Laurențiu Mihăescu

The Universe

Absolute and Relative

www.1theory.com

prime@1theory.com

Bucharest, Romania, 2016

PREMIUS

Fifth edition, March 2022

Premius Publishing House, 2016

Website: www.premius.ro

E-mail: info@premius.ro

ISBN: 978-606-93843-7-4

Table of Contents

1. Introduction

Scientific knowledge helps us to decipher the secrets of all things in this Universe, to solve the mysteries of their emergence and their interactions. Better or less good explanations were given across the ages, using different terms and means. Democritus has tried to show that all objects are composed of very small, indivisible particles called atoms; he also said that the connections between atoms made all things possible and allowed the diversity of matter. It was a logical, pure rational explanation, highly advanced for those times, which has opened the gates of the truly scientific approach.

Science and philosophy progressed a lot since then; now, after more than two thousand years, we have a fairly complete picture of atoms. Many scientific experiments have led to the development of some quantum physics theories that all suggested the existence of an internal structure of atoms; thus, the atoms proved to be formed of smaller things, later called particles. These new entities, elementary or composite, are all interacting due to a few different forces that are generated by some special "fields". Currently, the Standard Model of particle physics explains quite satisfactorily all interactions of these matter constituents, at the quantum level. Along with the Theory of Relativity, it succeeded to provide an almost perfect model of reality; the connections between time, space, energy and mass were transposed in simple and general equations, at both quantum and macroscopic scales. However, with all the scientific development over the last hundred years, there are still many unanswered questions. For example, this universal force called gravity, which links all the bodies from outer space, does not have yet a complete physical and theoretical explanation, unanimously accepted by scientists. The equations giving the magnitude of the gravitational forces have all been written, and the 'curvature' of space around massive bodies has been well quantified. However, a clear explanation about what causes the gravity, about the true nature of this field (and even of the other ones) is still expected. A couple of new theories have appeared lately, Quantum Gravity and String Theory; despite their exotic beauty, the expected enlightenment is not brought yet upon this subject. Gravity remains a very difficult topic, and its mystery seems to deepen over time.

As some objective limitations are present in the experimental field, matter cannot be "probed" below a certain dimensional scale, regardless of technology; therefore, a great opportunity arises for physicists and mathematicians, namely to develop new theories that may be based more on imagination instead of concrete aspects. The same thing is also happening at the cosmic scale, where we have already reached some limits of observation.

In order to overcome many of these obstacles, my recent decision was to add one more "layer" to the description of all things, at a truly fundamental, sub-quantum level. The related theory of physics was widely presented in a book that has been published a year ago, *Prime Theory* [6]. Space was considered as having a granular structure, which means that matter, at any level, is actually made of a unique raw material; in addition, all characteristics of this granular constituent have been described in great detail. Therefore, logically and unequivocally, rational explanations have been easily shaped for all the subjects that remained in question, such as gravity, mass, electric charge and fields. The mechanism of granular interaction has offered a common ground for all known fields, including the gravitational one; it also allowed detailed explanations over the genesis, shape and stability of any elementary particle. And we are not going back in time this way, to the 19th or 20th century, when the problem of spatial graininess was seriously taken into account; we rather make an important step forward by inserting this necessary corollary of new principles into Quantum Physics. All the quantum mechanisms will therefore have a surplus of determinism and rationality, while many of the basic principles remain unchanged. At the fundamental level of matter, however, the elementary rules of interactions have all been extended and adapted, and this will lead eventually to reasonable and causal explanations for any known phenomenon.

If we detach ourselves a little from the usual, these things would seem normal and no one should be surprised. It is natural that, once the scale is reduced to the granular level, the complexity decreases and all the interaction laws become simpler, reaching an absolute elementary. Also, it seems natural that the matter of any kind has a common and unique factor, a minimal ingredient that only operates on a basic set of rules. The initial granular fluxes (very strong) have generated the first stable rotational structures and then imposed their interaction rules; most of the particles existing in our Universe were produced in this way. It also seems normal that there is a minimal level of energy, the granular level, which determines the conservative interactions between granules or those between fields and particles. These are the natural explanations for a deterministic and causal reality, which all were given in detail by the Prime Theory for a presumed closed, perpetual moving and forever expanding Universe; they also include a profound relativization of all the nature's laws, starting from the lowest possible level of matter - the granular one. However, a new reference point will be added to this deeply relative Universe, especially by the *Theory of the Absolute* chapter. As far as it is possible, the connection with the actual formulas and theories of physics (in particular with the Theory of Relativity) will be closely maintained. This is my personal attempt to put the cornerstone of a new construction that is intended to succeed in fully describing the physical reality. My approach is clearly deterministic, entirely based on the concrete nature of things; as we come to really understand their working mechanisms, we may write all the mathematical equations that could describe them precisely. There are causes and there are effects for any phenomenon. The mathematical equations, which are trying to express the rules by using a certain formalism, are not revealing the true meanings of things and phenomena, only the understanding of their objective nature might do that! Also, some limits and solutions of these equations do not always have a physical equivalent in the real world! Consequently, the natural order of steps a scientist should make is this: first, he must get to the basic meanings of reality, then he must analyze and understand them, and finally, he may try to elaborate some appropriate theories. Even this kind of theories, sometimes excessively abstract, must be corrected and improved all the time, as we are continuously gaining more and more concrete knowledge of the physical phenomena.

2. Absolute and relative

2.1. Universe - Time Zero

Let's analyze now all things in a temporal and causal context, in which the Primary Universe would have been born through the First Bang, then it evolved, transformed, its matter aggregates and then compresses, and new universes were finally generated through other Big Bangs. PT made a detailed description of the creation of the Primary Universe: it all has started from an undefined "nothingness", which through an essentially mechanical process (like a fluctuation) has been separated at a given time into those two constituents of space, the "full" and the "empty" ones. Thus, the entire raw material has been created in a compact form: we have in fact a huge "primordial granule", filled with matter, enclosed within an empty three-dimensional space, where it may move in any direction. The fundamental equation that describes the genesis of the Primary Universe may now be simply written:

$$0 = X - X \quad (1)$$

This equality should be only regarded from left to right because it means a transformation, an **irreversible** separation of the nothingness **(0)** in two different, complementary things, something **(X)** and anti-something **(-X)**. More specifically, both *space* and *matter* appeared this way, as a closed three-dimensional framework and respectively, as a primordial granule. However, there still are a few unknown things in this scenario, like the origin and the consistency of that "nothingness". The mystery behind the Universe's genesis could last forever; any theoretical hypothesis we would formulate cannot be applied to this *first moment* of time, when a very clear limit of the principle of causality is reached. Moreover, a closed Universe objectively adds some cognitive barriers, which all suddenly appear in front of us when we try to define and analyze a *unique* primordial material.

This genesis process continues as follows: the primordial granule, whose material is characterized by a perfect elasticity, begins to divide. Initially, it only splits up into two parts, and this is the first mechanical movement that has ever appeared. Those two halves started to move, one to the other, inside that elastic "bubble" of space. As it has been shown in PT, this granular division will continue faster and faster, and increasingly smaller fragments of matter will collide at increasingly higher speeds; this whole phenomenon is naturally accompanied by the expansion of the spherical space – the empty frame where all this happened.

At the end of the division process, a virtually infinite number of infinitesimal granules resulted from that primordial, huge granule of matter (presumed fixed); they all are continuously moving, perpetually bumping into each other and into the edges of space. This is a simple mechanistic hypothesis, but it is the only one that justifies the formation of those two components of the Universe; it explains how the granules were formed, why they are moving and how the granular aggregation led to the creation of all elementary particles. The initial energy, as this Primary Universe's birth model has presumed, remained constant throughout the entire process of division and expansion. Moreover, the *Third Law* of PT shows that the sum of all granular energies in our closed Universe is constant over time (remark -

these fundamental laws do refer to any universe that would have been created, if there were more than one). If we accept the Law of global energy conservation (energy assumed to be only of mechanical nature), it results that this constant value is the exact amount of energy held by all of the granules at their emergence moment, which is equal to that of the primordial granule.

We may say, in this context, that primordial energy did not exist. According to formula (1), the energy has simply appeared from nothing, in form of space and matter. However, each of these components contains an equal amount of energy, but of different signs. A moment later, the energy of that primordial matter was uniformly distributed in a simple conservative process of division; it was actually transferred to an infinite number of granules, being transposed into their motion. The same process creates and expands the three-dimensional geometric space - that place where all granules are moving and which contains the other half of energy.

The hypothetical First Bang and those Big Bangs that followed are similar cosmic events; they gave "birth" to very similar systems (as structure and as functionality), called universes. However, three differences may be mentioned here:

1. *Localization*: FB was a phenomenon dispersed across the whole volume of the primary material, while BB represents a sudden expansion of a smaller quantity of the same material (which was in a highly compressed state - a structure called singularity in many current theories).

2. *Scale*: FB is a global event, a fluctuation of the *entire* primordial material, while BB engaged only a part of this material

- for example, a part that was gravitationally concentrated into a supermassive black hole of the Primary Universe [6].

3. *Speed*: FB was a relatively slow process, yet having certain acceleration, while BB is an instant explosion of granular matter.

These universes ("parent" and "child") have evolved in similar ways; however, the moment when the process of granular division has just been completed (after FB) will be further used as a starting point to classify and characterize their future stages. Let's now consider that we are located inside this closed system called *Universe*, trying to discover its specific laws of physics and to establish precise units of measurement for all the quantities involved. To this purpose, some concrete systems of reference are also required, as we need to describe the motion in both relative and absolute manners.

2.2. Universe - First Stage

How can we describe this granular medium at its earliest moments? In short, there is a huge cloud of free granules that are randomly moving at a constant speed. We may already see the omnidirectional, quasi-uniform fluxes, but any compact granular structures, such as elementary particles or photons, do not exist yet. On a slightly larger scale, all this stuff can be regarded as an amorphous substance of ultra-high-density (which decreases with the space expansion), having no identifiable points or distinct regions. This special fluid, which is made up of those infinitesimally small granules, completely fills any available volume and dilates the three-dimensional space. As this granular system contains no structured matter, we cannot talk about mass and energy in their normal sense; consequently, we cannot talk about ordinary time either. However, space does exist in this period, but we cannot measure any length, we cannot establish a coordinate system and neither a direction of travel. The granular postulates (introduced by PT), all being valid at this moment, include some special words such as mass, energy, impulse, but they are rather some reflections of the terms employed by the macroscopic level physics; anyway, their meaning was changed just a little, being projected and adapted to the granular level. Associated with the granular movement, particular terms such as *relative* and *absolute* keeps their usual meaning and may be freely used.

What can we say about the main physical quantities in this stage?

1. *Granular space*: At first, the exact position of the Primary Universe cannot be specified, the uniqueness of its emergence process prevents us from doing so. The same rule applies to our Universe, the presumed "child": we cannot relate it to something else in order to determine the exact position of its initial singularity. Space, as a three-dimensional framework, did not exist at the moment of FB, it was created during that bang. We may further consider this space as being a linear, uniform and isotropic frame which is continuously expanding.

2. *Number of dimensions*: The primordial "nothingness" had an unknown number of dimensions; its derivative products, space and matter, are three-dimensional things only in our perspective, as observers from inside the system. As we cannot relate this to something similar, the dimensional aspect can be further considered either an illusion or a geometric simplification.

3. *Movement*: This phenomenon may only be perceived if there are at least two distinct material entities (by mutual reference). None of them would have the "fixed" attribute for real; however, considering one of these entities at rest could be an acceptable simplification in some cases. During this stage, the granular movement may only be described in a global and relative manner, as granules moving against other granules, and therefore it cannot be clearly defined or localized somewhere in that system.

4. *Granular time*: As it was shown before, the flow of time can only be associated with space and matter (with motion in fact), being a representation of the maximal internal rate at which a material system changes. This rate derives from the speed of the system's distinct parts that are moving or oscillating, identifying the sequences of their movements. Therefore, at this stage and this level, we may artificially introduce the physical quantity *time*, but only in relation to the uniformity of the granular movement. Since there is no other system that could be used as a reference, the granular time may have a unique and constant rate, arbitrarily established.

5. *Granular energy*: This type of energy can be seen as a part of the mechanical energy possessed by the primordial matter, an infinitesimal amount that has been distributed to every granule through the division process.

6. *Mass*: Considering the PT's definition of mass, this property has no sense in this stage; as a physical quantity, it may only characterize solid granular formations, and this kind of structure will form at a later moment. However, we may intuitively give it the signification of the *amount of substance* that each granule holds.

There are two types of physical quantities related to the granular movement (and they are also connected to each other):

- Speed, which would be given by a hypothetical unit of length that is traveled in a unit of granular time (a primary equation of the granular physics); speed has now the normal meaning;

- Energy/mass/momentum, as quantities that have special significations and their own laws of conservation (PT) at this level.

These quantities and their laws represent the foundation of any model that would describe the future transformations this system might be going through; thus, this very young universe is considered deterministic and its whole evolution becomes predictable. At the first sight, all quantities seem to contain a certain degree of *relative*, as long as they are associated to an almost *infinite* number of *identical* "objects" that are moving at the same speed. The granular movement is distributed in each and every possible direction inside that ever-expanding space. Therefore, some real units of measurement cannot be set in this "world" of no distinct entities and no stable bounds. Although many laws of physics are applicable at this particular moment, we may only apply them theoretically, in an *abstract* manner, as long as any experimental verification is truly impossible.

Considering the way this system was born and its evolution during the first stage, a certain degree of *absolute* may also be identified in the physical quantities described above. But where did this attribute come from? And how does it manifest?

- Firstly, this system is **unitary**, as it holds a *fixed quantity* of primordial material and a *fixed* amount of energy. These things can be found in the speed and size that every granule will come to have at the end of this stage, when the two granular quantities will become *constant*.

- This system is **conservative**; its total amount of energy and impulse will be conserved over time.

- When the division process completes, this system will become **stable** in regard to the size, speed and number of its granular components.

- As the FB hypothesis has assumed, this system is **singular**.

Considering all of these aspects, one or more physical quantities may be equally chosen to bear the attribute of *absolute*. They all will be able to carry on the essence and the uniqueness of this system to the next stages; moreover, the laws of the granular physics will naturally extend to the higher levels, providing a solid foundation for all the other laws of physics.

2.3. The Absolute Granular Velocity

At the end of the granular division process (a process that conserves the global momentum), the granular speed reached its maximum value - as PT has already shown; this superluminal speed ***C*** may therefore be considered an *absolute constant*. Each granule moves in any direction at this speed; we consider that this value would be measured from an absolute, stationary frame of reference, directly associated to our Universe. However, in order to correctly absolutize this speed and declare it as a universal constant, a few assumptions and postulates have to be made in addition to those already issued by PT:

1. The size of all the granules is constant over time and their collisions are perfectly elastic; the initial process of granular division is definitely finished.

2. The properties of the spatial geometric frame do not change over time, regardless of its expanding process.

3. The granular time is a hypothetical quantity assumed to have a constant rate. Its signification is not identical to that of the macroscopic time in material systems, but is similar; they both are associated with certain movements through space. This type of time has only been introduced to help us correctly define the absolute and constant speed of the granular motion.

Note 1:

- At the granular level, both time and space (seen as a geometric framework) are abstract physical quantities, a sort of linear "reflections" of the macroscopic-scale quantities that bear the same names.

Note 2:

- Their presumed linearity allows us to operate further, at the quantum level and above, with the equivalent macroscopic quantities; therefore, the regular space and time are both considered intrinsically uniform and we may thus correctly quantify their potential variability in certain circumstances.

2.4. Universe - Second Stage

First Stage took a very short time, in cosmic terms. As this period ends, space contains a quasi-uniform, omnidirectional distribution of primordial energy, the granular energies. However, if this medium would be seen at a lower scale, different gradients and concentrations of granular energies may be easily observed; these distinct regions are randomly distributed and their local density is higher than the average density of space. It practically means that the granular structuring process has just begun; this phenomenon will soon lead to the emergence of the first elementary particles and of their systems, making possible the rapid formation of some bigger material structures. The omnidirectional granular fluxes are continuously crossing this medium, transferring elementary energies and allowing various interactions between particles and between systems of particles. We could say in other words that all material structures, as well as the fields that mediate their interactions, are in fact localized energy concentrations of a uniform granular fluid. Yet, all this spatial fluid and its global energy represent only one half of the cosmic *zero-sum* game that just started up.

Countless stable granular entities, of different shapes and sizes, have emerged during this *Second Stage* (a stage that lasted for a longer period, also in cosmic terms). These new, high-speed structures are continuously moving and interacting; thus, most of the elementary particles created in this epoch will rapidly collide with their antiparticles, annihilating each other and producing photon pairs. Once the extreme density and temperature have dropped enough, many of those quarks will bind together and the first composite particles, neutrons and protons, came into existence. These nucleons will soon attract the free electrons around, forming the first Hydrogen and Helium atoms. This creation process continues on a global scale, leading to a quasi-uniform distribution of primary matter all over space. The ordinary matter will then start to condense gravitationally, forming the spinning gas clouds that gave birth to the first generation of stars in the Universe.

As a huge number of material structures were formed during this stage, we may now introduce the notion of *time* (using the current sense of this word). The elementary particles are continuously moving through space, interacting in several ways. All the quantum interactions produce forces of different magnitudes, their final effects depending on the mass of each particle. The frequency of the intrinsic rotations and oscillations of particles also depends on their mass, in fact on the number of constituent granules. As this number results from the balance between their granular impulse and the local flux, the rate of time could be directly related to the intensity of local granular fluxes, and inherently to the granular density of the Universe at a given moment. However, the evolution of this rate cannot be estimated accurately, so any time interval in this stage will be measured using our current time (which has a stable rate).

2.5. The Absolute Time

The simple existence of the *absolute speed* (as it was previously postulated in Chapter 2.3) creates a certain connection of deterministic nature between the granular time and the "normal" one.

Q. What does it mean *normal time* (the time we measure at a given point in space, associated with a real material body)?
A. Intuitively speaking, it would be the time shown at that point by a clock that is moving along with the material body.

Q. Why do we need to associate time with a material body or with a particle/atom?
A. Because the time itself, seen apart from any material structure, has no practical or useful significance, it only becomes an abstract quantity.

Remark 1: In the Universe, the average rate of the normal time is given in fact by the speed of granular motion; this speed actually sets the whole dynamics of matter at the quantum level and above. In an absolute frame of reference, a physical body experiences a time that is determined by the average granular density of space and by the asymmetry of the local granular flux. Time gets an absolute character in this particular case, having an almost constant rate within very large regions of empty space.

