

Blogs on Applications of Neutrosophics and Multispace in Sciences

Prof. Florentin Smarandache
Dept. of Mathematics and Science
University of New Mexico, USA

The following blogs on applications of neutrosophics and multispace in sciences include meditations / reflections on science, comments, hypotheses, proposals, comparisons of ideas, possible projects, extensions or deviations or alternatives to classical knowledge, etc. selected from e-mails, letters, drafts, conversations, impressions, my diary, etc.

We introduce the *non-standard quaternion space* and *non-standard biquaternion space* [and even a generalization of them to a general non-standard vector space of any dimension] as possible working spaces for connecting the micro- and macro-levels in physics. Neutrosophy is a MetaPhilosophy.

Also, we consider that our multispace (with its multistructure of course) unifies many science fields. We write about parallel quantum computing and mu-bit, about multi-entangled states or particles and up to multi-entangles objects, about multispace and multivalued logics, about possible connection between unmatter with dark matter (what about investigating a possible existence of dark antimatter and dark unmatter?), about parallel time lines and multi-curve time, projects about writing SF at the quantum level as for example the adventure of a particle-man or “Star Shrek” – a satire to *Star Trek* (just for fun), about parallel universes as particular case of the multispace, and advance the hypothesis that more models of the atom are correct not only the standard model of the atom, etc.

I coined the name *unmatter* as a combination of matter and antimatter – and a possible third form of matter - since 2004, in a paper uploaded in the CERN website, and I published papers about “unmatter” that is now the predecessor of unparticles, which are a type of unmatter (mixtures of particles and antiparticles).

These fragments of ideas and believes have to be further investigated, developed and check experimentally if possible. {Actually, no knowledge is definitive in no domain!}

1. Blog on the Applications of Neutrosophics in Sciences.

1.1. I supposed that the readers will find it helpful trying to calculate for example Schrödinger's equation from quantum mechanics taking into consideration the indeterminacy.

1.2. As a physics example, in Schrödinger's Cat the neutrosophic logic offer the possibility of considering the cat neither dead nor alive, but undecided, while the fuzzy logic does not do that.

We can, let's say, instead of introducing in the problem a pair of twin cats - one cat in the box and another outside, we might also think at introducing a pair of entangled particles A (in the box) and B (outside the box). Then everything what happens to particle A inside will happen the opposite to particle B outside, hence measuring B will know the state of A (since A and B are complementary).

Readers, what are your opinions?

It would be nice to have entangled macro-objects (for example Entangled... Cats!). Let's name the two cats C_1 and C_2 , but in such a way that cat C_2 is made from all entangled particles which form cat C_1 . Then cat C_2 will be the entangled cat of C_1 .

Similarly to the possible teleportation of objects: decompose an object in particle, then teleportate each particle, and then reassemble the teleportated particles - in this way it might be possible to teleportate objects.

Hence, decompose C_1 in particle, get an entangle particle for each particle of C_1 , then reassemble the entangled particles and get a cat C_2 that is the entangled of C_1 .

Herein the neutrosophic logic, based on three components, truth component, falsehood component, indeterminacy component (T, I, F), works very well.

We agree that Multivalued interpretation offers better explanation, but it seems to me that physicists in particular those who work with experiments prefer some quantitative effect: what can be measured?

For instance, some people began to test this paradox using Bose condensate... so we should translate this issue in a math language, like Bell inequality, which is testable; see the below references in arXiv.org:

cond-mat/0508659:

Title: Creation, detection and decoherence of Schrödinger cat states in Bose-Einstein condensates

Authors: Y. P. Huang, M. G. Moore

cond-mat/0310573:

Title: Generating Schrödinger-cat states in momentum and internal-state space from Bose-Einstein condensates with repulsive interactions

Authors: J. Higbie, D. M. Stamper-Kurn

cond-mat/0006349:

Title: Decoherence and long-lived Schrödinger cats in BEC

Authors: Diego A. R. Dalvit, Jacek Dziarmaga, Wojciech H. Zurek

I think that perhaps we should find first Schrödinger's original paper on this issue.

This problem has deep linkage with decoherence, in my opinion.

In the meantime, my viewpoint is that Schrodinger wanted to emphasize the inadequacy of statistical interpretation of his wavefunction. Therefore, multivaluedness offer significant advantage... .

I find this *n-valued logic* interpretation of Schrödinger equation goes unnoticed in almost all physics literature... .

The cat can be dead, or can be alive, or it is undecided (i.e. we don't know if she is dead or alive).

Frédéric Dambreville, a French expert in logics [I was amazed by his “referee function” in sensors’ fusion, being able to deduce many fusion rules], wrote to me that the notion of “true” is very subtle in the deterministic (non classical) logics.

Certain modal logics can include three states: *certain*, *possible*, and *impossible*. These are not habitual multi-valued logics, but they ‘simulate’ a kind of three-valued logic.

I replied back that there also are other logics, such as: the dynamic logic, tense logic, dialethism, etc. and also that:

Dans l'intuitionniste logique je suis d'accord qu'il n'est pas toujours vrai que d'une contradiction on peut trouver n'importe quoi [tu m'as écrit ça dans un e-mail antérieur];

par exemple: "il pleut" et "il ne pleut pas" n'implique pas que "ma voiture est blanche";

car dans la logique classique tu as:

$A \wedge \text{non}A \rightarrow B$ est vrai pour n'importe quelles propositions logiques A, B .

Aussi pour la logique trivalente, introduite par Lukasiewicz, avec les valeurs 1, 1/2, 0.

Mais, dans les applications de la logique floue, ça marche mieux que dans la logique modale qui donne l'état de possibilité (il peut être 1% possible ou bien 99% possible, mais entre ceux-ci est une grande différence).

Aussi, la logique néutrosophique marche mieux que la logique trivalente, qui dit que 1 = vrai, 0 = faux, et 1/2 = inconnu, car la logique néutrosophique donne des pourcents (est plus raffinée, plus exacte).

Splitting indeterminacy may help to a better accuracy, depending on the type of indeterminacy. Normally indeterminacy (I) is split into uncertainty (U) and paradox / conflicting (P).

The sum of the components is 1 in complete information, but we may have less than 1 for incomplete information, and greater than 1 for paraconsistent information.

In the cases when it is not 1, we can normalize the components if needed (dividing each component by the sum of all components) and the sum becomes 1.

A known approach explaining the n -value logic is via hydrodynamics (Fokker) process.

