

# THE THEORY OF METARELATIVITY: BEYOND ALBERT EINSTEIN'S RELATIVITY

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## ABSTRACT

The theory of metarelativity is a system of equations written to take into consideration additional effects in the universe and about the matter inside it. The study begins with Albert Einstein's theory of special relativity and it develops a system of equations which lead us to further explanations and to a new physics paradigm. Like special relativity which was created in 1905 and then expanded later to general relativity to explain, among other things, the aberration in the motion of the planet Mercury and the gravitational lenses, metarelativity explains many phenomena like for example the nature of dark matter laying inside and outside galaxies and in the universe and the existence of supraluminal particles or tachyons and their corresponding dark energy. Metarelativity is a work of pure science which encompasses mathematics and fundamental physics. All the explanations are deduced from a new system of equations called the metarelativistic transformations that will be proven mathematically and explained physically. The facts and experiments that are noted in this theory come from a large series of astronomical observations taken far later than 1905 till now by reliable observatories in the world.

**Keywords:** Metarelativistic Transformations, Imaginary Number, Imaginary Dimensions, Metaparticles, Tachyons, Dark Matter, Metaenergy, Dark Energy, Metaentropy, Universe R, Metauniverse M, The Great Universe G

## 1. INTRODUCTION

Aczel (2000); Dalmedico *et al.* (1992); Einstein (1958; 2001); Feynmann (1980); Balibar and Einstein (2002); Hawking (2002; 2007; 2011) and Hoffmann (1972) I started working on this theory by expanding the Einstein-Lorentz equations of special relativity and assuming that the velocity of an inertial referential could be greater than the velocity of light. This idea is new in physics. I developed the new theory gradually and did a lot of reading till now and explained why astronomers have not observed yet particles that are moving with velocities greater than that of light as well as the nature and the existence of the mysterious dark matter and dark energy in the universe. This incited me to continue and to more elaborate the work below. In fact, no theory beholds and explains these observations in modern science since what we know in modern physics is the

Einstein's model that is special relativity and its expansion which is the general theory of relativity.

This new theory could be the new model to take into account the supraluminal particles undetected yet by our telescopes and explains the nature of dark matter and dark energy.

The theory of metarelativity takes its name from the original special relativity since the prefix 'meta' was added and this means 'what is beyond Einstein's relativity'. In fact, this work affirms the existence of a supraluminal matter absolutely since this is a new thing to us to assume velocities greater than light. As a matter of fact, Einstein's model states that light is the limit velocity that couldn't be surpassed.

The theory of metarelativity develops more the theory of relativity which was divided by Einstein into two parts:

- The special relativity
- The general relativity

Relativity is an outstanding theory written at the beginning of the 20th century. It deals with the velocity of light. The general one deals with gravitation and space-time. The theory is very elegant and considered as a marvelous work of abstraction. The special one uses the Euclidean geometry and is very simple. The general one uses the non-Euclidean geometry. So relativity uses both, the Euclidean and the non-Euclidean geometries. In the special relativity, we use the Einstein-Lorentz transformations to compute the velocity of inertial referentials relatively to each other and relatively to light. In the general one, we study gravitation and the effect of matter on the structure of space-time. The latter is an expansion of the first theory in which space-time stops being flat but starts to be curved due to the effect of light, matter and energy. In fact, matter and energy are equivalent according to Einstein in his theory and this is shown by the famous equation put by Einstein:

$$E = mc^2$$

Albert Einstein showed that light is the limit speed that a moving body could reach. In addition, matter affects the structure of space-time to make it curved and this is due surely to the interaction between matter and space-time. It is important to mention here that space and time are considered in the Einstein's model as one continuum where all interacting bodies move. What is more interesting is that energy converts into matter and matter into energy when acting in space-time.

Moreover, gravitation is shown by Einstein to be as a fictitious force and is the consequence of inertia. In fact, the principle of inertia states that a moving body continues to move in a straight line if no action was done on the body (free motion). Albert Einstein was accurate in determining the effect of the curvature of space-time and calculated the curvature of space-time near the sun and hence predicted the discrepancy in the position of distant stars and the anomalies in the motion of the planet Mercury which is the nearest planet to the sun in the solar system. Einstein used also his theory to estimate the form of the universe and the galaxies inside it.

Furthermore, Einstein noted in his photoelectric theory that photons are the particles of light and that their velocity is accordingly the velocity of light denoted by 'c' for short. He excelled in his theory when he

discovered the photoelectric effect where photons hit electrons like two moving balls and this yields an electric current like in wires due to the action made by the photons on the electrons.

In addition, all the concepts used by Einstein were very easy and very clear except perhaps the identification of gravitation to inertia in accelerating referentials which needs a little bit of abstraction and meditation. What should be noted in addition is that both theories (special and general relativity) are expansions of the model created by Sir Isaac Newton in his mechanics and his theory of gravitation.

As a matter of fact, all the three theories written: The mechanics of Isaac Newton in the 17th century, the special relativity and the general relativity in the twentieth century, were paradigms to represent and understand the universe. They were in fact complex theories that try to explain the universe in which all matter interacts.

Finally, the theory of metarelativity is an attempt to expand this paradigm another time by increasing matter velocity to greater than the velocity of light like in outer space and artificially in gigantic accelerators which accelerate particles to test the interactions of modern physics.

