}}, \\ & (F_l)_{l=\{1,2,\dots,s\}}) \\ & = ([t-conorm(T_j)]_{j=\{1,2,\dots,p\}}, \\ & \quad [t-norm(I_k)]_{k=1,2,\dots,r}, \\ & \quad [t-norm(F_l)]_{l=1,2,\dots,s}) \end{aligned} \tag{4.3}$$

and then one normalizes if needed.

Since the *n-norms/n-conorms*, alike *t-norms/t-conorms*, can only approximate the inter-connectivity between two *n-Valued Neutrosophic Propositions*, there are many versions of these approximations.

For example, for the *n-norm*: the indeterminate (sub)components I_k alone can be combined with the *t-conorm* in a pessimistic way [i.e. ***lower bound***], or with the *t-norm* in an optimistic way [***upper bound***]; while for the *n-conorm*: the indeterminate (sub)components I_k alone can be combined with the *t-norm* in a pessimistic way [i.e. ***lower bound***], or with the *t-conorm* in an optimistic way [***upper bound***].

In general, if one uses in defining an *n-norm/n-conorm* for example the *t-norm* $min\{x, y\}$, then it is indicated that the corresponding *t-conorm* used be $max\{x, y\}$; or if the *t-norm* used is the product xy, then the corresponding *t-conorm* should be $x + y - xy$; and similarly if the *t-norm* used is $max\{0, x + y - 1\}$, then the corresponding *t-conorm* should be $min\{x + y, 1\}$; and so on.

Yet, it is still possible to define the *n-norm* and *n-conorm* using different types of *t-norms* and *t-conorms*.

4.7.2. n-norm and n-conorm based on priorities

For the *n-norm* we can consider the priority: $T < I < F$, where the subcomponents are supposed to conformwith similar priorities, i.e.

$$T_1 < T_2 < \dots < T_p < I_1 < I_2 < \dots \\ < I_r < F_1 < F_2 < \dots < F_s. \tag{4.4}$$

While for the *n-conorm* one has the opposite priorities: $T > I > F$, or for the refined case:

$$T_1 > T_2 > \dots > T_p > I_1 > I_2 > \dots \\ > I_r > F_1 > F_2 > \dots > F_s. \tag{4.5}$$

By definition $A < B$ means that all products between A and B go to B (the bigger).

Let's say, one has two neutrosophic values in simple (non-refined case):

$$(T_x; I_x; F_x) \tag{4.6}$$

and

$$(T_y; I_y; F_y) \tag{4.7}$$

Applying the *n-norm* to both of them, with priorities $T < I < F$, we get:

$$\begin{aligned}&(T_x, I_x, F_x) \wedge_n (T_y, I_y, F_y)\\&= (T_x T_y, T_x I_y + T_y I_x + I_x I_y,\\&\quad T_x F_y + T_y F_x + I_x F_y + I_y F_x + F_x F_y).\end{aligned} \tag{4.8}$$

Applying the *n-conorm* to both of them, with priorities $T > I > F$, we get:

$$\begin{aligned}&(T_x, I_x, F_x) \vee_n (T_y, I_y, F_y)\\&= (T_x T_y + T_x I_y + T_y I_x + T_x F_y + T_y F_x,\\&\quad I_x I_y + I_x F_y + I_y F_x, F_x F_y).\end{aligned} \tag{4.9}$$

In *a lower bound (pessimistic) n-norm* one considers the priorities $T < I < F$, while in *an upper bound (optimistic) n-norm* one considers the priorities $I < T < F$.

Whereas, in *an upper bound (optimistic) n-conorm* one considers $T > I > F$, while in *a lower bound (pessimistic) n-conorm* one considers the priorities $T > F > I$.

Various priorities can be employed by other researchers depending on each particular application.

4.8. Particular Cases

If in 4.6.1. and 4.6.2., one has all $I_k = 0, k = \{1, 2, \dots, r\}$, we get the *n-Valued Refined Fuzzy Logic*.

If in 4.6.1. and 4.6.2., one has only one type of indeterminacy, i.e. $k = 1$, hence $I_1 = I > 0$, we get the *n-Valued Refined Intuitionistic Fuzzy Logic*.

4.9. Distinction between Neutrosophic Physics and Paradoxist Physics

Firstly, we make a distinction between ***Neutrosophic Physics*** and ***Paradoxist Physics***.

4.9.1. Neutrosophic Physics

Let <A> be a physical entity (i.e. concept, notion, object, space, field, idea, law, property, state, attribute, theorem, theory, etc.), <antiA> be the opposite of <A>, and <neutA> be their neutral (i.e. neither <A> nor <antiA>, but in between).

Neutrosophic Physics is a mixture of two or three of these entities <A>, <antiA>, and <neutA> that hold together. Therefore, we can have *neutrosophic fields, and neutrosophic objects, neutrosophic states*, etc.

4.9.2. Paradoxist Physics

Neutrosophic Physics is an extension of *Paradoxist Physics*, since *Paradoxist Physics* is a combination of physical contradictories <A> and <antiA> only that hold together, without referring to their neutrality <neutA>. *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 in the 1995 within the frame of neutrosophy, neutrosophic logic/set/probability/statistics.

4.10. n-Valued Refined Neutrosophic Logic Applied to Physics

There are many cases in the scientific (and also in humanistic) fields that two or three of these items <A>, <antiA>, and <neutA> simultaneously coexist.

4.10.1. 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 quasifree 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 (F. Smarandache, 2004);
- neutral kaon, which is a pion and anti-pion composite (R. M. Santilli, 1978) and thus a form of unmatter;
- neutrosophic methods in General Relativity (D. Rabounski, F. Smarandache, L. Borissova, 2005);
- neutrosophic cosmological model (D. Rabounski, L. Borissova, 2011);
- neutrosophic gravitation (D. Rabounski);

- qubit and generally quantum superposition of states;
- 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);
- neutrino-photon doublet (E. Goldfain);
- the "multiplet" of elementary particles is a kind of "neutrosophic field" with two or more values (E. Goldfain, 2011);
- a "neutrosophic field" can be generalized to that of operators whose action is selective. The effect of the neutrosophic field is somehow equivalent with the "tunneling" from the solid physics, or with the "spontaneous symmetry breaking" (SSB) where there is an internal symmetry which is broken by a particular selection of the vacuum state (E. Goldfain). Etc.

4.11. Conclusion

Many types of logics have been presented above. For the most general logic, the *n-valued refined neutrosophic logic*, we presented two classes of neutrosophic operators to be used in combinations of neutrosophic valued propositions in physics.

Similar generalizations are done for *n-Valued Refined Neutrosophic Set*, and respectively *n-Valued Refined Neutrosophic Probability*.

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Originally published in PROGRESS IN PHYSICS,
Volume 4 (2013), Issue 4 (October), p. 143-146. Reviewed.

5. Neutrosophic Diagram and Classes of Neutrosophic Paradoxes or to the Outer-Limits of Science

These paradoxes are called "neutrosophic" since they are based on indeterminacy (or neutrality, i.e. neither true nor false), which is the third component in neutrosophic logic. We generalize the Venn diagram to a Neutrosophic Diagram, which deals with vague, inexact, ambiguous, ill-defined ideas, statements, notions, entities with unclear borders. We define the neutrosophic truth table, then we introduce two neutrosophic operators (neuterization and antonymization operators), and give many classes of neutrosophic paradoxes.

5.1. Introduction to the neutrosophics

Let <*A*> be an idea, or proposition, statement, attribute, theory, event, concept, entity, and <*nonA*> what is not <*A*>. Let <*antiA*> be the opposite of <*A*>. We have introduced a new notation [1998], <*neutA*>, which is neither <*A*> nor <*antiA*> but in between. <*neutA*> is related with <*A*> and <*antiA*>.

Let's see an example for vague (not exact) concepts: if <A> is "*tall*" (an attribute), then <anti A> is "*short*", and <neut A> is "*medium*", while <non A> is "*not tall*" (which can be "*medium or short*"). Similarly, for other <A>, <neut A>, <anti A> such as: *<good>*, *<so and so>*, *<bad>*, or *<perfect>*, *<average>*, *<imperfect>*, or *<high>*, *<medium>*, *<small>*, or respectively *<possible>*, *<sometimes possible and other times impossible>*, *<impossible>*, etc.

Now, let's take an exact concept / statement: if *<A>* is the statement "$1 + 1 = 2$ in base 10" , then *<antiA>* is "$1 + 1 \neq 2$ in base 10", while *<neutA>* is undefined (doesn't exist) since it is not possible to have a statement in between "$1 + 1 = 2$ in base 10" and "$1 + 1 \neq 2$ in base 10" because in base 10 we have $1 + 1$ is either equal to 2 or $1 + 1$ is different from 2. *<nonA>* coincides with *<antiA>* in this case, *<nonA>* is "$1 + 1 \neq 2$ in base 10".

Neutrosophy is a theory the author developed since 1995 as a generalization of dialectics. This theory considers every notion or idea *<A>* together with its opposite or negation *<antiA>*, and the spectrum of "neutralities" in between them and related to them, noted by *<neutA>*.

The Neutrosophy is a new branch of philosophy which studies the origin, nature, and scope of neutralities, as well as their interactions with different ideational spectra.

Its Fundamental Thesis: Any idea *<A>* is *T%* true, *I%* indeterminate (i.e. neither true nor false, but neutral, unknown), and *F%* false.

Its Fundamental Theory: Every idea <*A*> tends to be neutralized, diminished, balanced by <*nonA*> ideas (not only by <*antiA*> as Hegel asserted) — as a state of equilibrium.

In between <*A*> and <*antiA*> there may be a continuous spectrum of particular <*neutA*> ideas, which can balance <*A*> and <*antiA*>.

To neuter an idea one must discover all its three sides: of sense (truth), of nonsense (falsity), and of undecidability (indeterminacy) - then reverse/combine them. Afterwards, the idea will be classified as neutrality.

There exists a *Principle of Attraction* not only between the opposites <*A*> and <*antiA*> (as in dialectics), but also between them and their neutralities <*neutA*> related to them, since <*neutA*> contributes to the *Completeness of Knowledge*.

Hence, neutrosophy is based not only on analysis of oppositional propositions as dialectic does, but on analysis of these contradictions together with the neutralities related to them.

Neutrosophy was extended to Neutrosophic Logic, Neutrosophic Set, Neutrosophic Probability and Neutrosophic Statistics, which are used in technical applications.

In the Neutrosophic Logic (which is a generalization of fuzzy logic, especially of intuitionistic fuzzy logic) every logical variable x is described by an ordered triple $x = (T, I, F)$, where T is the degree of truth, F is the degree of falsehood, and I the degree of indeterminacy (or neutrality, i.e. neither true nor false, but vague, unknown, imprecise), with T, I, F standard or non-standard subsets of the non-standard unit interval $]^{-}0;\ 1^{+}[$. In addition, these values may vary over time, space, hidden parameters, etc.

Neutrosophic Probability (as a generalization of the classical probability and imprecise probability) studies the chance that a particular event <*A*> will occur, where that chance is represented by three coordinates (variables): *T%* chance the event will occur, *I%* indeterminate (unknown) chance, and *F%* chance the event will not occur.

Neutrosophic Statistics is the analysis of neutrosophic probabilistic events.

Neutrosophic Set (as a generalization of the fuzzy set, and especially of intuitionistic fuzzy set) is a set such that an element belongs to the set with a neutrosophic probability, i.e. *T* degree of appurtenance (membership) to the set, *I* degree of indeterminacy (unknown if it is appurtenance or nonappurtenance to the set), and *F* degree of non-appurtenance (non-membership) to the set.

