



Bijection Analysis of Physical Equations and Physical Models

Amrit Sorli

ABSTRACT

A bijective function $f : X \rightarrow Y$ is a function between the elements of two sets, where each element of one set is paired with exactly one element of the other set, and where each element of the other set is paired with exactly one element of the first set. We can define every physical equation as the set X and the corresponding physical reality that the equation describes as the set Y . Every element in a given equation is an element in the set X , and each element in set X should have exactly one paired element in the set Y . The bijective analysis confirms that Newtonian physics satisfies the bijective function. On the other hand, not all of the equations in the Theory of Relativity satisfy the bijective function. Additionally, the Higgs mechanism does not satisfy the bijective function.

Key Words: Bijective Function, Newton Physics, Theory of Relativity, Gravitational Waves, Higgs Mechanism, Holographic Mass, Proton's Schwarzschild Radius

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Introduction

In mathematics, a bijection, bijective function, or one-to-one correspondence is a function between the elements of two sets, where each element of one set is paired with exactly one element of the other set, and each element of the other set is paired with exactly one element of the first set.

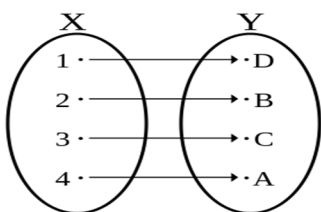


Figure 1. A bijective function, $f: X \rightarrow Y$, where set X is $\{1, 2, 3, 4\}$ and set Y is $\{A, B, C, D\}$. For example, $f(1) = D$

Let's analyse one of the most fundamental equations with the help of bijective function:

$$d = v \cdot t \tag{1}$$

where d is distance, v is velocity, and t is time as the duration of motion on distance d .

In equation (1), every element of set X corresponds to exactly one element in the set Y . Between equation (1) and physical reality there is a one-to-one bijective correspondence with physical reality. Equation (1) is a 100% exact picture of physical reality. The same is valid for all equations of Newtonian physics.

In order to rescue the ether model, Lorentz developed a formula for length contraction:

$$L = \frac{L_0}{\gamma} \tag{2}$$

where L_0 is proper length, L is the length of a moving object and γ is the Lorentz factor.

Corresponding author: Amrit Sorli

Address: Foundations of Physics Institute, Slovenia

e-mail ✉ sorli.amrit@gmail.com

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Length contraction has never been observed nor measured in physical reality. We do not have any experimental data that length contraction actually exists in physical reality. Between formula (2) and physical reality there is no bijective correspondence. We cannot assume that formula (2) is a 100% exact picture of physical reality. Lorentz did not explain, (nor has anyone ever explained) the physical circumstances that would cause length contraction. For more than 100 years formula (2) has been accepted in physics as if it had bijective correspondence with physical reality, even though it does not.

Space-time model has no bijective correspondence with physical reality

For 100 years in physics it has been fully accepted that time is the 4th dimension of space. However, bijective analysis confirms that time is not the 4th dimension of space; rather, time is the duration of motion in space (Fiscaletti, Sorli, 2015). Thus, the element of »coordinate time« in Special Relativity has no bijective correspondence with physical reality. Likewise, the formula (3) below has no bijective correspondence with physical reality:

$$X_4 = ict \tag{3}$$

where X_4 is meant to be the 4th dimension of space, i is an imaginary number, c is light speed, and t is time as duration. In order to make the formula more "realistic" physicists removed the i and the formula became:

$$X_4 = ct \tag{4}$$

Formula (4) is equal to formula (1) and has bijective correspondence with physical reality if X_4 represents distance in space. But physicists were convinced that X_4 is the time coordinate, and so they replaced light speed c (which is constant) with the number 1 and they got:

$$X_4 = t \tag{5}$$

In formula (5) time has become distance, which has no bijective correspondence with physical reality.

Bijective analysis confirms that the Minkowski manifold interpreted as 3D + T (e spatial dimensions and 1 temporal dimension) has

no bijective correspondence with physical reality. We are not living in space and time, we are living only in a 4D space. The universe exists only in space, and time, when measured, is the duration of motion in space. In space is always NOW (Sorli *et al.*, 2017b).

