

What they don't teach you at Harvard-Smithsonian In search of Navier-Stokes model of the Solar System

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Abstract

In this paper, we will discuss shortly a nonlinear cosmology model inspired by analogy between cosmology phenomena and low temperature physics, especially superfluid vortices dynamics. We described: (a) a nonlinear cosmology model based on Navier-Stokes turbulence equations, which then they are connected to superfluid turbulence, and (b) the superfluid turbulence can lead to superfluid quantized vortices, which can be viewed as large scale version of Bohr's quantization rule, and (c) this superfluid quantized vortice interpretation of Bohr's rule allow us to predict quantization of planetary orbits in solar system including new possible orbits beyond Pluto. This paper is intended as a retrospect of what happened after the publication of earlier papers, and also some related ideas we developed since that time. In the second section we also discuss a recent development in matter-creation hypothesis, by virtue of unmatter concept and its extension. It is our hope that the new proposed view will inspire younger physicists and cosmologists to develop more realistic nonlinear cosmology models. And although some of our predictions since 2004 have come to observed data, we also hope the ideas presented here can be further verified with observation data.

Keywords: nonlinear cosmology, Newtonian cosmology, vortex dynamics, superfluid turbulence, Navier-Stokes equations, Ermakov-type equation, unmatter, matter-creation.

Introduction

Cosmology models of various kind have been developed in the past decades, with the Lambda-CDM as accepted Standard Model. However, there are known problems with the so-called Lambda-CDM model which forms the basis of Big Bang Cosmology, one of these problems is that Lambda-CDM model is based on linear cosmology, while many phenomena in the Universe are mostly nonlinear in processes and nature.

In this paper, we will discuss shortly a nonlinear cosmology model inspired by analogy between cosmology phenomena and low temperature physics, especially superfluid vortex. We described: (a) a nonlinear cosmology model based on Navier-Stokes turbulence equations, which then they are connected to superfluid turbulence, and (b) the superfluid turbulence can lead to superfluid quantized vortices, which can be viewed as large scale version of Bohr's quantization rule, and (c) this superfluid quantized vortices interpretation of Bohr's rule allow us to predict quantization of planetary orbits in solar system including new possible orbits beyond Pluto.

This paper is intended as a retrospect of what happened after the publication of earlier papers, and also some related ideas

we developed since that time. In the second section we also discuss a recent development in matter-creation hypothesis, by virtue of unmatter concept and its extension.

Section A: Cantorian Superfluid Turbulence Cantorian Superfluid Universe

Since more than 16 years ago, my first paper was published in *Apeiron Journal*, January 2004, while a condensed version of the ideas has been published earlier at July 2003 [6][7].

Among key ideas in those two papers are (a) a nonlinear cosmology model based on Navier-Stokes turbulence equations, which then they are connected to superfluid turbulence, and (b) the superfluid turbulence can lead to superfluid quantized vortices, which can be viewed as large scale version of Bohr's quantization rule, and (c) this superfluid quantized vortices interpretation of Bohr's rule allow us to predict quantization of planetary orbits in solar system including new possible orbits beyond Pluto. Then a follow-up paper was published in July 2004, because I read about recent discovery of Sedna, which at the time it was the first discovered planetoid at the outer side of Pluto.

The discovery by Mike Brown-Trujillo team from Caltech was quite a big news back then. Other discoveries of new planetoids beyond Pluto have been reported since then, which seem to cause IAU to admit in a conference held around 2005: Pluto is no longer the edge of our solar system.

As with ourselves, the truth was that I was refused to publish more papers in Apeiron. So he decided to send subsequent papers to other journals, like *Annales de la Fondation Louis de Broglie* [8], after kind help by an editor of Apeiron Journal.

After bouncing back and forth with other topics in astrophysics and quantum mechanics, finally VC found back his early interest on Cantorian turbulence cosmology. In a series of papers published in *Prespacetime Journal*, since 2010 up to 2017, we explored topics like Primordial Rotation of Universe and also Cantorian Navier-Stokes cosmology (minus the superfluid term in 2004 paper), see [18]-[20].

Now, in this paper allow us to summarize a few new findings related to that topic.