There exist, for each particular idea: PRO parameters, CONTRA parameters, and NEUTER parameters which influence the above values. Indeterminacy results from any hazard which may occur, from unknown parameters, or from new arising conditions. This resulted from practice.

5.2. Applications of neutrosophics

Neutrosophic logic/set/probability/statistics are useful in artificial intelligence, neural networks, evolutionary programming, neutrosophic dynamic systems, and quantum mechanics.

5.3. Examples of neutrosophy used in Arabic philosophy

- While Avicenna promotes the idea that the world is contingent if it is necessitated by its causes, Averroes rejects it, and both of them are right from their point of view. Hence <A> and <anti A> have common parts.
- Islamic dialectical theology (*kalam*) promoting creationism was connected by Avicenna in an extraordinary way with the opposite Aristotelian-Neoplatonic tradition. Actually a lot of work by Avicenna falls into the frame of neutrosophy.
- Averroes's religious judges (*qadis*) can be connected with atheists' believes.
- al-Farabi's metaphysics and general theory of emanation vs. al-Ghazali's Sufi writings and mystical treatises [we may think about a coherence of al-Ghazali's "Incoherence of the Incoherence" book].
- al-Kindi's combination of Koranic doctrines with Greek philosophy.
- Islamic Neoplatonism + Western Neoplatonism.
- Ibn-Khaldun's statements in his theory on the cyclic sequence of civilizations, says that: Luxury leads to the raising of civilization (because the people seek for comforts of life) but also Luxury leads to the decay of civilization (because its correlation with the corruption of ethics).

- On the other hand, there's the method of absent-by-present syllogism in jurisprudence, in which we find the same principles and laws of neutrosophy.
- In fact, we can also function a lot of Arabic aphorisms, maxims, Koranic miracles (Ayat Al-Qur'an) and Sunna of the prophet, to support the theory of neutrosophy. Take the colloquial proverb that "The continuance of state is impossible" too, or "Everything, if it's increased over its extreme, it will turn over to its opposite"!

5.4. The Venn diagram

In a Venn diagram we have with respect to a universal set U the following:

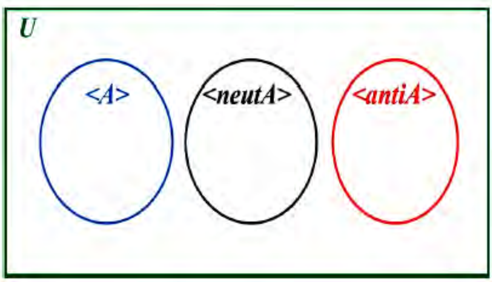

Fig. 5.1. Venn diagram

Therefore, there are no common parts amongst <*A*>, <*neutA*>, and <*antiA*>, and all three of them are (completely) contained by the universal set *U*. Also, all borders of these sets <*A*>, <*neutA*>, <*antiA*>, and *U* are clear, exact.

All these four sets are well-defined. While <*neutA*> means neutralities related to <*A*> and <*antiA*>, what is outside of $< A > U < neutA > U < antiA >$ but inside of U are other neutralities, not related to <*A*> or to <*antiA*>.

Given <*A*>, there are two types of neutralities: those related to <*A*> (and implicitly related to <*antiA*>), and those not related to <*A*> (and implicitly not related to <*antiA*>).

5.5. The neutrosophic diagram, as extension of the Venn diagram

Yet, for ambiguous, vague, not-well-known (or even unknown) imprecise ideas / notions / statements / entities with unclear frontiers amongst them the below relationships may occur because between an approximate idea noted by <*A*> and its opposite <*antiA*> and their neutralities <*neutA*> there are not clear delimitations, not clear borders to distinguish amongst what is <*A*> and what is not <*A*>. There are buffer zones in between <*A*> and <*antiA*> and <*neutA*>, and an element *x* from a buffer zone between <*A*> and <*antiA*> may or may not belong to both <*A*> and <*antiA*> simultaneously. And similarly for an element *y* in a buffer zone between <*A*> and <*neutA*>, or an element *z* in the buffer zone between <*neutA*> and <*antiA*>. We may have a buffer zone where the confusion of appurtenance to <*A*>, or to <*neutA*>, or to <*antiA*> is so high, that we can consider that an element *w* belongs to all of them simultaneously (or to none of them simultaneously).

We say that all four sets <*A*>, <*neutA*>, <*antiA*>, and the neutrosophic universal set *U* are illdefined, inexact, unknown (especially if we deal with predictions; for example, if <*A*> is a statement with some degree of chance of occurring, with another degree of change of not occurring, plus an unknown part). In the general case, none of the sets <*A*>, <*neutA*>, <*antiA*>, <*nonA*> are completely included in *U*, and neither *U* is completely known; for example, if *U* is the neutrosophic universal set of some specific given events, what about an unexpected event that might belong to *U*? That's why an approximate *U* (with vague borders) leaves room for expecting the unexpected.

The Neutrosophic Diagram in the general case is the following (Fig. 2): the borders of <*A*>, <*antiA*>, and <*neutA*> are dotted since they are unclear.

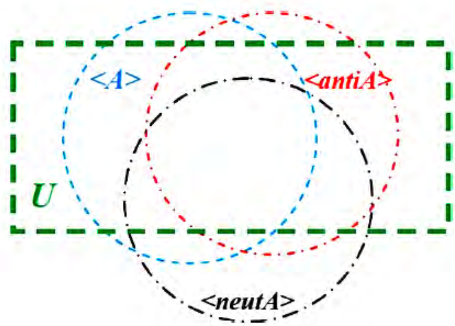

Fig. 5.2: Neutrosophic Diagram

Similarly, the border of the neutrosophic universal set *U* is dotted, meaning also unclear, so *U* may not completely contain <*A*>, nor <*neutA*> or <*antiA*>, but *U* "approximately" contains each of them. Therefore, there are elements in <*A*> that may not belong to *U*, and the same thing for <*neutA*> and <*antiA*>. Or elements, in the most ambiguous case, there may be elements in <*A*> and in <*neutA*> and in <*antiA*> which are not contained in the universal set *U*.

Even the neutrosophic universal set is ambiguous, vague, and with unclear borders.

Of course, the intersections amongst <*A*>, <*neutA*>, <*antiA*>, and *U* may be smaller or bigger or even empty depending on each particular case.

See below an example of a particular neutrosophic diagram (Fig. 3), when some intersections are contained by the neutrosophic universal set:

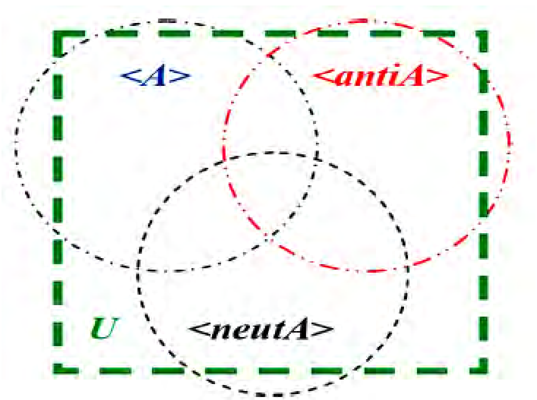

Fig. 5.3: Example of a particular neutrosophic diagram

A neutrosophic diagram is different from a Venn diagram since the borders in a neutrosophic diagram are vague. When all borders are exact and all intersections among <*A*>, <*neutA*>, and <*antiA*> are empty, and all <*A*>, <*neutA*>, and <*antiA*> are included in the neutrosophic universal set *U*, then the neutrosophic diagram becomes a Venn diagram.

The neutrosophic diagram, which complies with the neutrosophic logic and neutrosophic set, is an extension of the Venn diagram.

5.6. Classes of neutrosophic paradoxes

The below classes of neutrosophic paradoxes are not simply word puzzles. They may look absurd or unreal from the classical logic and classical set theory perspective. If <*A*> is a precise / exact idea, with well-defined borders that delimit it from others, then of course the below relationships do not occur.

But let <*A*> be a vague, imprecise, ambiguous, not-wellknown, not-clear-boundary entity, <*nonA*> means what is not <*A*>, and <*antiA*> means the opposite of <*A*>. <*neutA*> means the neutralities related to <*A*> and <*antiA*>, neutralities which are in between them.

When <*A*>, <*neutA*>, <*antiA*>, <*non A*>, *U* are uncertain, imprecise, they may be selfcontradictory. Also, there are cases when the distinction between a set and its elements is not clear.

Although these neutrosophic paradoxes are based on "pathological sets" (those whose properties are considered atypically counterintuitive), they are not referring to the theory of Meinongian objects (*Gegenstandstheorie*) such as round squares, unicorns, etc. Neutrosophic paradoxes are not reported to objects, but to vague, imprecise, unclear ideas or predictions or approximate notions or attributes from our everyday life.

5.7. Neutrosophic operators

Let's introduce for the first time two new Neutrosophic Operators:

1. An operator that "neuterizes" an idea. **To neuterize** [neuter+ize, transitive verb; from the Latin word *neuter* = neutral, in neither side], n (.), means to map an entity to its neutral part. [We use the Segoe Print for "n(.)".]

"To neuterize" is different from "to neutralize" [from the French word *neutraliser*] which means to declare a territory neutral in war, or to make ineffective an enemy, or to destroy an enemy.

n(<*A*>) = <*neutA*>. By definition n (<*neutA*>) = <*neutA*>.

For example, if <*A*> is "*tall*", then **n**(*tall*) = *medium*, also **n**(*short*) = *medium*, **n**(*medium*) = *medium*.

But if <*A*> is "1 + 1 = 2 in base 10", then n (<1 + 1 = 2 in base 10>) is undefined (does not exist), and similarly n (<1 + 1 ≠ 2 in base 10>) is undefined.

2. An operator that "antonymizes" an idea. **To antonymize** [antonym+ize, transitive verb; from the Greek work *antonymia* = instead of, opposite], a(.), means to map an entity to its opposite. [We use the Segoe Print for a(.)] a(<*A*>) = <*antiA*>.

For example, if <*A*> is "*tall*", then *a*(*tall*) = *short*, also *a*(*short*) = *tall*, and *a*(*medium*) = *tall or short*.

But if <*A*> is "1 + 1 = 2 in base 10", then *a*(<1 + 1 = 2 in base10>) = <1 + 1 ≠ 2 in base 10> and reciprocally *a*(<1 + 1 ≠ 2 in base 10>) = <1 + 1 = 2 in base 10>.

The classical operator for *negation* / *complement* in logics respectively in set theory, "*to negate*" (¬), which is equivalent in neutrosophy with the operator "*to nonize*" (i.e. to *non+ize*) or *nonization* (i.e. *non+ization*), means to map an idea to its neutral or to its opposite (a union of the previous two neutrosophic operators: *neuterization* and *antonymization*):

$$\neg\langle A\rangle = \langle non\,A\rangle = \langle neut\,A\rangle \cup \langle anti\,A\rangle = n(\langle A\rangle) \cup a(\langle A\rangle).$$

Neutrosophic Paradoxes result from the following *neutrosophic logic / set connectives* following all apparently impossibilities or semi-impossibilities of neutrosophically connecting <*A*>; <*antiA*>; <*neutA*>; <*nonA*>, and the neutrosophic universal set *U*.