- 1.3. But it seems to me, that an unexplored part of information theory in physics, is what we know as **the physics of information**. For instance, physicists used to exchange scientific articles and cite each other. Can we consider it as unit of 'information bit'?

I've got a draft article on this issue, albeit not rigorous yet. The idea is quite simple: each time a scientist cites another article by his/her peer, we can count it as 1 quantum bit of information. At the end, citation analysis would end up to become another 'lab' where we could study quantum of decision making... Perhaps we could extend this approach.

Maybe we'd like to write a story/novel where philosophy ideas become the main theme, though in 'playful' tone or perhaps humorous, like Borges or Umberto Eco who blends

ancient tales with philosophical maze. Borges used mysticism somehow, while Eco science and religion.

I'd like to write this in popular style: the connection between the universe, cosmology, and number theory. But, of course, it should go beyond simple numerology or gematria, but perhaps a touch on information theory, Shannon entropy, Riemann zeta hypothesis, and perhaps also neutrosophy (and world peace?)...

Or, as alternative, what if a kind of weird *UFO*-like culture want to wreck havoc to this Earth, and there is no way to stop it except we can come into their computer-base, crack their own computer code (which requires some cryptography exposition), and reprogramming all their scenario from the ground?

In information fusion, the neutrosophic bba (basic believe assignment) is a generalization of the classical bba, because if for example the frame of discernment is $\Theta = \{A, B\}$ and $m_1(A)=0.2$, $m_1(B)=0.5$, $m_1(A \cup B)=0.3$, then you can write it as a neutrosophic bba: $nm_1(A)=(0.2,0,0)$, $nm_1(B)=(0.5,0,0)$, $nm_1(A \cup B)=(0.3,0,0)$,

where each triplet for example $nm(A) = (a_1, a_2, a_3)$ means the believe in A is a_1 , the disbelieve in A is a_3 , and the unknown/indeterminate believe in A is a_2 .

Better example is when we have the complement:

$m_2(A)=0.4$, $m_2(nonA)=0.1$, $m_2(nonB)=0.3$, $m_2(A \cup B)=0.2$,

then the neutrosophic bba associated to $m_2(.)$ is:

$nm_2(A)=(0.4, 0, 0.1)$, $nm_2(B)=(0, 0.3, 0)$, $nm_2(A \cup B)=(0.2,0,0)$.

And then you combine $nm_1(., ., .)$ with $nm_2(., ., .)$ using an N -norm and/or N -conorm.

- 1.4. Other questions: Do **advanced cultures beyond Earth** have advanced computation system using neutrosophy logic, instead of binary logic? If yes, does it mean that it is possible to write a programming language based on neutrosophy logic?

We say yes, there are programs based on fuzzy logic and on neutrosophic logic.

The binary logic does not work in all our everyday life events. We deal with approximations every time.

We cannot say exactly "Team X will win in the game", hence we cannot use binary logic. In binary logic there is only black or white, but you know that in between there are more colors.

When we predict, we cannot predict 100% (we are not Gods!), we predict a certain percent, say 60% (but this is fuzzy or neutrosophic logic).

- 1.5. In an Ancient book of Chinese, The Book of Change, the TAIJI diagram in fact presents positive with that of negative, and they harmoniously exists.

In neutrosophy not only positive and negative harmoniously exist (as in the Ancient Chinese philosophy and as in dialectics) but also the positive, negative, and neutralities in between them harmoniously exist.

You might get an idea, according to some application for example, to split Indeterminacy differently, and thus to form a new neutrosophic logic and study it.

Do we mean that Lukasiewicz argument meant that multiple-value logic could be real?

Yes. See in the voting process or in a soccer game.

You have three possibilities: to gain, to loose, or to get a tight game. Hence the binary logic does not work any longer in such cases.

1.6. Observation does not always reflect the reality; there might be distorted observation due to various objective factors (various media of transmission/propagation of light, optical illusions, disturbed sounds, etc.).

So the experiment is best [not many done to prove quantum or astrophysical theories unfortunately], then observation, then ideas.

But all three have to prove/implicate each other for a perfect/correct/real theory.

1.7. About the deSitter space: I was neither against it nor for it, but as in neutrosophic logic, as you already remarked, in between [thus, we realize very well how important is multi-valued logic in physics]. So I am not under scientific pressure for this subject. But I confess I had better/smoothier relationships with Dmitri Rabounski, Larissa Borissova, and Stephen Crothers.

I think, there are cases when deSitter is degenerated, and others where it is not [= neutrosophic logic!].

So, this has to be pointed out to all three fighting people, therefore everybody is right and wrong in some degree, and in another degree ambiguous/unclear.

1.8. Most physicists are busy with other things, except with revising of 'logic'. Only a few take a look of modifying physics from the scratch (defining logic, see for instance Rauscher or Bearden).

You know I'm more inclined to applications to physics, and for physicists things start to become interesting if we present it as geometry. Therefore I think more physicists appreciate my *NL* than mathematicians, perhaps we shall define the Neutrosophy as geometry of logic. This is why I think this modal logic seems interesting.

Possible paper may be something like 'Geometric Logic representation of Neutrosophy'... Therefore, physicists can use their knowledge in geometry to study implications of NL, actually this is what I choose to do in a paper, using simple coin tossing problem as example.

We could also analyze something concerning the 'quantization of decision making' in quantitative way. I don't find yet any similar approach in the physics literature.

1.9. John A. Wheeler concludes, following Niels Bohr, that the universe is **self-organizing**. I subscribe to this self-organization in any macro- or micro-field.

This is connected with topology and with Peirce's process philosophy.
I thought at defining and developing a quantum topology – for example.

1.10. About 'our' Lunar Base (by V. Christianto & F. Smarandache):

What do you think about the life effect under various gravities?

For example, after living for decades on a lunar base, where gravity is 6 times smaller, how a human being will look like? What physical and psychical changes would occur?

Or, on a big planet, say Jupiter, with a big mass and big gravity, might be difficult to walk...

Or will it be possible to increase or decrease gravity and atmosphere pressure in such of way to have the same as on the earth?

1.11. If neither Hilbert space, nor axiomatization (I hate this in quantum theory - which is more chaos), then **multiple valued logic** should do better.

But I thought at "multiple spaces overlapping" [*multi-space* or shortly *mu-space*], so we can explain how a particle can be in two places in the same time, or how a particle can be and cannot be in one place simultaneously, and maybe other odd phenomena in *QM*.