Time dilation has bijective correspondence with physical reality

GPS systems confirm that clocks on satellites have a slower rate than the clocks on the Earth's surface by 7 microseconds per day (NASA, 2014). The formula that describes time dilation has bijective correspondence with physical reality:

$$t = t_0 \cdot \gamma \tag{6}$$

where t is the time on the satellite, t_0 is the time on the Earth's surface and γ is the Lorentz factor. Time dilates in the sense that the rate of the clocks and the velocity of all physical changes becomes slower. Formula (6) does not mean that time, as the fourth coordinate of space, could dilate so that light would then need more time to pass the distance from point A to point B in space. The Shapiro experiment, which confirms that in a strong gravitational field light speed is slightly diminished, is explained as "gravitational time dilation," in the sense that time, as the 4th coordinate of space, is conceived to be dilating in the relatively stronger gravitational field, which then causes light to need more time to move from A to B. However, this imagined "gravitational time dilation" has no bijective correspondence with physical reality. What really happens is that in a relatively stronger gravitational field the permittivity and permeability of space changes, which changes then minimally diminish the velocity of light:

$$c = \frac{1}{\epsilon_0 \mu_0} \tag{7}$$

where ϵ_0 is electric permittivity and μ_0 is magnetic permeability. The minimal variability of light speed does not contradict Special Relativity; it only confirms that gravity has an influence on light speed.



Dilation and contraction of space have no bijective correspondence with physical reality

General Relativity predicts that space can be dilated and contracted by gravitational waves (Tiec, Novak, 2017), which were discovered in (Abott *et al.*, 2016). However, the idea that a gravity wave could shrink and dilate space and therefore affect the beams of the LIGO interferometer, has no bijective correspondence with the physical world. Dilation and contraction of space have never been directly observed. What was observed in LIGO is that laser light has minimal time dilation and minimal time contraction. It is not that the beams of the interferometer are changing length; rather, what actually happens in LIGO is that the gravity wave changes the permittivity and permeability of space which in turn then causes the minimal variations of laser light speed as we have seen in chapter 3.

Higgs mechanism has no bijective correspondence with physical reality

The Higgs mechanism has its origin in supersymmetry (SUSY), which is an extension of the Standard Model: "Supersymmetry predicts a partner particle for each particle in the standard model, to help explain why particles have mass. At first sight, the Standard Model seems to predict that all particles should be massless, an idea at odds with what we observe around us. Theorists have come up with a mechanism to give particles masses that requires the existence of a new particle, the Higgs boson" (CERN, 2018). There is no experimental data that proves that SUSY has bijective correspondence with physical reality. Additionally, the model of the Higgs field has no bijective correspondence with physical reality. At CERN they discovered that the Higgs boson is a momentary characteristic flux of energy with life time $1,56 \cdot 10^{-22} s$ released by the collision of two protons. Frankly, bijective analysis confirms that the existence of the Higgs boson does not prove the existence of the Higgs field. Between the discovery of the Higgs boson and the existence of the Higgs field there is a huge "bijective gap."

The assumption of Higgs mechanism: "Must be a field which gives mass to the particles", seems not right. The right assumption is: "Must be a field which gives inertial mass to the particles". In this article it is shown that the field that gives inertial mass to the particles is space itself, namely, its variable energy density. Inertia of

elementary particles which fully respects mass-energy equivalence is solved with the introduction of Euclidean-Planck metrics of space (EPM) (Sorli *et al.*, 2018). In EPM the inertia of a given massive particle, massive body, or stellar object has its origin in the diminished energy density of space ρ_{SE} in the centre of a given physical object, which causes outer higher pressure of space with Planck energy density ρ_{PE} towards the centre of given physical object:

$$\rho_{SE} = \rho_{PE} - \frac{mc^2}{V} \quad (8) [7],$$

where m is the mass of the object, c is the light speed and V is its volume.