5.8. Neutrosophic truth tables

For <*A*> = "*tall*":

$\langle A\rangle$	$a(\langle A\rangle)$	$n(\langle A\rangle)$	$\neg\langle A\rangle$
tall	short	medium	short or medium
medium	short or tall	medium	short or tall
short	tall	medium	tall or medium

To remark that $\boldsymbol{n}(<medium>) \triangleq medium$. If $<A> = tall$, then $<neutA> = medium$, and $<neut(neutA)> = <neutA>$, or $\boldsymbol{n}(<\boldsymbol{n}(<A>)>) = n(<A>)$.

To remark that $\boldsymbol{n}(<medium>) \triangleq medium$. If $<A> = tall$, then $<neut\,A> = medium$, and $<neut(neut\,A)> = <neut\,A>$, or $\boldsymbol{n}(<\boldsymbol{n}(<A>)>) = n(<A>)$.

For $<A>$ = "$1 + 1 = 2\ in\ base\ 10$" we have $<anti\,A> = <non\,A>$ = "$1 + 1 \neq 2\ in\ base\ 10$", while $<neut\,A>$ is undefined (N/A) — whence the neutrosophic truth table becomes:

For $<A>$ = "1 + 1 = 2 in base 10" we have $<antiA> = <nonA>$ = "$1 + 1 \neq 2$ in base 10", while $<neutA>$ is undefined (N/A) - whence the neutrosophic truth table becomes:

$<A>$	$\boldsymbol{a}(<A>)$	$\boldsymbol{n}(<A>)$	$\neg<A>$
True	False	N/A	False
False	True	N/A	True

In the case when a statement is given by its neutrosophic logic components $<A> = (T, I, F)$, i.e. $<A>$ is $T\%$ true, $I\%$ indeterminate, and $F\%$ false, then the neutrosophic truth table depends on the defined neutrosophic operators for each application.

5.9. Neutrosophic operators and classes of neutrosophic paradoxes

5.9.1. Complement/Negation

$\neg<A> \neq <non\,A>$ and reciprocally $\neg<non\,A> \neq <A>$.

$$\neg(\neg<A>) \neq <A>$$
$$\neg(\neg<anti\,A>) \neq <anti\,A>$$
$$\neg(\neg<non\,A>) \neq <non\,A>$$

$\neg(\neg\langle neut\ A\rangle) \neq \langle neut\ A\rangle$
$\neg(\neg U) \neq U$, where U is the neutrosophic universal set. $\neg(\neg\langle\varnothing\rangle) \neq \langle\varnothing\rangle$, where $\langle\varnothing\rangle$ is the neutrosophic empty set.

5.9.2. Neuterization

$\boldsymbol{n}(\langle A\rangle) \neq \langle neut\ A\rangle$
$\boldsymbol{n}(\langle anti\ A\rangle) \neq \langle neut\ A\rangle$
$\boldsymbol{n}(\langle non\ A\rangle) \neq \langle neut\ A\rangle$
$\boldsymbol{n}(\boldsymbol{n}(\langle A\rangle)) \neq \langle A\rangle$

5.9.3. Antonymization

$\boldsymbol{a}(\langle A\rangle) \neq \langle anti\ A\rangle$
$\boldsymbol{a}(\langle anti\ A\rangle) \neq \langle A\rangle$
$\boldsymbol{a}(\langle non\ A\rangle) \neq \langle A\rangle$
$\boldsymbol{a}(\boldsymbol{a}(\langle A\rangle)) \neq \langle A\rangle$

5.9.4. Intersection/Conjunction

$\langle A\rangle \cap \langle non\ A\rangle \neq \varnothing$ (neutrosophic empty set) [symbolically $(\exists x)(x \in A \wedge x \in \neg A)$],
or even more $\langle A\rangle \cap \langle anti\ A\rangle \neq \varnothing$ [symbolically $(\exists x)(x \in A \wedge x \in \boldsymbol{a}(A))$],
similarly $\langle A\rangle \cap \langle neut\ A\rangle \neq \varnothing$ and $\langle anti\ A\rangle \cap \langle neut\ A\rangle \neq \varnothing$,
up to $\langle A\rangle \cap \langle neut\ A\rangle \cap \langle anti\ A\rangle \neq \varnothing$.

The symbolic notations will be in a similar way.

This is *Neutrosophic Transdisciplinarity*, which means to find common features to uncommon entities.

For examples: There are things which are good and bad in the same time.

There are things which are good and bad and medium in the same time (because from one point of view they may be god, from other point of view they may be bad, and from a third point of view they may be medium).

5.9.5. Union / Weak Disjunction

$<A> \cup <neut\ A> \cup <anti\ A> \neq U$.

$<anti\ A> \cup <neut\ A> \neq <non\ A>$.

Etc.

5.9.6. Inclusion/Conditional

$<A> \subset <anti\ A>$

$(\forall x)(x \in A \rightarrow x \in \boldsymbol{a}(A))$

All is $<anti\ A>$, the $<A>$ too.

All good things are also bad.

All is imperfect, the perfect too.

$<anti\ A> \subset <A>$

$(\forall x)(x \in \boldsymbol{a}(A) \rightarrow x \in A)$

All is $<A>$, the $<anti\ A>$ too.

All bad things have something good in them [this is rather a fuzzy paradox].

All is perfect things are imperfect in some degree.

$<non\ A> \subset <A>$

$(\forall x)(x \in \neg A \rightarrow x \in A)$

All is $<A>$, the $<non\ A>$ too.

All bad things have something good and something medium in them [this is a neutrosophic paradox, since it is based on good, bad, and medium].

All is perfect things have some imperfectness and mediocrity in them at some degree.

$<A> \subset <neut\ A>$

$(\forall x)(x \in A \rightarrow x \in \boldsymbol{n}(A))$

All is $<neutA>$, the $<A>$ too.

$<non\ A> \subset <neutA>$ [partial neutrosophic paradox of inclusion]

$(\forall x)(x \in \neg A \rightarrow x \in \boldsymbol{n}(A))$
All is <*neutA*>, the <*non A*> too.
<*non A*> $\subset$ <*antiA*> [partial neutrosophic paradox of inclusion]
$(\forall x)(x \in \neg A \rightarrow x \in \boldsymbol{a}(A))$
All is <*antiA*>, the <*non A*> too.
<*antiA*> $\subset$ <*neut A*>
$(\forall \mathrm{x})(\mathrm{x} \in \boldsymbol{a}(A) \rightarrow \mathrm{x} \in \boldsymbol{n}(\mathrm{A}))$
All is <*neut A*>, the <*anti A*> too.
<*A*> $\cup$ <*anti A*> $\subset$ <*neut A*>
$(\forall \mathrm{x})((x \in \mathrm{A} \vee \mathrm{x} \in \boldsymbol{a}(\mathrm{A})) \rightarrow \mathrm{x} \in \boldsymbol{n}(\mathrm{A}))$
All is <*neutA*>, the <*A*> and <*antiA*> too.

Paradoxes of some Neutrosophic Arguments

$<A> \Rightarrow <B>$
$<B> \Rightarrow <anti\ A>$
$\therefore <A> \Rightarrow <anti\ A>$

Example: too much work produces sickness; sickness produces less work (absences from work, low efficiency); therefore, too much work implies less work (this is a *Law of Self-Equilibrium*).

$<A> \Rightarrow <B>$
$<B> \Rightarrow <non\ A>$
$\therefore <A> \Rightarrow <non\ A>$

$<A> \Rightarrow <B>$
$<B> \Rightarrow <neut\ A>$
$\therefore <A> \Rightarrow <neut\ A>$

5.9.7. Equality/Biconditional

Unequal Equalities

$<A> \neq <A>$
which symbolically becomes $(\exists x)(x \in \neg A \leftrightarrow x \notin \neg A)$ or even stronger inequality $(\forall x)(x \in \neg A \leftrightarrow x \notin \neg A)$.

Nothing is <*A*>, nor even <*A*>.
<*anti A*> ≠ <*anti A*>
which symbolically becomes $(\exists x)(x \in A \leftrightarrow x \notin A)$
or even stronger inequality $(\forall x)(x \in A \leftrightarrow x \notin A)$.

<*neut A*> ≠ <*neut A*>
which symbolically becomes $(\exists x)(x \in \upsilon A \leftrightarrow x \notin \upsilon A)$
or even stronger inequality $(\forall x)(x \in \upsilon A \leftrightarrow x \notin \upsilon A)$.
<*non A*> ≠ <*non A*>
which symbolically becomes $(\exists x)(x \in \neg A \leftrightarrow x \notin \neg A)$
or even stronger inequality $(\forall x)(x \in \neg A \leftrightarrow x \notin \neg A)$.

Equal Inequalities
<*A*> = <*anti A*>
$(\forall x)(x \in A \leftrightarrow x \in \boldsymbol{a}(A))$
All is <*A*>, the <*anti A*> too; and reciprocally, all is <*anti A*>, the <*A*> too. Or, both combined implications give: All is <*A*> is equivalent to all is <*anti A*>.
And so on:
<*A*> = <*neut A*>
<*anti A*> = <*neut A*>
<*non A*> = <*A*>

Dilations and Absorptions
<*anti A*> = <*non A*>,

which means that <*antiA*> is dilated to its neutrosophic superset <*nonA*>, or <*nonA*> is absorbed to its neutrosophic subset <*antiA*>.

Similarly for:
<*neut A*> = <*non A*>
<*A*> = *U*
<*neut A*> = *U*
<*anti A*> = *U*
<*non A*> = *U*

5.9.8. Combinations

Combinations of the previous single neutrosophic operator equalities and/or inequalities, resulting in more neutrosophic operators involved in the same expression.

For examples:

$<neut\ A> \cap (<A> \cup <anti\ A>) \neq \emptyset$ [two neutrosophic operators].

$<A> \cup <anti\ A> \neq \neg<neut\ A>$ and reciprocally $\neg(<A> \cup <anti\ A>) \neq <neut\ A>$.

$<A> \cup <neut\ A> \neq \neg<anti\ A>$ and reciprocally.

$\neg(<A> \cup <neut\ A> \cup <anti\ A>) \neq \emptyset$ and reciprocally.

Etc.

5.9.9. Other logical connectors

We can also take into consideration other logical connectors, such as strong disjunction (we previously used the weak disjunction), Shaffer's connector, Peirce's connector, and extend them to the neutrosophic form.

5.9.10. Substitutions

We may substitute $<A>$ by some entities, attributes, statements, ideas and get nice neutrosophic paradoxes, but not all substitutions will work properly.

5.10. Some particular paradoxes

5.10.1. Quantum semi-paradox

Let's go back to 1931 Schrödinger's paper. Saul Youssef writes (flipping a *quantum coin*) in *arXiv.org* at *quant-ph/9509004*:

"The situation before the observation could be described by the distribution (1/2,1/2) and after observing heads our description would be adjusted to (1,0). The problem is, what would you say to a student who then asks: “Yes, but what causes (1/2,1/2) to evolve into (1,0)? How does it happen?”

It is interesting. Actually we can say the same for any probability different from 1: If at the beginning, the probability of a quantum event, $P(quantum\ event) = p$, with $0 < p < 1$, and if later the event occurs, we get to $P(quantum\ event) = 1$; but if the event does not occur, then we get $P(quantum\ event) = 0$, so still a kind of contradiction.

5.10.2. Torture’s paradox

An innocent person P, who is tortured, would say to the torturer T whatever the torturer wants to hear, even if P doesn’t know anything.