### 1.1. The Theory

Einstein (2001); Balibar and Albert (2002); Hawking (2002; 2007; 2011); Hoffmann (1972) and Penrose (2004) the transformations of the theory of special relativity known as Einstein-Lorentz transformations are:

$$\left\{ \begin{array}{l} x' = \frac{(x - vt)}{\sqrt{1 - \frac{v^2}{c^2}}} \\ y' = y \\ z' = z \\ t' = \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{1 - \frac{v^2}{c^2}}} \end{array} \right.$$

It is important to mention that the referentials used are inertial referentials (they are not accelerating) and their relative velocity is smaller than the velocity of light ( $v < c$  for short) (**Fig. 1**) and we say that  $k = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$  and is called the factor of transformation.

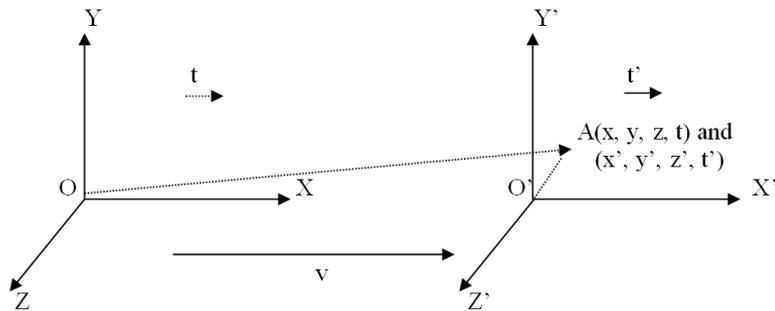


Fig. 1. Two inertial referentials

Assume that  $v$  becomes greater than  $c$ , the system of equations called the metarelativistic transformations becomes:

$$\left\{ \begin{aligned} x' &= \frac{(x - vt)}{\sqrt{(-1) \times \left(\frac{v^2}{c^2} - 1\right)}} = \frac{(x - vt)}{\sqrt{-1} \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{(x - vt)}{\sqrt{i^2} \times \sqrt{\frac{v^2}{c^2} - 1}} \\ &= \frac{(x - vt)}{\pm i \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{\pm i \times (x - vt)}{\sqrt{\frac{v^2}{c^2} - 1}} \\ &\qquad y' = y \\ &\qquad z' = z \\ t' &= \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{(-1) \times \left(\frac{v^2}{c^2} - 1\right)}} = \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{-1} \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{i^2} \times \sqrt{\frac{v^2}{c^2} - 1}} \\ &= \frac{\left(t - \frac{vx}{c^2}\right)}{\pm i \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{\pm i \times \left(t - \frac{vx}{c^2}\right)}{\sqrt{\frac{v^2}{c^2} - 1}} \end{aligned} \right.$$

With,  $i$  is the imaginary number where  $i^2 = -1$  and equivalently  $\frac{1}{i} = -i$  and  $\frac{1}{-i} = i$ , as well  $\sqrt{-1} = \sqrt{i^2} = \pm i$ .

We say that  $k_i = \frac{\pm i}{\sqrt{\frac{v^2}{c^2} - 1}}$  is the new factor of

transformation.

These are the metarelativistic transformations. It is important to mention here that the first system of Einstein-Lorentz equations correspond to the universe R where all the quantities are real. R is nothing but our ordinary four dimensional universe. In the second and new system of metarelativistic equations, metarelativity

opens the door to complex numbers and transformations and therefore defines the new imaginary four dimensions called the universe M or for short: Metauniverse.

### 1.2. The Mass and Metamatter

Albert and Franc (1979); Einstein (2001); Hawking (2002; 2007; 2011); Hoffmann (1972) and Pickover (2008) we have in special relativity:

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

where,  $m_0$  is the rest mass of the body and  $m$  is the mass of the body while moving with the velocity  $v$ .  $v$  is here smaller than  $c$ .

If  $v$  becomes greater than  $c$ , then  $m$  becomes equal to:

$$\begin{aligned} m &= \frac{m_0}{\sqrt{(-1) \times \left(\frac{v^2}{c^2} - 1\right)}} = \frac{m_0}{\sqrt{-1} \times \sqrt{\frac{v^2}{c^2} - 1}} \\ &= \frac{m_0}{\sqrt{i^2} \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{m_0}{\pm i \times \sqrt{\frac{v^2}{c^2} - 1}} = \frac{\pm i \times m_0}{\sqrt{\frac{v^2}{c^2} - 1}} \end{aligned}$$

Yielding hence two imaginary and supraluminal particles  $+im$  and  $-im$ . They are called imaginary in the sense that they lay in the four dimensional supraluminal universe that we called previously M or the metauniverse.

Matter which has increased throughout the whole process of special relativity will become equal to infinity when velocity reaches  $c$  as it is apparent in the equations and in the new dimensions matter is imaginary due to the imaginary dimensions that we defined in the theory of metarelativity. We say that beneath  $c$  we are working in

R or in the universe and beyond c that we are working in M or the metauniverse.

Firstly in the first following Equation:

$$m = \frac{-im_0}{\sqrt{\frac{v^2}{c^2} - 1}}$$

We say mathematically, that if v tends to infinity, m tends to zero. Matter now will continue increasing as in the equation till it vanishes whenever the velocity reaches infinity that means that mass is equal to zero at the velocity infinity.