We can rearrange formula (8) and we get:

$$m = \frac{(\rho_{PE} - \rho_{SE}) \cdot V}{c^2} \quad (9).$$

The inertial mass m_i of a given massive particle with mass m has its origin in the diminished energy density of space in its centre. The value of inertial mass m_i is equal to the value of its mass m :

$$m_i = m = \frac{(\rho_{PE} - \rho_{SE}) \cdot V}{c^2} \quad (10).$$

Actually we define the amount of mass m of a given physical object by measuring its inertial mass m_i .

Formula (9) shows a given physical object with mass m diminishes the energy density of space exactly according to the amount of its energy E . We can express this by multiplying the formula by c^2 and we get:

$$E = mc^2 = (\rho_{PE} - \rho_{SE}) \cdot V \quad (11).$$

The right part of equation (11) has bijective correspondence with physical reality, because the idea of 20th century physics that space is empty and deprived of physical properties is false. Bijective analysis confirms that matter is energy and that matter exists in space, which means that space also is energy (Sorli *et al.*, 2018). NASA research confirms that universal space has a Euclidean shape (NASA, 2014), which means that the curvature of space in General Relativity is a



mathematical description of variable energy density of space (Fiscaletti and Sorli, 2014), which is its real physical property. Equation (11) is in accord with Einstein view on mass and energy: "Mass of a body is a measure of its energy-content" (Einstein 1916).

Quarks, Higgs boson, W and Z bosons are not "particles" as are protons, electrons, and photons

Particle physics research methodology for the last fifty years has primarily involved the scattering and collision of known particles, for example protons, as a way of search for previously unknown particles. Some of these previously unknown particles have extremely short lifetimes, which calls into question whether or not these particles have any real physical existence outside the context of the experimental environment of colliders. In this chapter we will challenge the objective existence of quarks, W and Z bosons.

The research methodology of scattering and collision generally involves shooting particles (for example protons) at targets (or between them in LHC), thereby smashing them and then observing the new particles that are created. These newly created particles have extremely short lifetimes. For example, the top quark lifetime is $5 \cdot 10^{-25} s$, the W and Z boson lifetimes are about $3 \cdot 10^{-25} s$, and the Higgs boson lifetime is $1,56 \cdot 10^{-22} s$. In our scientific imagination or conception, the term "subatomic particle" is usually associated with some element (a quark for example) that is a consistent part of a particle, such as a proton, that is itself extremely stable. The question arises: do quarks have an existence on their own? Put another way, are quarks real elements of the proton, or are they only characteristic fluxes of energy, or a particular pattern of energy, that is consistently released by scattering and collision? In this chapter this question will be examined in some detail.

A proton is a stable particle the lifetime of which is $2,1 \cdot 10^{29} s$. The existent description of the proton in the Standard Model is known: a proton is composed of two up quarks and one down quark which are bound together with gluons. When we "smash" the proton we observe quarks as its composite parts. We will present an alternative model of the proton as a vortex of space energy in the form of a torus where space energy is circulating in a closed torus loop. Proton

energy circulation creates its electric positive charge and magnetic momentum. The idea that the torus is the fundamental form in the universe is becoming actual in scientific thought (Meijer and Gesing 2016; Meijer and Gesing 2017). The idea that the proton could be in the form of torus is also entering physics (Piskounova 2017). A proton as the vortex of space energy in torus form has no composite parts; a photon is one unit, which when smashed falls apart in characteristic fluxes of energy which we observe as quarks. In the proton itself, there are no quarks and there are no gluons which would bind together quarks. Gluons are characteristic "sparkles" of energy released when a proton is smashed; they are not its composite parts.

A neutron, when not helping to compose the nucleus of an atom, is unstable, with a lifetime of $881,5 \pm 1,5 s$. A neutron decays into a proton and electron. The conception that the neutron is a consistent part of the nucleus has no bijective correspondence with physical reality, because a neutron alone is unstable and is composed of a proton and electron. A neutron is not particle in the sense of having a "stable life time," as for example a proton, or a photon which life time is about $10^{18} years$, or an electron which life time is about $6,6^{28} years$. Proton, electron and photon are particles in the sense of being composite parts of atoms. On the other hand, gluons and quarks seem not to be "particles" in the sense of being composite parts of atoms.