In this paper we will discuss a novel Newtonian cosmology model with vortex dynamics, especially with a numerical solution of 3D Navier-Stokes equations. It is our hope that the new proposed view will lead to more rigorous nonlinear cosmology models beyond the conventional Big Bang Standard Model Cosmology taught in most centers of astrophysics, like *Harvard Smithsonian of Astrophysics*. And although some of my earlier predictions at 2004 have found way to be observed, we also hope the ideas presented here can be further verified with observation data.

A few theoretical backgrounds

Some years ago, Matt Visser asked the following interesting questions: How much of modern cosmology is really cosmography? How much of modern cosmology is independent of the Einstein equations? (Independent of the Friedmann equations?) These questions are becoming increasingly germane — as the models cosmologists use for the stress-energy content of the universe become increasingly *baroque* [5].

In this regard, academician Isaak Khalatnikov mentioned at the 13th *Marcel Grossman Conference*², that Lev Landau suggesting that something is too symmetric in the models yielding singularities, and that this problem is one of the three most important problems of modern physics. The aim of this report is to show that singularities are, indeed, consequences of such an overly “symmetrical approach” in building non-robust (i.e. without structural stability) toy models with singularities. Such models typically apply a synchronous system of reference and “Hubble’s law”, neglecting not-to-be-averaged-out quadratic terms of perturbations (specifically, differentially rotational velocities, vortexes) [1].

Only by accounting the overlooked factors instead of Einstein’s ad hoc introduction of a new entity, which was later declared by him as his “*biggest blunder*”, can we correctly interpret accelerated cosmological expansion, as well as pro-

vide possibility of static solution. The common perception of the observed accelerated expansion is that there is need either in modifying the General Relativity or discover new particles with unusual properties. Interestingly enough, both ways are possible depending on what kind of system of reference and corresponding interpretation are chosen, a decision which is usually made depending on the level of “*geometrization*”[1].

Local rotations (vortices) play a role in radical stabilization of the cosmological singularity in the retrospective extrapolation, making possible a static or steady-state (on the average) Universe or local region. Therefore Einstein could “permit” the galaxies to rotate instead of postulating a cosmological constant *ad hoc* in his general-relativistic consideration of a static Universe. Though, it does not necessarily mean that the cosmological constant is not necessary for other arguments [2].

A few historical notes

Since long time ago, there were numerous models of the Universe, going back to Ptolemaic geocentric model, which was subsequently replaced by Nicolas Copernicus discovery. Copernicus model then was brought into fame after Isaac Newton published his book. But other than Newton, there was a model of Universe as a turbulent fluid (hurricane) brought by a French philosopher and mathematician, R. Descartes. But, his model was almost forgotten after rebuttal by Newton. Many physicists rejected Descartes’ model because it stood against Newtonian model, but the truth is turbulence model can be expressed in Navier-Stokes equations, and Navier-Stokes equations can be considered as a rigorous formulation of Newtonian laws, especially for fluid dynamics. In other words, we can say that a Newtonian turbulence Universe is not necessarily in direct contradiction with Newtonian dynamics. Therefore, in this paper we submit wholeheartedly a proposal that the Universe can be modelled as Newtonian-Vortex based on 3D Navier-Stokes equations. We shall show some implications of this new model in the following sections.

Solar System model

In this section, we will review the work which was carried out by me and with kind help of Prof. Florentin Smarandache from UNM, during the past ten years or so. The basic assumption here is that the Solar System’s planetary orbits are quantized. But how do their orbits behave? Do they follow Titius-Bode’s law? Our answer can be summarized as follows: [6][7][8].

Navier-Stokes equations → *superfluid quantized vortexes* → *Bohr’s quantization rule (1)*

Our predictive model based on that scheme has yielded some interesting results which may be comparable with the observed orbits of planetoids beyond Pluto, including what is dubbed as Sedna [9]. It seems that the proposed model is slightly better compared to Nottale-Schumacher’s gravitational Schrödinger model and also Titius-Bode’s empirical law. See table 1 below.