Secondly in the second following Equation:

$$m = \frac{+im_0}{\sqrt{\frac{v^2}{c^2} - 1}}$$

Matter now will continue decreasing till it vanishes whenever the velocity reaches infinity that means that mass is equal to zero at the velocity infinity. The following graph illustrates these two facts (Fig. 2).

Graphically, we can represent the two complementary metaparticles + im and -im by.

These metaparticles are faster than light and are called in literature tachyons. They are nothing but the particles of dark matter. In fact in the complex plane we have + im is in one direction and -im is in the opposite direction. Like ordinary matter and antimatter in the real universe, + im and - im can annihilate yielding a real particle in our universe denoted by R (Fig. 3). Due to the existence of metaparticles in another imaginary four dimensional universe M relatively to our 'real' universe R, they are very weakly interacting with real particles in R. This is why we used to call the metaparticles: WIMPs or Weekly Interactive Massive Particles and why they are so difficult to capture in our 'real' laboratories and accelerators that exist surely in R.

If we replace  $\pm i \times m_0$  by  $m_{0,t}$  (t is the symbol of the transformation), this gives:

$$m_t = \frac{m_{0,t}}{\sqrt{\frac{v^2}{c^2} - 1}}$$

If  $m_t = m_{0,t}$  then we get:

$$\begin{aligned} m_t = m_{0,t} &= \frac{m_{0,t}}{\sqrt{\frac{v^2}{c^2} - 1}} \Rightarrow 1 = \frac{1}{\sqrt{\frac{v^2}{c^2} - 1}} \Rightarrow \sqrt{\frac{v^2}{c^2} - 1} = 1 \\ \Rightarrow \frac{v^2}{c^2} - 1 &= 1^2 = 1 \Rightarrow \frac{v^2}{c^2} = 2 \Rightarrow v^2 = 2c^2 \\ \Rightarrow v &= c\sqrt{2} \end{aligned}$$

That means that the starting mass which is  $m_{0,t}$  in the metauniverse M, occurs when  $v = c\sqrt{2}$ . The starting mass in the universe R is got when  $m = m_0$  and its corresponding velocity is  $v = 0$  as it follows from the following equation:

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

If  $m = m_0$  then we get:

$$\begin{aligned} m = m_0 &= \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow 1 = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \Rightarrow \sqrt{1 - \frac{v^2}{c^2}} = 1 \\ \Rightarrow 1 - \frac{v^2}{c^2} &= 1^2 = 1 \Rightarrow \frac{v^2}{c^2} = 0 \Rightarrow v^2 = 0 \\ \Rightarrow v &= 0 \end{aligned}$$

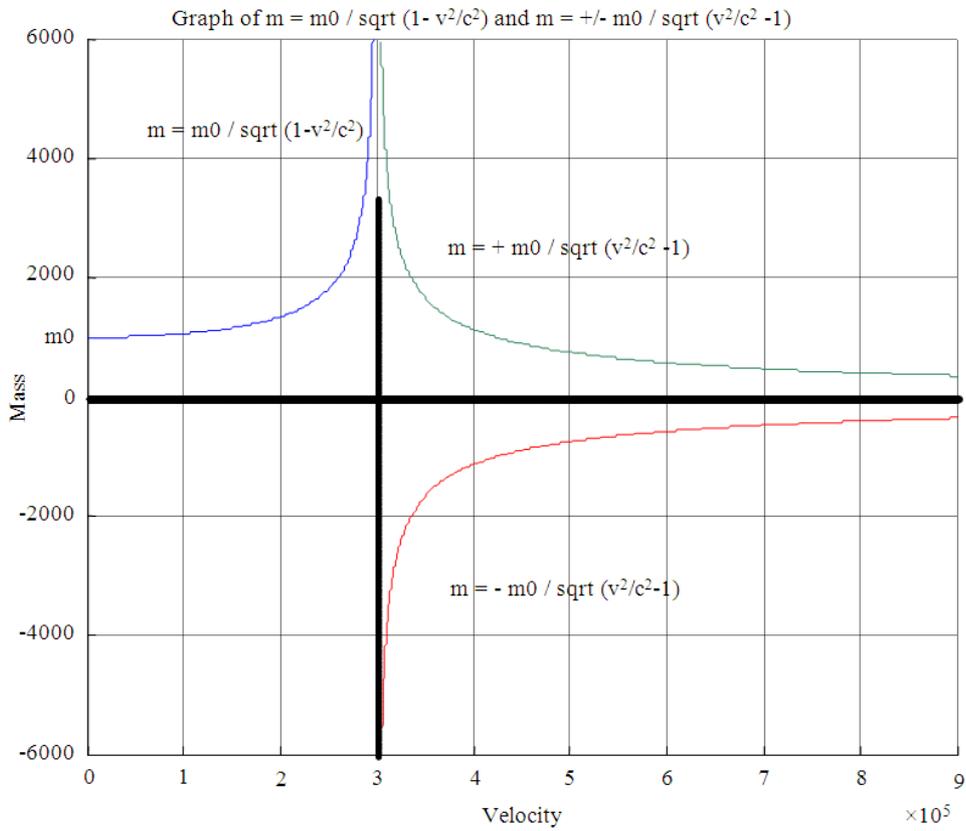
### 1.3. The Energy and the Metaenergy

Albert and Franc (1979); Einstein (2001); Hawking (2002; 2007; 2011); Hoffmann (1972) and Pickover (2008) we know from special relativity that energy is given by:

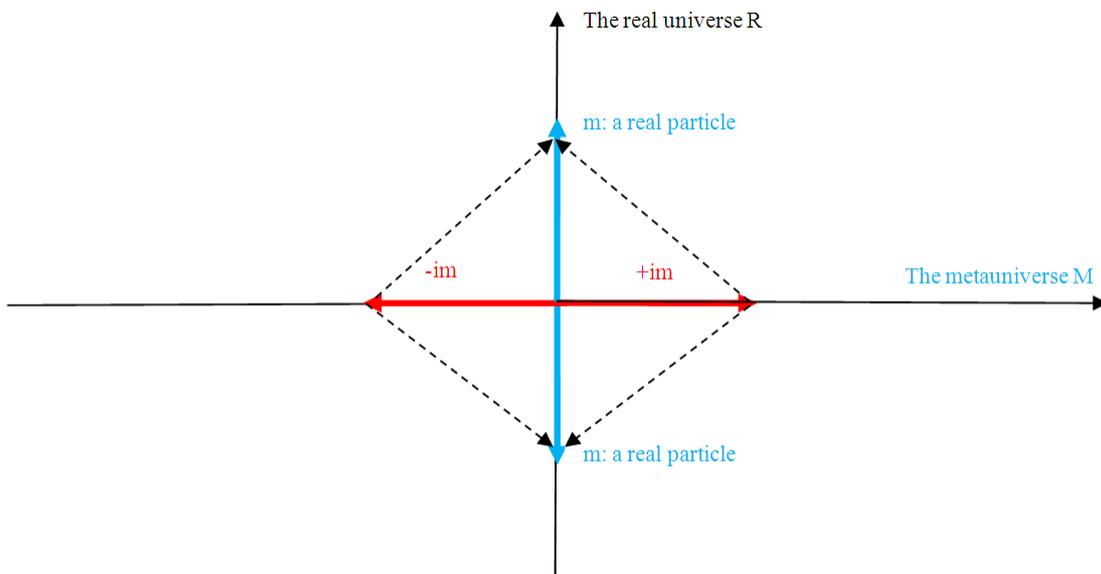
$$E = mc^2 = \frac{m_0 c^2}{\sqrt{1 - \frac{v^2}{c^2}}}$$

In metarelativity we have accordingly the imaginary energy or metaenergy given by:

$$E = \frac{\pm im_0 \times c^2}{\sqrt{\frac{v^2}{c^2} - 1}} = \frac{m_{0,t} \times c^2}{\sqrt{\frac{v^2}{c^2} - 1}} = E_t$$



**Fig. 2.** The graphs of matter and metamatter functions



**Fig. 3.** The two complementary particles of metamatter and their annihilation

(t is the symbol of the transformation).

This metaenergy is nothing but the dark energy that exists in the universe. It is clear from the equation above that this metaenergy can be positive as:

$$E = \frac{+im_0 \times c^2}{\sqrt{\frac{v^2}{c^2} - 1}}$$

Or it can be negative as:

$$E = \frac{-im_0 \times c^2}{\sqrt{\frac{v^2}{c^2} - 1}}$$

### 1.4. Time Intervals and Imaginary Time

Barrow (2006; 1992); Albert and Franc (1979); Einstein (2001); Hawking (2002; 2005; 2007; 2011); Hoffmann (1972) Penrose (2002; 2011) and Pickover (2008) it is previously established in special relativity

that  $T = \frac{T'}{\sqrt{1 - \frac{v^2}{c^2}}}$  and indicates that T is greater than T'.

Therefore processes occurring in a body in motion relative to the observer appear to take a longer time than those occurring in a body at rest; that is  $T_{\text{motion}} > T_{\text{rest}}$ . When v increases then T increases (time dilation). The unit of time in the reference at motion grows by a factor

$k = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ . This consequence of special relativity gave

life to the 'twin paradox' found in scientific literature.

When  $v > c$ , we get:

$$T = \frac{\pm i \times T'}{\sqrt{\frac{v^2}{c^2} - 1}}$$

If  $T = \frac{+i \times T'}{\sqrt{\frac{v^2}{c^2} - 1}}$  then this means that when v increases, T

decreases (time contraction) and if  $T = \frac{-i \times T'}{\sqrt{\frac{v^2}{c^2} - 1}}$  then this

means that when v increases, T increases (time dilation). The unit of time in the last equation grows also by a factor:

$$k_t = \frac{-i}{\sqrt{\frac{v^2}{c^2} - 1}}$$

Concerning the explanation of this is that in the first equation time goes clockwise in the new four dimensional continuum M relatively to the universe R since it is positive and in the second equation it goes counterclockwise relatively to the universe R since it is negative. It is to say once more that the imaginary number 'i' identifies the new four dimensions that define M (Fig. 4).