Remark 2: The rate of time in any isolated material system is variable, being determined by the speed of travel. Moreover, the time intervals between two events are differently perceived by an observer, as they depend on the relative velocity of the observer to the system. TR (Einstein) formulates the equations that describe this variable rate; however, the value of the local time results from the universal time and from a certain time variation that depends on the absolute speed (TA will show why).

The hypothetical rate at which time flows in any absolute frame of reference (assumed fixed with respect to the Universe) may be considered as a reference rate. If this frame above would be located right in the center of the Universe, where all directional granular fluxes are uniform, we could find the "fastest" possible time in this Universe (at a given moment of its existence), shortly named the **absolute time**. But this degree of absolute is not really necessary; for the usual, approximate calculations we may use the local time of the Earth, which has a rate (we will see very soon), that does not differ very much from the universal one.

In conclusion, the value of the granular speed - ***C*** - may become an absolute and universal constant only if the three-dimensional space would be linear and uniform and the reference time would have a constant rate. Naturally, the granular entities cannot reach this speed value due to the inter-granular collisions. The maximum speed that such a granular structure may have depends on the ***C***-value and on the local granular density, as we have already seen in PT. If the density of space could be considered constant over a large time interval, the value **c** - the speed of light in a vacuum - will automatically become another absolute and universal constant.

2.6. The Absolute Frame of Reference

Taking into consideration the new concepts presented in the last three subsections, a complete definition of the Absolute Frame of Reference (AFR) may be finally formulated as such:

The AFR is a virtual frame of reference that may be considered *fixed* in regard to the entire Universe and where the *absolute time* flows at a constant rate.

Comments

- All fundamental postulates of the Prime Theory were also expressed in relation to an AFR; the only difference is that its origin was temporarily chosen in the virtual center of the Universe.

- If another reference frame is at rest with respect to the AFR (at any distance), it should be considered an *equivalent* frame. Its local time may have the same rate as the absolute time.

- As a geometric frame, space is linear and isotropic, so any AFR we may use throughout this theory will have both these properties. Seen from a material perspective, as a collection of granular fluxes (a QM compatible view), space will have variable characteristics in some regions of the Universe (it is deformable, as in TR).

- The origin of an AFR is arbitrary, it could be anywhere in the Universe, even outside of its visible region! However, an exact position cannot be easily determined, as there are no truly fixed marks in our Universe. All "stationary" things, such as the distant galaxies or the background radiation, are observed from inside our galaxy and this could systematically change their actual positions! The structure and dynamics of the universe prevent us from finding a "fixed" point somewhere, for at least two reasons:

1. A single vantage point and a short observation interval cannot help us to have an accurate three-dimensional picture of the real position and the relative motion of the galaxies.

2. The redshift (see Annex 1) of the light coming from distant galaxies may give us more precise information about their movement, but this should be analyzed in the new perspective of TA, as it will be shown below; anyway, all the gathered data have to be carefully adjusted in order to provide an updated image of the Universe.

2.7. Universe - Third Stage

Let's imagine one more time the early moments of the sub-quantum medium - a dense fluid made of granules that are moving in all directions at a constant speed. No elementary particles, neither photons nor other granular structures. As there is no structured matter at all, the *time* quantity cannot be introduced yet. However, for that the granular movement does exist, we may already introduce the *relativity* notion. All the PT's granular postulates include terms like speed, energy, impulse, but the sense of these words is not conventional; they are rather a reflection of those regular quantities used in macroscopic physics. Although they have similar meanings, all these terms were specially adapted to the granular level. Elementary relativity appears to be a *sine qua non* feature of any movement through space; therefore, we will further consider *relativity* as being a fundamental physical notion. This is in fact a direct consequence of the particular way in which the space has been created: at first, the primordial material splits into two parts; then, the division process continues faster and faster, and all this ends shortly when a certain, minimum granular size has been reached.

This kind of "primary" relativity, induced by the simple existence of countless granules and their uniform motion, may also be considered as a reflection of the same macroscopic-level term. In order to use this general concept correctly, it must be associated in a deterministic manner with the absolute versions of time and space (already defined above). The movement of any hypothetical object at this dimensional level needs to be observed from some special reference systems, frames in which we are allowed to express those laws of primary relativity properly. The equivalent AFR has been defined exactly for this purpose, as it represents a fixed element that directly inherited the presumed stationarity of the primary material. This is in fact the only frame that allows a unitary formulation of the laws of motion and conservation at a granular level, a common factor of the Universe's birth and its expansion.

In this model, numerous granular concentrations have been formed right in the first moments of the Universe (Second Stage), and they shortly have turned into stable elementary particles. Consequently, this transformation allows us to speak now of particles, hence of some distinct material entities located in the amorphous space. This opens the possibility to define (in a relative manner) some "points" within that space. As there are particles and they are moving, it is reasonable to introduce at this moment the usual physical quantities (like time, speed, mass, energy) and to accept their well-known meanings. Although the constancy of the granular velocity causes a speed limitation to all particles, this system manifests a continuous increase in diversity and complexity. A theory of relativity - extended to the quantum level - as a natural derivative of a theory of the absolute, is now perfectly operable; however, both these theories are necessary to describe correctly the motion of elementary particles. Based on the solid foundation of granular mechanics, all the laws of quantum physics may now be rewritten. As you certainly expect, a similar phenomenon will happen, as time is passing and more particles are bound into atoms, on the macroscopic and cosmic layers of reality. The Third Stage of the Universe means bigger cosmic bodies, stars and planets, and the formation of larger structures, the galaxies. All the laws of physics may therefore be extended deterministically and logically to these new systems. Relativity, which started at the smallest level, is thus reflected forward and may operate identically at cosmic scale - as the speed limitation is maintained to any bigger structure. The absolute frame will also help us to understand the dynamics of our Universe, to build a model that will work perfectly at any level and any space-time coordinate.

3. Theory of the Absolute

3.1. Postulates

The granular space and the new mechanics it imposes to matter (see the PT's Laws of the Universe) compel us to change and adapt the entire field of modern physics, and this means that a new theory of space-time must be built at first. Two more postulates are required for this purpose, both being variations and extensions of the well-known Einstein's principles (TR):

A. *The speed of light is constant for all observers*

will be changed into this:

The speed of light has an absolute character, representing a constant upper limit for the speed of any granular structure (bodies, atoms, particles, etc) in the Universe. However, observers from inertial frames of reference may measure different values of this speed, depending on their own absolute velocity.

Note 1: Light travels in vacuum at a constant velocity (as value and direction) only if the granular density is constant and the local flux is uniform along the path considered for measurements.

Note 2: The absolute nature of this speed directly results from the constancy of the granular velocity (as PT has postulated) - and this feature is clearly revealed now when the AFR is used as a reference frame.

Note 3: All measurements are involving the absolute time.

B. *The laws of physics are the same for observers in all inertial reference frames (The Principle of Relativity)*

will be changed into this:

The laws of physics are the same in any inertial reference frame, but their parameters depend on the speed and direction that frame moves with respect to the AFR.

Note 1: Time and space are not absolute quantities in fact, they really depend on the frame of reference; however, these basic quantities must be redefined according to the scale of observation, as they all are directly connected with the absolute movement of particles and bodies. In this way, they both become non-uniform local quantities.

Note 2: The normal velocity addition will be used in any AFR, for relativization purposes; this does not mean that an object in AFR may have an absolute speed greater than the speed of light **c**. Figure 1 shows the sphere that is formed by all velocity vectors of magnitude **v = c** in AFR.

Note 3: It appears that the *relative* speed of two bodies (or particles, or photons) in AFR may have the maximum value of **2·c**; in this particular case, they will certainly move at the exact speed **c**, but in opposite directions.

Note 4: The absolute time has the greatest rate of passage; if a system moves with regard to the AFR, the rate of its local time will be lower than that maximum rate. However, the farther an equivalent AFR gets away from the Universe's central zone, the slower will be its flow of time (due to the increasing asymmetry of the granular fluxes); anyway, this small gravitational variation on very long distances will not be taken into account here. In a limited region of space, even about the size of a galaxy, the variation of this rate may be disregarded.

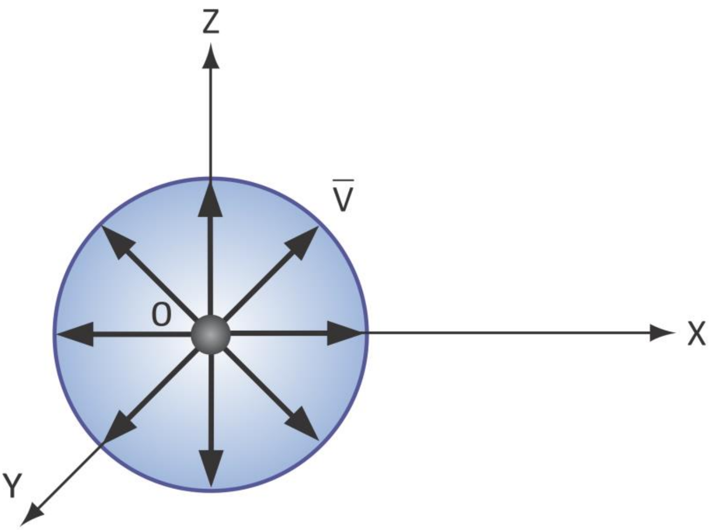

Figure 1 - *The speed of light in AFR*

Restrictive Postulate:

TR may be applied in any inertial frame of reference (frame that has a constant absolute speed), but only relative to the AFR.

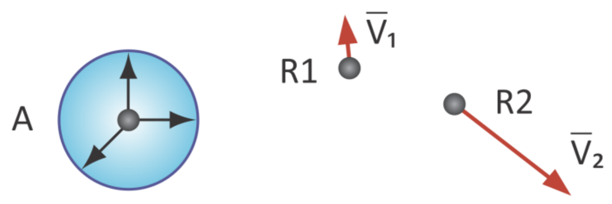

Figure 2 - *Example of different speeds*

Motivation

Let R1 and R2 be two inertial frames of reference (Figure 2), R1 having a very small absolute velocity and R2 a relativistic one; we may therefore say that, with respect to the AFR, the local time in R2 is dilated, while the time in R1 has a normal rate, almost identical to that of the AFR. These two systems, which are equivalent according to the TR, move relative to one another at a speed that is close to **c**; if we consider only this *relative* motion, their local rates of time cannot be correctly determined.

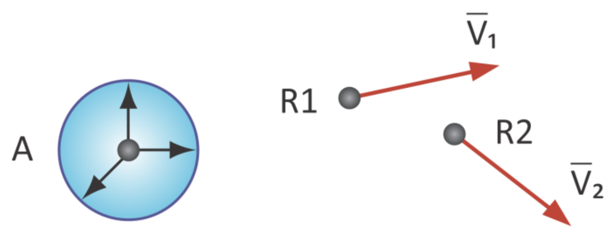

Figure 3 - *Example of equal speeds*

In case both frames would move with the same speed, close to **c** (as shown in Figure 3), we may say, however, that the rates of their local time are smaller than the AFR's one, but they have identical values.

Although the existence of this AFR seems natural, as it was already justified in PT, these two examples above clearly suggest that we must definitely introduce and use it. The local time in each of those frames (R1 and R2) cannot be determined solely on the basis of their relative motion; if both systems would be seen with regard to the AFR, their absolute velocities may univocally determine their "physics" and hence we may easily calculate their local rates of time.

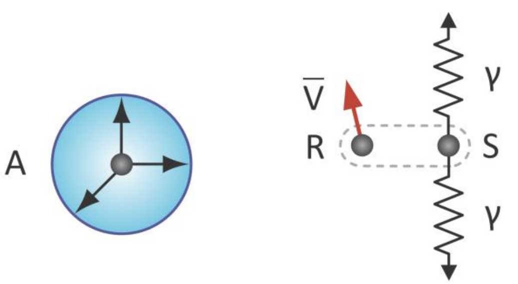

Figure 4 - *Two photons emitted by the source S*

Direct consequence

Let **R** be an inertial frame of reference (Figure 4) moving with the absolute velocity **v**, which now contains the stationary source **S** of omnidirectional light. Those two **γ** photons (both of frequency **f**) emitted by this source will have, of course, the absolute speed **c**, regardless of their direction. An observer from another frame of reference will measure a different wavelength (**λ<>c/f**) because that source of photons moved during emission (the Doppler effect). Analyzed in the AFR, the effects produced at source and receptor cumulates, and the global wavelength shift will depend on the absolute speeds of the frames and the angles made by photons with those absolute velocity vectors. If the source moves in the same direction as the emitted photon, the measured wavelength will decrease, and vice versa.

Seen together, the emitter and receptor’s frames will produce, by their relative movement, a global Doppler effect. However, if we want to evaluate the "absolute effect" on photons in each frame, the relative speed of these systems is no longer enough, we need to know their absolute velocities.

Another motivation

As a thought experiment, let's assume now that the entire Universe would contain a single material body. Obviously, TR cannot be applied in this particular case since the object cannot be related to something else. This example immediately leads to the important idea that TR is at least *incomplete*; TR does not help us to learn something about the local time or about the mass of that body as long as we do not know its relative speed to another reference frame. However, by using the AFR concept, the absolute velocity of this isolated body allows us to calculate correctly all its local parameters (like time or mass).

In the case of several bodies or of separate material systems, even if we know all data of their relative motion, TR cannot offer a full description of their "status" (or of their local "physics"). In order to determine the correct and complete status of each of them, we clearly need to relate their movement to the AFR.

However, TR could still be valid under certain circumstances, and it might be applied to any system, but only in relation to the AFR. Once the absolute state of a system was determined in this way, it may be compared - in a relative, but correct manner - with those of other systems (the restrictive postulate).

Description

As this postulate is considered true, the TR may only be applied with respect to the "truly" fixed frame AFR, and this will allow us to describe completely the "status" of a body or a system in uniform motion. Moreover, we will presume that the general conditions of PT are all valid, thus the granular space has the exact properties stated by this theory.

Now, let R1 and R2 be two macroscopic bodies lying in their own inertial frames of reference (as shown in Figure 3). These bodies are moving relative to the AFR at constant speeds, in different directions. These directions of travel are not influencing their states; space is considered an isotropic medium, the local flux is uniform, and consequently, all directions are equivalent. The absolute values of some physical quantities that characterize these bodies are denoted as follows:

	Speed	Mass	Time	Kinetic energy
R1 body:	$\mathbf{v_1}$	$\mathbf{m_1}$	$\mathbf{\Delta t_1}$	$\mathbf{E_1}$
R2 body:	$\mathbf{v_2}$	$\mathbf{m_2}$	$\mathbf{\Delta t_2}$	$\mathbf{E_2}$

We may now apply TR - with respect to the AFR - for these two moving objects. An additional assumption has to be made, their absolute rest masses are identical:

$$m_{10} = m_{20} = m_0$$

Their speeds are, obviously, lower than the speed of light:

$$v_1 < c, \quad v_2 < c$$

If **Δt** is a time interval in AFR, the local time in those systems of the moving bodies may therefore be given by these well-known formulas:

$$\Delta t_1 = \frac{\Delta t}{\sqrt{1 - v_1^2 / c^2}} \qquad \Delta t_2 = \frac{\Delta t}{\sqrt{1 - v_2^2 / c^2}}$$

It results that:

$$\Delta t_1 / \Delta t_2 = \sqrt{\frac{c^2 - v_2^2}{c^2 - v_1^2}}$$

Similarly, the formulas for mass and energy lead to these simple equations:

$$m_1 / m_2 = E_1 / E_2 = \sqrt{\frac{c^2 - v_2^2}{c^2 - v_1^2}}$$

To highlight the relative speed observed in AFR, let's now analyze the composition of velocities in these two systems by using the normal velocity-addition formula.

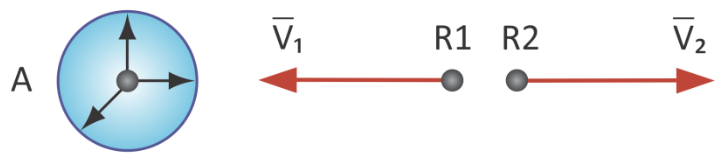

Figure 5 - *Opposite velocities*

- If $\mathbf{v_1}$ and $\mathbf{v_2}$ are opposite velocity vectors and their values are both close to **c**, it results that the relative velocity of these two bodies, perceived from the AFR, would have the approximate value of **2·c** (Figure 5), as it was already mentioned above.

- If R1 moves with the speed $\mathbf{v_1}$ (lower than **c**), and if R2 is the local frame of a photon emitted from R1, the value of the relative speed R1-photon will depend upon their directions like this (see the Figure 6, where the semicircle of photon's velocity vectors has the radius **c**):

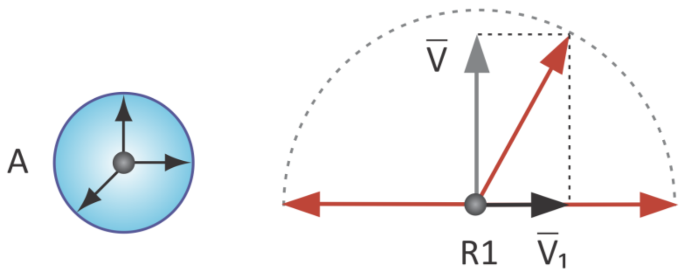

Figure 6 - *Relative velocities*

- Along the X-axis, in the same direction: $v_a = c - v_1$

- Along the X-axis, in opposite directions: $v_b = c + v_1$

- Along the Z-axis, perpendicular directions: $v_c = v_d = \sqrt{c^2 - v_1^2}$

It may be seen that these relative speeds does not exceed, as it was expected, the value **2·c**. A graph of the relative velocity, in two dimensions, may easily show how this vector sweeps a circular surface (the section through a sphere of radius **c**), as it is depicted in Figure 7.

Going down to the level of the sub-quantum world, we could also analyze how a free elementary particle, let's say R1, may contain granules that are moving (with speed ***C*** instead of **c**) in all directions, while the particle - as a whole - has a constant, determined speed and moves in a single direction.