Object	No	Titius	Nottale	CSV	Observ.	Δ, %
	1		0.4	0.43		
	2		1.7	1.71		
Mercury	3	4	3.9	3.85	3.87	0.52
Venus	4	7	6.8	6.84	7.32	6.50
Earth	5	10	10.7	10.70	10.00	-6.95
Mars	6	16	15.4	15.4	15.24	-1.05
Hungarias	7		21.0	20.96	20.99	0.14
Asteroid	8		27.4	27.38	27.0	1.40
Camilla	9		34.7	34.6	31.5	-10.00
Jupiter	2	52		45.52	52.03	12.51
Saturn	3	100		102.4	95.39	-7.38
Uranus	4	196		182.1	191.9	5.11
Neptune	5			284.5	301	5.48
Pluto	6	388		409.7	395	-3.72
2003EL61	7			557.7	520	-7.24
Sedna	8	722		728.4	760	4.16
2003UB31	9			921.8	970	4.96
Unobserv.	10			1138.1		
Unobserv.	11			1377.1		

Table 1 : Comparison of prediction and observed orbit distance of planets in solar system (in 0.1 AU unit)[28]

Table 1: Comparison between Laurent Nottale’s results, Titius-Bode law, and CSV.

(After V. Christianto, Apeiron, July 2004. URL: <http://redshift.vif.com>).

Numerical solution of 3D Navier-Stokes equations

In fluid mechanics, there is an essential deficiency of the analytical solutions of non-stationary 3D Navier–Stokes equations. Now, instead of using linearized NS equations as above, we will discuss a numerical solution of 3D Navier-Stokes equations based on Sergey Ershkov’s papers [13][14].

The Navier-Stokes system of equations for incompressible flow of Newtonian fluids can be written in the Cartesian coordinates as below (under the proper initial conditions): [13]

$$\nabla \cdot \vec{u} = 0, \tag{2}$$

$$\frac{\partial \vec{u}}{\partial t} + (\vec{u} \cdot \nabla) \vec{u} = -\frac{\nabla p}{\rho} + \nu \cdot \nabla^2 \vec{u} + \vec{F}. \tag{3}$$

Where u is the flow velocity, a vector field, ρ is the fluid density, p is the pressure, ν is the kinematic viscosity, and F represents external force (per unit mass of volume) acting on the fluid [13].

In ref. [13], Ershkov explores new ansatz of derivation of non-stationary solution for the Navier–Stokes equations in the case of incompressible flow, where his results can be written in general case as a mixed system of two coupled-Riccati ODEs (in regard to the time-parameter t). But instead of solving the problem analytically, we will try to find a numerical solution with the help of computer algebra package of *Mathematica* 11.

The coupled Riccati ODEs read as follows: [13]

$$a' = \frac{w_y}{2} \cdot a^2 - (w_x \cdot b) \cdot a - \frac{w_y}{2} (b^2 - 1) + w_z \cdot b, \tag{4}$$

$$b' = -\frac{w_x}{2} \cdot b^2 + (w_y \cdot a) \cdot b + \frac{w_x}{2} (a^2 - 1) - w_z \cdot a. \tag{5}$$

First, equations (4) and (5) can be rewritten in the form as follows:

$$x(t)' = \frac{v}{2} \cdot x(t)^2 - (u \cdot y(t)) \cdot x(t) - \frac{v}{2} (y(t)^2 - 1) + w \cdot y(t), \tag{6}$$

$$y(t)' = -\frac{u}{2} \cdot y(t)^2 + (v \cdot x(t)) \cdot y(t) + \frac{u}{2} (x(t)^2 - 1) - w \cdot x(t). \tag{7}$$

Then we can put the above equations into *Mathematica* expression:[3]

```
v=1;
u=1;
w=1;
{xans6[t_], vans6[t_]}=
{x[t],y[t]}/.Flatten[NDSolve[{x'[t]==(v/2)*x[t]^2-(u*y[t])*x-
[t]-(v/2)*(y[t]^2-1)+w*y[t], y'[t]==-(u/2)*y[t]^2+(v*x-
[t])*y[t]+(u/2)*(x[t]^2-1)-w*x[t], x[0]==1,y[0]==0},
{x[t],y[t]},{t,0,10}]]
graphx6 = Plot[xans6[t],{t,0,10}, AxesLabel->{"t","x"},Plot-
Style->Dashing[{0.02,0.02}]];
Show[graphx6,graphx6]
```

The result is as shown below: [3]