R. Garden's three-valued logic is referring to: true, false, undecided;
while neutrosophic logic is referring to: percentage of truth, percentage of falsehood, and percentage of undecidability/indeterminacy, so *NL* is more refined, more general.

More applicable in quantum physics would be neutrosophic probability (*NP*) {than neutrosophic logic (*NL*);

a neutrosophic probability space and its axioms are defined in my fourth edition book:

www.gallup.unm.edu/~smarandache/eBook-neutrosophics4.pdf

at the end of the book.

For example, the neutrosophic probability that a particle *A* is in a place P_1 and particle *A* is not in P_1 in the same time could be for example: $NP(A \text{ in } P_1) = (0.4, 0.2, 0.4)$, i.e. 40% *A* is in place P_1 , 40% *A* is not in P_1 , and 20% unknown.

And so on.

1.12. It is possible using graphs in Tiffit redshift quantization.

The book of Fuzzy Cognitive Maps and Neutrosophic Cognitive Maps, by W. B. Vasantha Kandasamy and F. Smarandache is the most used/read (online) book about neutrosophic cognitive maps: www.gallup.unm.edu/~smarandache/NCMs.pdf.

1.13. About modern logics: many of them differ from the way the logical operators (*and*, *or*, *implication*, *negation*) are defined. But also they depend on the introduction of new operators and their study: for example "it is possible that" or "it is sufficient" for modal logic. In neutrosophic logic I introduced the **neuterization** and **antonymization** operators, in addition of the classical ones adjusted to the neutrosophic way.

We can define ourselves more operators – if needed in practice - and make them work on a logical space, for example on the neutrosophic logical space since it is the most extended.

For example: one physics logical operator might be "it is a potential of/for" (or something similar), another physics logical operator could be another needed idea from physics, maybe "it is a condition of existence of", then another similar operator: "it is a hypothesis for", etc.

There is a book where a friend (Dr. Andrew Schumann) and I used some non-linear logics (are called non-linear since the logical operators are some non-linear functions): <http://www.gallup.unm.edu/~smarandache/Neutrality.pdf> .

How to relate the modal operators and other logical operators to neutrosophic logic? Just extending the operators from the Boolean (or other logical space) to the neutrosophic logic, i.e. instead of using 1 or 2 truthiness components for the logical propositions, we have to use 3. Then we need to adjust the logical operator's function.

I read the article *Matrix method to solve multivalued logic differential equations*, by Svetlana Yanushkevich.

We can extend the Boolean Differential Calculus (BDC) to Neutrosophic Differential Calculus (NDC).

The problem might be the usefulness of NDC in physics, hence we need first to know how is BDC used in physics?

1.14. 'Paraconsistency logic' is used in theoretical physics, which perhaps the reader may find interesting.

There also are good articles by W. Smilga (2005) discussing 'information theory' viewpoint of particle physics, based on binary logic ($1/0$). See below some references from arXiv.org:

**physics/0505040:

Title: Informational Structures in Particle Physics

Authors: Walter Smilga

**physics/0502040:

Title: Elementary Informational Structures of Particle

Physics and their Relation to Quantum Mechanics and Space-Time

Authors: Walter Smilga

Comments: 16 pages, in German, presented at the spring meeting 2005 of the German Physical Society, Berlin, 4-9 March 2005

I guess this is a good starting point; could it be particles 'interfere' with each other if we use multivalued-logic, perhaps resembles 'bootstrap theory' of Geoffrey Chew from UCLA, Berkeley? Furthermore, information (bit) could be related to Shannon entropy, then to thermodynamics... See this from arXiv.org:

physics/0401002:

Title: Information Flow and Computation in the Maxwell Demon Problem

Authors: Roger D. Jones, Sven G. Redsun, Roger E. Frye

Submitted to J. Stat. Phys.

1.15. Another interesting question, if it's real that information \rightarrow entropy \rightarrow thermodynamics, then does it offer any clue on reversibility problem? I find only very few articles discussing this issue \rightarrow Time flows backward are allowed or not?

I think this is right:

Shannon entropy \rightarrow thermodynamics

since entropy means disorder, the bigger entropy the higher temperature, pressure.

See:

physics/0406137:

Title: The (absence of a) relationship between thermodynamic and logical reversibility

Authors: O. J. E. Maroney

Based on talk at ESF Conference on Philosophical and Foundational Issues in Statistical Physics, Utrecht, November 2003.

Disorder also mean timearrow (Gibbs theorem). So one can say if we could arrange such that entropy becomes less, it would mean time flows backward... right?

Have you heard of Srinivasan's work on NAFL (non-Aristotelian finitary logic), which discusses among other things a new interpretation of wavefunction. Perhaps you'd like to see it:

PhilSci Archive - Quantum superposition justified in "A new non-Aristotelian finitary logic (NAFL)", proposed by Srinivasan Radhakrishnan.

Platonism in classical logic versus formalism;

philsci-archive.pitt.edu/archive/00000635/

[math/0506475] Foundations of real analysis and computability ...

From: Radhakrishnan Srinivasan

... theory in the recently proposed non-Aristotelian finitary logic (NAFL)...

arxiv.org/abs/math.LO/0506475

1.16. There are many ways of defining neutrosophic operators and the neutrosophic orders, so we might adjust them or define new ones according to each problem/application to solve.

In technical applications NL and NS components (T, I, F) are subsets of the interval $[0, 1]$, but in philosophy they are subsets of the non-standard unit interval $]0, I^+[$, since we need to be able to distinguish between absolute truth, which is I^+ , and (relative) truth, which is I . Similarly for absolute falsehood and (relative) falsehood, absolute indeterminacy and (relative) indeterminacy.

So, you might catch this in any of your future papers.

Then the negation of I^+ is $\bar{0}$.

$I^+ = I + \varepsilon$ (where ε is epsilon), and ε is a very tiny (close to zero) positive number (infinitesimal), and $\bar{0} = 0 - \varepsilon$.

I coined the name "neutrosophy-neutrosophic" in English language, since I

needed something related to the middle part: i.e. neutral component (neither true nor false, unknown, or indeterminacy).

So, the name "neutrosophic" is much better and natural name, than Atanassov's "intuitionistic".

Even more, " I " can be split depending on the application, into E = error, V = vague, K = unknown, etc. and we get a logic on more than four components (actually on n components).