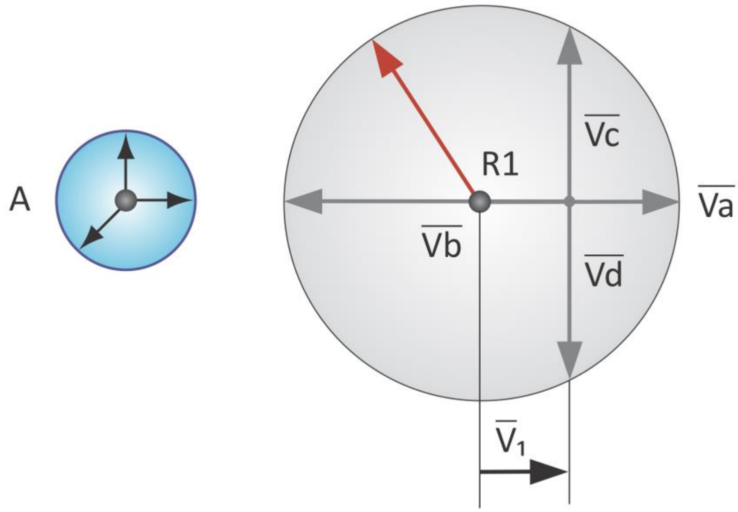

Figure 7 - *The sphere of velocities*

3.2. Space and Time

If TR is applied to a body (R1) with respect to the AFR, the rate of its local time may be described as a function of speed (v_1), you can see the graph from Figure 8. In full accordance with the well-known formula of relativity, the local time of the body flows normally (as in the AFR) at lower speeds; if the speed increases and gets closer to **c**, the local time of R1 will dilate - it flows more slowly and its rate asymptotically tends to infinity.

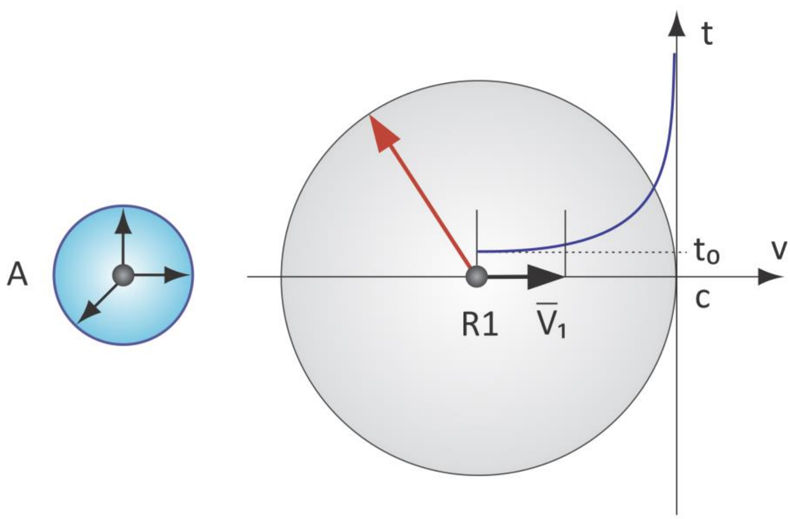

Figure 8 - *Evolution of the rate of time*

Let's now consider a local observer in R1's frame of reference (this body is moving with the absolute velocity $\mathbf{v_1}$, as shown in Figure 7). He postulates that there is a maximum possible speed in the Universe, namely the speed of the light in vacuum (value **c**), and then assumes that his absolute speed (**v_1**) is much smaller than **c**. In addition, he thinks that the existence of a limit for speed could affect his local time and the perceived distances, which both might change with speed. However, our observer considers at first that these quantities are not significantly affected, and also the local time is not direction-dependent. In order to check out these facts, he tries to set up a concrete experiment. Thus, he starts by measuring a fixed distance **s** on several directions, marking evenly distributed points on the surface of a sphere. Once some rays of light are emitted from the sphere's center in these directions, he measures the time intervals until photons got to those distinct points on the surface (where some light sensors were already installed), getting these values along the X and (nearly) Z-axes:

$$t_a = s / (c - v_1)$$

$$t_b = s / (c + v_1)$$

$$t_c = t_d = \frac{s}{\sqrt{c^2 - v_1^2}}$$

These calculations are based on the simple assumption that the relative velocities are obtained by normal composition. If the body R1 would have been "at rest", the absolute "flight" time would have had identical values in any direction:

$$t_0 = s / c$$

It is obvious now that the time intervals he measured vary around this latter value. Our observer thinks that the rate of its local time might be given in fact by the average value of all these durations and consequently, he calculates a geometric mean of the flight intervals on the X-axis:

$$t_x = \sqrt{t_a\ t_b} = \frac{s}{\sqrt{c^2 - v_1^2}}$$

which is equal to the respective durations (and their mean value) along Z-axis!

$$t_x = t_c = t_d$$

If it is expressed in relation to $\mathbf{t_0}$, the local time has, therefore, the well-known formula:

$$t_x = \frac{t_0}{\sqrt{1 - v_1^2 / c^2}}$$

In other words, if a local clock would function on the base of light pulses, it would show an average duration that has:

- a value that is always greater than the absolute one, $\mathbf{t_0}$

- an almost constant value, which depends very little on direction (of the velocity vector $\mathbf{v_1}$)

- a variation (time intervals are dilated) being equal to the value he calculates by applying TR with respect to the AFR.

Two conclusions may be drawn at this point:

1. The average value of the local time depends on the absolute velocity; its rate gets lower when the local frame speeds up relative to the AFR, as TR yields in this context.

2. The local time also depends on the absolute direction of travel, but a clock that would use alternating movements or oscillations in opposite directions will not have a significant deviation. At the quantum level, however, the local time of particles may have a bigger variation - as their direction of travel changes constantly.

How the observer from this mobile reference frame does "see" the space and lengths around him, knowing its local time is changed by speed? Will the density and volume of the material bodies change too? Will such a phenomenon depend on the absolute direction? There are two different cases to analyze here, namely the empty space and the material bodies:

Case A - The empty space: all distances perceived by our observer are naturally contracting in the same way the local time dilates, simply due to the constancy of the speed of light. However, the geometric space is not contracting for real; it will only be perceived in this mode by the mobile observer.

Case B - The material bodies: all bodies will be seen suffering the same contraction process; however, there is an additional physical effect occurring in the local objects. Their elementary particles, whose mass changes with speed, are experiencing variations of the fundamental forces acting on them, which alters their dynamics. For example, the orbital radius of an atomic electron depends on its mass, and therefore the atoms and the molecules of any material body may compress along the global direction of movement and even laterally.

3.3. Experiments

In order to endorse the above statements - that are telling us why photons might constitute an indicator of the absoluteness of motion through space - a special experiment will be designed now, trying to isolate them from the relative medium of that inertial frame of reference. This is somehow similar to the trials of many scientists, particularly in the 20th century, who have struggled to justify the existence of some spatial "ether" by using the changes it would cause to the propagation of light. My theoretical approach, while maintaining great respect for their work, is an attempt to correct the eventual errors they have made and to imagine new devices, more adapted to the PT’s photon model.

There are only two possible outcomes: as in the old experiments, we will always measure a constant value of the speed of light, or we will observe a significant variation determined by the speed at which the transmitter moves. However, a constant result does not negate the concept of absolute; it only illustrates the need to change the experimental conditions.

Let's now assume that the R1 body is our own planet (Figure 9) and its absolute motion through space has just the actual Earth’s revolution speed, $\mathbf{v_1}$, of about $\mathbf{3 \cdot 10^4}$ **m/s** (if we consider some new measurements, taken with respect to the cosmic background radiation, its absolute speed could be even 10 times greater). A beam of light is emitted from the planet’s surface at time $\mathbf{t_0}$, in a certain direction (drawn horizontally); all these photons will therefore have the absolute speed **c**.

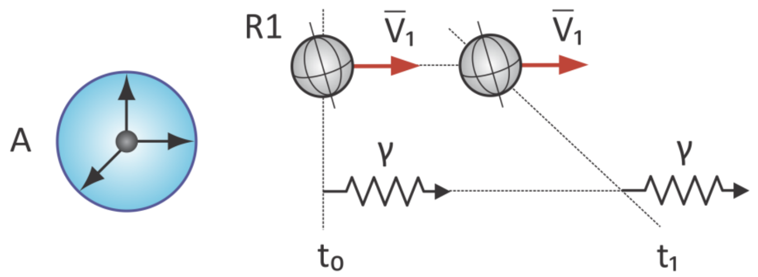

Figure 9 - *The absolute velocity of Earth*

Under ideal conditions (if the vacuum would be perfect and the gravity would be missing), after the time interval of one microsecond (at a later time, $\mathbf{t_1}$) we may have this situation:

$$\Delta t = t_1 - t_0 = 1\ \mu s$$

$$\Delta s_{\text{Photon}} = 300\ m$$

$$\Delta s_{\text{Earth}} = 30\ mm$$

Depending on the direction of the beam about to Earth's velocity vector, those photons travel a relative distance that could be within the following range:

$$\Delta s_{\text{Photon}} +/- \Delta s_{\text{Earth}} = 300\ m +/- 30\ mm$$

Therefore, the overall effect resulting from the composition of these velocities is seemingly measurable. If we are to consider the relativistic error due to the Earth's absolute speed:

$$\Delta t = 1.000\ 000\ 005 = 1 + 5{\cdot}10^{-9}\ \mu s$$

we would see a variation of time about $\mathbf{10^{-9}}$, which is totally negligible in comparison to the speed ratio of about $\mathbf{10^{-4}}$.

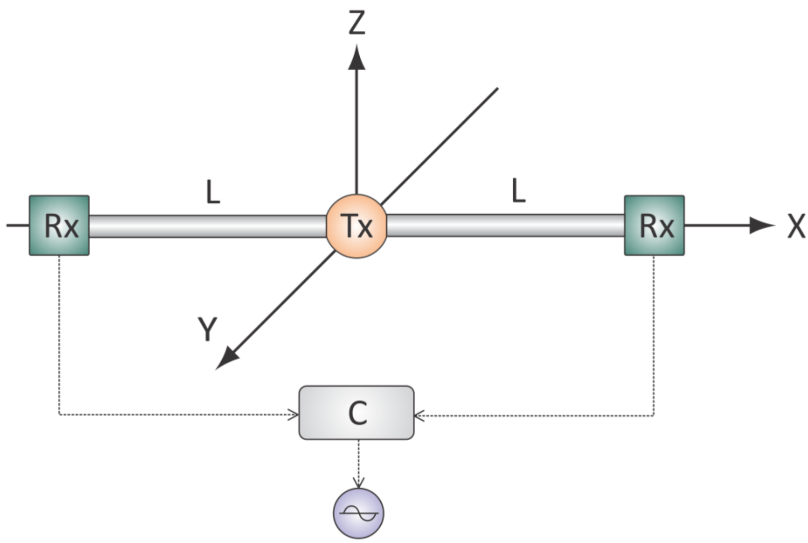

Figure 10 - *The speed measuring apparatus*

Here is a simple device we have imagined in order to demonstrate experimentally the above deviation in photon's velocity, confirming this way that all the initial premises were correct and the AFR does actually exist. The device shown in Figure 10 has the following components:

- The source of light (Tx), which can simultaneously emit two photons on the X-axis, in opposite directions, toward the Rx parts;

- Two receiving modules (Rx) - circular light sensors with a very small radius, about 5 mm;

- Two vacuumed tubes of exactly the same length, for example **L = 3m**, having circular sections;

- The signal analyzer (device C), which can compare, measure and display the electrical signals received from both sensors;

If the Earth's absolute velocity vector would be oriented at a certain moment right along the X-axis, we could theoretically register a maximum time difference of **+/- 1 ps** (one picosecond) between those photons, and this interval cannot be actually measured under normal conditions.

Remarks

1. If this difference would be measurable, two more devices like this one (mounted along the OY and OZ axes) might allow us to establish the absolute direction of Earth’s instantaneous velocity correctly.

2. Instead, this apparatus can indicate how much those light beams are displaced from the sensor's center, and this may only confirm the absolute rectilinear trajectory of photons. This deviation should vary periodically, by day and by year, corresponding to these two types of motion the Earth is experiencing: a rotation around its internal axis and a revolution on the solar orbit.

3. We may also observe a "pulling" or "dragging" effect, i.e. the direction of photons could change when the atmospheric air fills those tubes. In other words, the photons are deflected from their absolute trajectory, being "driven" by the average motion of the air molecules (the same global motion as of Tx and Rx devices).

The air inside these tubes moves simultaneously with the light emitter and receivers, which are all firmly tied to the planet's surface; therefore, that volume of air will move in the same way the Earth does. The atoms and molecules in the air are re-emitting those photons and their rectilinear trajectory will thus be modified bit by bit. There is an infinitesimal duration of time until a photon is re-emitted by an atomic electron; during this time interval, the atom moved an infinitesimal distance (the global movement of the planet). As a result, all photons will move along a special "straight line", being "deflected" in fact by the relative motion of this system's components (Figure 11).

4. The light sensors Rx1 and Rx2 must be identical, as well as the electrical connections to the signal analyzer; practically, in order to have the best possible results, the whole device must be perfectly symmetrical.

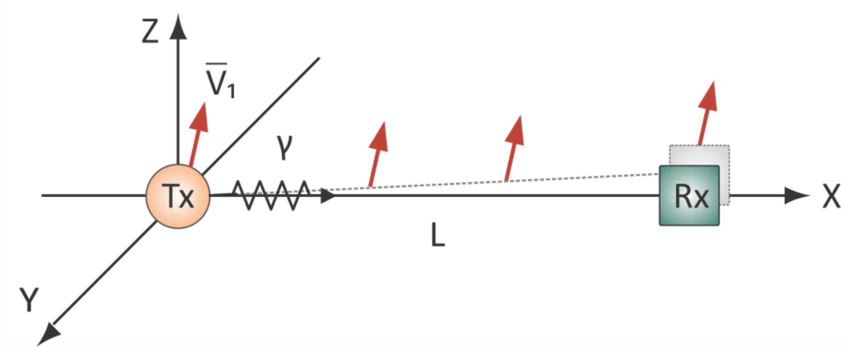

Figure 11 - *The new trajectory of photons*

5. As the small delays of photons cannot be accurately measured, this device may be adapted to compare only their arrival moments. When it is optimally oriented, this simple apparatus should detect the planet's periods of rotation and revolution.

6. To perform accurate measurements of the speed of light, this device must have a more complex configuration; as such experiment has to be performed in a vacuum, the whole apparatus should be moved into space, on a geostationary satellite. More details of a new and improved design will soon be published on PT's dedicated website.

Conclusion

We assumed that TR might be applied in R1 (or in any other frame of reference) with respect to the AFR; we also saw how an observer from R1 managed to determine the magnitude and direction of the velocity $\mathbf{v_1}$. In these circumstances, what can be said about the reference frame R2 (a situation as in Figure 2)?

We have seen that the rate of time cannot be calculated in a relative, direct manner; this can only be done by using the AFR:

$$\Delta t_2 = \Delta t_1 \sqrt{\frac{c^2 - v_1^2}{c^2 - v_2^2}}$$

where both velocities $\mathbf{v_1}$ and $\mathbf{v_2}$ have values smaller than $\mathbf{c}$. Here are a few particular cases of this important formula:

$\mathbf{v_1 = 0}$: normal relativity, $\mathbf{\Delta t_2}$ increases with speed $\mathbf{v_2}$ as usual.

$\mathbf{v_1 = v_2}$: the rates of time are identical in R1 and R2.

$\mathbf{v_1}$ tends to $\mathbf{c}$: $\mathbf{\Delta t_2}$ decreases, the rate is faster.

$\mathbf{v_2}$ tends to $\mathbf{c}$: $\mathbf{\Delta t_2}$ increases, the time is slowed down.

As the velocity vectors $\mathbf{v_1}$ and $\mathbf{v_2}$ have arbitrary directions in space, the difference between the rates of time in these reference frames will not directly depend on their relative speed, but on the absolute ones.

Now a concrete case: if a rocket takes off from the frame R1, its local time may vary greatly, depending on the direction of movement. When our rocket accelerates, the rate of its local time will not only slow down, as it results from TR, it may even increase. If this rocket continues to accelerate and its speed is getting closer to **c**, the local time will dilate significantly, but this time variation will not depend so much on the actual direction of movement. This case clearly illustrates that we have to correct the TR theory and especially its applicability conditions.

3.4. Errors in Einstein's Theory of Relativity

There is a postulate of TR stating that all the inertial frames of reference are equivalent. Therefore, if a certain frame of reference moves with regard to another frame that is considered fixed, its local time will pass more slowly and the mass of an attached body will increase. These variations would happen, according to the TR, due to the *relative* speed of higher, relativistic values. However, that body cannot reach a speed this high instantly, it surely goes through a certain period of acceleration. Now you may see that TR does not clearly explain how the local physical quantities of a system are depending on its past, on the manner it accelerated relative to another system being at rest. This is a concrete example showing that the inertial frames are not equivalent; their local physical laws are connecting in fact non-uniform quantities that all are depending on the direction these systems have previously accelerated.

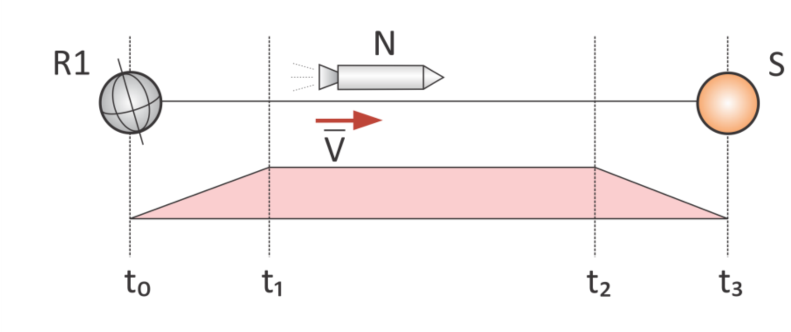

Figure 12 - *The spaceship*

Let be a hypothetical spaceship **N** that departs from Earth (R1) at time $\mathbf{t_0}$; this ship then accelerates and reaches a relativistic speed **v** (e.g. $\mathbf{v = 0.8 \cdot c}$) at time $\mathbf{t_1}$, continuing its journey to the distant star **S** (Figure 12). In the ship's local frame of reference, the actual time is now flowing slower than it does on Earth; it will dilate according to the TR's formula:

$$\Delta t_N = \frac{\Delta t_R}{\sqrt{1 - v^2 / c^2}} \quad \text{and therefore} \quad \Delta t_N > \Delta t_R$$

When the ship is close to the destination (the fixed star **S**), it starts to decelerate (at time $\mathbf{t_2}$, our time); gradually, at the end of the journey, the ship's local rate of time will get back to the value it had before the takeoff.