Moreover, starting from zero, if speed continues to increase, time will continue to dilate in special relativity. If it reaches the velocity of light, therefore time reaches infinity. In fact, infinity in algebra is the greatest 'number' that we can reach while counting. To be more accurate, it is a symbol more than a number, since no computer could reach infinity. Infinity is indefinite by nature. Infinity is extensively used in mathematics like in series and sequences but has no concrete physical meaning. This is why light is said to be the limit velocity and the barrier between the two geometries: The universe R and the metauniverse M. In fact if the velocity surpasses the velocity of light, time has to surpass infinity and we start counting anew. The counting is done now using clocks set up in the metauniverse or in the four imaginary dimensions that we have already discovered in the previous four equations of metarelativity. We precise again that the new dimensions are imaginary in the sense that they contain the imaginary number i. The time measurement starts now counterclockwise because it is negative and time is said to be dilating or it can start clockwise and contracting again depending on the sign before the imaginary number 'i'.

### 1.5. The Real and Imaginary Lengths

Barrow (2002; 2007; 2006); Becker *et al.* (2007); De Broglie (1937); Albert and Franc (1979); Einstein (2001); Gubser (2010); Hawking (2007; 2011); Hawking (2005); Hawking (2002); Heath (1956); Hoffmann (1972); Pickover (2008); Poincare (1968) and Weinberg (1993) it is previously established in special relativity that:

$$L = L' \sqrt{1 - \frac{v^2}{c^2}}$$

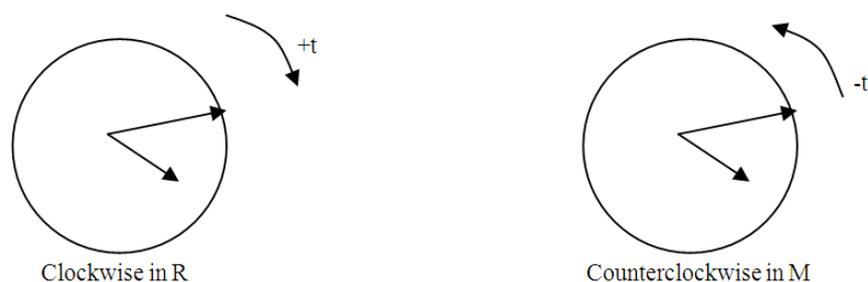


Fig. 4. The flow of time in both the universe and the metauniverse

where,  $L'$  is a length at rest relative to  $O'$ . This means that when  $v$  increases then  $L$  decreases (Length contraction). The unit of space in the referential at motion contracts by a factor  $\sqrt{1 - \frac{v^2}{c^2}} = \frac{1}{k}$ .

When  $v > c$ , we will have:

$$L = \pm i \times L' \sqrt{\frac{v^2}{c^2} - 1}$$

If  $L = +i \times L' \sqrt{\frac{v^2}{c^2} - 1}$  this means that when  $v$  increases so  $L$  increases (Length dilation). The unit of space in the reference at motion grows by a factor:

$$i \sqrt{\frac{v^2}{c^2} - 1} = \frac{1}{k_i}$$

and if  $L = -i \times L' \sqrt{\frac{v^2}{c^2} - 1}$  this means that when  $v$  increases so  $L$  decreases (Length contraction). In fact, the minus sign confirms the fact that a length contraction occurs in  $M$  when  $v > c$  similar to the length contraction in the region where  $v < c$  that means in the universe  $R$ . In addition, the symbol  $i$  identifies the new four dimensions that define the new universe denoted by  $M$ .

In the last metarelativistic transformations, velocity becomes superior to the velocity of light and new metarelativistic equations are used to express the behavior of matter (or metamatter) inside it. In fact, starting from zero, when velocity increases, time starts to dilate and space to contract according to the well known Einstein-Lorentz mathematical equations. When reaching the velocity of light, length at the end of contraction reaches its limits and becomes equal to zero. When velocity surpasses the barrier of light, space starts

expanding after it has reached the dimensions zero which are the dimensions of a geometric point. As a matter of fact, Euclid defined in his ELEMENTS the geometric point as a geometrical entity of dimensions zero. What is smaller than zero in algebra are negative numbers. What is smaller than the geometric zero is new to us. In fact, particles in the atomic world have dimensions and the smallest particles to our knowledge are the quarks which are the constituents of protons and neutrons. Even strings, the smallest postulated entities in String Theory, have dimensions greater than zero. Surely the dimensions of the quarks are smaller than the dimensions of protons and neutrons but they still have dimensions how small as they can be, but never the dimensions of a geometric point because zero is nothing in physics and it could not contain neither matter nor energy, except photons: Photons move at the velocity of light and could never have dimensions because nature forbids that a moving body having the velocity of light has any length. The last fact was shown by Einstein in the theory of special relativity. Therefore, we can say that when space reaches zero dimensions (when  $v = c$ ) it continues the shrinking process and what is smaller than zero in the four dimensions of the universe  $R$  is the zero in the four imaginary dimensions of the metauniverse  $M$ . Hence, after reaching zero in  $R$ , space starts here in the metauniverse from zero to expand again opening the field to new four imaginary dimensions as it is shown in the equations derived from the theory of metarelativity.