The theory of interval neutrosophic logic/set [14] can be extended in an easy way to subset neutrosophic logic/set, by taking $\inf(S)$ and $\sup(S)$, where S is the subset included in $[0, 1]$.

We can define a neutrosophic lattice, i.e. a *pseudo-lattice* on 3 components or more, that do not necessarily verify all axioms of a classical lattice, since nor NL verifies all properties of classical logic.

There is an attempt to define the *Neutrosophic Modal Logic* in my first book on neutrosophics (1998) but, of course, it should be developed.

I also think that (as in fuzzy logic/set) the connectives form classes of connectives (N -norm, N -conorm for example for neutrosophic conjunction and respectively neutrosophic disjunction), and in each case/application/problem we have to choose the best connectives that work for the respective problem; neither in fuzzy logic there is used only one conjunction and one disjunction for example. A paper of mine on N -norm and N -conorm partially solves this question.

Rivieccio also suggested to define suitable syntactical consequence relations and to prove completeness for each semantic neutrosophic system.

I fully agree; all people who worked in the neutrosophics were focusing either on using it in philosophy (I employed the "law of included middle" by designing the third component " I " = indeterminacy), or in technical applications (so that's why they/we mostly focused on \wedge , \vee , and \neg (*negation*) neutrosophic connectives).

Rivieccio said: let T, I, F be subsets of some partially or linearly ordered lattice L instead of the real unit interval $[0, 1]$, or even to consider different lattices L_1, L_2, L_3 such that $T \subseteq L_1, I \subseteq L_2$ and $F \subseteq L_3$.

Yes, this can be done, or this HAS to be done especially when T, I, F are subsets of $[0, 1]$ and it would be much harder to define a order relation between subsets like for example $[0.1, 0.3]$ and $[0.2, 0.4]$; but in a lattice we can better define the two binary operations "meet" and "join" and then a (partial) order relationship.

Neutrosophic modal logic and *neutrosophic temporal logic* could be developed for physics application, especially at the quantum level.

1.17. The use of neutrosophy in **nucleon model** is unexplored yet. I find it at least quite similar to Barut's binucleon.

The basic point is: physicists normally think of +/- like in electromagnetic field. I find Prof. Kaivarainen's work interesting in this regard (bi-vacuum model). But to include another 'neutral' aspect would require significant revision... I guess.

For instance, if we accept Don Borghi experiment supporting Rutherford's initial model, then it seems that $neutron = electron + proton$. The experimental fact that neutron radii ~ electron radii seems to verify this conjecture. But you know, this hypothesis has been almost forgotten in standard literature...

For information theory, I could only mention *Planck radiation*. Can we derive *Bose-Einstein condensate* from information theory (Shannon entropy), for instance?

This would be interesting, if possible.

In the meantime, I could only mention one reference book, albeit rather outdated: *Entropy, Complexity and the Physics of Information*, by Santa-Fe Studies, edited by W. Zurek (1990). This is one of the most mind-boggling books I've read.

1.18. While I'm sure that we can describe Schrödinger's paradox in terms of Neutrosophy, I guess most other people will not be quite happy to abandon their simple common-logic system, unless we can prove the advantages of using the multiple-value logic.

In this regard, I guess explaining the paradox is the prerequisite, but another problem is what we called **ultraviolet spectral lines**:

NASA scientists observed extreme ultraviolet spectral lines from space for hydrogen and helium.

This is what I don't find clue how to prove it in terms of *QM*.

Alternatively, there are few guys claiming to be able to explain the spectral lines using '*classical electromagnetic radiation*'.

The best *QM* approach so far is to use nonlinear field by introducing double-wavefunction into *NSE*. But it can't explain yet the anomalous spectral lines. I also remember herein a paper by Oleinik discussing this idea.

Another question: do you think there is linkage between *Schrödinger's paradox* and *Heisenberg's uncertainty* and also *Einstein-Podolsky-Rosen paradox*?

I'm not sure yet with Heisenberg's uncertainty, but it seems to me that *EPR* could be explained using superluminal lightspeed (I wrote on this issue in one of my controversial articles about entangled particles¹). Other references which may be useful to check.

But of course it will require more work to explore the 'parallelism' between theories. To quote Banach:

"Good mathematician finds analogy between theories,
Great mathematician finds analogy between analogies."

1.19. Non-standard vector space of any dimension to be used in physics.

¹ This was called the *Smarandache Hypothesis* that there is no speed barrier in the universe and one can construct any speed.

I thought that we could work with vectors v not only in the real vector space of dimension four, but to extend them to a complex vector space as follows:

$$v = (a_1 + b_1 i)x + (a_2 + b_2 i)y + (a_3 + b_3 i)z + (a_4 + b_4 i)t$$

where $a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4$ are real numbers,

$i = \sqrt{-1}$, $(x, y, z) = 3D$ -space, $t = \text{time}$.

Don't we get Minkovski's $4D$ -space when $b_1 = b_2 = b_3 = b_4 = 0$?

A further extension would like to introduce now in physics is the non-standard analysis and therefore the non-standard vector space:

$$V = (A_1 + B_1 i)x + (A_2 + B_2 i)y + (A_3 + B_3 i)z + (A_4 + B_4 i)t$$

where $A_1, A_2, A_3, A_4, B_1, B_2, B_3, B_4$ are non-standard numbers, i.e.

$A_k = a_k \pm \varepsilon$ and similarly $B_k = b_k \pm \varepsilon$, where ε is a very tiny positive number close to zero; for particular cases we may consider some ε 's equal to zero, therefore the corresponding $A_k = a_k$ or $B_k = b_k$ become just ordinary real numbers.

Having infinitesimals vector spaces may insure the connection between quantum level and macro-level in science, not explored before upon our knowledge.

We can generalize even more, considering a real vector space of dimension n , and then its corresponding complex space, and further their non-standard vector space:

$$V = (A_1 + B_1 i)x_1 + (A_2 + B_2 i)x_2 + \dots + (A_n + B_n i)x_n + (A_{n+1} + B_{n+1} i)t$$

$A_k = a_k \pm \varepsilon$ and similarly $B_k = b_k \pm \varepsilon$, where $\varepsilon \geq 0$ (when $\varepsilon = 0$ we can get into the macrolevel for that coordinate x_k , but if $\varepsilon > 0$ we could be in a quantum level for that coordinate x_k),

and even more coordinates for the time t as well: t_1, t_2, \dots .