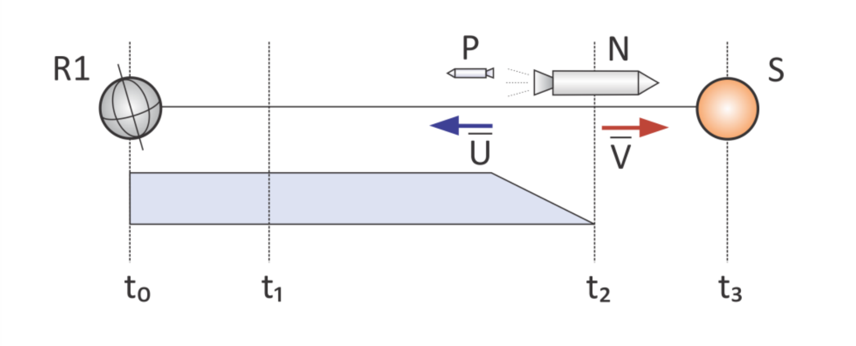

Figure 13 - *The additional rocket*

Let's now assume that just before the time $\mathbf{t_2}$, when the ship is still moving at the constant speed **v** and its local time is flowing slowly (for that the ship has accelerated away from Earth), an additional rocket denoted by **P** is launched off the ship (as depicted in Figure 13). This small rocket accelerates with respect to the ship **N** (which is now considered a fixed frame), on its way toward Earth, until it reaches the speed **u** (slightly larger than **v**). The local time of rocket **P**, related to that of the mothership, may be given by this TR's formula:

$$\Delta t_P = \frac{\Delta t_N}{\sqrt{1 - u^2/c^2}} \quad \text{and therefore} \quad \Delta t_P > \Delta t_N$$

We may calculate the actual speed of the rocket **P** (relative to Earth) by composing the velocities **u** and **v**. The non-relativistic speed that results will allow the rocket to slowly return home, and therefore we can write this equality:

$$\Delta t_P = \Delta t_R$$

The time intervals in the previous formulas may be simply compared and the following inequality results:

$$\Delta t_P > \Delta t_N > \Delta t_R$$

These two expressions, the equality and the inequality of the same terms are valid simultaneously, showing an obvious *contradiction* between the rates at which time flows on the rocket and on the Earth! This inconsistency may only be eliminated if we apply the TA; consequently, the rate of time in a certain frame of reference does not directly depend on its relative speed (after an acceleration period) with respect to another system, but only on its absolute speed in the AFR.

This also changes the kinetic energy of a body, which will directly depend on the absolute speed. The so-called *absolute energy* will therefore depend on the absolute velocity. It will also depend on the relative speed of the observer, but a precise calculation requires the new quantity denoted by **E***,* called *the absolute energy of the movement*:

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

Parenthesis on relative and absolute

As stated before, it is very difficult to build a device (even based on interference) that would detect and measure a very small difference in the speed of photons; the involved mechanical and electrical precision must be extremely high. Moreover, it should be specially designed for this single purpose: the complete separation of the relative part of the material world from the absolute one. Metaphorically saying, this apparatus must cut off the "bridge" between two universes:

- the absolute one, represented by space at granular (sub-quantum) level, and

- the relative one, of the "mobile" laboratory, where all devices are in the same state of relative motion.

To disconnect and then observe these two worlds seems to be very hard; we need to identify a special means that experiences the absolute movement and, at the same time, is observable from any frame of reference. All becomes clear now: this special agent that reflects the absoluteness of space could only be the photon. By their constant speed imposed by the granular space, photons are a perfect indicator of the absolute at a macroscopic level and they may eventually justify the existence and all characteristics of the AFR. However, photons could be replaced by particles (if they are accelerated close to the speed of light), but the experiment would be more complex and some additional errors might appear.

There are a few conclusions to be drawn now, helping us to formulate correctly the TA:

Conclusion 1: In regard to the movement of the material bodies with respect to a certain reference frame, space became a non-isotropic medium.

Conclusion 2: *The inertial frames of reference are not equivalent*; the local laws of physics (the values of some physical quantities) depend on their absolute speed and direction.

Conclusion 3: The existence of some virtual frames of reference, moving at a certain absolute velocity, is not a truly relevant situation in the context of this new theory. It is only the material bodies, whether they are fixed or mobile in these frames, which are experiencing internal changes that depend on speed. Some physical quantities, such as the time, must always be expressed as characteristics of *certain bodies* or *concrete systems*. A theory of absolute motion may operate with these quantities just because all the effects caused by motion are *real* to those entities. Thus, we may say that, in fact, absolute motion is the one changing *the state* of all bodies and systems. This proper, particular state will no longer depend directly on the relative speed a body (or a system) has with regard to another system, but only on its *absolute* velocity.

Conclusion 4: It can be easily inferred that only the relative-type velocities are currently available here, in the mini-universe of our planet, either for measurements or for calculations. Therefore, by applying the TR on these relative data, we will only obtain approximate results. Instead, we may get accurate results by applying a general theory of the absolute motion; but, in order to do this, we must know the absolute velocity of the systems.

3.5. Theory of the Absolute, Formulation and Notes

At first, one more definition should be given:

The **proper state** of a body is a palette of absolute physical characteristics that are all directly related to its particular form, consistency and motion. These quantities (e.g. proper mass and proper energy, local time, speed, etc.) are therefore measured with regard to the AFR and they exhaustively describe the state and dynamics of that body at a certain moment. The local time and the global speed of any other object being at rest relative to this body will thus have identical values.

Note 1: The local time and speed of a macroscopic body may be extended to lower dimensional levels. However, the atoms and their component particles may have a supplemental, relative motion, different from that of the body, which will continuously change their instantaneous state.

Note 2: The global state of the body in uniform motion is given by the mean value of all the physical quantities included in that palette; the averaging process is made in time and space upon the very large number of component particles (like atoms or molecules).

Theory of the Absolute (TA)

The proper state of a body in uniform motion can be fully and accurately determined only if its absolute velocity is known (or the velocity of its rest frame).

Corollary: *If two or more bodies are uniformly moving at different speeds, the proper state of each one of them can be determined only if their absolute velocities are all known.*

Note 1: The absolute velocity of the body could therefore be the velocity of its own frame of reference (where this body is at rest).

Note 2: TR may be applied to any inertial reference frame, but only with respect to the AFR (according to restrictive postulate).

If we apply TR in each system with respect to AFR, a relative, but correct relation may be determined between the proper states of those bodies. If we are only using TR and their relative speed, the proper state of any of them cannot be accurately described.

Note 3: The absolute velocities (the magnitude and direction of these vectors) of macroscopic bodies may be calculated from experiments in which the speed of photons is measured in all directions (the axes of a FR for example).

Note 4: The proper state of a body moving with a certain speed relative to another body can only be determined if the absolute velocity of the last one is known.

Note 5: All spatial directions are equivalent in AFR. However, for a certain body in an inertial frame, at the quantum level, the laws of physics depend on its absolute speed and direction. These two parameters change the proper state of that body (and of its component particles) in an absolute way, and this state will also change relatively, in regard to any other moving bodies.

Note 6: The speed of light (of photons) in a vacuum is a universal constant, but only if it is measured in AFR. In any other frames of reference, its concrete value will depend (if measured using an absolute time) on the absolute movement of each system, i.e. on their absolute velocity.

Note 7: All inertial frames of reference (those that are uniformly moving relative to the AFR) are making changes to the "physics" of the material bodies they contain. Thus, the values of some parameters related to the movement of these bodies will depend on the absolute speed and direction of the observer's frame.

Note 8: Most symmetries of particle physics (those phenomena that are invariant to some changes of parameters) are still valid in the FRs with significant speeds. The motion in different directions requires different actions on particles in order to produce the same results, as their mass depends on the absolute speed and the absolute direction of travel. In this context, certain symmetries (rotation, translation) and their related laws of conservation should therefore be adapted to an anisotropic space-time, by taking into account the absolute velocity of the local frames of reference.

3.6. Comments

Comment 1

Let two fixed bodies be in separate frames of reference, R1 and R2; these bodies have been accelerated from rest to the absolute velocities $\mathbf{v_1}$ and $\mathbf{v_2}$, which are thus the velocities of their own reference frames (as shown in Figure 2). As observers in AFR (the fixed spatial system), we may apply TR to these bodies and obtain in this way a relation (as we saw earlier) between their rates of time or between their masses, a ratio that depends on the absolute velocities $\mathbf{v_1}$ and $\mathbf{v_2}$. This is all we can say about these two bodies, and only if we know both speed values. We cannot deduce the real values of their physical quantities just from their relative speed (measured in AFR). The same thing happens if we would measure the relative speed of a body in the frame of reference of the other one.

Comment 2

Let's now assume that the frames R1 and R2 have the same point of origin and the same absolute velocity $\mathbf{v_1}$, at a certain moment, as shown in Figure 14. According to the TA, we may say this: if two bodies are temporarily stuck to each other (for example the Earth and a rocket on its surface), their physical quantities will vary in the same way relative to the AFR (as we saw before), and this variation is given by the $\boldsymbol{\gamma}$ factor:

$$\gamma = \frac{1}{\sqrt{1 - v_1^2 / c^2}}$$

Figure 14 - *Overlapped frames of reference*

Once the rocket R2 is launched, it speeds up until the speed **u** is reached (relative to Earth), a moment when the acceleration process stops. Figure 15 shows this exact moment, the rocket being already at a great distance from the planet:

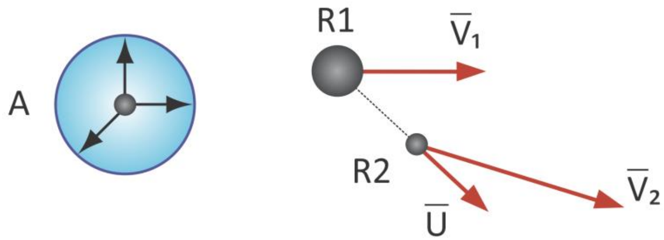

Figure 15 - *Separated frames of reference*

The rocket reached in this way the *absolute* velocity $\mathbf{v_2}$, which may be relativistic or not. This absolute velocity, which really expresses the rocket's "state" of motion, may be calculated by using the relativistic addition of velocity vectors $\mathbf{v_1}$ and **u** (a formula that directly results from TR). In other words, the current "state" of R2 can be determined from the relative velocity **u,** but only if we also know the absolute velocity $\mathbf{v_1}$. Consequently, we have seen one more time that the relative speed of a moving body (measured with respect to an inertial reference) frame *is not sufficient* to describe completely its proper state.

Comment 3

Let now be a body that moves with the absolute velocity $\mathbf{v_1}$ and emits photons in all directions; analyzing how the speed of these photons is distributed, we will rapidly discover certain *anisotropy* of space. As this property extends to the whole quantum realm, we may also realize the existence of a "privileged" direction for both photons and particles. Therefore, if a particle is accelerated in this special direction (opposite to $\mathbf{v_1}$) and reached a certain speed within the relativistic range, it could even experience a decrease in mass. However, this phenomenon has no real or observable effects, due to at least two reasons:

A. The absolute velocity $\mathbf{v_1}$ is not constant over time, neither as direction nor as magnitude.
B. An elementary particle has an intrinsic precession motion, which continuously changes its instantaneous direction of travel (but globally, we may consider an averaged path of its motion).

Comment 4

The absolute velocity of a photon, if combined with the motion of the emitting particle, generates a change in the photon's wavelength to all observers. Photons, as granular structures in motion, are created layer by layer, and this process takes a certain amount of time. Let's now assume that the source of photons, one particular electron in an atom, has a global, non-relativistic speed. The Doppler Effect, that effect about which we are talking here, means a change in the photon's wavelength that is produced during each of the emission and reception periods. According to TA, the global intensity of the Doppler Effect (relativistic or not) depends on the absolute velocities of both emitting and receiving particles. Therefore, to know the relative speed of these two devices may not be enough, their absolute velocities are definitely necessary for calculations. It might be interesting to check if this effect could be used in our previous experiment with light, if the measurements are affected and to what extent. In my opinion, that experiment will not be influenced at all; the reference frames R1 and R2 - represented by those Tx and Rx devices - are tied together, so whatever deviation the wavelength of the emitted photons might have, it will be fully compensated at the receiving end.

Comment 5

The way an observer perceives the simultaneity of certain events from another FR will be also changed. As expected, the simultaneity will not directly depend on the relative velocity, but on the absolute velocities of both reference frames (as values and directions). Figure 16 presents in space-time coordinates (the two-dimensional space is on the XOY-plane and the flow of time is on the vertical axis) the light cones of all the events that may occur in a system. On the upward side of each picture are the *future* light cones, while the *past* light cones, where the past events lie (events that could have potentially influenced the future ones), are on the downward side.

The upper picture depicts the light cones as seen from the AFR: all trajectories of photons emitted from point O - the present - are confined to the outer surface of the cones, as any photon is only moving at the maximum speed **c**. The bottom picture shows the light cones that are observed from a reference frame named R, which moves to the right with the absolute velocity **v**. The velocities of photons in this system, observed from AFR, will thus describe different cones, skewed at some angle in the proper velocity's direction**.**

Comment 6

TGR must also be adapted and changed once the AFR has been introduced. Any field, and hence the gravitational one, is exerting a certain force on a body or a particle; this causes objects to accelerate, increasing their speed with respect to an inertial FR. However, the magnitude of this effect will also depend on the absolute velocity of that body, because only this type of velocity directly determines the mass (and the proper state) of all objects in motion. The gravitational field is still equivalent to any other force field that can accelerate an object; in accordance with the Prime Theory, there is no phenomenological difference between the forces that are caused by an imbalance in the uniformity of the local flux and those generated by an additional granular flux.

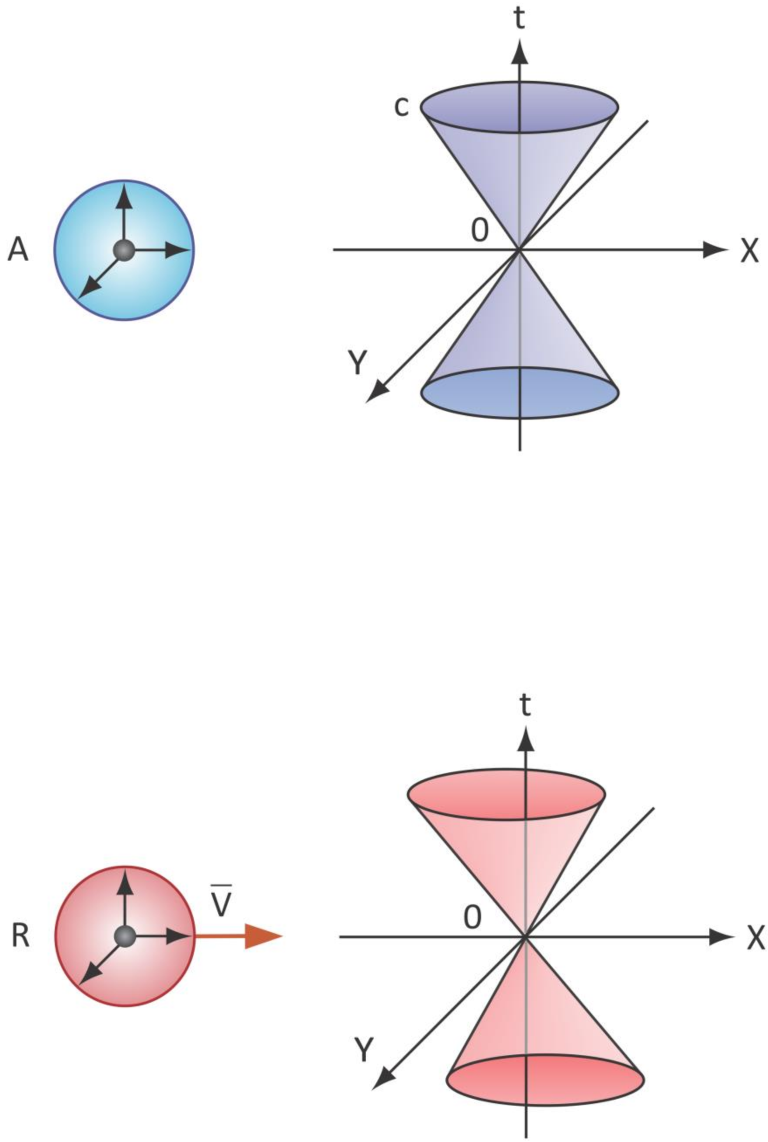

Figure 16 - *The light cones*

Comment 7

Under TA, mass and energy will become absolute quantities, as they both directly depend on the speed that a certain body or particle has in an AFR. Theoretically speaking, these quantities will also be dependent on the direction that body moves or accelerates relative to an inertial reference frame. Practically, for any macroscopic body, this dependence is strongly "diluted" by the *omnidirectional* distribution of the movements, oscillations or vibrations of the component atoms. Due to these things, a precise description of the absolute movement these parts of matter are executing in a local frame is almost impossible. Only ***photons*** - seen as fixed structures of granular fluxes - are reflecting the absoluteness of space accurately; moreover, this feature of the surrounding reality can always be revealed by performing some appropriate measurements, in any frame of reference.

If a rigid body stays at rest in our laboratory frame of reference, we may consider that its mass has a minimum value; in case this body would be moving, the TR's formula will not give us the real dependency of its mass with speed. Anyway, the rest mass of a body is in fact a *mass "of motion"*, namely the mass it has acquired by moving concurrently with the laboratory with respect to the AFR. It should be noted that the mass of a body is seen here as an additive quantity, obtained from the averaged inertial contribution of all the component particles of that body. Moreover, according to PT, particles will always have a mass "of motion", as they all are continuously performing the intrinsic precession movement - even at absolute rest. Therefore, the absolute rest mass, as well as the absolute velocity, both must be known in order to fully characterize the "state" of a body in motion and to correctly apply TR with respect to the AFR.

The amount of energy consumed to change this "state" of a body also has different values, being dependent on the absolute speed and direction of its local frame of reference. In the particular case of Earth, all these errors and differences are very small as its absolute speed through Universe is apparently small. The regular composition of all the planet's movements - rotation, revolution and the galactic ones - could generate a peak speed value around one-thousandth of **c**.

Comment 8

The previous experiment was specifically designed to reflect the absolute speed of photons; however, the contribution made by quantum uncertainty to the measurement errors was not taken into account. The emitting and receiving atoms cannot be clearly pinpointed, and their position cannot be precisely established. Similarly, the exact moment a certain photon is emitted (or a ray is modulated) is practically unknown, we may only have a time range for this event. Does the intrinsic uncertainty of photon positions affect our measurements? Does all this imply a small amount of time (much less than the photon flying duration) and the end results might not be affected at all? In my opinion, the differences all these specific quantum effects are causing to the results may be included in a small margin of error; measurements will not be significantly affected, especially if optimal conditions are chosen for this experiment.

3.7. Conclusions

The simple existence of the AFR helped us reveal the real meaning of mass and time, which both became in fact absolute physical quantities; they no longer depend on the relative speed a system moves with respect to certain reference frames, their true dependency is only on the absolute velocity. Moreover, TA allows us to apply TR, but only in a particular way, relative to the AFR. For a rigid body located in an inertial FR, the relation between its own "state" and the state of another body may be determined only if their absolute speeds are both known. If TR is simply applied using their relative speed, important errors could occur sometimes, bigger as their absolute velocities are greater. Consequently, the inertial reference frames will no longer be equivalent, and most of the local laws of physics can no longer be formulated as in isotropic mediums - i.e. they are not *invariant* under the change of the FR.