So, T would receive incorrect information that will work against him/her. Thus, the torture returns against the torturer.

5.10.3. Paradoxist psychological behavior

Instead of being afraid of something, say <A>, try to be afraid of its opposite <*antiA*>, and thus (because of your fear) you’ll end up with the <*anti*<*antiA*>>, which is <*A*>.

Paradoxically, negative publicity attracts better than positive one (enemies of those who do negative publicity against you will sympathize with you and become your friends).

Paradoxistically [word coming etymologically from *paradoxism*, *paradoxist*], to be in opposition is more poetical and interesting than being opportunistic.

At a sportive, literary, or scientific competition, or in a war, to be on the side of the weaker is more challenging but on the edge of chaos and, as in *Complex Adoptive System*, more potential to higher creation.

5.10.4. Law of Self-Equilibrium

(Already cited above at the Neutrosophic Inclusion/Conditional Paradoxes) <*A*> → <*B*> and <*B*> → <*antiA*>, therefore <A> → <*antiA*> !

Example: too much work produces sickness; sickness produces less work (absences from work, low efficiency); therefore, too much more implies less work.

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Originally published in PROGRESS IN PHYSICS,
Volume 4 (2010), Issue 4 (October), p. 18-23. Reviewed.

REVIEWS&ABSTRACTS

6. Unparticle, a Special Case of Unmatter

The idea of **unparticle** was first considered by F. Smarandache in 2004, 2005 and 2006, when he uploaded a paper on CERN website and published three papers about what he called "unmatter," which is a new form of matter formed by matter and antimatter that bind together.

Unmatter was introduced in the context of "neutrosophy" (Smarandache, 1995) and "paradoxism" (Smarandache, 1980), which are based on combinations of opposite entities "A" and "antiA" together with their neutralities "neutA" that are in between.

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, as a result of non-equilibrium dynamics and the onset of complex behavior.

In the TeV sector the hypothetical high energy states consist of arbitrary mixtures of particles and antiparticles, which are similar to unparticles, and thus unparticles are particular cases of unmatter.

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.

Unparticles are massless fields of nonintegral scaling dimensions.

Abstract Submitted on 28 Apr 2011 for the *DPP11 Meeting of The American Physical Society*.

7. Connection Between Unparticle and Unmatter

The connection between *unparticle* and *unmatter* is as follows. Unparticles have very odd properties which result from the fact that they represent fractional field quanta. Unparticles are manifested as mixed states that contain arbitrary mixtures of particles and antiparticles (therefore they simultaneously evolve "forward" and "backward" in time). From this, the connection with unmatter (since unmatter is formed by particles and antiparticles). Using the fractal operators of differentiation and integration we get the connection between unparticle and unmatter. *Unmatter* was coined by F. Smarandache in 2004 in CERN's website; he published three papers on the subject.

Abstract Submitted on 04 Oct 2010 for the *CAL10 Meeting of The American Physical Society*.

8. Neutrosophic Physics as A New Field of Research

Neutrosophic Physics describes collections of objects or states that are individually characterized by opposite properties, or are characterized neither by a property nor by the opposite of that property.

Neutrosophic Physics means a mixture of physical concepts/ideas/spaces/laws/theories <A> with their opposite <antiA> or with their neutral <neutA> [where <neutA> means neither <A> nor <antiA>, but in between, i.e. the neutral part], and it is a combination of heterogeneous contradictory things which hold together.

There are many cases in scientific fields (and in humanistic fields) that an item <A> and its opposite <antiA> or their neutral <neutA> are simultaneously valid.

See below some examples of neutrosophic entities:

1. in two spatial dimensions, anyons are arbitrary spin particles that are neither bosons (integer spin) nor fermions (half integer spin);

2. among possible Dark Matter candidates there may be exotic particles that are neither Dirac nor Majorana fermions;

3. mercury (Hg) is a state that is neither liquid nor solid under normal conditions at room temperature;

4. non-magnetic materials are neither ferromagnetic nor anti-ferromagnetic;

5. 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;

6. unmatter, which is formed by matter and antimatter that bind together (Smarandache, 2004);

7. neutral Kaon, which is a pion & anti-pion composite (Santilli, 1978) and therefore a form of unmatter;

8. neutrosophic methods in General Relativity (Rabounski-Smarandache-Borissova, 2005);

9. neutrosophic cosmological model (Rabounski-Borissova, 2011);

10. neutrosophic gravitation (Rabounski).

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

Neutrosophic Physics is derived from Neutrosophic Logic, Neutrosophic Set, Neutrosophic Probability and Statistics, which have many applications.

Researchers are invited to submit papers to fsmarandache@gmail.com or smarand@unm.edu about physical entities that have contradictory properties, or have neither a property nor the opposite of that property, to the author for a collective volume on Neutrosophic Physics.

Acknowledgement

The author addresses his thanks to Ervin Goldfain, Dmitri Rabounski, Larissa Borissova, and Thomas R. Love for their suggestions about this paper.

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9. Neutrosophic Degree of Paradoxicity of a Scientific Statement

Let <S> be a scientific statement (in physics, mathematics, etc.). Let's also consider the implication (C_1) "If <S> is true it may result that <S> is false," and the reciprocal implication (C_2) "If <S> is false it may result that <S> is true." Both implications (conditionals) depend on other factors in order to occur or not, or they are partially true (T), partially indeterminate (I), and partially false (F) [as in neutrosophic logic]. If the implication (C_1) has the neutrosophic truth value (T_1; I_1; F_1); and the reciprocal implication (C_2) has the neutrosophic truth value (T_2; I_2; F_2), then *the neutrosophic degree of paradoxicity of the statement* <S> is the average of the component triplets:

$$((T1+T2)/2; (I1+I2)/2; (F1+F2)/2);$$

where the addition of two sets A and B (in the case when T, I, or F are sets) is simply defined as:

$$A + B = \{x | x = a + b, \text{with } a \in A \text{ and } b \in B\}.$$

Abstract Submitted on 24 Aug 2011 for the *4CF11 Meeting of The American Physical Society*.

10. The Multispace with Its Multistructure as Unified Field Theory

Let $S_1, S_2, \ldots, S_n$ be n structures on respectively the sets $M_1, M_2, \ldots, M_n$, where $n \geq 2$ (n may even be infinite). The structures S_i, $i = 1, 2, \ldots, n$, may not necessarily be distinct two by two; each structure S_i may be or not n_i_concentric, for $n_i \geq 1$. And the sets M_i, $i = 1, 2, \ldots, n$, may not necessarily be disjoint, also some sets M_i may be equal to or included in other sets M_j, $j = 1, 2, \ldots, n$. We defined the multispace M as a union of the previous sets: $M = M_1 \cup M_2 \cup \ldots \cup M_n$, hence we have n (different or not, overlapping or not) structures on M.

A multi-space is a space with many structures that may overlap, or some structures may include others or may be equal, or the structures may interact and in°uence each other as in our everyday life.

Therefore, for a unified field theory we build a multispace M with a multistructure as a union of a gravitational space, electromagnetic space, weak interactions space, and strong interactions space. Then we construct a corresponding physical model.

Abstract Submitted on 02 Oct 2011 for the *PSF11 Meeting of The American Physical Society*.

11. Multispace and Multistructure as a Theory of Everything

In a general definition, a multispace (also spelt multi-space) is a finite or infinite (countable or uncountable) union of many spaces that have various structures.

The spaces may overlap. A such multispace can be used in physics for the Unified Field Theory that tries to unite the gravitational, electromagnetic, weak and strong interactions. Or in the parallel quantum computing and in the mu-bit theory, in multi-entangled states or particles and up to multi-entangles objects.

It is believed that the multispace with its multistructure is the best candidate for 21st century Theory of Everything in any domain. It connects many knowledge fields.

The multispace is a qualitative notion, since it is too large and includes both metric and non-metric spaces.

The notion of multispace was introduced by the author in 1969 under the idea of hybrid mathematics: combining different fields into a unifying field, which is closer to our real life, since we don't have a homogeneous space, but many heterogeneous ones.

As applications we also mention: the algebraic multispaces (multi-groups, multi-rings, multi-vector spaces, multi-operation systems and multi-manifolds, also multi-voltage graphs, multi-embedding of a graph in an nmanifold, etc.), geometric multispaces (combinations of Euclidean and Non-Euclidean geometries into one space as in Smarandache geometries), theoretical physics, including the relativity theory, the M-theory and the cosmology, then multi-space models for p-branes and cosmology, etc.

Abstract Submitted on 26 Aug 2011 for the *NWS11 Meeting of The American Physical Society*.

12. Five Paradoxes and a General Question on Time Traveling

12.1. Traveling to the past

Joe40, who is 40 years old, travels 10 years back to the past when he was 30 years old. He meets himself when he was 30 years old, let's call this Joe30.

Joe40 kills Joe30.

If so, we mean if Joe died at age 30 (because Joe30 was killed), how could he live up to age 40?

12.2. Traveling to the future

Joe30, who is 30 years old, travels 10 years in the future and meats himself when he will be 40 years old, let's call him Joe40.

Joe40 kills Joe30.

At what age did Joe die, at 30 or 40?

If Joe30 died, then Joe40 would not exist.

12.3. Traveling pregnant woman

a) A 3-month pregnant woman, Jane3, travels 6 months to the future where she gives birth to a child Johnny3.

b) Then she returns with the child back, and after 1 month she travels 5 months to the future exactly at the same time as before.

Then how is it possible to have at exactly the same time two different situations: first only the pregnant woman, and second the pregnant woman and her child?

12.4. Traveling in the past before birth

Joe30, who is 30 years old, travels 40 years in the past, therefore 10 years before he was born.

How is it possible for him to be in the time when he did not exist?

12.5. Traveling in the future after death

Joe30, who is 30 years old, travels 40 years in the future, 10 years after his death. He has died when he was 60 years old, as Joe60.

How is it possible for him to be in the time when he did not exist any longer?

12.6. A general question about time traveling

When traveling say 50 years in the past [let's say from year 2010 to year 1960] or 50 years in the future [respectively from year 2010 to year 2060], how long does the traveling itself last?

If it's an instantaneous traveling in the past, is the time traveler jumping from year 2010 directly to year 1960, or is he continuously passing through all years in between 2010 and 1960?

If the traveling lasts longer say, a few units (seconds, minutes, etc.) of time, where will be the traveler at the second unit or third unit of time?

I mean, suppose it takes 5 seconds to travel from year 2010 back to year 1960; then in the 1st second is he in year 2000, in the 2nd second in year 1990, in the 3rd second in year 1980, in the 4st second in year 1970, and in the 5st second in year 1960?

So, his speed is 10 years per second?

Similar question for traveling in the future.

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Published in PROGRESS IN PHYSICS, vol. 4, October 2010, p. 24. Reviewed.

13. Introduction to the Mu-bit

Mu-bit is defined here as `multi-space bit'. It is different from the standard meaning of bit in conventional computation, because in Smarandache's multispace theory (also spelt multi-space) the bit is created simultaneously in many subspaces (that form together a multi-space). This new `bit' term is different from multi-valued-bit already known in computer technology, for example as MVLong. This new concept is also different from qu-bit from quantum computation terminology. We know that using quantum mechanics logic we could introduce new way of computation with 'qubit' (quantum bit), but the logic remains Neumann. Now, from the viewpoint of m-valued multi-space logic, we introduce a new term: 'mu-bit' (from multi-space bit).