Therefore, as particular cases, the quaternion and biquaternion spaces can be well extended to non-standard quaternion space and non-standard biquaternion space respectively.

1.20. Neutrosophy as a MetaPhilosophy.

Student:

Then the question: Which is the real happiness and what contribute to our real happiness. What would we feel if we suddenly died? Happy or miserable? What would we have if all those we possess became the past?

Neutrosophic Philosopher:

It depends on what everybody understands by "happiness"? Myself I am interested in discovering new ideas in science, arts. Someone else would like to become a leader, another to have a nice family, etc.

Student:

Is fate destined by some imaginary power or accumulated by ourselves in the long life cycles?

Neutrosophic Philosopher:

It is created by us, by chance, by friends, by society.

Student:

Then what should we do to create real happiness?

Neutrosophic Philosopher:

Learn to attain happiness defined in your terms. Know how to measure it.

Student:

I am really limited to give any further insight, and you can follow plenty of Buddhist URLs from our previous contact (or other great teachings I am not familiar with). There is only sincerity in this practice.

The slightest bargain can definitely result in the opposite destiny. May you be really genius and understand it.

Neutrosophic Philosopher:

Right, the theory of paradoxism: when I want something, it almost surely happen the contradictory!

Feng Liu mentioned in his presentation to the International Congress of Mathematicians (Beijing, P.R. China, August 2002) which I attended, that *T, I, F* in neutrosophy can signify intentions or confidence, not necessarily figures.

He also mentioned in his Dialogues and Sushi's poem: we fail to see the true face of Lushan mountain just because we are in it. Therefore a preliminary means is to abandon logic.

He said in the Chinese Translation of Neutrosophics [1] that the evolution and retrogression of human society is more or less a misleading concept, and people have followed a wrong teacher like Darwin, since those who diligently follow the Way would often be sniffed at. The "wise" adhere fast to their accomplishments and would actually understand nothing different from their own referential world, and fail to reach the light.

Meanwhile the Chinese are adapting more and more wastes than treasures from the west – added Feng Liu - the whole globe is merely a neglectable tiny spot in the universe. Man is sin by nature, and also from his sin, he possesses by nature the limitless power of self-enlightenment. When one is deprived of all his treasures - or replaces them with means, he begins his beggar's life. What an exchange of culture! (Clearly such Neutrosophic Dialogues are needed.)

Years ago, Master Chin Kung suggested that one should reach *arhat* stage before he can translate Buddhist sutras. As we know all written words are symbols to illustrate the underlying truth. One needs to actually see the truth instead of imaging the truth.

Arhat stage is the final goal of *Buddhist practice*; the highest rank in early Indian Buddhism, when there is nothing left to learn.

Literally it means “foe destroyer” or “worthy of respect”.

Buddhist sutras are referring to Buddha's teaching the *Bodhisattva's path* to the fifty-five stages of the enlightenment, the specific working of individual and collective karma, the existence, the *Instructions to Purity*, how to get a *Bodhimanda* and the *Shurangama Mantra*, and understanding the fifty kinds of deviant *Samadhi-concentrations* that delude us.

2. Blog on Applications of Multispace (and Multistructure) in Science

2.1. Think about parallel quantum computing [somehow similar to parallel computer programming that we are very familiar].

Since we work in a multispace $S = S_1 \cup S_2 \cup \dots \cup S_n$, (a union of spaces that may overlap) which consequently has a multistructure, we may consider a quantum computing in the same time in each space S_1, S_2, \dots, S_n – connecting this to the mu-bit.

This is an interesting idea. I could imagine we may propose a novel nanocomputer using this concept...

<http://www.foresight.org/updates/Update12/Update12.2.html>.

We should call it multi-nanocomputer or *munanocomputer*.

Can we connect the mu-bit and parallel quantum computing to new energy creation (what everybody is looking for today)?

Not sure, but it is useful to check it. Just find an interesting Stanford thesis discussing quantum computation and quaternion number... May be they could be related...

<http://www.stanford.edu/~eboyden3/mengthesis/thesis1.htm>.

Now perhaps we could combine the mu-bit with Cantor's infinity

<http://www.earlham.edu/~peters/writing/infinity.htm>

and get an *infinite-bit*?

2.2. Imagine some multi-entangled states or particles (if possible?) + multispace + multi-parallel quantum computing.

One particle (or one particle state) in each space of the multispace.

My best thought so far is to compare this multispace-bit with Young double slit experiment - like the paradox that light could resemble particle (photon) yet it could behave like wave (Fresnel).

We can try a similar experiment with more slits at different distances from each other, or slits of various shapes, and the source light coming from many angles either separately i.e. each time from an angle, or in the same time from many angles.

It seems to me that this paradox could be reconciled once we introduce multispace-bit, that creation of 'bit' will multiply itself into multi-space, which triggers wave pattern in Young slit experiment.

But how to put in into a quantum-mechanics language?

In each space S_i the bit may be different, as for the light: particle in S_1 , wave in another space S_2 . But there might be possible another form of the light (neither particle, nor wave - maybe both of them simultaneously, or none of them as in neutrosophics - i.e. a form that we are not aware of in today's science) occurring in space S_3 , and so on.

I tried to develop the (geometrical or algebraic or analytical, etc.) multi-space, and then to consider a similar/adopted correspondent for bit, qu-bit, up to mu-bit (= **multi-bit** in a multi-space).

I read a paper about: "Multivalued logic and gates for quantum computation" by Ashok Muthukrishnan *et al.*

The authors define the 'qudit' [as a generalization of the qubit] as a d -dimensional quantum system with the basis states $|0\rangle$, $|1\rangle$, ..., $|d-1\rangle$, and also they talk about 'quantum computing in multilevel systems'.

I think the mu-bit and multi-parallel quantum computing are different from 'qudit' and 'quantum computing in multilevel systems' respectively.

In our (mine and Vic Christianto's) 'multispace bit' we consider that each space may have a different structure, while I feel that in the 'qudit' the structures are the same for each level.

Hence I think the mu-bit is a generalization of the qudit.

We are able to explain the particle/wave duality of the light, while the qudit is not.

Similarly our multi-parallel quantum computing is a generalization of 'quantum computing in multilevel systems' since we may have different types of quantum computing at each level/space since we accept different structures.

2.3. A question perhaps: does it mean that multispace corresponds to multivalued logic, and if yes could we apply it to make 'multispace-multivalued' interpretation of Schrödinger equation? And how to find differential equation in multispaces?...