From this perspective W bosons in Z bosons which life time is about $3 \cdot 10^{-25} s$ are also not "particles," as are the proton, electron and photon. Rather, W bosons in Z bosons are momentary fluxes of energy characteristic of the weak interaction.

In general bijective analysis of Higgs boson, W and Z bosons and gluons, all of which have extremely short lifetimes, confirms that these physical entities are momentary energy fluxes and cannot be considered as "particles," which are constitutive elements of atoms.

Recent research speculates that the Higgs boson, which constitutes the Higgs field, appears before inflation (according to the Big Bang theory) and that the coupling of the Higgs field with gravitation causes accelerated expansion of the universe (Brezukov, 2014). Our research confirms that the radius of the universe in the Big Bang model is too small for the rate 10^4 to be placed in



existent mapped universe and that the inflation signal would still be 32,9 billion light years distant from the planet Earth (Sorli *et al.*, 2018). The Big Bang model has no scientific validity and also weakens the validity of the existence of the Higgs field, which is also extremely weak from the point of epistemology (Sorli, Kaufman, 2018).

Variable energy density of space and vortex model of elementary particles

In this article a model of the proton is presented in which the proton, as a vortex of space, is the only particle which has inertial mass. In the centre of the proton vortex the energy density of space ρ_{SE} is lower, and that causes the outside pressure of space where energy density has the Planck value ρ_{PE} . Inertial mass m_i of the proton is equal to its mass in the Einsteinian sense: "Mass of a body is a measure of its energy-content" (Einstein, 1916). Einstein has proved in his General Theory of Relativity that inertial mass m_i and gravitational mass m_g of a given physical object are equal. The formula below which is derived from (9), clearly express the relation between proton mass, proton inertial mass, and proton gravitational mass:

$$m_i = m_g = m = \frac{(\rho_{PE} - \rho_{SE}) \cdot V}{c^2} \quad (12).$$



Figure 2. Proton is a vortex of space energy in the form of torus

Calculation of diminished energy density of space ρ_{SE} in the centre of the proton vortex in empty space far away from stellar objects is following:

- Planck energy density $\rho_{PE} : 4,633 \cdot 10^{113} J / m^3$
- Mass of the proton $m_p : 1,6727 \cdot 10^{-27} kg$
- Volume of the proton: $V_p = 2,5 \cdot 10^{-45} m^3$

Formula for energy density of space ρ_{SE} in the centre of proton vortex we derive from formula (12):

$$\rho_{SE} = \rho_{PE} - \frac{m_p \cdot c^2}{V} \quad (13).$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J / m^3 - \frac{1,6727 \cdot 10^{-27} kg \cdot (299792458 ms^{-1})^2}{2,5 \cdot 10^{-45} m^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J / m^3 - \frac{1,6727 \cdot 10^{-27} kg \cdot 8,99 \cdot 10^{16} m^2 s^{-2}}{2,5 \cdot 10^{-45} m^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J / m^3 - \frac{15,04 \cdot 10^{-11} J}{2,5 \cdot 10^{-45} m^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J / m^3 - 6,015 \cdot 10^{34} J / m^3$$

$$\Delta_{space.energy.density} = \rho_{PE} - \rho_{SE} = 6,015 \cdot 10^{34} J / m^3$$

In the centre of a proton the vortex energy density of interstellar space is smaller than the outer Planck energy density of space of $6,015 \cdot 10^{34} J / m^3$. Protons are continuously created throughout universal interstellar space out of space energy. In black holes the energy density of space is at the minimum, which causes proton to become unstable and disintegrate back into the energy of space. The value of the energy density of space in the centre of a black hole with the mass of the Sun is smaller than in outer intergalactic space by $1,582 \cdot 10^{36} J / m^3$ (Sorli *et al.*, 2018). The idea that a proton could be a kind of mini black hole [16] is not in accord with the calculations above and disagree with regard the energy density of space in the centre a of proton vortex and in the centre of a black hole for the value:

$$\Delta_{BLACKHOLE.CENTRE-PROTON.CENTRE} = 1,582 \cdot 10^{36} - 6,015 \cdot 10^{34} J / m^3$$