Abstract Submitted on 03 Sep 2010 for the *MAR11 Meeting of The American Physical Society*.

14. Introduction to SC-Potential

A new type of potential for nucleus, which is different from Coulomb potential or Yukawa potential, is introduced. This new called Smarandache-Christianto potential may have effect for radius range within r = 5-10 fm. For experimental verification of this potential, we find possible applications in the context of Condensed Matter Nuclear reaction.

According to Takahashi's research, it is more likely to get condensed matter nuclear reaction using cluster of deuterium (4D) rather than using D+D reaction (as in hot-fusion, in this process Coulomb barrier is very high). In recent work, Takahashi shows that in the TSC framework it is also possible to do CMNS reaction not only with DDDD, but also with DDDH, DDHH, DHHH, or HHHH, where the reaction can be different.

In other words, TSC can be a mixture of heavy and light water (as in neutrosophic logic). More interestingly, his EQPET/TSC *(tetrahedra symmetric condensate)* model, Takahashi can predict a new potential called STTBA *(sudden-tall thin barrier approximate)* which includes negative potential (reverse potential) and differs from Coulomb potential. The SC-potential, which has sinusoidal form, can be viewed as a generalization of Takahashi's TSC/STTBA potential.

Abstract Submitted on 05 Oct 2010 for the *MAR11 Meeting of The American Physical Society*.

15. New Relativistic Paradoxes (new edition)

I have released a second edition of my latest book, *New Relativistic Paradoxes and Open Questions* (2012, The Educational Publisher). The first edition was published by Somipress (1983, Fes). The book is available from Amazon in print or Kindle editions.

Following the Special Theory of Relativity, I have generalized the Lorentz contraction factor to an oblique-contraction factor, which gives the contraction factor of the lengths moving at an oblique angle with respect to the motion direction. I assert that relativistic moving bodies are distorted, and compute the angle-distortion equations. I show several paradoxes, inconsistencies, contradictions and anomalies in the Theory of Relativity.

Not all physical laws are the same in all inertial reference frames, and I give several counter-examples. I support superluminal speeds, and consider that the speed of light in vacuum is variable depending on the moving reference frame. I explain that the redshift and blueshift are not entirely due to the Doppler effect, but also to the medium gradient and refraction index. I hypothesize that space is not curved and the light near massive cosmic bodies bends not because of gravity only as the General Theory of Relativity asserts (gravitational lensing), but because of medium lensing.

In order to make the distinction between “clock” and “time,” the book suggests a first experiment with a different clock type for the GPS clocks, for proving that the resultant dilation and contraction factors are different from those obtained with the cesium atomic clock; and a second experiment with different medium compositions for proving that different degrees of redshifts/blueshifts and different degrees of medium lensing would result.

Readers are encouraged to contact me at fsmarandache@gmail.com or smarand@unm.edu with any questions or comments about the book.

Letter to the Editor of INFINITE ENERGY.

16. A Review on Di Hua's Relativity of Quantum Theories

On: Di Hua, *Back to Square One and Restart Anew / Deepening the Relativity Theory and Quantum Mechanics*. American Academic Press, Salt Lake City, USA, 135 p., 2015.

The problems that physicists must solve today are, to a large extent, questions that remain unanswered because of the incompleteness of the 20th century's scientific revolution. Inspite of great progress over the century, the two discoveries, of the relativity and of the quantum, remain incomplete. Each has defects that points to the existence of a deeper theory. There are two great problems in theoretical physics, today:

> ***Problem 1:* To combine the special and the general theories of relativity, either by inventing a new theory that does sense or by making sense of the theory of relativity as it stands.**
>
> ***Problem 2:* To reseolve the problems in the foundations of quantum mechanics and combine the relativity theory and the quantum theory into a single theory that can claim to be the complete theory of nature.**

These two problems together drive most current work on the frontier of theoretical physiscs.

Both the realtivity theory and the quantum theory give a problem of *infinities* due to the Lorentz factor

$$\beta = \frac{1}{\sqrt{1 - v^2/c^2}}.$$

Moreover, the quantum theory gives only statistical predictions of subatomic behavior.

In my opinion, this Lorentz factor is not very useful in our reality. Our ability to do any better than that is limited by the uncertainity principle.

Problems come from the division of the world required to make sense of quantum theory. One difficulty is where you draw the dividing line between the micro and the macro.

The problems have not been solved after all this time; it is because something missing, a link between relativistic mechanics and quantum mechanics. The problem of quantum mechanics is unlikely to be solved in isolation.

I deeply admire the author for his courahe to ignore fashion and attack the hardest and most fundamental problems.

As for his work under review, I am delighted to confirm:

1. The mathematical deductions look correct and its physical explanations may be reasonable. Lab experiments and astronomical observations will later be able to check them.
2. The theory, solely based on the Galilean transformation without any postulate, conforms fully with the principle of relativity and provides

a marvelous chain from micro-particle through macro-body to cosmology. [See also Absolute Theory of Relativity (1982)].

3. Especially significant is the seamless link between the relativistic mechanics and the quantum mechanics.

The publication of this monography will add a new name to the list of interesting physiscists of today.

17. Heisenberg Uncertainty Principle Extended to *n*-Plets

All measurable properties of a physical system come in *n*-plets; as one measures a member of the *n*-plets very accurately, consequently the other left *n-1* members of the *n*-plets are measured very inaccurately. If there is a minimum uncertainty in a member's measurement, there is a maximum uncertainty in the other *n-1* members' measurements. The product of the *n* uncertainties corresponding respectively to the measurements of the *n* members is constant:

$$u_1 \bullet u_2 \bullet \ldots \bullet u_n = h = 6.626 \times 10^{-34} \text{ kg } m_2 s^{-1},$$

where *h* is Planck's constant.

Open Question

If possible to simultaneously measure *m* members of the *n*-plets very accurately, for $2 \leq m \leq n-1$ would consequently result that the other left *n - m* members of the *n*-plets are measured very inaccurately?

Abstract Submitted on 11 Aug 2013 for the *OSF13 Meeting of The American Physical Society*.

BLOGS

18. Stars and Planets

Questions:

We know that the stars die after a long period of time.

1) After a star dies, then what happens with the planets around it?
2) Will they still rotate around the previous place of the star?
3) Or, will they joint another star, maybe the closest one, and rotate around it?
4) Or will they fly freely in the space and collide with other planets or stars?
5) Will the natural satellites of these planets still rotate around their planets or not?

Planets also die after a time.

1) Is their orbit filled in by another planet?
2) What is the impact of a planet dying (being destroyed) on the other planet in the same solar system?

If the stars die, then there should be a method that new stars are borne, if not, then the whole universe will die when all stars die [no life will survive any longer].

1) How do the new stars are then borne today?
2) Is it at any moment a small big bang giving birth to new (sub-)universes?

3) If a planet is destroyed, what happens with its moons?
4) The moons leave their positions for the cosmos, because they still not attracted by the central body (planet)?

Dmitri Rabounski's answer:

A. A start does not disappear at the final stage of its evolution, as a substance cannot disappear but only transforms into another sort of matter. When astrophysicists tell "a star dies" they mean three versions of this event:

a) The star is cooled down due to the end the fuel storage in it (no matter what fuel -- hydrogen in the process of nuclear fusion, or something else of the other, unknown sources of the stellar energy). Thus, the star becomes a relatively cold sphere of substance, which radiates so little that cannot be observed. At this stage the star compresses according to the laws of physics, becoming a compact object (not a giant sphere as earlier). Therefore, if there were planets orbiting the star, they still remain in their orbits, because the star's mass remains unchanged (so the orbits remains unchanged as well according to the laws of mechanics). However life will die in the planets being frozen.

b) The star's substance experiences a transit into another physical state. As a result, thermodynamics of the star changes, depending on the new state of its substance. A star can transform, at the final stage of its evolution, into a collapsed sphere --- black hole, where no light or other matter can leave it due to the extra-strong gravitation, --- so the star becomes invisible. A star can transform into a "neutron state", in which the star does not radiate energy in the visible scale of the spectrum (no visible light observed), but still radiates in X-ray and gamma scales. In other word, the star truncates radiation in the most scales of the spectrum, but still radiates (with much power than earlier) in a small scale. As a result of the distribution of energy, the star radiates much, much lesser than earlier, and can live in this state for very long time, almost for eternity. In this case the planets do not remain at their old orbits, but become close to the star, according to the laws of mechanics. This is because neutron star can be born because of an explosion of a regular star, losing the most part of its mass for the energy radiated in the explosion. Also, all life in them deceased being killed by the strong X or gamma radiation.

Another end can be if the star becomes a white dwarf -- as well a special kind of stars which are very small in the size but very, very dense. Such a compression leads to truncating the necessary radiation due to truncating the surface of the compressed star in any million times. Thus, being in the state, the star can still live almost eternal (at least for very long time). In this case, the planets become also close to the star, because a white dwarf can be born after an explosion of a regular star.

c) The star exploses in "complete" so that it mass transfers into radiation and also into gas which ejects into the cosmos constructing a gaseous nebula. In this case no exact centre of the gravitation remains in the old position of the star, so the planets, if not finally destroyed in the explosion, will travel into the cosmos according to their initially momenta, which is the sum of their orbital momenta in the moment of the explosion (disappearing the centre of gravitation) and the momenta the planets get from the explosion.

B. Planets -- solid spheres -- do not die with time. They may cool down if the star's radiation deceases. A planet can also be destroyed by the tidal forces, if approaching the star so close that crossing the Roche limit for the mass of the planet. But this is a very, very close distance. Thus, a planet cannot die. A solid stone is solid stone in any case, if no external power will destroy it.

C. Stars give birth at any time in the universe. We see, in many regions of the sky, the associations of very young stars. The process of birth is not understood in clear, but it is self-understood that stars appear from the compression of rare fracted matter such as the interstellar gas.

19. Unmatter

In the article “Unparticle physics” from http://www.spiritus-temporis.com/unparticle-physics/properties.html

it is said that:

"In 2004, 2005 and 2006 F. Smarandache uploaded a set of documents on CERN web site and published three papers about what he called "unmatter", which according to his writings, represents a new bound form of matter and antimatter (a concept largely unrelated to "unparticles"). In 2006, prior to Georgi's proposal, E. Goldfain introduced the concept of "fractional number of field quanta". He conjectured that unparticles are nontrivial states of matter that may emerge in the near or deep TeV sector of high-energy physics, as a result of non-equilibrium dynamics and complex behavior."

But in the paper "On Emergent Physics, 'Unparticles' and Exotic 'Unmatter' States," by E. Goldfain and F. Smarandache, Prog. Phys., Vol. 4, 10-15, 2008, online at http://www.ptep-online.com/index_files/2008/PP-15-02.PDF

and its abstract at The Smithsonian/NASA Astrophysics Data System: http://adsabs.harvard.edu/abs/2009APS

it is explained the connection between unmatter (Smarandache's sense) and unparticle.

Unparticles are mixed states that contain arbitrary mixtures of particles and antiparticles, hence connection with unmatter.

The use of the fractal operators of differentiation and integration leads to the connection between unparticles and unmatter.

Therefore, according to the cited published article, the concept "unmatter" is related to the concept "unparticle".

Note: *Unparticle is formed by unmatter. Unmatter is combination of matter and antimatter.*

20. Nucleon clusters

I observed something interesting in Robert D. Davic's Table on Brightsen model prediction for nucleon clusters associated with electron orbitals for stable isotopes (H to B): each orbit has one or two clusters of unmatter type 2 of dimension 1 {i.e. one positive and one negative plus neutrals}, or dimension 2, i.e. two positives and two negatives plus neutrals.