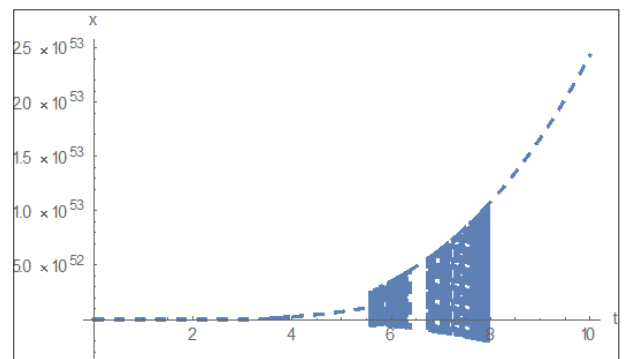


DIAGRAM 1: Graphical plot of solution for case $v=u=w=1$. See [3]

Section B: Matter-creation process and unmatter hypothesis

Matter-creation process and unmatter phenomena

Physicists throughout many centuries have debated over the physical existence of aether medium. Since its inception by Isaac Newton and later on by others too, many believed that it is needed because otherwise there is no way to explain *interaction at a distance* in a vacuum space. We need medium of interaction, of which has been called by various names, such as: quantum vacuum, zero point field, etc.

Nonetheless, modern physicists would answer: no, it is not needed, especially after Special Relativity theory. Some would even say that aether has been removed even since Maxwell’s theory, but it is not true: James Clark Maxwell initially suggested a mechanical model of aether vortices in his theory

[31-33]. Regardless of those debates, both approaches (with or without assuming aether) are apparently resulting in the same empirical results, but with entirely different physical processes and assumptions.

The famous *Michelson-Morley* experiments were thought to give null result to aether hypothesis, and historically it was the basis of Einstein's STR. Nonetheless, newer discussions proved that the evidence was rather ambiguous, from MM data itself. Especially after *Dayton Miller's* experiments of aether drift were reported, more and more data came to support aether hypothesis,³ although many physicists would prefer a new terms such as physical vacuum or superfluid vacuum [34-38].

Once we accept the existence of aether as physical medium, then we can start to ask on what causes matter ejection, as observed in various findings related to quasars etc. One particular cosmology model known as VMH (variable mass hypothesis) has been suggested by notable astrophysicists like Halton Arp and Jayant V. Narlikar, and the essence of VMH model is matter creation processes in various physical phenomena. Nonetheless, matter creation process in Nature remains a big mystery for physicists, biologists and other science researchers. To this problem *Neutrosophic Logic* offers a solution.⁴

Let us assume that under certain conditions that aether can transform using Bose condensation process to become "unmatter", a transition phase of material, which then it sublimates into matter (solid, gas, liquid). Unmatter can also be considered as "pre-physical matter."

Summarizing our idea, it is depicted in the following block diagram:

Aether → bose condensation → "unmatter" (pre-physical matter) → sublimation → ordinary matter/particle

Diagram 2: How aether becomes ordinary matter

In this paper, unmatter is considered as a transition state (pre-physical) from aether to become ordinary matter/particle, see also [42]. Moreover, superfluid model of dark matter has been discussed by some authors [43].

As one more example of our proposed scheme of transition from aether to matter, see a recent paper [44]. See the illustrations at pages 5 and 6 of [18] regarding the physically observed properties of the Galactic Center (GC), which are obviously completely different from the imaginary "black hole" model. The mapping of the magnetic field structures of the Core is a profile of a torus, as we have previously suggested. Page 5 in that paper also illustrates the relation between Sag A and Sag B and the space in between them. These illustrations are also relevant to *matter creation* at the galactic scale. Also note the gamma ray distributions in [44], which are relevant to matter destruction processes. Electrical discharges such as lightning, stars, and galaxies, all produce gamma rays.

Aether winds can be superluminal, or subluminal. The velocity and temperature of the aether is a determining factor in many normal matter events. For example the mixing rate and interaction rate of various chemical reactions can be increased or slowed down by aether processes. Frolov talks about this, and has a machine that can slow down or speed up chemical reactions, using aether activities.

Probably, additional creation processes such those produced via B/E condensates, can happen internal to the planet. There may be other processes, as well, involving other phase states of the 5 phase-state aether (Mishin⁵). This can be modeled by considering interactions among the phase states of normal matter, which we suggest are analogous to the phase-state behaviors of aether matter. So normal matter fluids cooling off, create solids, for example.

In our present view, this happens with aether-matter, as well. So the 5 phase aether has energy density capacities which are dependent on which aether phase we are examining. The same can be said of normal matter, as well as aether matter. We have to start viewing the aether as another kind of matter, because it makes understanding so much easier, and because, so far, the analogy has been accurate to the observable facts.