We can apply the multi-valued logic in the following way:

a logic L_1 in a field F_1 , another logic L_2 in another field F_2 , etc. (as many as necessary).

About a common *differential equation* there might be a problem, but I think it would be possible to get a differential equation E_1 in a field F_1 , another differential equation E_2 in another field F_2 , and so on. Then try to connect all of them under a general differential equation.

In a multi-space, a point (or an entire region which is common to more spaces) may have in the same time many metrics and pseudo-metrics (metrics that do not verify all metrics' axioms).

So, the multi-space becomes more complex. I wrote this to the physicist D. Rabounski, since this might give him a new impulse of reinterpretation of singular points in various theories.

2.4. I read Dr. Kaivarainen's idea about overunity machine and the possibility of using virtual particles and real particles and antiparticles.

I wonder if another category of particles, called unparticles which are a kind of unmatter (neither particles, nor antiparticles, but something in between: combinations of quarks and antiquarks bounding together even for a very short period of time, such as: pions, pentaquarks, etc.) would be of any usefulness for the interacting with those virtual particles, real particles, and antiparticles? Thus, having four categories of particles interacting each other.

Curiously, in the journal "Telegraph", from 23rd January 2008, there is an article by Roger Highfield, called *Is our cosmos teeming with alien 'unmatter'*, where the name

“unmatter” is just in the article’s title, but my name is not even cited:
<http://www.telegraph.co.uk/science/large-hadron-collider/3322840/Is-our-cosmos-teeming-with-alien-unmatter.html> ;

only Prof. Howard Georgi from Harvard University is cited for “unparticle” that is a kind of unmatter particle,

and everybody knows I coined the name **unmatter** as a combination of matter and antimatter – and a possible third form of matter - since 2004, in CERN website, and I published papers about “unmatter”:

1. “A New Form of Matter – Unmatter, Formed by Particles and Anti-Particles” (EXT-2004-182), in CERN’s web site: <http://cdsweb.cern.ch/record/798551> and <http://cdsweb.cern.ch/record/798551/files/ext-2004-142.pdf?version=1> (2004);
 - and in <Progress in Physics>, UNM-G, Vol. 1, 9-11, 2005;
 - and under the title of “Matter, Antimatter, and Unmatter” in <Infinite Energy>, Concord, NH, USA, Vol. 11, Issue 62, 50-51, 2005;
 - and in <Bulletin of Pure and Applied Sciences>, Vol. 23D, No. 2, 173-177, 2004.
2. “Verifying Unmatter by Experiments, More Types of Unmatter, and A Quantum Chromodynamics Formula”, in Progress in Physics, Vol. 2, 113-116, 2005;
 - an improved version in “Infinite Energy”, Concord, NH, USA, 36-39, Vol. 12, Issue 67, 2006.
3. "Unmatter Entities inside Nuclei, Predicted by the Brightsen Nucleon Cluster Model”, Progress in Physics, Vol. 1, 14-18, 2006 (with D. Rabounski).
4. On Emergent Physics, “Unparticles” and Exotic “Unmatter” States, by Ervin Goldfain and Florentin Smarandache, Progress in Physics, Vol. 4, 10-15, 2008;
 - and in <Hadronic Journal>, Vol. 31, No. 6, 591-604, December 2008, http://www.hadronicpress.com/hadronic_journal.htm.

Or my abstract on unmatter in American Physical Society’s meetings:

<http://meetings.aps.org/Meeting/GEC09/Event/107355> ;

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, USA.

In the below site there is a blog and a link to my CERN article:

http://novaspivack.typepad.com/nova_spivacks_weblog/2005/03/unmatter_a_poss.html

“Unmatter: A Possible Third Form of Matter.

This interesting [abstract](#) from CERN proposes a third form of matter that is between matter and antimatter: "unmatter." Interesting idea to track. It could have huge implications if confirmed.”

Doing a search on Google for “unmatter” there are 2,680 sites (end of March 2010), and my unmatter articles are among the first, therefore anybody could read them and my definition of “unmatter”.

From our above paper *On Emergent Physics, “Unparticles” and Exotic “Unmatter” States*, by E. Goldfain and F. Smarandache, unparticles represent exotic quantum states

that can occur at energies greater than the Standard Model's energy (bigger than 1 TeV), with abnormal properties:

- a) they are mixtures of particles and antiparticles [= unmatter];
- b) their spin is not integer but fractional (i.e. their spin is different from 1 or 0 for Bosons, and different from $1/2$, $3/2$, $5/2$, etc. for Fermions); they are neither particles of matter (leptons and quarks), nor particles that transmit forces {gauge Bosons, as for example photons, gravitons, particles that transmit the weak interaction (W , Z), or gluons that connect the quarks in nuclei and transmit the strong interaction}; therefore, unparticles represent arbitrary mixtures of particles of matter with particles that tie the matter;
- c) they are mixtures between Left and Right states (i.e. an arbitrary combination of quantum polarizations; they do not satisfy today's theory of the quantum field);
- d) they are very unstable and decompose almost instantaneously.

I hope the scientific justice will eventually prevail.

2.5. I've studied that Ginzburg-Landau model can be related to 'compact sphere model', therefore this approach may be connected (somehow) to CGLE method of Ervin Goldfain. Others may find linkage with Schrödinger equation, Brownian motion etc.

2.6. I'd be happy to cooperate with Dr. Ervin Goldfain into connecting Unmatter with Dark Matter {and an idea just coming into my mind is about... Dark Antimatter and Dark Unmatter if these might exist (?)} – but this has to be proved in Geneva's Large Hadron Collider.

Ervin e-mailed me that the properties of "dark matter" seem to be close to unmatter and unparticles, but the experiments in this domain are barely starting.

Matter, antimatter, and unmatter; or particle, antiparticle, and unparticle – as in neutrosophy $\langle M \rangle$, $\langle antiM \rangle$, and $\langle unM \rangle$; or $\langle P \rangle$, $\langle antiP \rangle$, and $\langle unP \rangle$.

It would be interesting in finding out if Dark Matter is composed from aggregates of unmatter and unparticles (without electrical charge, and formed from mixtures of particles with fractional spin).

2.7. Apparently why normal scientists could not accept CF (cold fusion) easily (Taleyarkhan, Putterman etc.) is because there is an obvious problem herein: how to overcome Coulomb barrier? This is why hot-fusioners should create large Tokamak chamber like in ITER project (now to be built in France)...