Can we make it a physics law? Is it any orbital that has 3 or more such unmatter type 2 clusters?

So, the nucleon is formed by several unmatters type 2 clusters.

The clusters we talked about are not unmatter type 2 (at the level of protons, neutrons, and electrons).

What about thinking in terms of clusters of quarks and antiquarks (not protons, neutrons, and electrons) in Brigthsen Model?

21. Vacuum

Question: I thought vacuum would be some particular space where there is no particle and no field of any kind (no wave) too. So simply empty. Therefore energy zero. But it looks that in the universe such completely empty space does not exist.

What about the astronauts that fly in their rocket's cabin? Is there maybe a near-zero energy space? (But not zero?)

Dmitri Rabounski's answer:

All that you thought about vacuum was a result of the "mix" among the terminology. For example, the astronauts' cabin flies in not vacuum but in a space filled with fields and particles. There is not so much rarefraction to mean the space to be empty: even in an earthy lab, the scientists approach emptiness, not in the cosmic space --- a "soup" of the particles (solar wind) and electromagnetic fields.

A really near-zero space region is a very rare exotics. It is easier to get it in a laboratory than find somewhere in the cosmos.

22. Neutrosophic Numbers in Physics

I did together with Vic Christianto an interpretation of some physical equations we did using the quaternions and/or biquaternions.

We can do the same thing using the neutrosophic numbers, which are numbers of the form: $N = a + bI$, where a, b are real numbers and I = indeterminacy, with I^n = I {"I" is different from "i", which i =sqr(-1) }. Where a=real part, and b=indeterminate part of the number N.

Or more general: $a + bI$, where a, b are complex numbers.

So, some physical equations (especially in quantum physics, where there is a lot of indeterminacy), can be extended to neutrosophic format.

CONFERENCES &PAPERS

23. American Physical Society – Conferences / Papers / Abstracts

(also see Bulletin of American Physical Society at
http://www.aps.org/meetings/baps/)

1. Florentin Smarandache, **Unparticle, a special case of unmatter**, Bulletin of the American Physical Society, 53rd Annual Meeting of the APS Division of Plasma Physics, Volume 56, Number 16, Monday–Friday, November 14–18, 2011; Salt Lake City, Utah, http://meetings.aps.org/Meeting/DPP11/Event/153509
2. Florentin Smarandache, **Neutrosophic Physics as a new field of research**, Bulletin of the American Physical Society, APS March Meeting 2012, Volume 57, Number 1, Monday–Friday, February 27–March 2 2012; Boston, Massachusetts, http://meetings.aps.org/Meeting/MAR12/Event/160317
3. Ervin Goldfain, Florentin Smarandache, **Connection between `unparticle' and `unmatter'**, Bulletin of the American Physical Society, 2010 Annual Meeting of the California-Nevada Section of the APS Volume 55, Number 12, Friday–Saturday, October 29–30, 2010; Pasadena, California, http://meetings.aps.org/Meeting/CAL10/Event/135968
4. Florentin Smarandache, **Multispace and Multistructure as a Theory of Everything**, Bulletin of the American Physical Society, 13th Annual Meeting

of the Northwest Section of the APS Volume 56, Number 10, Thursday–Saturday, October 20–22, 2011; Corvallis, Oregon, http://meetings.aps.org/Meeting/NWS11/Event/157429

5. Dmitri Rabounski, Florentin Smarandache, **The Brightsen Nucleon Cluster Model Predicts Unmatter Entities inside Nuclei**, Bulletin of the American Physical Society, 2008 Annual Meeting of the Division of Nuclear Physics Volume 53, Number 12, Thursday–Sunday, October 23–26, 2008; Oakland, California, http://meetings.aps.org/Meeting/DNP08/Event/87738
6. Florentin Smarandache, Victor Christianto, **Introduction to SC-Potential**, Bulletin of the American Physical Society, APS March Meeting 2011 Volume 56, Number 1, Monday–Friday, March 21–25, 2011; Dallas, Texas, http://meetings.aps.org/Meeting/MAR11/Event/139539
7. Florentin Smarandache, V. Christianto, **Introduction to the Mu-bit**, Bulletin of the American Physical Society, APS March Meeting 2011 Volume 56, Number 1, Monday–Friday, March 21–25, 2011; Dallas, Texas, http://meetings.aps.org/Meeting/MAR11/Event/137706
8. V. Christianto, Florentin Smarandache, **On the Meaning if Imaginary Part of Solution of Biquaternion Klein-Gordon Equation**, Bulletin of the American Physical Society, 52nd Annual Meeting of the APS Division of Plasma Physics Volume 55,

Number 15, Monday–Friday, November 8–12, 2010; Chicago, Illinois, http://meetings.aps.org/Meeting/DPP10/Session/XP9.42

9. Florentin Smarandache, **Redshift and Blueshift are not entirely due to the Doppler's Effect but also to the Medium Composition. A Suggested Experiment with Different Medium Compositions**, Bulletin of the American Physical Society, APS April Meeting 2013, Volume 58, Number 4, Saturday–Tuesday, April 13–16, 2013; Denver, Colorado, http://meetings.aps.org/Meeting/APR13/Session/T14.4
10. Florentin Smarandache, **Superluminal Particle Hypothesis**, Bulletin of the American Physical Society, APS April Meeting 2013, Volume 58, Number 4, Saturday–Tuesday, April 13–16, 2013; Denver, Colorado, http://meetings.aps.org/Meeting/APR13/Session/E2.12
11. Alexander Yefremov, Vic Christianto, Florentin Smarandache, **Yang-Mills Field from Quaternion Space Geometry, and its Klein-Gordon Representation**, Bulletin of the American Physical Society, 2009 Annual Meeting of the California Section of the APS Volume 54, Number 18, Friday–Saturday, November 13–14, 2009; Monterey, California, http://meetings.aps.org/Meeting/CAL09/Event/114577
12. Florentin Smarandache, **Some Unsolved Problems, Questions, and Applications of the Brightsen Nucleon Cluster Model**, Bulletin of the American Physical Society, Joint Fall 2010 Meeting of the APS

Ohio Section and AAPT Appalachian and Southern Ohio Sections Volume 55, Number 8, Friday–Saturday, October 8–9, 2010; Marietta, Ohio, http://meetings.aps.org/Meeting/OSF10/Event/135348

13. Florentin Smarandache, V. Christianto, **Unleashing the Quark within: LENR, Klein-Gordon Equation, and Elementary Particle Physics**, Bulletin of the American Physical Society, 2010 Annual Meeting of the California-Nevada Section of the APS Volume 55, Number 12. Friday–Saturday, October 29–30, 2010; Pasadena, California, http://meetings.aps.org/Meeting/CAL10/Event/135962
14. Florentin Smarandache, Vic Christianto, **A Note on Geometric and Information Fusion Interpretation of Bell's Theorem and Quantum Measurement**, Bulletin of the American Physical Society, Joint Fall 2009 Meeting of the New England Section of the APS and AAPT Volume 54, Number 11. Friday–Saturday, October 16–17, 2009; Durham, New Hampshire, http://meetings.aps.org/Meeting/NEF09/Event/114034
15. Florentin Smarandache, **The Real Meaning of the Spacetime-Interval**, Bulletin of the American Physical Society, Spring 2013 Meeting of the APS Ohio-Region Section Volume 58, Number 2. Friday–Saturday, March 29–30, 2013; Athens, Ohio, http://meetings.aps.org/Meeting/OSS13/Event/195668
16. Victor Christianto, Florentin Smarandache, **On the Relation between Mathematics, Natural Sciences, and Scientific Inquiry**, Bulletin of the American

Physical Society, 2011 Fall Meeting of the APS Ohio-Region Section Volume 56, Number 8, Friday–Saturday, October 14–15, 2011; Muncie, Indiana, http://meetings.aps.org/Meeting/OSF11/Event/157172

17. V. Christianto, Florentin Smarandache, **On PT-Symmetric Periodic Potential, Quark Confinement, and Other Impossible Pursuits**, Bulletin of the American Physical Society, 2009 Spring Meeting of the Texas Sections of the APS, AAPT, and SPS Volume 54, Number 2, Thursday–Saturday, April 2–4, 2009; Stephenville, Texas, http://meetings.aps.org/Meeting/TSS09/Event/106204
18. D. Rabounski, F. Smarandache, Larissa Borissova, **S-Denying of the Signature Conditions Expands General Relativity's Space**, Bul. of the Amer. Physical Soc., 2009 Spring Meeting of the Texas Sections of the APS, AAPT, and SPS Volume 54, Number 2, Thursday–Saturday, April 2–4, 2009; Stephenville, Texas, http://meetings.aps.org/link/BAPS.2009.TSS.C1.2
19. Ervin Goldfain, Florentin Smarandache, **On Emergent Physics, Unparticles and Exotic Unmatter States**, Bulletin of the American Physical Society, 2009 Joint Spring Meeting of the New England Section of APS and AAPT Volume 54, Number 5, Friday–Saturday, May 8–9, 2009; Boston, Massachusetts, http://meetings.aps.org/link/BAPS.2009.NES.APSP.2
20. Vic Christianto, Matti Pitkaneny, F. Smarandache, **A few remarks on The Length of Day: A Cosmological Perspective**, Bul. of the Amer. Physical Soc., 2009

Joint Spring Meeting of the Ohio Sections of the APS and AAPT, Volume 54, Number 3, Friday–Saturday, April 24–25, 2009; Ada, Ohio, http://meetings.aps.org/link/BAPS.2009.OSS.P1.4

21. Victor Christianto, Florentin Smarandache, **Numerical Result of Supersymmetric Klein-Gordon Equation. Plausible Observation of Supersymmetric-Meson**, Bulletin of the American Physical Society, 12th Annual Meeting of the Northwest Section of the APS Volume 55, Number 6. Friday–Saturday, October 1–2, 2010; Walla Walla, Washington, http://meetings.aps.org/link/BAPS.2010.NWS.D1.12
22. V. Christianto, Florentin Smarandache, F. Lichtenberg, **A Note of Extended Proca Equations and Superconductivity**, Bulletin of the American Physical Society, 2008 Joint Fall Meeting of the New England Sections of APS and AAPT, Volume 53, Number 9. Friday–Saturday, October 10–11, 2008; Boston, Massachusetts, http://meetings.aps.org/link/BAPS.2008.NEF.D1.5
23. Florentin Smarandache, **Photon's Wavelength Stretching and Shrinking?**, Bulletin of the American Physical Society, 66th Annual Gaseous Electronics Conference, Volume 58, Number 8, Monday–Friday, September 30–October 4 2013; Princeton, New Jersey, http://meetings.aps.org/Meeting/GEC13/Session/HW1.12
24. Vic Christianto, Florentin Smarandache, **What Gravity Is. Some Recent Considerations**, Bul. of the

Amer. Physical Soc., 11th Annual Meeting of the Northwest Section, Volume 54, Number 6. Thursday–Saturday, May 14–16, 2009; Vancouver, BC, Canada, http://meetings.aps.org/link/BAPS.2009.NWS.C1.1