Finally, the chain of **causation** in nature, which is now perfectly defined by the PT, TA and their postulates, must be described once more, in brief:

The value of the **absolute speed** of a body (or of a particle) determines the value of its **absolute mass**, which in turn will determine the magnitude (and so the effects) of all fundamental forces (interactions of any kind), and therefore it will set the rate of the **local time** in relation to the absolute one. Similarly, the presence of **gravity** - seen as an asymmetry of local granular fluxes - also determines a variation of the fundamental forces, producing a real change (dilation) to the rate of **local time.**

Note 1: For an *isolated* elementary particle, the use of term 'local time' becomes a little improper, although this physical quantity may be used in its formulas and equations of motion. This term makes more sense only in the case of composite particles or systems of particles because all interactions between components are affected as their mass increases with speed.

Note 2: Any cosmic body executes a complex movement, which may include several independent motions (rotations and translations) that all depend on the larger systems where it belongs. If we look at a lower scale, from an absolute frame of reference, we may see how the component particles of that rigid body will have the same global motion, but in addition to the proper ones. As the absolute motions continuously change the state of any particle, we could simply predict that the spatial directions are not equivalent. In any local frame of reference, the instantaneous state of a particle will depend on its instantaneous velocity (direction and magnitude); this thing is more visible at the atomic and quantum levels and within the relativistic range of speeds. Therefore, any experiment, measurement or test we would perform there, using certain parameters of the quantum objects (particles, atoms and photons) in relation with the so-called "fixed" local frame of reference, the results will be somehow affected due to the changes caused to objects by their motion. This "relative" type of quantum experiments could be used to generate perfect random numbers or to analyze the quantum entanglement phenomena, for example, but the numbers and all the other readings will contain *implicitly* a certain degree of correlation. They are practically becoming irrelevant to any process or measurement that implies high accuracy of data, and thus we cannot use them to prove fundamental principles and laws of physics.

Note 3: This new perspective on time and space will also change some other "classic" things that resulted from TR, such as the Twin Paradox (see the Annex 2 for more details).

4. The Movement of Elementary Particles

4.1. First Elementary Particles

Let's imagine we have traveled back in time at the end of the First Stage when the density of the granular medium has dropped enough and the development of some stable granular formations has just begun. Due to the predictable nonuniformity of the primordial fluid at the quantum scale, many adjacent regions of space got different density values and a lot of granular gradients were formed in this way. Such gradients caused a progressive deflection of the directional fluxes that crossed these regions. When two opposite fluxes have been bending simultaneously, concentrating within the same region of space, a new three-dimensional structure emerged in that place; these circular formations started to spin immediately, remaining stable for long periods of time. This simple mechanism led to the creation of the first elementary particles and of their antiparticles, as shown in Figure 17. Two opposite fluxes, $\boldsymbol{\varphi_1}$ and $\boldsymbol{\varphi_2}$, which overlap in a zone of high, but variable granular density (suggested by the shades of gray of the background), are forming the stable structure **P**; this disc-shaped *particle* will immediately start to move in a certain direction. At this very moment, its thin cylindrical body will randomly turn into a convex or a concave one, which means that the electric charge of particles appeared exactly at the time of their birth. The chaotic movement of these newly born particles (quarks at first) will cause, when the temperature drops enough, the formation of the first composite structures. All particles with opposite-sign charges are attracting each other, therefore they started to move and accelerate on collision courses; eventually, when some quarks got very close to each other, the gluonic field emerges and balances out the forces of electric nature. The structures made of three quarks have proven to be very stable; they are today's composite particles, the well-known neutrons and protons. At a later moment, the electrons and their antiparticles - the positrons - also started to form, the electrons being produced in a slightly larger number. Having lower masses and charges of opposite signs, these leptons got higher acceleration values and so they were able to annihilate each other in pairs. At the end of this process, only a small part of the initial number of electrons remained. As the temperature continued to drop, many "cold" electrons were caught in the electric field of protons and thus the first Hydrogen atoms have been formed. Huge numbers of **γ** photons have been produced in the above annihilation processes; later, they create other electron-positron pairs, and the dynamic process of creation and annihilation has been considerably prolonged in this simple way.

All these particles, let's call them primordial (whether they are in composite structures or not), were stable over large periods of time, they are stable now and we expect to remain so for billions of years. Interestingly, this stability was still maintained while the density of the granular space continued to decrease. A single justification may be given for this, namely that any elementary particle does really contain an *enormous* number of constitutive granules. As all the granular fluxes have diminished over time, this number (and the mass) has also decreased; regardless of its variable value, the structure of particles was stable all the time and we may simply predict now that this stability will be further maintained for long.

An extraordinary property of the granules must be disclosed now; this special feature has directly derived from their perfect elasticity and contributed decisively to the formation of the stable structures we have mentioned. It is about the reason why these granules stayed close to each other, practically bonded together, under those specific conditions.

Let's now imagine two free granules (at this point we know they have the same absolute speed ***C***) that are on a collision course, moving rectilinearly at an extremely small angle (i.e. they have nearly parallel trajectories). These granules will soon collide elastically and exchange their momentum, continuing to travel (as equivalent granules) on the initial trajectories. However, this type of collision takes longer than a frontal or lateral one, and those granules will remain in contact for significantly more time. As the period of contact ends, these granules may collide again, exchanging their impulses with other granules; eventually, the first two granules might come closer again and the process above may continue in the same way. This phenomenon keeps repeating itself, and therefore some granules could remain "stuck together" over larger durations of time until other collisions (under bigger angles) will separate them. This cohesive property, a sort of mutual "adhesiveness", obviously extends to the larger groups of granules that have almost identical trajectories; all this may explain, in fact, how the high-density granular groups are forming inside an elementary particle and also why particles have their particular behavior.

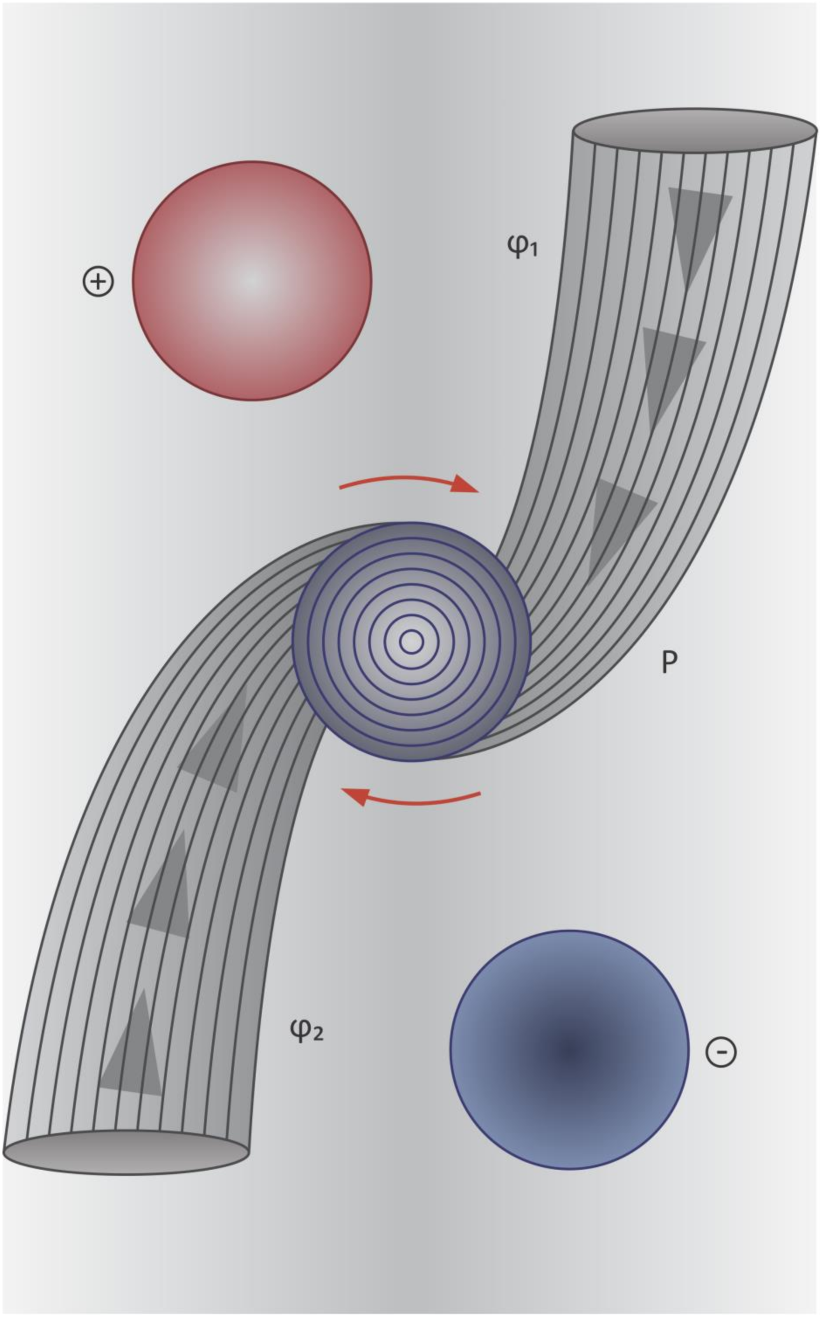

Figure 17 - *Creation of elementary particles*

As the granules from a group are in contact with each other over large time intervals (they have quasi-identical directions), certain "hardness", a kind of solidity is generated for the entire structure. Therefore, these special clusters will act together as a whole, as a distinct entity that manifests a bigger "mass" during collisions (with other granules or with similar groups).

The "cohesion" property described above determines the entire dynamics of any granular group; moreover, this special mechanics allows the existence and ensures the stability of all elementary particles.

This particular dynamics also establishes the behavior of the external granules that collide with a particle. Thus, depending on the direction of the free granule relative to that of the particle, several distinct situations may appear:

- That granule is reflected on the particle's surface (it practically obeys the laws of reflection, according to PT)

- That granule is integrated into the particle's body (the fuzzy surface is ignored here, and we are only talking about equivalent granules in these statements)

- After a collision, one or more granules are detached from the group that has been bumped.

As the granular density near the surface of a charged particle is variable and as all the particles rotate while performing the intrinsic precession, a few other effects may be added to the description of granular reflections:

- A curvature of the granular trajectory near the particle's surface

- The change of the reflection angles at relativistic speeds

- The emergence of a gluonic field, as the incident and reflected fluxes are concentrated in the central zones

- A rotational component of the reflected fluxes

We wrote several simulation programs in order to verify the stability of a granular structure, implementing all the basic rules of granular collisions that were described above. At first, a uniform (two-dimensional) granular medium was simulated inside a virtual "box"; then, one "particle" - a compact granular area of high density - was added in the middle. These applications were able to simulate the elastic collision of up to 50,000 granules, free or in structures. That particle has started spinning immediately and displayed the tendency to become more compact, yet keeping its initial shape over time; it has also shown a secondary, global rotation. At this point of our tests, it was clear that the simulations should be only performed in three-dimensional boxes and by using a much higher number of granules.

Let's consider the elastic collision between two granular groups (or clusters); the impulse vectors of these groups have the magnitudes **a, b** and form the angles $\mathbf{\Phi_1}$, $\mathbf{\Phi_2}$ with a specific axis. The direction of the global momentum to that axis is given by the tangent of angle $\mathbf{\Phi}$:

$$\mathrm{tg}\,\phi = \frac{a \sin \phi_1 + b \sin \phi_2}{a \cos \phi_1 + b \cos \phi_2}$$

and the final impulse vectors of the two groups will make these angles to the same working axis:

$$\phi_1' = 2\phi - \phi_1$$

$$\phi_2' = 2\phi - \phi_2$$

A lot of different numbers were tested and we finally concluded that any rotational structure made of granular groups:

- tends to maintain its circular shape while spinning

- holds its position and remains stable in case of quasi-uniform granular fluxes

- exhibits a certain global elasticity (it may temporarily deform under the action of a supplemental flux, but shortly returns to its original shape when that flux has stopped; also, its volume remains constant during the shape-shifting process).

For that the computing power of a regular PC is not sufficient to simulate a particle in real-time, we had to turn to a simpler model and implement the same properties and mechanisms to a particle with no internal structure. Considering the shape proposed by PT for the charged elementary particles, the current version of our simulation program (***Particle Simulation***, you may download it from the theory's website [5]) can show the real flux - particle interactions and the emergence of the gluonic field.

4.2. Flux - Particle Interactions

To determine the real equations behind the kinematics of any elementary particle, two distinct cases of flux/particle interaction will now be analyzed using the PT and TA's principles:

Case 1: A fixed particle in AFR, a perpendicular flux.

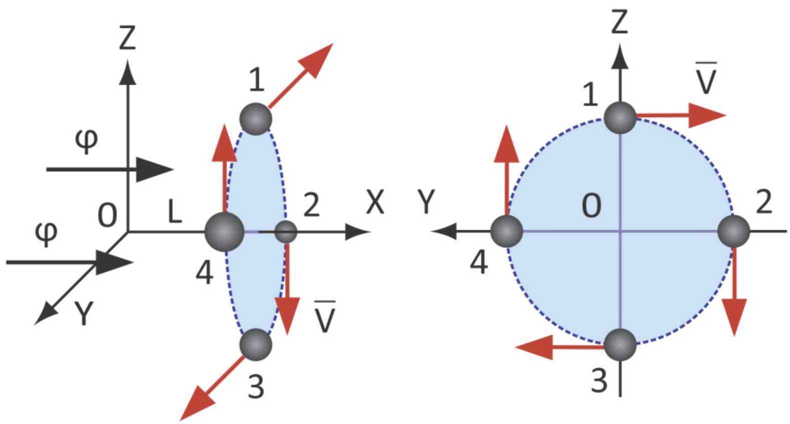

Figure 18 - *Perpendicular flux*

Let be a generic disc-shaped particle at rest in AFR, positioned at distance **L** on the X-axis; its planar surface is perpendicular to this axis, as in Figure 18. There are only shown four granular groups **1...4**, all of them rotating at the absolute speed (of value ***C***) on the edge of the particle. We will ignore the duration of their internal granular collisions and further assume they all move at this maximum speed. At a given moment, an additional flux **φ** starts to flow along the X-axis and hits the particle; consequently, all those red velocity vectors will evenly incline to the right. This angular deviation could be calculated using the PT's method, applying the impulse conservation formulas; thus, the whole particle would simply shift along the X-axis. However, this hypothetical case is highly unlikely to occur and it will no longer be analyzed.

Case 2: A fixed particle in AFR, an oblique flux.

The same particle is now subjected to another flux, **φ**, whose direction forms the angle **α** with the Y-axis, α = (0...90°). The granules of the flux **φ** will bump into the four granular groups for a very short period. Let **m** be the number of granules in this flux and **n** the number of granules making up each group.

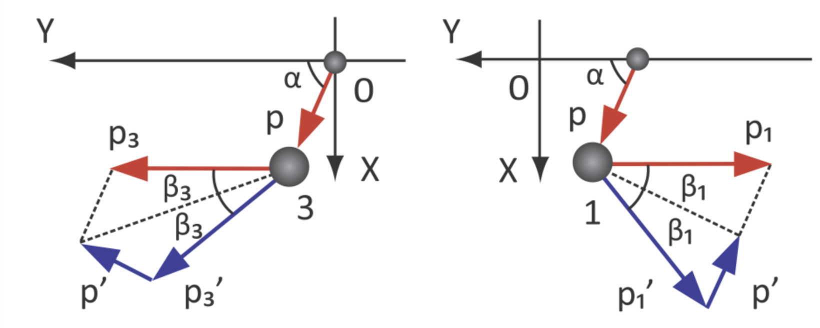

Figure 19 - *Granular collisions (clusters 1 and 3)*

Once those collisions have ended, the velocity vectors of each granular group show certain deviations (Figure 19). The angles formed between the initial impulse vectors (**p_1**, **p_3**) and the resultant ones will be **β_1** and respectively **β_3**. Now, the final impulses **p_1'** and **p_3'** will be inclined by the angles **$2\beta_1$** and **$2\beta_3$**

relative to their original directions, and these angles may be easily calculated in this way:

$$\mathrm{tg}\,\beta_1 = \frac{p \sin\alpha}{p_1 + p\cos\alpha} = \frac{m \sin\alpha}{n + m\cos\alpha}$$

$$\mathrm{tg}\,\beta_3 = \frac{p \sin\alpha}{p_3 - p\cos\alpha} = \frac{m \sin\alpha}{n - m\cos\alpha}$$

Both angles β_1 and β_3 are measured in the XOY-plane. As for the granular groups **2** and **4,** there will be two *identical* angles, β_2 and β_4, but the resultant velocity vector will have components along all the axes (OX, OY and OZ). Their concrete situation in the same XOY-plane is shown in Figure 20:

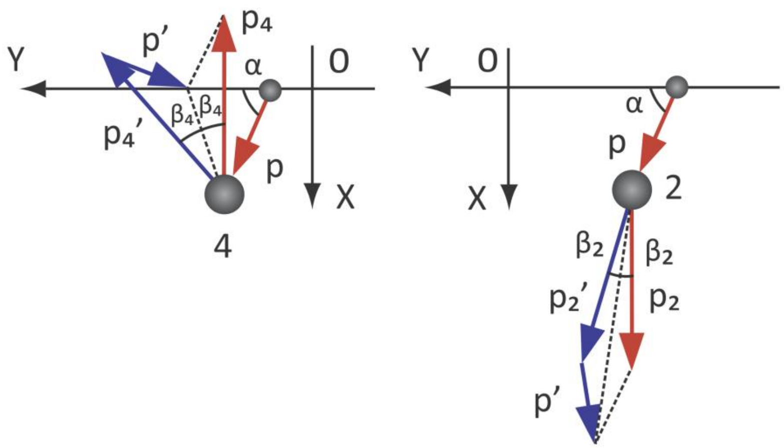

Figure 20 - *Granular collisions (clusters 2 and 4)*

$$\mathrm{tg}\,\beta_2 = \mathrm{tg}\,\beta_4 = p / p_2 = m / n$$

Let **k** be a constant (**k = m/n**) showing the ratio between the total numbers of granules, i.e. between the magnitude of the applied impulse relative to that of the bumped group (**k << 1**). We can replace the final impulses **p_1'**...**p_4'** by the velocity vectors (of value ***C***), their angles of inclination being **$2 \cdot \beta_1$**...**$2 \cdot \beta_4$**. The new position of our particle is shown in Figure 21.