This is partly why we introduced the 'Hulthen potential' term in Ginzburg-Landau equation, because Hulthen potential permits Coulomb barrier reversal, therefore it could be attractive instead of repulsive at some conditions...

We should envisage all fusions to be done simultaneously in each space S_1 , ..., S_n , at various (lower, medium, higher) temperatures, pressures, etc..

2.8. Nanotechnology is stressing here in academia as a hot research subject. I bought a handbook from Amazon.com, but it has much organic chemistry.

We can unite nanoscale space with our world scale and with cosmic scale, or inorganic nanoscale with organic nanoscale.

2.9. Multi-space (or multispace) unifies science fields; actually the whole universe is a multi-space.

It is curious that we accepted all quantum theories, not yet proven, many based on imagination (maybe science fiction), while others are reluctant to multi-space which constitutes so obvious our reality. Sure, I acknowledge (and it is my fault and incompleteness) that there is not much theory behind multi-space (some theory is about Sm. Geometries, that are a particular type of multi-space formed as unions of geometrical spaces only).

Multispace is a qualitative notion, not a metrics notion, since multispace is too large and such including metric and non-metric spaces.

Weyl and Kahler geometries are used in quantization somehow, but my geometries look to be more general and including these geometries; how should we use them?

www.gallup.unm.edu/~smarandache/geometries.htm

Laurent Schadeck has asked if the Smarandache geometries relate to non-associative structures.

Non-associative structures are structures whose laws are not associative.

These geometries are regarded from another point of view, considering a union of hybrid geometrical spaces (that form together a multi-space).

In general, this multi-space embedded with a law is a non-associative structure.

2.10. Parallel universes are also a particular case of multi-space anyway.

You can have parallel universes on each dimension.

But "combinatorial manifolds" do not include the possibility to use pseudomanifolds as used in the Theory of Relativity.

While combinatorial pseudomanifolds will be part of Sm. multi-space.

2.11. I was still in a trip in Egypt, when an idea came to me that - following the neutrosophic logic where $\langle A \rangle$ and $\langle antiA \rangle$ can be simultaneously true, or using the multispace - maybe more models of the atom might be correct, not only the standard model of the atom.

But the type of model might depend of the substance atom, and on other parameters (temperature, pressure, etc.).

2.12. I read papers on parallel timelines, but those explanations look somehow fantastic to me.

Time is considered a line; shouldn't it be a curve since in the text it is taken for a spiral?

Multi-space could work for time in the sense of multi-curve time, I mean curve C_1 (like space C_1) representing time t_1 , curve C_2 representing time t_2 , etc. Hence, do we need infinitely many curve-times?

2.13. Did you hear that Pluto is not considered a planet any longer, so we now have only eight planets in the solar system (so far... who knows in the future?).

2.14. What about writing **sci-fi** using nanotechnology? [say a nanorobot guided inside the body to fight viruses, or nanomachines that auto-reproduce, etc.]. Like Asimov's stories, but adopted for today's science.

Microchips as additional human memories implemented in man's brain, etc.

Would it be exciting writing such stories? Maybe first we can start with short stories and make a collection.

Another choice I just think is writing a 'satire' version of Star Trek with the purpose of humor, for instance: "**Star Shrek**". Therefore, we can write another fiction. The character 'Shrek', from Disney, now is going to space-travel...

<http://www.magicdragon.com/UltimateSF/SF-Index.html>.

Just Google to see that there is no 'Star Shrek' novel so far...

2.15. But I'd imagine something in microuniverse, since in macrouniverse many people wrote before us, as "the adventure of a particle-man", etc... or a man who can move from our normal space to a nucleus space...

using a lot of fantasist quantum physics...

with things which are in two places in the same times, and with superluminal speeds inside...

Also, to be innovatory, we can include differential equations in the novel [why not first starting with short SF stories, and then go to a SF novel?];

for example, the equation may describe the trajectory of the particle-man inside a hydrogen atom...

or even parts of a scientific article [from ours, in order not having copyright problems], explaining the *SC potential* of the particle-man inside the nucleus, or how the particle-man moves from a space into another space with its multispace, for example from the quantum space to the macrospace and becomes a real man...

something funny...

In conclusion:

Should we keep these ideas for ourselves only so nobody would claim later he/she developed them before us?

Well, there is paradox here: if we don't discuss with anybody else, our ideas cannot grow, but if we discuss it others could steal them (with people from Seattle I mean is: 'Most Intelligent Customers Realize Our Software Only Fools Teenagers' - you know this joke? (www.ngkhai.net/blog/category/general-interest/jokesquotes)).

Therefore I think the best way is to secure them first (US/ Europe is the best place, because if we apply to developing countries somehow a patent registered at Europe could supersede it), then begin writing articles for journals, etc...

A. References for Neutrosophics:

1. Florentin Smarandache, "Neutrosophy. / Neutrosophic Probability, Set, and Logic", American Research Press, Rehoboth, USA, 1998, 105 p.;

republished in 2003, *A Unifying Field in Logics: Neutrosophic Logic. Neutrosophy, Neutrosophic Set, Neutrosophic Probability* (third edition), American Research Press, 143 p.;

Chinese translation by Feng Liu, “A Unifying Field in Logics: Neutrosophic Logic. / Neutrosophy, Neutrosophic Set, Neutrosophic Probability and statistics”, Xiquan Chinese Branch, 2003, 121 p.

2. Florentin Smarandache, editor, *Proceedings of the First International Conference on Neutrosophy, Neutrosophic Logic, Neutrosophic Set, Neutrosophic Probability and Statistics*, editor, University of New Mexico, Gallup Campus, Xiquan, Phoenix, 147 p., 2002.

3. W. B. Vasantha Kandasamy, Florentin Smarandache, *Fuzzy Cognitive Maps and Neutrosophic Cognitive Maps*, Xiquan, Phoenix, 211 p., 2003.

4. Florentin Smarandache, Feng Liu, *Neutrosophic Dialogues*, Xiquan, Phoenix, 97 p., 2004.

5. W. B. Vasantha Kandasamy, Florentin Smarandache, *Fuzzy Relational Equations & Neutrosophic Relational Equations*, Hexis, 301 p., 2004.

6. W. B. Vasantha Kandasamy, Florentin Smarandache, *Basic Neutrosophic Algebraic Structures and their Applications to Fuzzy and Neutrosophic Models*, Hexis, 149 p., 2004.