25. Florentin Smarandache, **The Multispace with its Multistructure as a Unified Field Theory**, Bulletin of the American Physical Society, Fall 2011 Meeting of the APS Prairie Section, Volume 56, Number 13, Thursday–Saturday, November 10–12, 2011; Cedar Falls, Iowa, http://meetings.aps.org/link/BAPS.2011.PSF.E1.3
26. Florentin Smarandache, V. Christianto, **Schrodinger Equation and the Quantization of the Celestial Systems**, Bulletin of the American Physical Society, Joint Fall 2009 Meeting of the Ohio Sections of the APS and AAPT, Volume 54, Number 9, Friday–Saturday, October 9–10, 2009; Delaware, Ohio, http://meetings.aps.org/link/BAPS.2009.OSF.P1.25
27. Florentin Smarandache, Vic Christianto, **Plausible Explanation of Quantization of Intrinsic Redshift from Hall Effect and Weyl Quantization**, Bulletin of the American Physical Society, Joint Fall 2009 Meeting of the Texas Sections of the APS, AAPT, and SPS Volume 54, Number 13, Thursday–Saturday, October 22–24, 2009; San Marcos, Texas, http://meetings.aps.org/link/BAPS.2009.TSF.D1.7
28. Dmitri Rabounski, Florentin Smarandache, **Entangled States and Quantum Causality Threshold in General Theory of Relativity**, Bulletin of the American Physical Society, Joint Fall 2009

Meeting of the Texas Sections of the APS, AAPT, and SPS, Volume 54, Number 13. Thursday–Saturday, October 22–24, 2009; San Marcos, Texas,
http://meetings.aps.org/link/BAPS.2009.TSF.D1.17

29. Florentin Smarandache, **Tangential Relations between Distorted Angles vs. Original Angles of a Traveling General Triangle in Special Relativity**, Bulletin of the American Physical Society, Joint Spring 2013 Meeting of the Texas Sections of the APS and AAPT and Zone 13 of the SPS Volume 58, Number 3, April 4–6, 2013; Stephenville, Texas,
http://meetings.aps.org/link/BAPS.2013.TSS.B3.1
30. Florentin Smarandache, **Space Station Twin Paradox**, Bulletin of the American Physical Society Joint Spring 2013 Meeting of the Texas Sections of the APS and AAPT and Zone 13 of the SPS Volume 58, Number 3, Thursday–Saturday, April 4–6, 2013; Stephenville, Texas,
http://meetings.aps.org/link/BAPS.2013.TSS.E1.19
31. Florentin Smarandache, **Quantum Causality Threshold and Paradoxes**, Bulletin of the American Physical Society Inaugural Fall 2009 Meeting of the Prairie Section of the APS, Volume 54, Number 17. Thursday–Saturday, November 12–14, 2009; Iowa City,
http://meetings.aps.org/link/BAPS.2009.PSF.H2.1
32. F. Smarandache, **Other Relations between Distorted Angles vs. Original Angles of a Traveling General Triangle in Special Relativity**, Bul. of the Amer. Physical Soc. Spring 2013, Meeting of the APS Ohio-

Region Section Vol. 58, No 2. Friday–Saturday, March 29–30, 2013; Athens, Ohio,
http://meetings.aps.org/link/BAPS.2013.OSS.B1.32

33. Vic Christianto, Diego L. Rapoport, F. Smarandache, **Numerical Solution of Time-Dependent Gravitational Schrodinger Equation**, Bull. of the American Physical Society 76th Annual Meeting of the Southeastern Section of APS Volume 54, Number 16. Wednesday–Saturday, November 11–14, 2009; Atlanta, Georgia,
http://meetings.aps.org/link/BAPS.2009.SES.LA.32

34. V. Christianto, Florentin Smarandache, **Thirty Unsolved Problems in the Physics of Elementary Particles**, Bulletin of the American Physical Society, 3rd Joint Meeting of the APS Division of Nuclear Physics and the Physical Society of Japan Volume 54, Number 10. Tuesday–Saturday, October 13–17, 2009; Waikoloa, Hawaii,
http://meetings.aps.org/link/BAPS.2009.HAW.KD.10

35. Florentin Smarandache, V. Christianto, **A Neutrosophic Logic View to Schrodinger's Cat Paradox**, Bulletin of the American Physical Society 2008 Joint Fall Meeting of the Texas and Four Corners Sections of APS, AAPT, and Zones 13 and 16 of SPS, and the Societies of Hispanic & Black Physicists Volume 53, Number 11. Friday–Saturday, October 17–18, 2008; El Paso, Texas,
http://meetings.aps.org/link/BAPS.2008.TS4CF.E4.8

36. Florentin Smarandache, **Neutrosophic Degree of Paradoxicity of a Scientific Statement**, Bulletin of the American Physical Society 2011 Annual Meeting of the Four Corners Section of the APS Volume 56, Number 11. Friday–Saturday, October 21–22, 2011; Tuscon, Arizona, http://meetings.aps.org/link/BAPS.2011.4CF.F1.37
37. V. Christianto, Florentin Smarandache, **Generalized Quaternion Quantum Electrodynamics from Ginzburg-Landau-Schrodinger type Equation**, Bull. of the American Physical Society Joint Fall 2010 Meeting of the Texas Sections of the APS, AAPT, Zone 13 of SPS and the Nat. Soc. of Hispanic Physicists Volume 55, Number 11. October 21–23, 2010; San Antonio, Texas, http://meetings.aps.org/link/BAPS.2010.TSF.FP1.2
38. Florentin Smarandache, **Distinction between \textit{Clock} and \textit{Time}, and a Suggested Experiment with Different Types of Clocks in GPS**, Bulletin of the American Physical Society APS March Meeting 2013 Volume 58, Number 1, March 18–22, 2013; Baltimore, Maryland, http://meetings.aps.org/link/BAPS.2013.MAR.V1.292
39. Florentin Smarandache, **Tangential Relations between Distorted Acute Angles vs. Original Acute Angles of a Traveling Right Triangle in Special Relativity**, Bull. of the Am. Physical Soc., APS March Meeting 2013 Volume 58, Number 1. Monday–Friday, March 18–22, 2013; Baltimore, Maryland, http://meetings.aps.org/link/BAPS.2013.MAR.V1.291

40. Victor Christianto, Florentin Smarandache, **Of intent, citation game, and scale-free networks in science: A heuristic argument**, Bulletin of the American Physical Society, Joint Fall 2011 Meeting of the Texas Sections of the APS, AAPT, and Zone 13 of the SPS Volume 56, Number 7. Thursday–Saturday, October 6–8, 2011; Commerce, Texas, http://meetings.aps.org/link/BAPS.2011.TSF.H1.43
41. Florentin Smarandache, **Rocky Planet Paradox**, Bulletin of the American Physical Society, 18th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter held in conjunction with the 24th Biennial Intl. Conference of the Intl. Association for the Advancement of High Pressure Science and Technology (AIRAPT), Volume 58, Number 7, http://meetings.aps.org/Meeting/SHOCK13/Event/196780
42. V. Christianto, F. Smarandache, **An Introduction to Biquaternion Number, Schrodinger Equation, and Fractal Graph**, Bulletin of the American Physical Society, Annual Meeting of the Four Corners Section of the APS Volume 55, Number 9. Friday–Saturday, October 15–16, 2010; Ogden, Utah, http://meetings.aps.org/link/BAPS.2010.4CF.E1.48
43. Florentin Smarandache, **Open and Solved Elementary Questions in Astronomy**, Bul. of the Amer. Physical Soc., 78th Annual Meeting of the Southeastern Section of the APS Volume 56, Number 9. Wednesday–

Saturday, October 19–22, 2011; Roanoke, Virginia, http://meetings.aps.org/link/BAPS.2011.SES.LA.41

44. D. Rabounski, F. Smarandache, **Positive, Neutral, and Negative Mass-Charges in General Relativity**, Bulletin of the American Physical Society Fall 2009 Meeting of the Four Corners Section of the APS, Volume 54, Number 14. Friday–Saturday, October 23–24, 2009; Golden, Colorado, http://meetings.aps.org/link/BAPS.2009.4CF.D1.16

45. Florentin Smarandache, Vic Christianto, **Less Mundane Explanation of Pioneer Anomaly from Q-Relativity**, Bulletin of the American Physical Society, Fall 2009 Meeting of the Four Corners Section of the APS Volume 54, Number 14. Friday–Saturday, October 23–24, 2009; Golden, Colorado, http://meetings.aps.org/link/BAPS.2009.4CF.D1.17

46. Florentin Smarandache, **Verifying Unmatter by Experiments, More Types of Unmatter, and a Quantum Chromodynamics Formula**, Bulletin of the American Physical Society, 62nd Annual Gaseous Electronics Conference Volume 54, Number 12. Tuesday–Friday, October 20–23, 2009; Saratoga Springs, New York, http://meetings.aps.org/link/BAPS.2009.GEC.KTP.110

47. Florentin Smarandache, **Five Paradoxes and a General Question on Time Traveling**, Bull. of the Amer. Physical Society APS April Meeting 2011 Volume 56, Number 4, April 30–May 3 2011; Anaheim, California, http://meetings.aps.org/link/BAPS.2011.APR.K1.2

48. Vic Christianto, F. Smarandache, **Reply to "Notes on Pioneer Anomaly Explanation by Satellite-Shift Formula of Quaternion Relativity"**, Bulletin of the American Physical Society, 51st Annual Meeting of the APS Division of Plasma Physics Volume 54, Number 15. Monday–Friday, November 2–6, 2009; Atlanta, Georgia, http://meetings.aps.org/link/BAPS.2009.DPP.XP8.52
49. Vic Christianto, Florentin Smarandache, **A Note on Unified Statistics Including Fermi-Dirac, Bose-Einstein, and Tsallis Statistics, and Plausible Extension to Anisotropic Effect**, Bulletin of the American Physical Society, 16th APS Topical Conference on Shock Compression of Condensed Matter Volume 54, Number 8. Sunday–Friday, June 28–July 3 2009; Nashville, Tennessee, http://meetings.aps.org/link/BAPS.2009.SHOCK.N1.76
50. Florentin Smarandache, **A New Form of Matter -- Unmatter, Composed of Particles and Anti-Particles**, Bull. of the Amer. Physical Soc., 40th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 54, Number 7. Tuesday–Saturday, May 19–23, 2009; Charlottesville, Virginia, http://meetings.aps.org/link/BAPS.2009.DAMOP.E1.97
51. Vic Christianto, Florentin Smarandache, **Kaluza-Klein-Carmeli Metric from Quaternion-Clifford Space, Lorentz' Force, and Some Observables**,

Bulletin of the American Physical Society, 40th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 54, Number 7. Tuesday–Saturday, May 19–23, 2009; Charlottesville, Virginia, http://meetings.aps.org/link/BAPS.2009.DAMOP.T1.81

52. Vic Christianto, Florentin Smarandache, **Numerical Solution of Radial Biquaternion Klein-Gordon Equation**, Bulletin of the American Physical Society, 41st Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 55, Number 5. Tuesday–Saturday, May 25–29, 2010; Houston, Texas, http://meetings.aps.org/link/BAPS.2010.DAMOP.T1.143
53. Vic Christianto, Florentin Smarandache, **A New Derivation of Biquaternion Schrodinger Equation and Plausible Implications**, Bulletin of the American Physical Society APS April Meeting 2010 Volume 55, Number 1. Saturday–Tuesday, February 13–16, 2010; Washington, DC, http://meetings.aps.org/link/BAPS.2010.APR.M1.16
54. Vic Christianto, Florentin Smarandache, **Is There Iso-PT Symmetric Potential in Nature?**, Bulletin of the American Physical Society Fall 2010 Meeting of the New England Section of APS Volume 55, Number 13. Friday–Saturday, October 29–30, 2010; Providence, Rhode Island, http://meetings.aps.org/link/BAPS.2010.NEF.B1.33