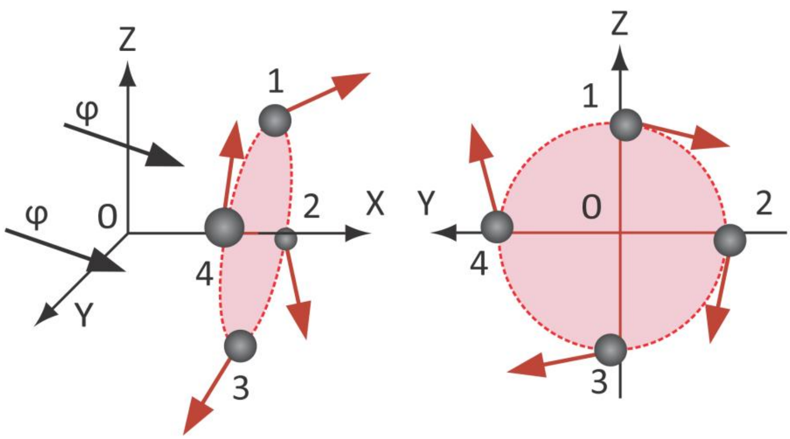

Figure 21 - *Oblique flux*

Let's analyze the components of each group's (**1...4**) velocity vector along the X-axis:

$$v_{1x} = C \sin 2\beta_1$$

$$v_{3x} = C \sin 2\beta_3$$

$$v_{2x} = v_{4x} = C \sin 2\beta_2 \sin \alpha$$

and along the Y-axis:

$$v_{1y} = C \cos 2\beta_1$$

$$v_{3y} = C \cos 2\beta_3$$

$$v_{2y} = v_{4y} = C \sin 2\beta_2 \cos \alpha$$

As **k << 1**, the angles $\boldsymbol{\beta_1 \ldots \beta_4}$ are also very small and we may use the approximation **sin 2x ≈ 2 sin x ≈ 2 tg x**; it yields the following formulas:

$$v_{1x} = \frac{2\,C\,k \sin \alpha}{1 + k \cos \alpha}$$

$$v_{3x} = \frac{2\,C\,k \sin \alpha}{1 - k \cos \alpha}$$

$$v_{2x} = 2\,C\,k \sin \alpha$$

which leads to these inequalities: $\mathbf{v_{3x} > v_{2x} > v_{1x}}$**.**

The projections of all velocities along the X-axis were *zero* before the action of this flux. We may compute the Z-axis components by using the well-known formula **$\cos 2x = 1 - 2 \sin^2 x$**:

$$v_{2z} = v_{4z} = C \cos 2\beta_2 = C\,(1 - 2\,k^2)$$

$$v_{1y} = C\,(1 - 2\,(k \sin \alpha / (1 + k \cos \alpha))^2)$$

$$v_{3y} = C\,(1 - 2\,(k \sin \alpha / (1 - k \cos \alpha))^2)$$

The particle seems to rotate slower in the YOX-plane, as these equations show:

$$\Delta v_{2z} = 2\ C\ k^2$$

$$\Delta v_{1y} = 2\ C\ (k \sin \alpha / (1 + k \cos \alpha))^2$$

$$\Delta v_{3y} = 2\ C\ (k \sin \alpha / (1 - k \cos \alpha))^2$$

But we know (Figure 20) that **tg** $\boldsymbol{\beta_2} = \mathbf{k}$. Let's now suppose that the impulse vectors **p** and $\mathbf{p_2}$ are no longer making a right angle (just after collision), and their actual angle increases by the value $\boldsymbol{\gamma}$ ($\boldsymbol{\gamma > 0}$). The new angle $\boldsymbol{\beta'}$ of the resultant momentum is:

$$\text{tg}\ \beta' = k \cos \gamma / (k \sin \gamma + 1)$$

and $\mathbf{p_2'}$ has now the deviation $\mathbf{2\beta'}$ from its original direction.

Remark

$$\gamma = 90° \quad \rightarrow \quad \text{tg}\ \beta' = 0$$

$$\gamma = 0° \quad \rightarrow \quad \text{tg}\ \beta' = k$$

The higher the $\boldsymbol{\gamma}$-angle gets, the smaller will be the effect of the impulse **p** (which is revealed by the deviation of the impulse $\mathbf{p_2}$, as shown in Figure 22). The direction of the velocity vector (as of the impulse) will change too. Its resultant component along the direction of impulse **p** is (as the projection of global velocity on the XOY-plane):

$$v = C \sin \gamma \quad \text{(initial)}$$

$$v' = C \sin (\gamma + 2\beta') \quad \text{(final)}$$

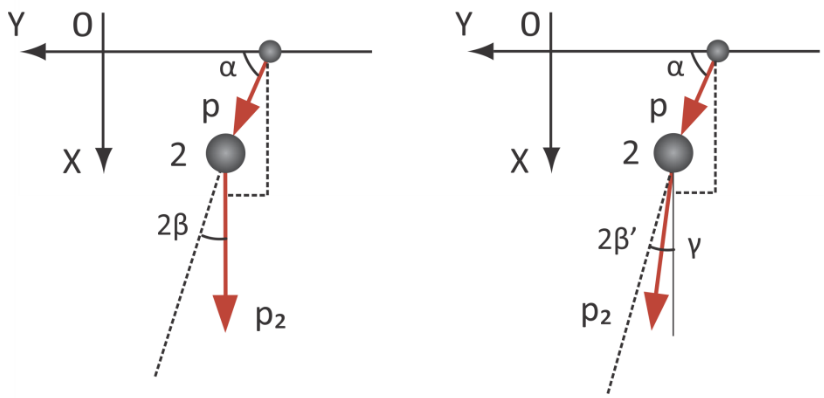

Figure 22 - *Deviations of the impulse vectors*

Notice that the speed **v'** increases more slowly than the angle **γ**.

Conclusions

1. From this inequality $\mathbf{v_{3x} > v_{2x} > v_{1x}}$ (or $\mathbf{v_{3x} > v_{1x}}$) we could draw the conclusion that, under the action of an oblique flux **φ** on its surface (angle of incidence **α**), a particle will start rotating around the Y-axis; the increase of its peripheral speed is **Δv** (as shown in Figure 23):

$$\Delta v = v_{3x} - v_{1x} = 2\,C\,k^2 \sin 2\alpha / (1 - k^2 \cos^2 \alpha) \approx 2\,C\,k^2 \sin 2\alpha$$

Therefore, the tangential speed is proportional to **k^2** and **sin 2α.**

2. Our particle is pushed by the flux on the direction of flowing; in the end, its translational speed will be **v'**. If **γ = 0**, we have:

$$v' = C \sin (2 \beta') = C \, tg \, \beta' / (1 + tg^2 \beta')$$

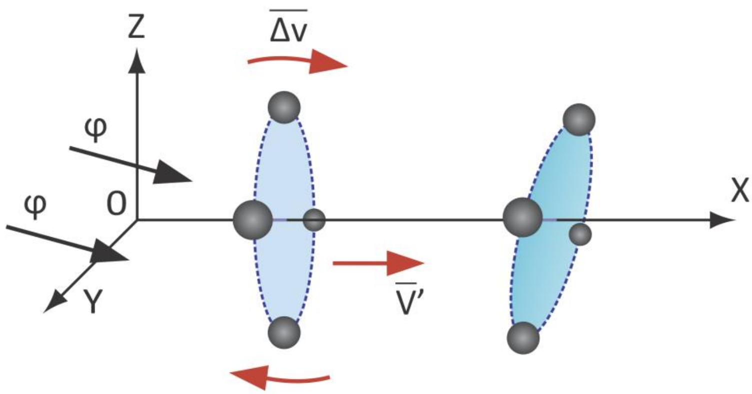

Figure 23 - *The movements of a particle*

As **tg β' ≈ k**, we may write:

$$v' = 2 \, C \, k / (1 + k^2)$$

In conclusion, it would result that the translational speed has a quasi-linear dependence on the constant **k**.

3. The effect of this flux will be averaged and balanced on the entire surface of the particle. Its end result will be a composite

motion, rotational and translational, which is added to the particle's internal rotation. Seen as a whole, our particle will have a helical movement that consists of these components:

- a translational motion in a certain direction, plus

- a rotational motion; the particle's center and its constitutive granules will rotate in the same direction.

These two distinct movements are correlated, and their speeds - the linear and angular ones - are both depending on the intensity and direction of the flux, as well as on the instantaneous speed of the particle. In the case of an oblique flux, the averaged effect on the particle's surface is thus expressed by a "pushing force" and an additional torque; they both will modify the particle's current translational and rotational motions.

4. It may be noted that, at higher speeds, a certain increase in speed requires a larger momentum to be applied, i.e. a more intense flux is needed for a similar effect. This implicitly explains the reason why the mass of a particle increases with speed, as being a direct consequence of the total momentum conservation law. However, the particle's exact response to any kind of incident flux requires a more complex model and a lot of computing power for simulations.

5. The intrinsic motion of a particle is very complex; on the inside, the granular groups have different movements, but they all are continuously held together by the local flow. These facts may lead to some very interesting conclusions:

- The electric charge of a particle, caused by the particular shape of its surfaces, could now be explained by the internal movement of all granular groups, as it has already been assumed in Chapter 2.3, Second Stage. On the first interaction with a granular flux, a presumed cylindrical-shaped particle is "forced" to adjust its lateral surfaces; in this way, it will simply turn into a stable structure of either concave or convex shape. These two kinds of three-dimensional geometry seem to be the only ones that allow a limited directional deviation, being compatible with that specific movement of elementary particles we have already described. The exact equations of these special surfaces could also be obtained by running some numerical simulations. The electric charge, as a geometrical consequence of the particle's internal motion, is certainly maintained unchanged over time. Therefore, an elementary particle will preserve its initial type of electric charge, which by simple extrapolation will lead us to the law of conservation of charge in all quantum systems.

- If the incident flux stops, the bumped particle will maintain its final state of motion (if the local flux is uniform). The helical motion of the particle is composed of those two proper motions above (or degrees of freedom); in this kinematic model, they both determine and maintain a global ***state*** of motion. The average inclination angle of the granular velocities stores the translation speed, while the small velocity difference between diametrically opposed groups will store the rotation speed. The particle's state of motion, as a part of its *proper state*, is completely given by the magnitude and direction of all these vectors expressing the intrinsic movements. All these state parameters, if were seen with regard to the AFR, would constitute a formal and uniform framework for particles; in this frame, the motion of a certain particle may be accurately and completely characterized, and then correctly compared to the motion of another particle or system.

4.3. The Spin of Particles

PT has shown that an elementary particle cannot be assimilated with a classical point-like particle; it is in fact a complex granular structure, a kind of micro-universe. The reason why all particles have special dynamics, an intrinsic precession movement, has been widely presented in the previous chapter. We may observe (from an inertial FR) how the center of a particle follows a helical trajectory, as a result of its translation and rotation motions. Referring to the physical reality, both these movements derive from the granular nature of particles, a nature that imposes the particle's "external" response to the action of directional fluxes. Thus, the instantaneous velocity vector will be restricted to a certain range of angles to the global direction of movement, and their values are only depending on the particle's speed. If a particle is electrically charged, it will be subjected to some electric or magnetic fields (it is all about the action of different granular fluxes). However, in the case of an isolated particle, the global state of motion remained unchanged (its speed, direction, as well as the other state parameters - such as the rotation axis, i.e. the proper spin).

A generic particle and its helical movement are shown in Figure 24 (the blue disc from the upper picture). The average angular speed of the granular rotation is denoted by **ω**, while the instantaneous velocity of the particle's center is denoted by **v** (whose translational component is the velocity vector **u**). That helical trajectory of pitch **p** fits perfectly inside the gray cylinder of radius **r**. The spin vector **S**, which could indicate the particle's global direction of movement, is shown in the middle picture. This vector may have a different direction, as in the bottom picture, forming the angle **α** with the global direction of movement.

Let's now take a closer look at the actions of different fields on a concrete particle (which may be treated as a whole).

Possible effects:

1. A certain force is produced when a directional flux hits the particle's surface; this will change the direction of all internal granules and, therefore, the angle of the spin vector will also be changed, by average.

If this force is continuously applied, our particle will speed up. A constant force leads to constant acceleration, but only within the non-relativistic speed range. Over the relativistic limit, the mass, seen as a measure of particle's inertia, will no longer have a constant value. It increases faster, non-linearly, as the speed gets closer to the speed of light (a value that cannot be exceeded by the particle as a whole).

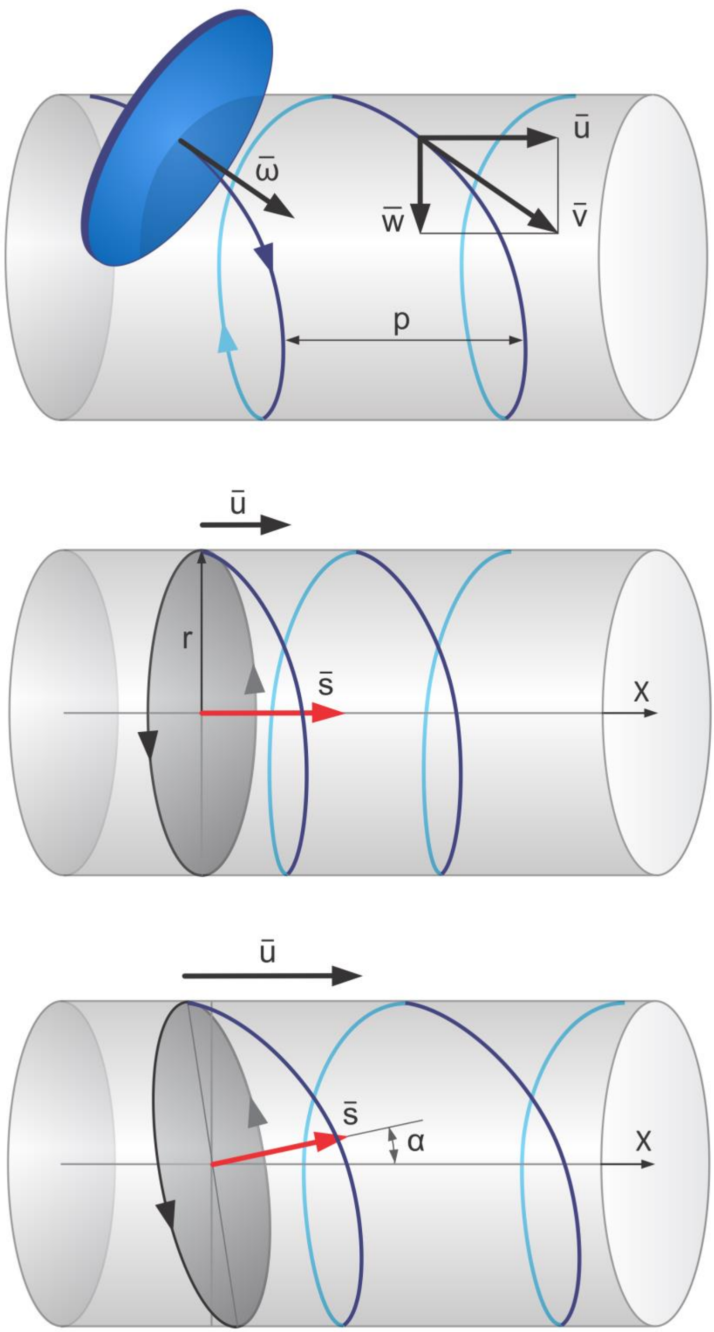

Figure 24 - *The trajectory of a particle*

2. Let's now consider some specific cases:

- The force is applied along the direction a particle globally moves: it leads to certain acceleration;

- The force is applied in the opposite direction: the particle will be slowed down;

- The force is applied in a perpendicular direction: the particle will move on a curved path, and we may calculate its radius.

If we are to analyze a short period (the duration of two revolutions, for example, as in Figure 24), during which the average angle of the particle's spin does not change significantly, we may see how two equal fluxes, flowing perpendicularly, are producing different effects on the same particle - as shown in Figure 25.

As these fluxes have different inclinations relative to the particle's surface, their acceleration effects will be different. Specifically, the values of the instantaneous mass that are "seen" by these perpendicular forces will not be identical (fluxes $\boldsymbol{\varphi_1}$ and $\boldsymbol{\varphi_2}$ are having the same intensity as projections). Moreover, this phenomenon occurs within a very wide range of speeds, not only in the particular case of $\boldsymbol{\alpha = 45^\circ}$.

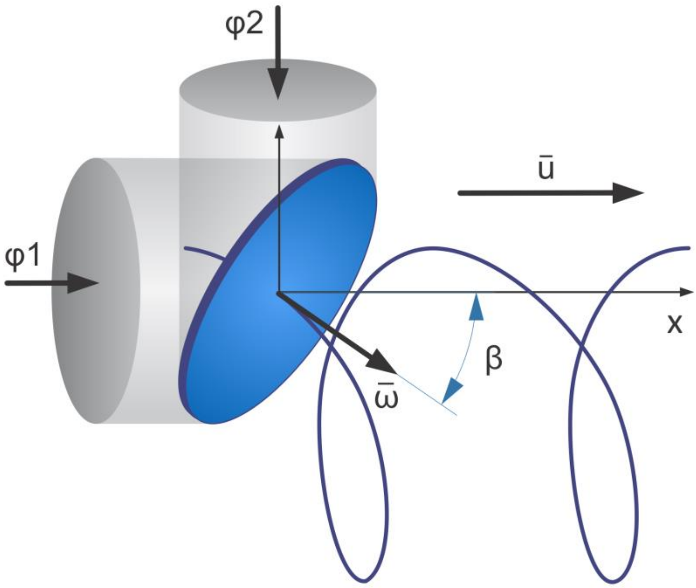

Figure 25 - *The effect of perpendicular fluxes*

However, the mass has an intrinsic relativistic mechanism and a global medium value (due to the particle's precession movement, which certainly has to be taken into account - as PT explained). While spinning, the two side surfaces of the particle may form various angles with a directional flux. In other words, the uneven distribution of the electric field and the precession movement are causing a special behavior to any particle (seen as a whole), determining some "external" properties that depend on the direction for short intervals. This is a source of fundamental uncertainty on the particles' position/speed quantities, which may validate their "wave" property assigned by QM. Moreover, if it is corroborated with the objective observational limitation, we may even validate the *probabilistic* approach of QM that describes the movement and position of an elementary particle.