Furthermore, as we have noticed, the metauniverse is truly at a different level of experience, it is in fact beneath the atomic world when speaking about space (dimensions smaller than zero) and beyond infinity when speaking about time. In fact we may ask where is this metauniverse if it is beyond infinity and beneath zero? The answer is evident and it is shown in the equations: In other dimensions which form the space-time of the metauniverse, in the world of the imaginary number  $i$ . If

a new matter is indirectly detected (like dark matter) then metarelativity is able to explain it and it takes into consideration its existence because no directly detectable matter was found. So it should be another kind of matter, faster than light and unseen by our telescopes and accelerators. So it should lay somewhere in space-time and this somewhere is the metauniverse. This will truly prove the existence of the metauniverse which exists by mathematical and physical necessities and by the power of facts and experience. In fact, what is in fact more important in physics than the equations themselves is the understanding and the explanations given to the equations themselves. What is more important than mathematics is its meaning and its philosophy.

### 1.6. The Entropy and the Metaentropy

Hawking (2002); Pickover (2008); Reeves (1988); Ronan (1988) and Stewart (1998) to understand the meaning of negative time in M relatively to R, then entropy is the best tool. We know that entropy is defined as  $dS \geq 0$  in the second principle of thermodynamics. We say that when time grows, then entropy increases. Due to the fact that time is negative in M, this implies that  $dS \leq 0$ . We say that when time flows, then entropy (or metaentropy) decreases. This means directly the following: The direction of evolution in M is the opposite to that in R.

### 1.7. The Transformation of Velocities

Albert and Franc (1979); Einstein (2001); Hawking (2002; 2007; 2011); Hoffmann (1972) and Pickover (2008) the velocity of the body A that is measured by O is:

$$v = \frac{dx}{dt}$$

The velocity of A measured by O' is:

$$V' = \frac{dx'}{dt'}$$

This implies that:

$$V' = \frac{V - v}{\left(1 - \frac{vV}{c^2}\right)}$$

which implies also that:

$$v = \frac{V' - V}{\left(\frac{VV'}{c^2} - 1\right)} \text{ (Relation 1)}$$

Let us consider all the possible six cases that may occur.

#### First Case:

This is the case of two bodies in R where their velocities are smaller than c.



From relation (1) we have:

$$v = \frac{c^2(V' - V)}{(VV' - c^2)}$$

We note that:  $V = fc$  where  $0 \leq f < 1$  and  $V' = f'c$  where  $0 \leq f' < 1$ .

This implies that:

$$v = \frac{c^2(fc - f'c)}{(ff'c^2 - c^2)} = \frac{c^2 \times c \times (f - f')}{c^2 \times (ff' - 1)} = \frac{c(f - f')}{ff' - 1}$$

This relation is the one we use in relativistic computations. So it is not new to us and just as predicted by special relativity.

#### Second Case:

This is the case of a body in R (where the velocity is  $< c$ ) and a beam of light (where the velocity is  $c$ ).



From relation (1) we have:

$$v = \frac{c^2(V' - V)}{(VV' - c^2)}$$

We know that  $V = c$  and  $V' = fc$  where  $0 \leq f < 1$ . Then:

$$v = \frac{c^2(fc - c)}{((fc \times c) - c^2)} = \frac{c^2 \times c \times (f - 1)}{(fc^2 - c^2)} = \frac{c^3 \times (f - 1)}{c^2 \times (f - 1)} = c$$

This means that light is the limit velocity in R and is constant in it whatever is the velocity of the body in R relatively to the beam of light. This just like Einstein's special relativity has predicted.

**Third Case:**

This is the case of a beam of light relatively to another beam of light.



We know that have here  $V = c$  and  $V' = c$ . In this case  $v = c$  and this is not new to us also. It is the consequence of the relativistic transformation also.

**Fourth Case:**

This is the case of a beam of light relatively to a moving body in M where the velocity is greater than c:



We note that  $V' = fc$  where  $f > 1$  and  $V = c$ . Then:

$$v = \frac{c^2(fc - c)}{(fc \times c) - c^2} = \frac{c^2 \times c \times (f - 1)}{(fc^2 - c^2)} = \frac{c^3 \times (f - 1)}{c^2 \times (f - 1)} = c$$

This means that relatively to M, light is still the limit velocity. In other words, M relatively to Light is similar to R relatively to Light. Light is the limit velocity in both R and M. This fact will be more clarified in the fifth case.

**Fifth Case:**

This is the case of a moving body in M relatively to another moving body in M:



Assume that  $V = c\sqrt{2}$  (the smallest velocity in M) and that  $V' = \beta c\sqrt{2}$  (any velocity greater or equal to the starting velocity, in other words  $\beta \geq 1$ ). This implies that:

$$v = \frac{c^2(\beta c\sqrt{2} - c\sqrt{2})}{(2\beta c^2 - c^2)} = \frac{c\sqrt{2}(\beta - 1)}{(2\beta - 1)}$$

If  $\beta = 1$  then  $v = 0$ ;

If  $\beta \rightarrow \infty$  then  $v \rightarrow \frac{c\sqrt{2}}{2} < c$

This is similar to the relativistic transformations since we have:  $0 \leq v \leq \frac{c\sqrt{2}}{2} < c$ . As if we are working in R... This means that the universe M relatively to itself,

behaves like the universe R relatively to itself since the velocity of M relatively to M is smaller than c just like the velocity of R relatively to R.