55. Vic Christianto, Florentin Smarandache, **An Exact Mapping from Navier-Stokes Equation to Schrodinger Equation via Riccati Equation**, Bulletin of the American Physical Society, APS March Meeting 2010 Volume 55, Number 2. Monday–Friday, March 15–19, 2010; Portland, Oregon, http://meetings.aps.org/link/BAPS.2010.MAR.S1.162
56. V. Christianto, Florentin Smarandache, **On recent discovery of new planetoids in the solar system and quantization of celestial system**, Bulletin of the American Physical Society, 42nd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 56, Number 5. Monday–Friday, June 13–17, 2011; Atlanta, Georgia, http://meetings.aps.org/link/BAPS.2011.DAMOP.E1.164
57. Vic Christianto, Florentin Smarandache, **Numerical Solution of Schrodinger Equation with PT-Symmetric Periodic Potential, and its Gamow Integral**, Bulletin of the American Physical Society, Fall 2010 Meeting of the New England Section of APS Volume 55, Number 13. Friday–Saturday, October 29–30, 2010; Providence, Rhode Island, http://meetings.aps.org/link/BAPS.2010.NEF.B1.37
58. Florentin Smarandache, **Angle-Distortion Equations in Special Relativity**, Bulletin of the American Physical Society 18th Biennial Intl. Conference of the APS Topical Group on Shock Compression of Condensed Matter held in conjunction with the 24th

Biennial Intl. Conference of the Intl. Association for the Advancement of High Pressure Science and Technology (AIRAPT), Volume 58, Number 7. Sunday–Friday, July 7–12, 2013; Seattle, Washington, http://meetings.aps.org/Meeting/SHOCK13/Event/196433

59. Florentin Smarandache, Vic Christianto, **The Neutrosophic Logic View to Schrodinger Cat Paradox, Revisited**, Bulletin of the American Physical Society APS March Meeting 2010 Volume 55, Number 2. Monday–Friday, March 15–19, 2010; Portland, Oregon, http://meetings.aps.org/link/BAPS.2010.MAR.S1.157

60. F. Smarandache, **Oblique-Length Contraction Factor in Special Relativity**, Bulletin of the American Physical Society 2013 Joint Meeting of the APS Division of Atomic, Molecular & Optical Physics and the CAP Division of Atomic, Molecular & Optical Physics, Canada, Volume 58, Number 6. Monday–Friday, June 3–7, 2013; Quebec City, Canada, http://meetings.aps.org/Meeting/DAMOP13/Session/D1.2

61. Florentin Smarandache, **Heisenberg Uncertainty Principle Extended to \textit{n-plets}**, Bulletin of the American Physical Society 2013 Annual Fall Meeting of the APS Ohio-Region Section Volume 58, Number 9. Friday–Saturday, October 4–5, 2013; Cincinnati, Ohio, http://meetings.aps.org/Meeting/OSF13/Event/205647

62. Florentin Smarandache, **Not only Gravitational Lensing, but in general Medium Lensing**, Bulletin of the American Physical Society 2013 Joint Meeting of the APS Division of Atomic, Molecular & Optical Physics and the CAP Division of Atomic, Molecular & Optical Physics, Canada, Volume 58, Number 6. Monday–Friday, June 3–7, 2013; Quebec City, Canada, http://meetings.aps.org/Meeting/DAMOP13/Session/Q1.125
63. Florentin Smarandache, **n-Valued Refined Neutrosophic Logic and Its Applications to Physics**, Bulletin of the American Physical Society 2013 Annual Fall Meeting of the APS Ohio-Region Section Volume 58, Number 9. Friday–Saturday, October 4–5, 2013; Cincinnati, Ohio, http://meetings.aps.org/Meeting/OSF13/Event/205641
64. Florentin Smarandache, **Odd Length Contraction**, Bulletin of the American Physical Society, 66th Annual Gaseous Electronics Conference, Volume 58, Number 8. Monday–Friday, September 30–October 4 2013; Princeton, New Jersey, http://meetings.aps.org/Meeting/GEC13/Session/HW1.89
65. Florentin Smarandache, **An Introduction to Neutrosophic Probability Applied in Quantum Physics**, Bulletin of the American Physical Society 2009 APS April Meeting Volume 54, Number 4. Saturday–Tuesday, May 2–5, 2009; Denver, Colorado, http://meetings.aps.org/link/BAPS.2009.APR.E1.78

66. Florentin Smarandache, **Elasticity of Relativistic Rigid Bodies?**, Bulletin of the American Physical Society 55th Annual Meeting of the APS Division of Plasma Physics Volume 58, Number 16. Monday–Friday, November 11–15, 2013; Denver, Colorado, http://meetings.aps.org/Meeting/DPP13/Session/YP8.7

67. Florentin Smarandache, **Rotational Twin Paradox**, Bulletin of the American Physical Society, 2012 Fall Meeting of the APS Division of Nuclear Physics Volume 57, Number 9. Wednesday–Saturday, October 24–27, 2012; Newport Beach, California, http://meetings.aps.org/link/BAPS.2012.DNP.CG.3

68. Florentin Smarandache, V. Christianto, **Observation of Anomalous Potential Electric Energy in Distilled Water Under Solar Heating**, Bulletin of the American Physical Society, Joint Spring 2011 Meeting of the New England Sections of the APS and the AAPT Volume 56, Number 2. Friday–Saturday, April 8–9, 2011; Lowell, Massachusetts, http://meetings.aps.org/link/BAPS.2011.NES.C1.8

69. Florentin Smarandache, **Quantum Quasi-Paradoxes and Quantum Sorites Paradoxes**, Bulletin of the American Physical Society 2009 APS March Meeting Volume 54, Number 1. Monday–Friday, March 16–20, 2009; Pittsburgh, Pennsylvania, http://meetings.aps.org/link/BAPS.2009.MAR.K1.257

70. Florentin Smarandache, **There is no speed barrier in the universe**, Bulletin of the American Physical

Society 43rd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics Volume 57, Number 5. Monday–Friday, June 4–8, 2012; Orange County, California, http://meetings.aps.org/Meeting/DAMOP12/Event/171441

71. Florentin Smarandache, **Superluminal Physics {\&} Instantaneous Physics - as new trends in research**, Bulletin of the American Physical Society APS April Meeting 2012 Volume 57, Number 3. Saturday–Tuesday, March 31–April 3 2012; Atlanta, Georgia, http://meetings.aps.org/link/BAPS.2012.APR.E1.44
72. Florentin Smarandache, **Unparticle, a special case of unmatter**, Bulletin of the American Physical Society, 53rd Annual Meeting of the APS Division of Plasma Physics Volume 56, Number 16. Monday–Friday, November 14–18, 2011; Salt Lake City, Utah, http://meetings.aps.org/Meeting/DPP11/SessionIndex3/?SessionEventID=158034
73. Florentin Smarandache, **Absolute Theory of Relativity**, Bulletin of the American Physical Society, Joint Spring 2012 Meeting of the Texas Sections of the APS and AAPT and Zone 13 of the SPS, Volume 57, Number 2. March 22–24, 2012; San Angelo, Texas, http://meetings.aps.org/link/BAPS.2012.TSS.B1.18
74. Florentin Smarandache, **Both Twins Traveling Paradox**, Bul. of the Amer. Physical Soc.,, 54th Annual Meeting of the APS Division of Plasma Physics Volume

57, Number 12. Monday–Friday, October 29–November 2 2012; Providence, Rhode Island, http://meetings.aps.org/link/BAPS.2012.DPP.JP8.8

75. Florentin Smarandache, **Neutrosophic Diagram and Classes of Neutrosophic Paradoxes, or To the Outer-Limits of Science**, Bul. of the Amer. Physical Soc.,, 17th Biennial International Conference of the APS Topical Group on Shock Compression of Condensed Matter Volume 56, Number 6. Sunday–Friday, June 26–July 1 2011; Chicago, Illinois, http://meetings.aps.org/link/BAPS.2011.SHOCK.F1.167

76. Florentin Smarandache, **Noninertial Multirelativity**, Bul. of the Amer. Physical Soc.,, 65th Annual Gaseous Electronics Conference Volume 57, Number 8. Monday–Friday, October 22–26, 2012; Austin, Texas, http://meetings.aps.org/link/BAPS.2012.GEC.PR1.92

77. Florentin Smarandache, **Parameterized Special Theory of Relativity**, Bul. of the Amer. Physical Soc., Spring 2012 Meeting of the APS Ohio-Region Section Volume 57, Number 4. Friday–Saturday, April 13–14, 2012; Columbus, Ohio, http://meetings.aps.org/link/BAPS.2012.OSS.C1.25

78. V. Christianto, F. Smarandache, **Potential Use of Lime as Nitric Acid Source for Alternative Electrolyte Fuel-Cell Method**, Bul. of the Amer. Physical Soc., Spring 2011 Meeting Ohio-Region Section of the APS Volume 56, Number 3. Friday–Saturday, April 15–16, 2011; University Heights, Ohio, http://meetings.aps.org/link/BAPS.2011.OSS.P1.2

About the author.

Dr. Florentin Smarandache is a Professor of Mathematics at the University of New Mexico in USA. He published over 100 books and 300 articles and notes in mathematics, physics, philosophy, psychology, literature, arts. In mathematics his research is in number theory, non-Euclidean geometry, synthetic geometry, algebraic structures, statistics, neutrosophic logic and set (generalizations of fuzzy logic and set respectively), neutrosophic probability (generalization of classical and imprecise probability). Also, small contributions to nuclear and particle physics, information fusion, neutrosophy (a generalization of dialectics), law of sensations and stimuli, etc. He got the 2010 Telesio-Galilei Academy of Science Gold Medal, Adjunct Professor (equivalent to Doctor Honoris Causa) of Beijing Jiaotong University in 2011, and 2011 Romanian Academy Award for Technical Science.

This book is a collection of articles, notes, reviews, blogs and abstracts on Physics. Some are published for the first time here, some were previously published in journals, and revised here.

We approach a novel form of plasma, Unmatter Plasma. The electron-positron beam plasma was generated in the laboratory in the beginning of 2015. This experimental fact shows that unmatter, a new form of matter that is formed by matter and antimatter bind together (mathematically predicted a decade ago) really exists.

Further, we generalize the Lorentz Contraction Factor for the case when the lengths are moving at an oblique angle with respect to the motion direction, and show that the angles of the moving relativistic objects are distorted.

Then, using the Oblique-Length Contraction Factor, we show several trigonometric relations between distorted and original angles of moving object lengths in the Special Theory of Relativity.

We also discuss some paradoxes which we call "neutrosophic" since they are based on indeterminacy (or neutrality, i.e. neither true nor false), which is the third component in neutrosophic logic. We generalize the Venn diagram to a Neutrosophic Diagram, which deals with vague, inexact, ambiguous, ill-defined ideas, statements, notions, entities with unclear borders. We define the neutrosophic truth table, then we introduce two neutrosophic operators (neuterization and antonymization operators), and give many classes of neutrosophic paradoxes.

Other topics addressed in this book are: neutrosophic physics as a new field of research, neutrosophic numbers in physics, neutrosophic degree of paradoxicity, unparticle and unmatter, multispace and multistructure, nucleon clusters, and others.

ISBN 978-1-59973-346-3