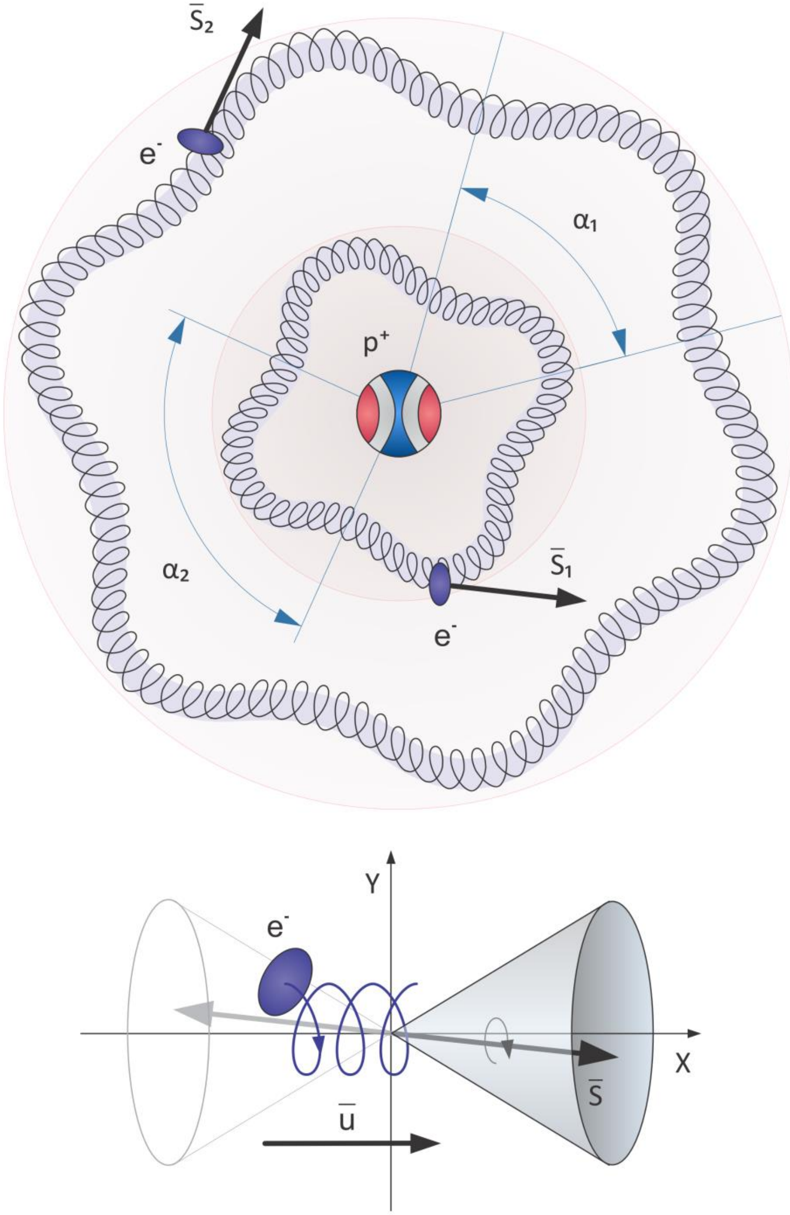

Figure 26 - *The trajectory and spin of orbital electrons*

There are several ways in which the trajectory of a particle may be deformed. Regions with certain gradients of electric and magnetic fields might change the particle's spin axis, and its real motion could feature some supplemental oscillations. Therefore, we may have a supplemental helical motion that is added to the particle's precession, of a bigger "wavelength"; thus, the global geometry of the orbit might be a double helix. These things may continue on a larger scale, by adding other translational and rotational motions. Practically, the movement of a charged particle continuously adapts itself; it will always "resonate" with the configuration of fields to which the particle is subjected.

All these things are particularly important because they allow us to analyze more precisely the movement of electrons in the atomic orbitals (see Figure 26, the electron trajectory and its spin vector) and the generation/absorption of photons in this context. In fact, an orbital electron is always in a dynamic balance with the nearby electric charges. Its trajectory (which would normally be rectilinear) bends as the particle continuously "falls" towards the atomic nucleus; thus, it is maintained in a region where the tangential velocity creates a centrifugal force equal to the pull of the positive charge. At the "internal" level, the particle's spin vector has a certain, averaged inclination; its oscillations "resonate", getting in sync with all fields applied. Within this orbital, the electron's inertia is always balanced by the electromagnetic field; as consequence, the particle is stable and keeps rotating, while its energy level remains constant. Electrons are thus located inside an "electron cloud", and QM can give their position only by the means of the probability distribution.

At the sub-quantum level, the explanations for all the movements of a particle are based on the direction-dependent effects produced by the granular fluxes. Being in the nucleus' potential field, an electron normally tends to change direction and accelerate toward the atomic center. However, the change in direction would modify the average angle of its spin, which automatically decreases the electric force. This oscillation around a state of dynamic balance maintains the electron's orbit within a region of fixed dimensions and also represents the basic motivation, at a granular level, for the quantization of the orbital angular momentum in QM's formulas.

If we ignore the intrinsic movement, the orbiting electron will therefore have a helical trajectory and the length of its path is an integer multiple of the oscillation wavelength. From the nucleus' perspective, one wavelength-wide segment is "seen" under angles $\boldsymbol{\alpha_1}$ or $\boldsymbol{\alpha_2}$. As it may be observed in the bottom picture of Figure 26, the tilt angle of the electron's spin vector **S** (to the global trajectory or the velocity vector **u**) has a continuous variation. However, this vector will stay inside the boundaries of the gray cone during the normal orbital movement.

Conclusions regarding the half-integer spin particles:

1. All the internal granular layers of particles are continuously spinning in a certain plane, moving at a quasi-linear velocity of value ***C***. We may thus introduce a hypothetical angular velocity, of the particle seen as a whole, which is perpendicular to the plane of rotation. This vector cannot be perpendicular or parallel to the instantaneous direction of travel. The average angle formed by this vector with the global direction of travel is dependent on the particle's linear velocity, and its current values may range between two fixed limits (see Annex 1 of PT).

2. The intrinsic motion of precession, as a superposition of rotational and translational motions, is causing helical trajectories

to all particles. The rotational motion (a half-integer spin particle gets the same orientation after two complete revolutions, i.e. a total angle of 720 degrees) is characterized by a spin vector, named *proper spin*, which may be oriented:

- in the same direction as the global velocity vector, and we are talking about right-handed helicity;

- in the opposite direction, and we are talking about left-handed helicity;

If the plane of rotation is not perpendicular to the velocity vector (Figure 24, the bottom picture), the proper spin vector will form the **α** angle with the direction of motion. This angle may be constant or may vary during the movement, even during a two-revolution timeframe. If that particle is isolated, the direction of this vector will not change. We may decompose the particle's proper spin into three spin vectors along the axes of a reference frame; each of these components may thus have a distinct value, constant or variable over time.

Therefore, the particle's spin is not a virtual measure, a quantity that has no real equivalent, which would only describe mathematically an abstract rotation! Similarly, the special degree of freedom approach is not a precise description either! The quantum spin has, in fact, a corresponding thing in the physical reality, being directly associated with the intrinsic motion of all particles - as it was described thoroughly in one chapter of PT.

3. All elementary particles are continuously executing this special movement through space; with regard to the global direction of travel, their instantaneous velocity may have a variable angle, so they may even move backward sometimes. This does not mean a

particle may travel in time, it may "know" the future or that there are parallel universes. Particles cannot choose the future. Particles have a helical motion at all times and their interactions (including the electric and magnetic ones) with some other particles are all based on deterministic rules. Their laws of motion are exactly reflected at the macroscopic level; but their complexity, along with the observational uncertainty, adds a certain degree of exoticness to the quantum world. It simply results that particles are not actually waves; only their special undulatory trajectories may be eventually described as waves, while their position in space may be seen as a probability density.

5. Photons

This section is supposed to be an improvement of the initial PT model of photons (all their fundamental features will be kept).

5.1. Creation

As the movement of elementary particles has been widely described in Chapter 4, we can easily analyze now the photonic interaction and also describe how photons are generated. PT has shown us that photons are generated by a charged particle when it accelerates or decelerates. Let's review this process, going into more details on the electron jumps to lower energy levels. This simple atomic electron transition may occur spontaneously or it may be stimulated; either way, a small change in the electron energy or a perturbation may trigger the escape from the stationary orbit. The electron's potential energy (in the electron - atomic nucleus system) gets lower as the electron gets closer to the nucleus (on a curved trajectory), while its kinetic energy increases. The positive electric field of the nucleus rapidly accelerates the electron up to a relativistic speed, very close to the limit **c**. Meanwhile, the electron's proper spin aligns perpendicularly to that of the positive nucleus due to the variations of the electric field. Once the electron got to a "lower" trajectory (it almost reached the speed of light and its direction of movement became tangential to this temporary orbit), the acceleration process finishes. Our particle should keep its last direction and speed, but this thing cannot actually happen to an electron that belongs to a system. In order to reach a state of dynamic balance in this new orbit, the electron must have a lower speed value. The centrifugal force, which is related to the magnitude of the tangential velocity, gets very high and overcomes the electric attraction. Therefore, the electron "goes up" and gains potential energy, while the kinetic one decreases. This process ends when that particle has been slowed down sufficiently and it is able again to maintain a stationary orbit; this new level it just reached "matches" its current parameters.

During the acceleration and deceleration periods, as it has been widely described in PT, the electron radiates continuously, generating in this way a complete photon. This photon's granular distribution will reproduce exactly the motion and the trajectory followed by the emitting electron over that time interval, and its granular density will be directly proportional to the particle's instantaneous acceleration. These periods of acceleration and deceleration are not identical, nor their variation pattern over time. The point is that the electron's final speed will be greater than the initial one and the energy transferred to the photon will be equal (or at least proportional) to the change in the electron's total energy between these two stationary orbits. We did not take into consideration here that the atomic nucleus is also attracted by the electron; the effect of the electric force on a mass this large will not significantly affect the creation process. In my opinion, the emitted photon is in fact an accurate, three-dimensional replica of the electron's movement pattern (of its "jump"), from the intrinsic motion up to the curvature of the trajectory. The granular structure of the photon's directional flux will store the difference between the electron's potential and kinetic energy at the initial and final moments of the jump. Therefore, the successions of granular layers will render exactly the helical motion, which means the inner structure of the photon will even preserve a "matrix" of the instantaneous speed that the electron had during the jump.

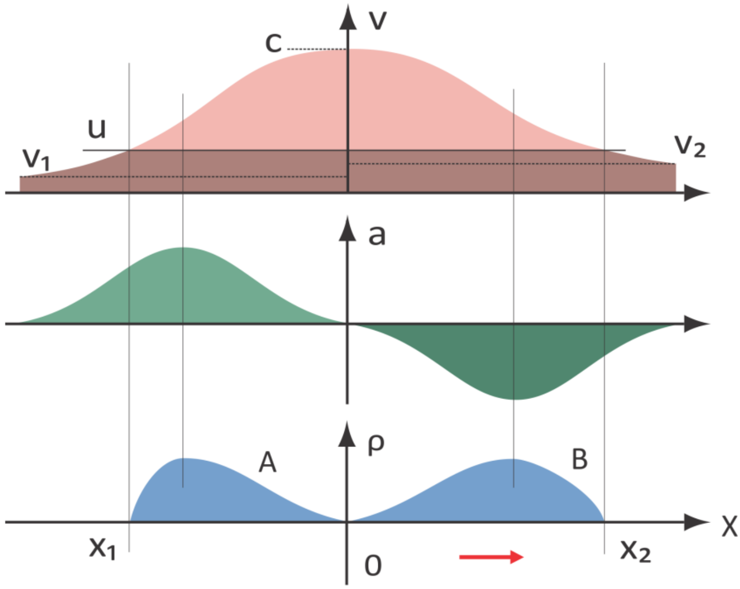

Figure 27 - *A complete photon*

Interestingly, a photon contains two distinct zones, **A** and **B**, which correspond to the acceleration and deceleration periods, as shown in Figure 27 (where the blue areas represent the granular density **ρ**). The front part **A** was generated during the acceleration period (**a > 0**); it includes denser granular layers followed by some normal ones. Globally, the density of this region is greater than the average value, i.e. a significant number of granules were added to the directional flux; in conclusion, a photon is not a simple "modulation" of the flux, but a structured supplement of granules that move in a single direction. The rear part **B**, which corresponds to the deceleration time interval, has denser layers behind the ones of almost normal density. The granular density, which is supposed to be proportional to the particle's acceleration, may have in fact a more complex formula.

However, the variable pitch of the successive granular layers certainly depends on the instantaneous speed; it easily results that the largest distance between these layers (which accurately reproduce the double-helical path of the electron) is in the middle part of the photon.

Let's now assume that $\mathbf{v_1}$ is the initial speed of a high orbit electron (seen in a semi-classical approach). This particle accelerates for a while and its speed exceeds the relativistic threshold **u** at a certain moment. Then, it starts radiating, continuing to gain speed until the limit **c** is reached; at that moment, its acceleration will temporarily become zero. Subsequently, the slowing down process begins; at a later moment, when the speed drops to the threshold value **u**, the generation process comes to an end and the electron will start to rotate on the new orbit at a higher speed, $\mathbf{v_2}$ ($\mathbf{v_2 > v_1}$).

A photon is emitted when an atomic electron jumps to a lower orbit, during the periods of time this charged particle either accelerates or decelerates and its instantaneous speed is greater than the relativistic limit.

The orientation of the electron's spin is approximately constant during this time interval; this thing allows the relativistic reflections on the particle's surface to concentrate and form a denser granular structure that is emitted in a single direction. This three-dimensional structure is a curved "tube" of almost constant diameter; it is composed of numerous granular layers of variable density that are arranged on a helical trajectory of variable pitch. All parameters of this geometric structure (length, width, pitch, density, etc.) are storing in fact the variations in energy of the emitting electron, along with the spatial trajectory it has followed during the jump.

If an atomic electron does not satisfy one of the above conditions, denser granular structures cannot be created and no photons will be generated. An electron (either free or in an orbit) always reflects and concentrates the granular fluxes in certain directions, this is the true nature of its electric field. These directions are normally included in very large solid angles, and for this simple reason, the compact granular structures cannot be formed. The three-dimensional structure of the photon may be produced only in relativistic conditions, the photon energy reflecting all the changes that occurred in the electron's energy. However, how this energy is stored in photons? As it was described in PT, the physical length of the photon is associated to one wavelength of its granular density oscillation. Therefore, a photon may also be seen as a wave, and we may eventually state that the electron's lost energy is found in this wave's *frequency*.

5.2. Absorption

Figure 28 shows an excited hydrogen atom in which the electron transition between two energy levels generates a complete photon; the **γ** photon then travels in straight line until an electron from another atom absorbs it. Thus, this electron gets a surplus of energy and it immediately jumps into a higher orbit, farther away from the atomic nucleus. The photon-particle interaction, which has previously been described by PT, has some special characteristics. Practically, a photon may transfer a certain amount of momentum, whose value only depends on the degree of synchronicity between its variations in density and the specific movements (the intrinsic one plus that motion imposed by its system) of the receiving particle.

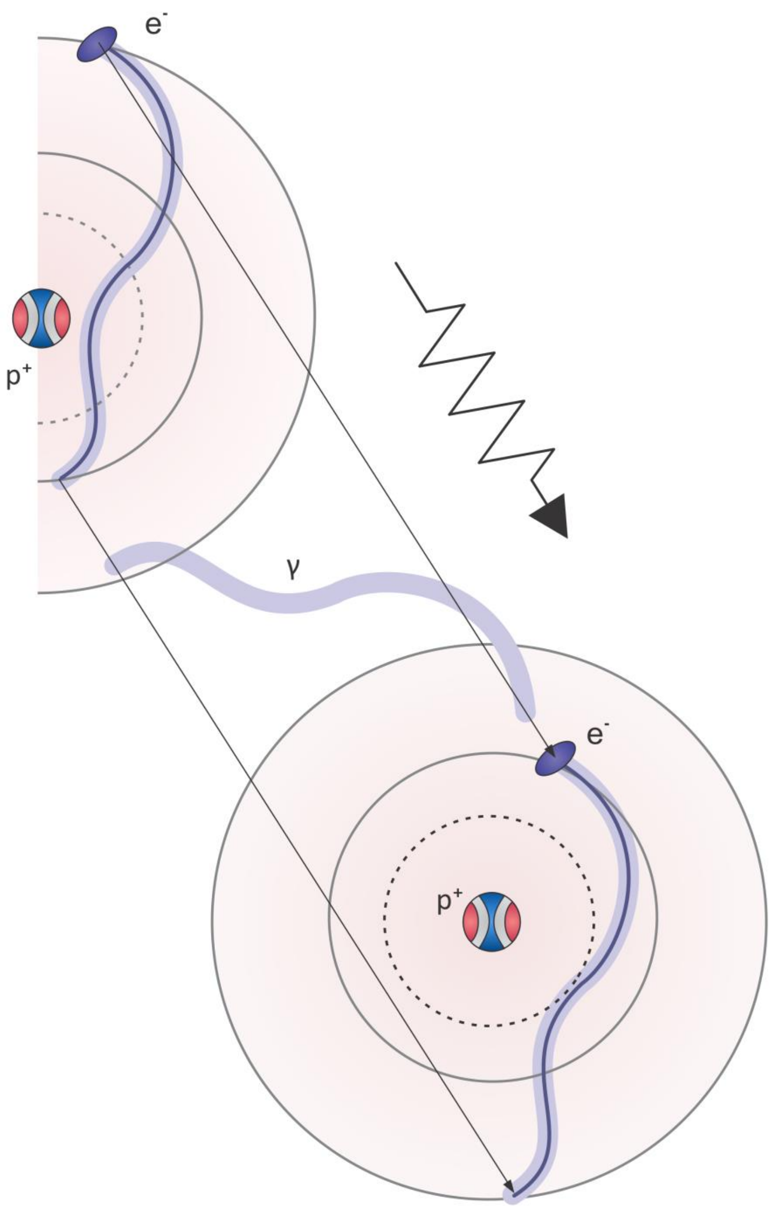

Figure 28 - *Absorption of a photon*

The successive collisions of various photon layers with the particle's surface may eventually accelerate or decelerate it, depending on their temporal correlation and on their relative positions in space.

If the photon momentum, i.e. the energy it may contain, "matches" the value required by the electron to jump into a higher orbit, the photon will be absorbed and the jump will be carried out. All of the granular layers will collide with the particle's surface and will reflect in different directions, the whole structure of the photon being destroyed in this process.

Q. Why the photon momentum is not transmitted to a free particle?

A. A photon may interact with an electron if, after their initial contact, they got into synchronicity. This means the helical layers of the photon must continuously hit the particle's surface in order to transfer momentum; also, the particle's intrinsic and orbital motions must "match" all the movements of the emitting particle. In other words, the photon momentum can only be transferred if a special state of "**resonance**", of maximum coupling is reached.