**Sixth Case:**

This is the case of R relatively to M:



We have here  $v > c$ . This implies that the metarelativistic transformations are needed here and for the first time.

**1.8. Explanation of the Results**

Nothing is new in the first three cases. They were considered in Einstein's special relativity. The fourth, fifth and sixth cases are new and coherent. In fact, they mean that the universe M is a metauniverse relatively to R (we use the metarelativistic transformations) but relatively to itself it behaves just like R relatively to itself (where we have  $v < c$  and use accordingly the relativistic transformations).

The sixth case deals with R and M relatively to each other. It is the only case where the metarelativistic transformations and equations are needed. Whereas in the fifth case (M relatively to M) we don't need the metarelativistic transformations but only the Einstein-Lorentz transformations.

The fourth case (M and Light) proves that our interpretation of the results is valid: Light acts in M as it acts in R, it is a limit velocity. As if the supraluminal velocities didn't affect the transformations or the phenomena. The fourth case came to insist that the universe M is another four dimensional real continuum relatively to itself and to light just like the universe R. Light behaves as a limit velocity both in M and R.

Hence, to conclude, we can say that M is like the real R relatively to itself and can be denoted as R', to insist on the fact that relatively to itself M is a real continuum just like R. But R' relatively to R becomes imaginary and is therefore denoted by M.

Finally, we note that the new metarelativistic paradigm can be represented and summarized by the following Equation:

$$R + \text{Light} + M = \text{The great universe G}$$

Knowing that we have considered above all the possible six cases in G.

## 1.9. The New Principle of Metarelativity

Albert and Franc (1979); Einstein (2001); Hawking (2002; 2007; 2011); Hoffmann (1972) and Pickover (2008) let us now introduce in this part the new principle of metarelativity. After all what has been explained and proved, we return to the principle of special relativity proposed by Einstein in 1905 in his theory. It is the following.

“Inertial observers must correlate their observations by means of the Lorentz transformations and all physical quantities must transform from one inertial system to another in such a way that the expression of the physical laws is the same for all inertial observers”.

Now, if we want to elaborate the new principle of metarelativity, it will be.

“Inertial observers must correlate their observations by means of relativistic-Lorentz transformations if the velocity is smaller than  $c$  and by means of the metarelativistic transformations if the velocity is greater than  $c$  and all physical quantities must transform from one inertial system to another in such a way that the expression of the physical laws is the same for all inertial observers. The subluminal universe is denoted by  $R$  and the supraluminal universe is denoted by  $M$ . The sum of  $R$ , light and  $M$  is denoted by  $G$  and light is at constant velocity in both  $R$  and  $M$ .”

## 1.10. The Four Physical Interactions, Vacuum Fluctuations and the Origin of the Universe

Gates (2010); Greene (2003; 2004); Gribbin (1993); Hawking (2000; 1989); Luminet (1997); Nicolson (2007); Panek (2011); Planck (1993); Proust and Vanderriest (1997); Sagan (1975); Singh (2005); Thorne (1997); Weinberg (1988) and Weinberg (2008; 1993) as it is known, the four physical interactions are:

- Gravitation
- Electromagnetic interaction
- Strong interaction
- Weak interaction

They may be related to other interactions governing the metauniverse. In fact both the two space-times  $R$  and  $M$  may interact in the same fashion that a positive particle interacts with a negative particle. We may think also that all the interactions that we know have their origin in the metauniverse...In fact the metauniverse or the four dimensions of meta-space-time may be regarded as a field full of potential and latent energy and that exists by necessity as we have mentioned but ‘invisible’

in nature since it is supraluminal. We said a field because the hidden matter that lies inside it forms a field of action and potentialities that can be discovered, like in the atom. This field that lays outside the universe or below the atomic level, is like the mathematical zero that we use in counting. Alone, zero means nothing, but when it is put near another figure it makes its effect (e.g., 10, 100, 1000,...) like philosophers mathematicians noted many centuries ago. We may see that the universe is the 1 and the metauniverse is the zero. The metauniverse is a field of latent energy relatively to  $R$ . It needs the power of the one (the universe) to make it exist. What does the metauniverse mean relatively to itself? The answer of this question was answered before in this theory. The result derives from the metarelativistic equations above. The outcome is that the metauniverse relatively to itself is just like the universe relatively to itself. I made the separation between both (between the two space-times) but in fact they are related and bonded both mathematically through precise equations. So we have discovered the secret of the zero: Its hidden imaginary dimensions which lay in  $M$ , its hidden energy (dark energy) and its hidden mass (dark matter).