$$\Delta_{BLACKHOLE.CENTRE-PROTON.CENTRE} = 1,522 \cdot 10^{36} J / m^3 ,$$

which is an error of magnitude 10^{36} . Building a model of mass of the proton on the proposition that proton is a mini black hole, leads to conclusions that do not seem to have correspondence with the physical reality of the proton, namely: "The mass of the proton can be described as the exchange of information across the boundary of its Event Horizon, and that its gravitational mass is equivalent with the strong force when special relativity and mass dilation is considered" (Haramain, 2013). Schwarzschild radius of the proton is mathematical construct with no correspondence to any physical reality. We can calculate Schwarzschild radius for the Sun which is 3000 meters, but we have to understand that this calculation has no physical meaning,



because Sun will never develop into a black hole. Recent research confirms Sun will develop into red giant and further on in white dwarf (Gesicki *et al.*, 2018). The calculation of Schwarzschild radius of Sun just helps us to understand theoretically how a star as our Sun has to be compressed in order to reach the diminished energy density of the space in its centre which is characteristic for a black hole (see figure 4 in this chapter). Recent research confirms that for a star to become a black hole 2,16 solar masses is needed. If the star has less mass than 2,16 solar masses it will develop into a neutron star (Rezzolla *et al.*, 2108). The famous formula for Schwarzschild radius was developed by German astronomer Karl Schwarzschild back in 1916:

$$r_s = \frac{2GM}{c^2} \quad (14),$$

where r_s is Schwarzschild radius, G is gravitational constant, and M is the mass of a star. Discovery of Rezzolla confirms that formula (14) has physical meaning when condition (15) is fulfilled:

$$M \succ 2,16 \cdot M_{Sun} \quad (15).$$

Bijective analysis confirms that the model of proton as a black hole has no bijective correspondence with the physical world. Regarding the idea of proton having Schwarzschild radius as something that has physical existence, the famous quote of Nicola Tesla is fully justified: "Today's scientists have substituted mathematics for experiments, and they wander off through equation after equation, and eventually« build a structure which has no relation to reality".

We can develop formula (12) in the following formula:

$$\rho_{SE} = \rho_{PE} - \frac{3m \cdot c^2}{4\pi \cdot (r + d)^3} \quad (16),$$

where m is the mass of the material object, r is radius of the material object and d is the distance from the centre of the material object to a given point T (see figure 3 below). When $d = 0$, one gets energy density of space in the centre of the stellar object. When $d \succ 0$, one gets energy density of space at the point T which is at the distance d from the centre. We can imagine that

the radius of the stellar object is extended for distance d to the imaginary point T* and its volume is increased respectively. Because of the increased imaginary volume of the stellar object, the value of the energy density of space in its centre becomes bigger and is increases in the direction away from the centre. By using this imaginary volume we will actually calculate the energy density of space at the real point T. When $d = r$, one gets energy density of space on the surface of the stellar object. When $d = \infty$, one gets energy density of space in intergalactic space far away from stellar object which is Planck energy density ρ_{PE} .

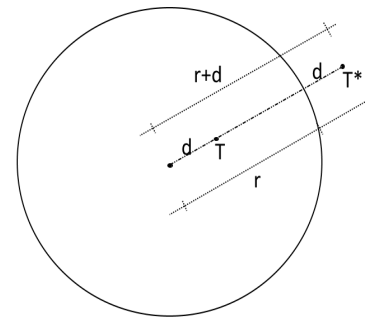


Figure 3. Energy density of space of a given point T from its centre

The calculation of the energy density of space on the Earth's surface is as follows:

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{3 \cdot 5,97219 \cdot 10^{24} kg \cdot (299792458 ms^{-1})^2}{4\pi \cdot (2 \cdot 6371000m)^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{17,91657 \cdot 10^{24} kg \cdot 8,99 \cdot 10^{16} m^2 s^{-2}}{4\pi \cdot (2,07 \cdot 10^{21} m)^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{161,07 \cdot 10^{40} m^2 s^{-2}}{26,012 \cdot 10^{21} m^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - 6,192 \cdot 10^{19} J/m^3$$

$$\Delta_{space.energy.density} = \rho_{PE} - \rho_{SE} = 6,192 \cdot 10^{19} J/m^3.$$