In other side, it is known that astronomers find that only 1% of matter in the universe is observed, while 99% is undetected. That is why they call it the Hidden Universe. Could it be that aether (may be in form of superfluid medium, a ka Mishin phase state) can be an intermediate entity in Neutrosophic sense?

In this line of thought, it is possible to come up with an expanded model of unmatter, as follows:

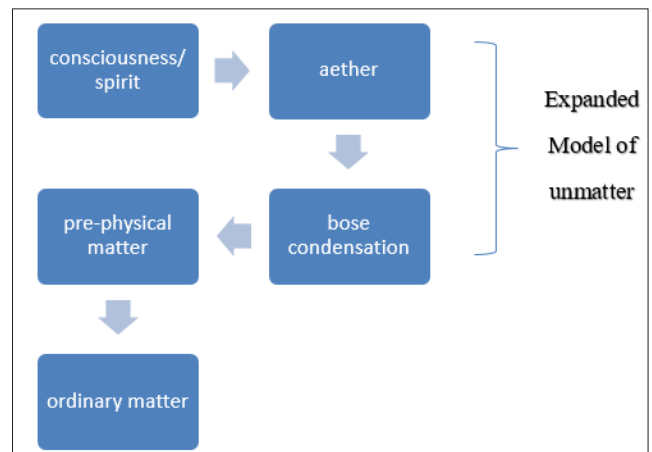


Diagram 3: An expanded model of unmatter (After Christiano, Smarandache, Boyd [45])

May be it is because the remaining entities are in the form of consciousness, aether and pre-physical matter. That is what can be called as "expanded model of unmatter." See [45].

Concluding remarks

It is known that most existing cosmology models are linear in nature, while large scale phenomena are mostly *nonlinear*, therefore it is required to come up with a nonlinear cosmology model. Moreover, it has been known for long time that most of the existing cosmology models have singularity problem. Cosmological singularity has been a consequence of excessive symmetry of flow, such as “Hubble’s law”. More realistic one is suggested, based on Newtonian cosmology model but here we include the vortical-rotational effect of the whole Universe.

We also discuss on how to solve 3D Navier-Stokes equations numerically. It is our hope that the above numerical solution of 3D Navier-Stokes equations can be found useful.

The solutions obtained here open up new ways to interpret existing solutions of known 3D Navier-Stokes problem in physics, astrophysics, cosmology and engineering fields, especially those associated with nonlinear hydrodynamics and turbulence modelling.

Further theoretical as well as observational investigations are recommended.