Moreover, take a series that starts with zero, then one, two, three, four...till infinity if we want to. What's before the 1 is zero. As if the one came out from zero and the two from 1 (like  $1+1 = 2$ ) and the three from 2 (like  $2+1 = 3$ ) and so on...So we may say that the four interactions originated from the metauniverse like in the example of the zero and the integers 1, 2, 3, ... Or we may say that the whole universe came out from the metauniverse like when the one came out from the zero. In fact in our calculations we expanded the Einstein-Lorentz equations to reach the metauniverse, as if we have done the backward walk. The direct walk is that from this latent energy the universe  $R$  emerged. In fact, if we do the direct walk, we will see the whole universe coming out from nothing, from void, to existence like in the Big Bang model. This ‘nothing’ that we noted is the supraluminal universe that we established its existence. The dot or the geometric point that we were talking about is the singularity in space-time that the general relativity talks about. In fact, according to the Big Bang model, from a singularity in space-time all space-time was generated and all matter within it. In the early fractions of a second, the particles and matter, the space-time itself was condensed in a small portion. This is said, we could assume that our visible universe came from another universe, which is the invisible metauniverse itself. This potent and latent energy that represents the

metauniverse, forms the invisible matter or the dark matter that is hidden in the great universe G denoted by:

$$G = \text{universe R} + \text{Light} + \text{universe M}$$

Which is similar to the complex set of numbers denoted in mathematics by C.

The first proof of the existence of M is the Big Bang theory. Now, the second proof of the existence of the metauniverse is at the level of the atom where we have in Heisenberg's uncertainty principle:

$$\Delta E \times \Delta t \geq \frac{h}{4\pi}$$

Which is called the vacuum fluctuation theory also. The explanation of the principle is that energy is created from void during an interval  $\Delta t$  and then returns to void creating therefore virtual particles. In fact, the nothing or the vacuum as we have seen is the zero that we have spoken about or the metauniverse M that we deduced from relativity itself. Some physicists say that the whole universe is a quantum fluctuation phenomenon like in the principle of uncertainty. This is true if we looked at the equation from a different angle...If we reshape our minds and say that from the metauniverse a quantum phenomenon occurred that means a parcel of energy burst out from the metauniverse, that is full of potency, to 'real existence' where a universe was created and that will eventually disappear, say the physicists, in a period of time  $\Delta t$ .

Furthermore, this metauniverse is not truly void or nothing. It is non material in nature and we said and mathematically proved that it is supraluminal and as real as the universe in which the known matter interacts. Relatively to a referential moving in the universe, the metauniverse is imaginary and fictitious and relatively to a referential moving in the metauniverse, the referentials of the universe are fictitious and imaginary, so this relation is parallel and identical. Thus, the metauniverse is real to itself.

Additionally, some physicists spoke about supraluminal velocities and called the corresponding particles the tachyons. They tried to detect them but they couldn't and this because they lay in imaginary dimensions.

Finally, we said that what is more important than the equations is the explanation that we give to them. In fact without Albert Einstein, special relativity wouldn't have a meaning, since the Lorentz equations were discovered earlier by Henri Poincare but were not interpreted

adequately. It is the genius of Einstein that gave them their meaning otherwise the equations would have stayed devoid of sense and just a simple set of equations.

### 1.11. The Gravitational Effect of the Metauniverse

Albert and Franc (1979); Einstein (2001); Hawking (2002; 2007; 2011); Hoffmann (1972) and Pickover (2008) as it is well known in physics, gravitational waves travel with the velocity of light. As it was proved in the equations above, light is the limit velocity in both R and M. Consequently, gravitation behaves relatively to matter just like to metamatter since it has the speed of light. Therefore, metamatter exerts gravitational effects on matter just like ordinary matter as a result of this fact. It is the effect of metamatter on matter that we observe inside and outside galaxies. Consequently, dark matter which is metamatter when it exists near matter attracts it. This is what we are actually observing in astronomy.

### 1.12. The Interaction of Metamatter with Light

Gates (2010); Nicolson (2007) and Panek (2011) as it was discovered in astronomy, dark matter does not absorb nor emit light, this explains why it is dark. As a matter of fact, metamatter is supraluminal by nature as we have previously proved and it lays in an imaginary metauniverse relatively to our material 'real' universe. It should follow that metamatter should not interact with light since it has firstly a speed greater than that of light relatively to us who are observers in the subluminal continuum R, since it exists secondly in another imaginary four dimensional metauniverse and since it is thirdly dark and invisible to our 'real' telescopes and observatories. This explains why relatively to R, M is dark and invisible.

## 2. CONCLUSION

The expansion of a new theory which is called the theory of metarelativity creates a new continuum or space-time in which a new matter interacts. This newly discovered matter is surely not the ordinary matter but a new kind of matter that can be easily identified to dark matter that scientists seek to find. In fact, the theory shows that this new matter is supraluminal by nature and is related to the new space-time in the same fashion that ordinary matter is related to the ordinary space-time that we know.

From what has been proved, it was shown that the theory doesn't destroy the Einstein's theory of relativity that we know but expands it, but on the contrary, it proves its veracity...The new space-time is now called

meta-space-time or metauniverse M because it lays beyond the ordinary space-time as well as the matter interacting within it. Now the relation between both matter and metamatter is shown in the theory of metarelativity. The first space-time is called the universe and the second space-time is called the metauniverse which is another universe if we can say as material as the first one and as real as the first one but at different level of experience because it is supraluminal relatively to the first one. It is similar to the atomic world that exists and is real but at a different level of physical experience, in the sense that we have discovered its laws in the theory of quantum mechanics where we deal with atoms and particles instead of dealing in astronomy with planets and galaxies....In fact, astronomy is also real in the sense that we have discovered the laws governing the stars and planets but at a different level of reality from our everyday world and experience. Metarelativity comes now to enlarge once more the scope of our understanding to encompass a new level of physical reality.

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