The calculation of the energy density of space at the Earth's centre is as follows:

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{3 \cdot 5,97219 \cdot 10^{24} kg \cdot (299792458 ms^{-1})^2}{4\pi \cdot (6371000m)^3}$$



$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{17,91657 \cdot 10^{24} kg \cdot 8,99 \cdot 10^{16} m^2 s^{-2}}{4\pi \cdot (2,586 \cdot 10^{20} m)^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - \frac{161,07 \cdot 10^{40} m^2 s^{-2}}{3,250 \cdot 10^{21} m^3}$$

$$\rho_{SE} = 4,633 \cdot 10^{113} J/m^3 - 49,56 \cdot 10^{19} J/m^3$$

We see here that the space energy density on the Earth's surface is smaller than the space energy density in outer space (which is Planck energy density $\rho_{PE} = 4,633 \cdot 10^{113} J/m^3$) by a value of $6,192 \cdot 10^{19} J/m^3$. On the Earth's surface in the centre of a proton vortex the space energy density is smaller by $6,015 \cdot 10^{-66} J/m^3$. Energy density of space in the centre of the Earth is $4,956 \cdot 10^{20} J/m^3$ smaller than Planck energy density. In the centre of black hole with the mass of the sun and radius of 3000 m energy density of space is smaller than Planck energy density for $1,582 \cdot 10^{36} J/m^3$.

Planck energy density P_{PE}	$P_{PE} = 4,6 \times 10E113 J/m^3$
Energy density on the Earth surface	$P_{PE} - 6,6 \times 10E19 J/m^3$
Energy density in the Earth centre	$P_{PE} - 4,9 \times 10E20 J/m^3$
Energy density in the centre of the proton	$P_{PE} - 6,0 \times 10E34 J/m^3$
Energy density in the centre of black hole	$P_{PE} - 1,6 \times 10E36 J/m^3$

Figure 4. Calculations of space energy density

In figure 4 we can see an extremely interesting thing; namely, the energy density at the centre of a proton is smaller than at the centre of the Earth. This gives a new interpretation of the "strong force" which binds together protons and neutrons.

At the range of $10^{-15} m$ (1 femtometer), the strong force is approximately 137 times as strong as electromagnetism, a million times as strong as the weak interaction, and 10^{38} times as strong as gravitation. In the model proposed here, the strong force has its origin in the diminished energy density of space that exists at the centre of a proton's vortex. The gravitational force F_g between stellar objects and the strong force inside

an atom's nucleus both have origin in the diminished energy density of space where protons and neutrons are pushed together in the same way as stellar objects via the pressure of the higher energy density of outer space towards lower the energy density of the space around the stellar objects, according to the famous Newton formula:

$$F_g = \frac{m_1 \cdot m_2 \cdot G}{r^2} \quad (17),$$

where m_1 is the amount of space energy incorporated in the first stellar object, m_2 is the amount of space energy incorporated in the second stellar object, G is the gravitational constant, and r is the distance between the centres of the stellar objects:

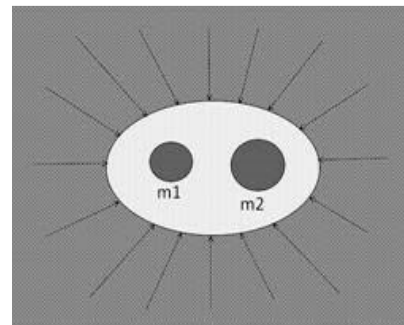


Figure 5. Gravity as the result of the higher outer pressure of space

The diminishing of the space energy density towards the centre of a given massive object is a missing model of today physics, which gives us a clear understanding about the relation: "massive object - space". The concept of the energy density of space in this article has bijective correspondence with the curvature of space utilized in General Relativity. Specifically, the greater the energy density of space the less is its curvature, whereas the less dense space is the greater is its curvature (Fiscaletti, Sorli 2015; Fiscaletti, Sorli 2017).