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References

1. Ildus S. Nurgaliev. *E pur si muove!* arXiv: 1210.4091. [1a] see also Singularities are averted by vortices. 13th *Gravitational Conference – International Conference on Gravitation, Cosmology and Astrophysics*. June 23-28, 2008. Peoples Friendship University of Russia (PFUR), Moscow, Russia. Abstracts. Published by *PFUR*, ISBN 978-5-209-03274-8, pp. 117–118; [1b] Also in *Gravitation and Cosmology vol. 16 no. 4* (2010) pp. 313-315.
2. Victor Christianto & Florentin Smarandache & Yunita Umniyati (2017) Solving Numerically Ermakov-type Equation for Newtonian Cosmology Model with Vortex. *Prespacetime Journal*, Aug. 2017. www.prespacetime.com
3. Victor Christianto & Sergey V. Ershkov (2017) Solving Numerically a System of Coupled Riccati ODEs for Incompressible Non-Stationary 3D Navier-Stokes Equations. Paper presented in ISCPMS, 26th July 2017. url: <http://iscpms.ui.ac.id>
4. Victor Christianto & Florentin Smarandache (2017) A Computer Algebra Solution of Ermakov Equation Corresponding to Diffusion Interpretation of Wave Mechanics. *Prespacetime Journal*, aug 2017.
5. Matt Visser (2004) Cosmography: Cosmology without Einstein equations. *General Relativity and Gravitation*, Nov. 2004. arXiv: gr-qc/0411131
6. Victor Christianto (2004) A Cantorian Superfluid Vortex and the Quantization of Planetary motion. *Apeiron Vol. 11, No. 1, January 2004*. Url: <http://redshift.vif.com/Journal-Files/V11NO1PDF/V11N1CHR.pdf>
7. Victor Christianto (2004) Comparison of Predictions of Planetary Quantization and Implications of the Sedna Finding. *Apeiron Vol. 11 No. 3, July 2004*. Url: https://www.researchgate.net/publication/228393806_Comparison_of_Predictions_of_Planetary_Quantization_and_Implications_of_the_Sedna_Finding
8. Victor Christianto (2006) On the origin of macroquantization in astrophysics and celestial motion. *Annales de la Fondation Louis de Broglie Vol. 31 No. 1, 2006*. url: https://www.researchgate.net/publication/240305621_On_the_origin_of_macroquantization_in_astrophysics_and_celestial_motion
9. Victor Christianto & Florentin Smarandache (2005) On recent discovery of new planetoids in the solar system and quantization of celestial system. Url: <http://www.gallup.unm.edu/~smarandache/ScArt6/RecentDiscoveryPlanetoids.pdf>
10. Georgios Vastistas (2010) The presence of interstellar turbulence could explain the velocity flattening in galaxies. arXiv: 1012.1384
11. M. Larcheveque & J. Chaskalovic (1994) A new mathematical model applied to tornado genesis. *Int. J. Engng. Sci.* 32(1): 187-193.
12. J. Chaskalovic & A. Chauviere (2003) Appearance of a source/sink line into a swirling vortex. *Math. Model and Methods in Appl. Sci.* 13(1): 121-142.
13. Sergey V. Ershkov (2016) Non-stationary Riccati-type flows for incompressible 3D Navier–Stokes equations. *Computers and Mathematics with Applications* 71: 1392–1404.
14. Sergey V. Ershkov. (2016) A procedure for the construction of non-stationary Riccati-type flows for incompressible 3D Navier–Stokes Equations. *Rend. Circ. Mat. Palermo* 65: 73–85.
15. I. Shingareva & Carlos Lizarraga-Celaya (2011) *Solving Nonlinear Partial Differential Equations with Maple and*