7. H. Wang, F. Smarandache, Y.-Q. Zhang, R. Sunderraman *Interval Neutrosophic Sets and Logic: Theory and Applications in Computing*, Hexis, 87 p., 2005.

8. Florentin Smarandache, “Neutrosophy, A New Branch of Philosophy”, in *<Multiple Valued Logic / An International Journal>*, USA, ISSN 1023-6627, Vol. 8, No. 3, pp. 297-384, 2002.

9. Florentin Smarandache, “A Unifying Field in Logics: Neutrosophic Logic”, in *<Multiple Valued Logic / An International Journal>*, USA, ISSN 1023-6627, Vol. 8, No. 3, pp. 385-438, 2002.

This whole issue of this journal is dedicated to Neutrosophy and Neutrosophic Logic.

10. Florentin Smarandache, “Definitions Derived from Neutrosophics”, in *<Multiple Valued Logic / An International Journal>*, USA, ISSN 1023-6627, Vol. 8, No. 5-6, pp. 591-604, 2002.

11. Florentin Smarandache, “An Introduction to the Neutrosophic Probability and Statistics”, in *<American Romanian Academy Journal>*, Vol. 2000-2002, No. 25-27, 71-74.

12. PlanetMath, *Neutrosophic Logic*

<http://planetmath.org/encyclopedia/NeutrosophicLogic.html>;

and *Neutrosophic Set* <http://planetmath.org/encyclopedia/NeutrosophicSet.html>

13. Umberto Rivieccio, *Neutrosophic logics: Prospects and problems*, in *Fuzzy Sets and Systems*, Vol. 159, Issue 14, pp. 1860 – 1868, 2008.

14. Haibin Wang, Praveen Madiraju, Yanqing Zhang, Rajshekhar Sunderraman, “Interval Neutrosophic Sets”, *International Journal of Applied Mathematics & Statistics*, Vol. 3, No. M05, pp. 1-18, March 2005.

15. Anne-Laure Jousselme, Patrick Maupin, *Neutrosophy in Situation Analysis*, Fusion 2004 International Conference, Stockholm, Sweden, June 28 – July 1, 2004;

<http://www.fusion2004.foi.se/papers/IF04-0400.pdf>

16. Neutrosophic probability: "An Introduction to the Neutrosophic Probability Applied in Quantum Statistics", in <Bulletin of Pure and Applied Sciences>, Physics, 13-25, Vol. 22D, No. 1, 2003.

B. References for Multispace:

1. F. Smarandache, *Multi-Space and Multi-Structure*, in "Neutrosophy. Neutrosophic Logic, Set, Probability and Statistics", American Research Press, 1998.
2. Linfan Mao, *Relativity in Combinatorial Gravitational Fields*, Progress in Physics, Vol. 3, 39-50, 2010.
3. Dmitri Rabounski, *Smarandache Spaces as a New Extension of the Basic Space-Time of General Relativity*, Progress in Physics, Vol. 2, L1-L2, 2010.
4. Linfan Mao, *Geometrical Theory on Combinatorial Manifolds*, in *JP Journal of Geometry and Topology*, Allahabad, India, 7(1), 2007, 65-113.

C. References for Multispace in Geometry:

1. Ashbacher, C., "Smarandache Geometries", Smarandache Notions Journal, Vol. 8, 212-215, No. 1-2-3, 1997.
2. S. Bhattacharya, „A Model to the Smarandache Geometries“, Journal of Recreational Mathematics, Vol. 33, No. 2, p. 66, 2004-2005;
modified version in <Octagon Mathematical Magazine>, Vol. 14, No. 2, 690-692, October 2006.
3. Chimienti, S. and Bencze, M., "Smarandache Paradoxist Geometry", Bulletin of Pure and Applied Sciences, Delhi, India, Vol. 17E, No. 1, 123-1124, 1998;
<http://www.gallup.unm.edu/~smarandache/prd-geo1.txt>.
4. Kuciuk, L., Antholy M., "An Introduction to Smarandache Geometries", Mathematics Magazine, Aurora, Canada, Vol. 12, 2003, and online:
http://www.mathematicsmagazine.com/1-2004/Sm_Geom_1_2004.htm;
also presented at New Zealand Mathematics Colloquium, Massey University, Palmerston North, New Zealand, December 3-6, 2001, <http://atlas-conferences.com/c/a/h/f/09.htm>;
also presented at the International Congress of Mathematicians (ICM2002), Beijing, China, 20-28 August 2002, http://www.icm2002.org.cn/B/Schedule_Section04.htm and in 'Abstracts of Short Communications to the International Congress of Mathematicians', International Congress of Mathematicians, 20-28 August 2002, Beijing, China, Higher Education Press, 2002;
and in JP Journal of Geometry and Topology, Allahabad, India, Vol. 5, No. 1, 77-82, 2005.
5. Mao, Linfan, "An introduction to Smarandache geometries on maps", 2005 International Conference on Graph Theory and Combinatorics, Zhejiang Normal University, Jinhua, Zhejiang, P. R. China, June 25-30, 2005.

6. Mao, Linfan, "Automorphism Groups of Maps, Surfaces and Smarandache Geometries", partially post-doctoral research for the Chinese Academy of Science, Am. Res. Press, Rehoboth, 2005.
7. Mao, Linfan, "Selected Papers on Mathematical Combinatorics (I)", World Academic Press, Liverpool, U.K., 2006.
8. Iseri, H., "Partially Paradoxist Smarandache Geometries", <http://www.gallup.unm.edu/~smarandache/Howard-Iseri-paper.htm>.
9. Iseri, H., "Smarandache Manifolds", Am. Res. Press, 2002, <http://www.gallup.unm.edu/~smarandache/Iseri-book1.pdf>
10. PlanetMath, "Smarandache Geometries", <http://planetmath.org/encyclopedia/SmarandacheGeometries.html>.
11. Perez, M., "Scientific Sites", in 'Journal of Recreational Mathematics', Amityville, NY, USA, Vol. 31, No. 1, 86, 2002-20003.
12. Smarandache, F., "Paradoxist Geometry", State Archives from Vâlcea, Rm. Vâlcea, Romania, 1969.
13. Smarandache, F., "Paradoxist Mathematics", in Collected Papers (Vol. II), Kishinev University Press, Kishinev, 5-28, 1997.