Neutron when alone is not stable and is not stable vortex as proton, electron and photon. Neutron is not fundamental primordial vortex; it is composed of proton vortex and electron vortex. Photon is also vortex of space energy. Elementary vortexes with stable lifetimes (proton, electron and photon) we can name "real particles" in the sense that they exist on their own as the constitutive elements of the universe. Particles



with short lifetimes are only characteristic fluxes of energy which are released in a given physical process. For example, the lifetime of pions (or “pi mesons”, denoted with Greek letter π) is $2,6033 \cdot 10^{-8} s$. We should not consider that pions are particles in the same way that protons, electrons and photons are considered to be particles.

SUSY, which predicts the existence of supersymmetry where every particle has its partner particle, is as we have seen in chapter 5, an incorrect model. The supersymmetry in the universe is not between particles, it is between the mass of the proton and the diminished energy density of space in the centre of the proton vortex. This symmetry is universal from the micro to the macro scale; it gives origin to the inertial mass of the proton, the inertial mass of an atom’s nucleon, and the inertial mass of a given physical object or stellar object.

One could ask: How it is possible that space has such a high energy density and we cannot detect it? The answer is as follows: the energy of space is the primordial energy of the universe, and syntropy is one of its characteristics (Sorli *et al.*, 2016; Sorli *et al.*, 2017b). Protons, electrons, and photons are vortexes made of this syntropic energy, which is what allows them to have such an extended lifetime. Entropy starts with the atoms which, in the course of universal dynamics, have the characteristic of increasing entropy as we progress up the ladder from helium to the atoms with big atomic numbers, and which atoms in black holes finally disintegrate back into the primordial syntropic energy of space (Sorli *et al.*, 2017b). Electrons do not fall into the nucleus of atoms because electrons are vortexes of space energy, and so are syntropic. Electrons do not get “exhausted” after spinning billions of years around a nucleus because electrons do not need (in the sense of classical mechanics) energy for their motion. In general we can say that universe is the “perpetual mobile” and that the energy of space is an inexhaustible source of energy.

Bijective analysis confirms syntropic space has actual 4 dimensions as already predicted by Einstein more than 100 years ago (he used term “4 dimensional continuum”). Einstein was aware that time is not 4th dimension of space. He said: “Time has no independent existence apart from the order of events by which we measure it.” However, he was not understood well until these days, namely, space continuum is 4D and matter is

3D. 3D material objects are somehow trapped in the areas of the diminished energy density of 4D space (as we can see in figure 5) which generates their inertial mass and gravitational mass. Inertia and gravity are not 3D phenomena, they are 4D phenomena.

With the introduction of 4D space as the fundamental syntropic energy of the universe, the theoretical foundations for “free energy technology” and antigravity have been laid. Once we are able to develop technology that makes it possible to increase the energy density of space, we will then be able to develop antigravity vehicles.

In this article it has been shown that the vortex model of elementary particles has a stronger bijective correspondence with the physical world than the Standard model, because the vortex model clearly describes the relation between mass (as the amount of energy incorporated in a given particle), inertial mass, and gravitational mass. Other researchers have proposed a vortex model of elementary particles where the mass and charge are global and indivisible properties of vortices (Rockenbeur, 2009). The vortex particle model presented in this article follows Ervin Schrödinger’s vision: “*What we observe as material bodies and forces are nothing but shapes and variations in the structure of space*” (Sorli *et al.*, 2018). The 20th century idea of physics that universal space has only geometrical properties, and is without physical properties, has lead modern physics into a “Standard model crisis,” where more and more new particles are discovered and yet still the unification of gravity with Standard model particle physics seems far away. The vortex model of the proton with variable energy density of space is a novel model in the unification of gravity with particle physics.

Conclusions

Bijective analysis is an indispensable tool for the validation of physical equations and physical models. For mathematical physics, successful testing with bijective analysis provides an assurance that a given physical equation or a given physical model is a 100% exact picture of the observed physical reality. In the absence of fully respecting bijective analysis, it is quite possible that described phenomenon exists only in the mind of the scientist without having the actual physical existence.