- Mathematica. Dordrecht : Springer, 2011. 371 p.*
16. Patrick T. Tam (2008) A Physicist's guide to Mathematica. 2nd ed. Amsterdam: *Academic Press - an imprint of Elsevier*, 2008. 749 p.
 17. L.D. Landau, E.M. Lifshitz (1987) Fluid mechanics, Course of Theoretical Physics 6, 2nd revised ed., Pergamon Press, 1987. ISBN: 0-08-033932-8
 18. V. Christianto (2015) Four Possible Applications of a Navier-Stokes Cosmology. *Prespacetime Journal* Vol. 6, No. 11 . url: www.prespacetime.com
 19. V. Christianto (2015) A Possible Route to Navier-Stokes Cosmology on Cantor Sets. *Prespacetime Journal* Vol. 6 No. 8 (2015). url: www.prespacetime.com
 20. V. Christianto (2012) On Primordial Rotation of the Universe, Hydrodynamics, Vortices & Angular Momenta of Celestial Objects. *Prespacetime Journal*, 3 No. 13. url: www.prespacetime.com
 21. L.H. Ford (2003) An estimate of the Vibrational Frequencies of Spherical Virus Particles. arXiv: 0303089 (2003)
 22. Vahe Galstyan, On Shun Pak, & Howard A. Stone (2015) A note on the breathing mode of an elastic sphere in Newtonian and complex fluids. arXiv: 1506.09212 (2015).
 23. Luc Montagnier et al. <http://iopscience.iop.org/article/10.1088/1742-6596/306/1/012007/meta>.
 24. Luc Montagnier. DNA between physics and biology. url: <http://omeopatia.org/upload/Image/convegno/VALERI-24-10-2011Relazione3.pdf>
 25. V. Christianto & Yunita Umniyati. A non-particle view of DNA and implications to cancer therapy. http://www.academia.edu/29253942/A_Non-Particle_View_of_DNA_and_Its_Implication_to_Cancer_Therapy
 26. V. Christianto & Yunita Umniyati (2016) A few comments of Montagnier and Gariaev's works. *DNA Decipher Journal*, 2016. Url: <http://dnadecipher.com/index.php/dj/article/download/102/112>
 27. C. Foias & J.C. Saut (1987) Linearization and normalization of Navier-Stokes equations with potential forces. *Annales de l'I.H.P., section C, tome 4 no. 1* (1987)
 28. Enrique A. Thomann & Ronald B. Guenther. The Fundamental Solution of the Linearized Navier Stokes Equations for Spinning Bodies in Three Spatial Dimensions - Time Dependent Case. *To Appear in Journal of Math. Fluid Mech.*
 29. A. Leonard (2016) Approximate Solutions to the Linearized Navier-Stokes Equations for Incompressible Channel Flow. *20th Australasian Fluid Mechanics Conference. Perth, Australia 5-8 December 2016.*
 30. A.A. Snelling & D. E. Rush (1993) Moon dust and the age of the Solar system. *CEN Tech. J.*, vol. 7(1): 2–42. See especially pp. 30
 31. James Clark Maxwell. On Physical Line of Forces. [26a] Maxwell, J. C., *A Treatise on Electricity and Magnetism, 3rd edition, Dover, New York, 1954*; The Dover edition is an unabridged, slightly altered, republication of the third edition, published by the Clarendon Press in 1891.
 32. Freeman J. Dyson. Why is it so hard to understand Maxwell equations? <http://www.damtp.cam.ac.uk/user/tong/em/dyson.pdf>
 33. Arthur D. Yaghjian (2014) Reflections on Maxwell's Treatise. *Progress In Electromagnetics Research*, Vol. 149: 217–249.
 34. Swenson, Loyd S. (1970) "The Michelson–Morley–Miller Experiments before and after 1905," *Journal for the History of Astronomy*. 1(2): 56–78.
 35. Swenson, Loyd S. The Ethereal ether: A History of the Michelson-Morley-Miller Aether-drift Experiments, 1880-1930. The University of Texas – Austin, 2013. https://books.google.co.id/books/about/The_Ethereal_Aether.html?id=kQTUAAAAQBAJ&redir_esc=y
 36. Dayton Miller (1933) The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth", *Reviews of Modern Physics*, Vol.5(2): 203-242, July 1933. See also [36a] Dayton Miller (1928) untitled lecture in "Conference on the Michelson-Morley Experiment", *Astrophysical Journal*, LXVIII:341-402, Dec. 1928; also in *Contributions From the Mount Wilson Observatory*, No.373, Carnegie Institution of Washington
 37. James DeMeo. Dayton J. Miller revisited (2011) In *Should the Laws of Gravitation be Reconsidered?* Hector Monera (Ed.) Apeiron, Montreal 2011, 11.285-315. <http://www.orgonelab.org/demeopubsPDFs/2011Miller.pdf>
 38. M. Consoli & A. Pluchino (2018) Michelson-Morley Experiments: *An Enigma for Physics and the History of Science*. World Scientific, 2018. <https://www.worldscientific.com/worldscibooks/10.1142/11209>
 39. Sinha, Sivaram, Sudharsan (1976) Aether as a superfluid state of particle-antiparticle pairs. *Foundations of Physics*, Vol. 6, No. 1.
 40. Sinha (1985) Bose condensation of particle-antiparticle systems. *Pramana – J. Phys.* Vol. 25.
 41. F. Smarandache. *A Unifying Field in Logics: Neutrosophic Logic. Neutrosophy, Neutrosophic Set, Neutrosophic Probability (sixth edition)*. <http://fs.unm.edu/eBook-Neutrosophics6.pdf>
 42. G. Le Bon (1909) *Evolution of matter*. The Walter Scott Publishing Co., Ltd. (London) Ch. Scribner's Sons (New York), 1909. : <http://rexresearch.com/lebonmat/lebonmat.htm>
 43. Lasha Berezghiani and Justin Khoury (2015) Dark Matter Superfluidity and Galactic Dynamics. arXiv:1506.07877 (2015)
 44. Mehmet Guenduez et al (2019) A Novel Analytical Model of the Magnetic Field Configuration in the Galactic Center Explaining the Diffuse Gamma-Ray Emission. *PLoS*. arXiv:1909.08379v1 [astro-ph.GA] 18 Sep 2019.
 45. V. Christianto, F. Smarandache, R.N. Boyd (2020) An expanded model of unmatter from Neutrosophic Logic perspective. *Intr. Journal of Neutrosophic Science* vol. 10, no. 1 (2020), pp. 65-72. url: An Expanded Model of Unmatter from Neutrosophic Logic perspective: Towards Matter-Spirit Unity View

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