References

- Abbott BP, Abbott R, Abbott TD, Abernathy MR, Acernese F, Ackley K, Adams C, Adams T, Addesso P, Adhikari RX, Adya VB. Observation of gravitational waves from a binary black hole merger. *Physical Review Letters* 2016; 116(6): 061102.
- Bezrukov F, Shaposhnikov M. Higgs inflation at the critical point. *Physics Letters B* 2014;734:249-54.
- CERN, Supersymmetry, (2018) <https://home.cern/about/physics/supersymmetry>
- Meijer DK, Geesink HJ. Consciousness in the universe is scale invariant and implies an event horizon of the human brain. *NeuroQuantology* 2017;15(3): 41-79.
- Meijer DK, Geesink JH. Phonon Guided Biology. Architecture of Life and Conscious Perception Are Mediated by Toroidal Coupling of Phonon, Photon and Electron Information Fluxes at Discrete Eigenfrequencies. *NeuroQuantology* 2016; 14(4):718-55.
- Einstein A. Does the inertia of a body depend upon its energy-content. *Annalen der Physik* 1905; 18(13): 639-41.
- Fiscaletti D, Sorli A. Bijective Epistemology and Space-Time. *Foundations of Science* 2015; 20(4): 387-98.
- Fiscaletti D, Sorli A. Space-time curvature of general relativity and energy density of a three-dimensional quantum vacuum. *Annales Universitatis Mariae Curie-Sklodowska, sectio AAA-Physica* 2015; 69(1): 55-88.
- Fiscaletti D, Sorli A. Quantum vacuum energy density and unifying perspectives between gravity and quantum behaviour of matter. *Annales de la Fondation Louis de Broglie* 2017; 42(2): 251-97.
- Gesicki K, Zijlstra AA, Bertolami MM. The mysterious age invariance of the planetary nebula luminosity function bright cut-off. *Nature Astronomy* 2018:1.
- Haramain N. Quantum gravity and the holographic mass. *Physical Review & Research International* 2013; 3(4): 270-92.
- NASA https://map.gsfc.nasa.gov/universe/uni_shape.html (2014).
- Oldershaw RL. Hadrons As Kerr-Newman Black Holes, <https://arxiv.org/abs/astro-ph/0701006> (2010).
- Piskounova Olga, Rapidity Gaps in Double Diffraction Events at LHC as a Manifestation of String Junction Net on the Topology of Torus, <https://arxiv.org/pdf/1702.02769.pdf> (2017).
- Real-World Relativity: The GPS Navigation System (2017) <http://www.astronomy.ohio-state.edu/~pogge/Ast162/Unit5/gps.html>
- Rezzolla L, Most ER, Weih LR. Using gravitational-wave observations and quasi-universal relations to constrain the maximum mass of neutron stars. *The Astrophysical Journal Letters* 2018; 852(2): L25.
- Rockenbauer A. Can the spinning of elementary particles produce the rest energy $m c^2$? The vortex model of elementary particles <https://arxiv.org/ftp/arxiv/papers/0808/0808.1656.pdf> (2009)
- Sorli A, Fiscaletti D, Mageshwaran M. Advanced Relativity: Unification of Space, Matter and Consciousness. *NeuroQuantology* 2016; 14(4): 445-56 .
- Sorli A, Dobnikar U, Fiscaletti D, Koroli V. Advanced relativity: multidimensionality of consciousness and mind, origin of life, psi phenomena. *NeuroQuantology* 2017a; 15(2): 109-17.
- Sorli A, Kaufman S, Dobnikar U, Fiscaletti D. Advanced relativity for the renaissance of cosmology and evolution of life. *NeuroQuantology* 2017b; 15 (4): 37-44.
- Sorli A, Kaufman S. The Epistemological Crisis in Modern Physics. *NeuroQuantology*, 2018; 16 (2): 1-5.
- Sorli A, Dobnikar U, Patro SK, Mageshwaran M, Fiscaletti D. Euclidean-planck metrics of space, particle physics and cosmology. *NeuroQuantology* 2018; 16 (4): 18-25.
- Tiec A, Novak J. Theory of Gravitational Waves, (2017) <https://arxiv.org/pdf/1607.04202.pdf>.