Let's now compare a free electron and an orbital one in regard to the absorption process. The interaction between the photon's frontal layers and particle is decisive in this process. Obviously, any granular layer in contact with the particle's surface will transfer momentum in a certain direction. Therefore, a free electron would be infinitesimally accelerated; it will maintain its initial motion, having no other interactions with the next granular layers. As there is no correlation, no synchronization and thus no coupling that might change its course, the electron will continue its free motion. Instead, an orbital electron forms a system with the atomic nucleus; it rotates there on a specific path, having certain potential energy, and therefore its motion may "match" the photon's special structure. In other words, the photon's first granular layers accelerate the electron and the exchange of granular impulses continues, all this being quite similar to the process that the emitting particle went through. Therefore, the orbital electron may perfectly *synchronize* with our photon and a *maximum momentum* is transferred; in the end, that photon will be completely absorbed.

The electron may even change its current direction, following the exact orientation of the photon's granular layers. Once it got in sync with those layers, the particle gains more and more energy and thus it can do mechanical work in the system - in fact, it will "jump" into an orbit of a larger radius. No laws of conservation are violated during this simple phenomenon.

Note 1:

Resonance is also the reason why an orbital electron will only interact with photons of a specific frequency (very precise value), whose energy can propel it on a higher energy level.

Note 2:

If two or more photons of different frequencies could simultaneously interact with an orbital electron, only the photon that has a matching frequency will be absorbed.

Note 3:

The absorbed and the re-emitted photons are two distinct quantum entities, even if they have the same frequency, phase, polarization, spin, etc.

Note 4:

The density distribution of the granular layers along a photon is not *purely sinusoidal*; it can be approximated as such in the assumption that this density only depends on the emitting particle's acceleration.

Note 5:

The photon's mass cannot be defined in the same way PT did for a compact granular structure of maximum density. Photons, as granular structures in motion, have a special character; they hold in their internal granular distribution a certain amount of energy, which depends on the wavelength of the global oscillation. A photon may transfer momentum to charged particles, but its granules, initially moving in a single direction, will be scattered in space during this process. Therefore, we could assign photons a special kind of mass, but this mass will no longer represent the inertia, the resistance of a solid structure to the change of speed.

Note 6:

A high-energy photon may be transformed into an electron-positron pair when it crosses the nuclear gluonic field. The granular layers from its first half will thus create a dense structure of circular shape; more, their inclination angles will cause a curvature to the emerging particle's surface, and therefore electric charge. The remaining half will generate another particle, which similarly gets an inversely curved surface, thus an electric charge of opposite sign. This mechanical balance simply results from the rotational symmetry of the new structures.

6. Quantum Entanglement

6.1. Quantum Uncertainty

Let's make a *thought experiment:* consider an isolated spatial framework (with no external interactions) that may contain various quantum objects, such as particles or photons, being in some definite quantum states (all their parameters are known). This micro-universe is completely deterministic, as PT presumes (a future state of the system is completely determined by the prior states); we know the current values of all its variables, the principle of causality applies, and any interaction propagates with the speed of light, **c**. Each object has a precise *position* at a moment, and any movement is performed by occupying all the intermediate positions on the trajectory. Everything is observed and measured from a fixed reference frame (relative to this experiment's spatial framework).

All parameters of photons are known:

- The frequency **f**, so their energy **h·f**;

- Their direction of travel and their speed **c**;

- Their location and their spatial extent at a given time;

- Their geometric shape, so their global polarization state;

- The orientation of their internal granular layers, right-handed or left-handed (helicity);

- Their completeness state.

As a remark, two or more photons are not interacting with each other, regardless of their parameters; they can pass one through the other without any interference. If photons collide with the matter, they can be totally or partially absorbed, reflected or even re-emitted as photons of different energy. Their parameters may only change in these particular cases; otherwise, we assume they will remain unchanged indefinitely.

We also know all data of the particles:

- Their type, i.e. mass, electric charge, shape, etc.

- Direction of travel, speed, spin, position at any given time.

Another remark, if there would be just a single particle, all its parameters would remain unchanged over time; this includes the global velocity - which will always be constant as magnitude and direction in relation to the FR above (the laws of conservation and postulates from PT and TA).

This whole system is therefore characterized by *realism*: all the properties of its quantum objects have pre-existing values, whether they will be observed or not. However, as QM states for all quantum objects, there is a certain degree of uncertainty in these pairs of quantities: position/momentum or energy/time (complementary variables); this aspect is present in all quantum interactions, which includes the measurements performed on those quantities with an apparatus. Uncertainty, as a fundamental quantum phenomenon, represents a relativization induced by a simple fact: any measurement performed at the quantum level (a limit of the ordinary matter) implies interaction *with other quantum objects and systems*, even if they are included in larger devices. More, as particles are continuously executing the intrinsic movement (see the PT), their accurate localization seems to be theoretically impossible. Therefore, the existence of the quantum *uncertainty*, as a kind quantum property reflected at the observational level, may look absolutely normal; consequently, it may also look normal to treat particles as "waves", computing their position as a probability described by the wave functions. This uncertainty appears to be a "given" of the quantum world, which directly implies that the accuracy of any measurement performed by an observer *will not only depend* on the accuracy of the measuring apparatus he may use.

6.2. Entangled States

This special micro-universe (remember its realism) may contain several quantum objects at a certain moment: for example, a few photons - which do not mutually interact, or some charged particles - which are influencing each other if they are close enough. Systems like this will evolve in time, the states and positions of their component objects will be continuously changing. In our system, any quantum object has a well-defined state at any given time, but this state remains unknown until we interact somehow with that object. Therefore, a special quantum state must be introduced, the *superposition* of all the object's possible states. Any measurement of these states implies getting some *information* from the quantum system, which automatically presumes the *existence of a certain interaction, of an energy exchange between the apparatus and the quantum objects*.

Does this energy transfer affect the measurement? Does the measured value reflect exactly the object's state at that moment?

The answer is simple: the measurement affects at least one parameter of the quantum object, so we may accurately measure a certain quantity only if the involved apparatus does not change it during the process.

Theoretically, all of the parameters associated with the state of an object may be measured accurately, within the quantum uncertainty, but its global state will change after this event.

For example, we may find out if a photon with a certain polarization has passed through a filter, but that photon will be finally absorbed in this process. A free electron may collide with an atom, but its velocity vector will change after this.

It is well known that quantum objects can be used to store and then retrieve information. This quantum information uses a unit of information named QUBIT. Let's assume that a quantum object could have two possible directions of rotation; the "up" spin would represent *state **1*** and the "down" spin is *state **0***. If a measurement is performed on this isolated object, each of those values can be read with the same probability. As we have introduced the superposition of the object's states, the unit of information - the qubit - will therefore be given by a new state, which is obtained from the presumed states $|0\rangle$ and $|1\rangle$ (bra-ket notation) as follows:

$$|\psi\rangle = a|0\rangle + b|1\rangle$$

where **a** and **b** are the probabilities of the states and $\mathbf{a^2 + b^2 = 1}$. This kind of equation has been formulated due to the possible interference between the states of the quantum objects, which may affect their distribution of probability. Moreover, the states

0 and **1** are chosen to be orthogonal, as the directions of spin could be, or the polarization states of photons.

The state of a system that contains two such quantum objects is a composition of their states. The system states are tensors in the Hilbert spaces of those qubits corresponding to the objects above [4]. We are assuming that these states are separable and thus we may write the states of the two objects:

$$|\psi_1\rangle = a_1|0\rangle + b_1|1\rangle$$

$$|\psi_2\rangle = a_2|0\rangle + b_2|1\rangle$$

and a state of the system (1 2) will be a tensor product of two individual states:

$$|\psi_1\rangle|\psi_2\rangle = a_1a_2|00\rangle + a_1b_2|01\rangle + a_2b_1|10\rangle + b_1b_2|11\rangle$$

However, there are some system states (inseparable) that cannot be described in this way (as a product):

$$|\psi\rangle = \frac{1}{\sqrt{2}}\left(|01\rangle + |10\rangle\right) \quad \text{or} \quad |\psi\rangle = \frac{1}{\sqrt{2}}\left(|00\rangle + |11\rangle\right)$$

These coupled, correlated states are called **entangled states**; in this case, a measurement of one object's state would seem to determine the quantum state of the other object, by "telling" us implicitly its exact state as well.

6.3. Principles

We have to define now the interactions between quantum objects from the granular mechanics' perspective, creating in fact a new **Principle of Locality** (principle of local causality); therefore, as a direct result of my PT and TA theories, this principle consists of the following three statements:

1. The state of a quantum object may be influenced by the existence of another object, as they might interact, and this would only happen at the current speed of light.

2. If these objects belong to different systems and the distance between them is greater than a certain threshold value, those two systems may have completely separable states.

3. If two isolated systems are moving away from each other, and the distance between them exceeded that threshold value, the possible entanglement of their initial states *may be conserved* in time. The measurement of a quantum state performed in one system can no longer affect the state of the objects from the other system.

This last statement can be extended to **n** systems, but there must be specified if they contain only photons (no particles). Photons do not have mutual interactions, and therefore that threshold value does not exist in this case. We also presume that the quantum objects from these systems do not emit or absorb photons. If we apply the principle of locality above only to particles, seen as quantum objects, we can formulate this: the measurement of the state of a particle from a pair of entangled particles can no longer affect the state of the other particle if the distance between them is greater than that threshold value.

The entangled objects could be obtained (for example) in processes that conserve the global momentum, and therefore they will have opposite impulses. If two such objects enter this isolated region and the threshold distance is exceeded, their initial degree of correlation (or of anti-correlation) is maintained over time. If they are subjected to measurements, as there will no longer be any mutual influence, the outcome could be real, objective (as much as is possible at quantum level). This measurement is equivalent: in whichever system it would be made, it will also give the outcome of an eventual measurement performed in the other system (which has to be reversed, as direction for example). Thus, the entangled objects have an informational redundancy. This thing could be useful when some information is transmitted at a distance, as you may check at the source if the whole transmission was correct; in order to have an accurate reception, we only have to make sure that the two quantum objects are still entangled.

6.4. Experiments and Errors

Let's consider the case of a photon: if there are no particles to interact with, this photon maintains its initial absolute direction and its structure will remain unchanged as long as the granular space is uniform. This thing happens because photons are not a simple variation of the electric and magnetic fields that propagates; they are in fact special, stable granular structures of well-defined shapes (according to PT). There are no interactions between photons, even if their trajectories are overlapping or intersecting in space. Therefore, photons may hold their polarization state (or any other parameter) over time, and this state may be "read" by an apparatus through a localized transfer of energy. Consequently, there is no other "communication" between the entangled photons; the correlation between their states was only transmitted at a distance, as information, with the speed of light in a vacuum. The relativistic causality principle can be thus applied in all cases of quantum entanglement. All of these things are based on the PT's principles and conclusions, namely on the fact that any granular structure does not change its state of motion (the rectilinear movement) in isolated systems, where the local flux is uniform; in other words, these granular structures can "carry" their initial states at any distance, and hence the associated information.

All the experiments measuring the states of entangled pairs of photons (tests of Bell inequalities), in which the distribution of probability is not consistent with the normal statistics, have systematic errors on several levels and therefore they are not eloquent at all.

About the errors of these experiments, leading to results in favor of the QM's model and not of the "hidden variables" one, it may only be said the following things:

- All those errors are "primordial"; they came from the very definition of photons, of their polarization states and of the methods used to generate pairs of entangled photons. It is about basic principles, and, in this context, PT has proved to be the only theory providing the necessary support to correct the quantum physics' vision on entanglement. More, it is not just about the relation between the deterministic way of nature and the quantum uncertainty, between the objective fact that we cannot measure precisely at quantum level and the existence of some hidden variables. We have to rethink the entire working basis. The model must be correctly built, by knowing everything about the structure of reality and its variables, even if this new approach will only start from theoretical considerations.

- This basic type of errors led to an incorrect design of the experiments (of their conditions) and to the wrong choice of the measurement apparatuses.

- The correlated photons are not always identical; the methods used to produce the entangled photons may not lead to perfectly symmetrical structures. Reflected and then re-emitted by different atomic electrons, photons may change their shapes, and therefore their polarization state - which will no longer be a certain state. Because of such transformations, the initial correlation information still can be inherited and forwarded to other photons, but more or less accurately. In fact, as photons are curved helical structures, we may rather define *a range of angles of polarization*; or it would be a much better option to create an adequate mathematical description, as a more complex, three-dimensional pattern of polarization. Moreover, photons may also be complete or incomplete structures, which feature may lead to different behaviors of the detection apparatus.

6.5. Conclusions

The first conclusions, having large implications in information and communication technology, are these:

- the entangled quantum objects do simply exist

- their connection can be "maintained" in time

- a certain quantum state can be sent at a distance

Accordingly, their special properties may constitute the basis of quantum information manipulation. Thus, the transmission of such an object at a distance (along with its entangled state), combined with the destruction of that state on the reading process, became a very useful element to work with in the future development of quantum cryptography.

But the most important conclusion, having many theoretical implications this time, may be formulated as follows:

The quantum objects cannot exert influence beyond a certain distance and they cannot transmit information (through their state) at a distance with superluminal velocity.

The measurement of their state at a given moment, which implies an interaction that finally leads to a complete certainty on that state, has no effect at long distances. It only means that you found out the probable state of an object from an isolated system, an object that has maintained its initial degree of correlation in time and space.

This conflict regarding the nature of reality, between realism (Einstein locality) and QM's interpretation (Bell locality), appears now to be artificial. The PT and TA theories, along with the new Principle of Locality, constitute now the perfect solution to correctly define and interpret the quantum entanglement; thus, we have to introduce first the granular level of matter, to redefine then the quantum realm and to finally complete all this by reflecting this entire new paradigm at the normal, macroscopic scale of reality.

7. Antigravity

The mechanical interaction between the particles of any material body and the spatial granular fluxes (evenly distributed in all directions) generates the gravitational force, as it was completely defined in PT. The primary effect of this force is that the large celestial bodies (planets, stars) are maintained as "solid" entities of a well-defined shape (spherical in principle). The secondary effect of the gravitational forces appears if two or more such bodies are in a cosmic neighborhood; they are pushed one to the other due to the decrease in intensity of the granular fluxes that flow in the space between them.

As shown in Figure 29, the body of a star **S** diminishes the granular fluxes directed towards the planet **P**, those that are distributed within the solid angle **Ω**. The gravitational force **G**, representing the "pull" exerted by star upon the planet, results from the normal composition of all the unitary forces **F** (vectors having the origin in the planetary center and the tips on a sphere); they were generated by the momentum that all the granular fluxes transfer to matter. Therefore, it comes naturally to say that the magnitude of force **G** (created by the gravitational field) is proportional to the masses of these two bodies and inversely proportional to the distance between them. Due to the presence of this force, each cosmic body will permanently "drop" to the other; if this motion is added to the linear movement, it simply results that these bodies will have a continuous rotational motion, on either circular or elliptical trajectories.

However, new questions arise in this context, such as:

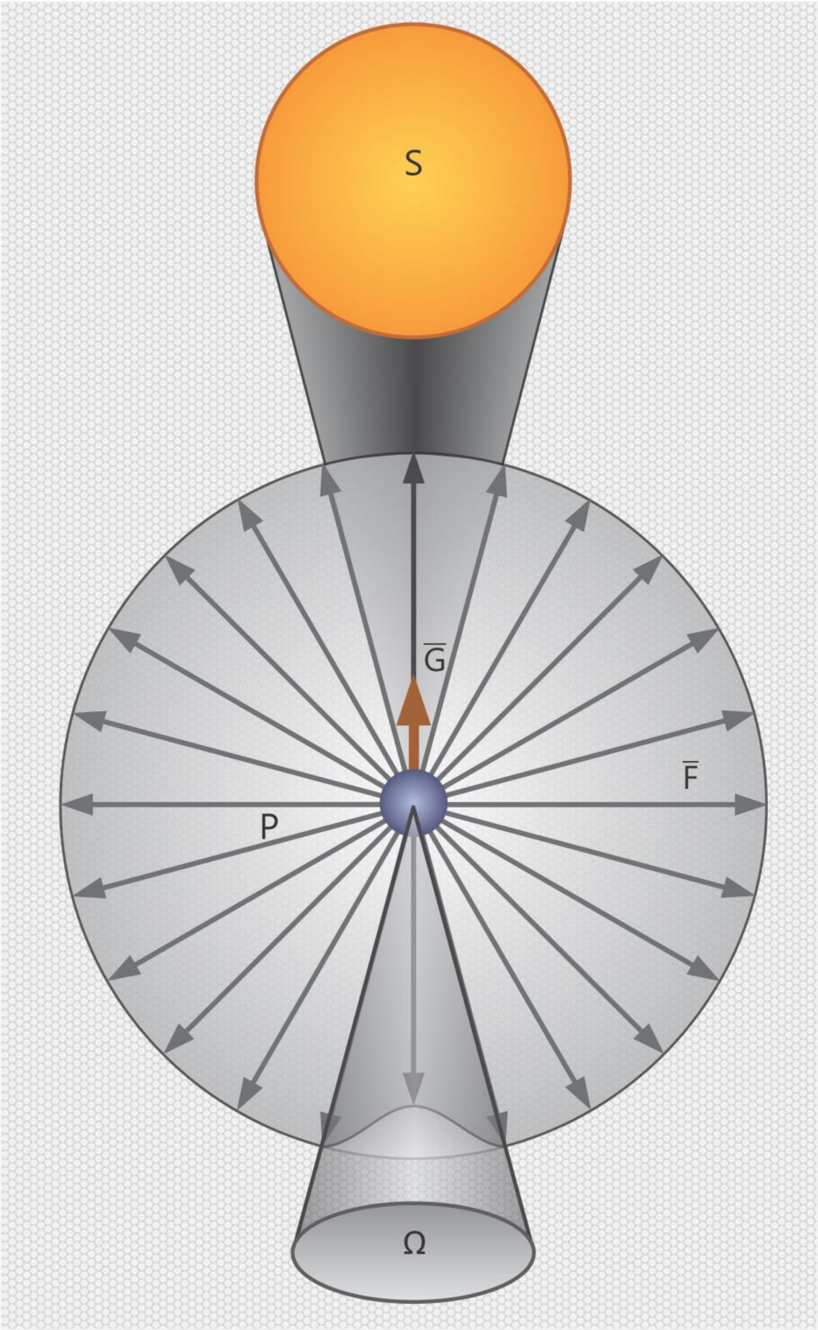

Figure 29 - *The gravitational force*

- Is "anti-gravity" possible, as a force opposed to gravity?

- Could this hypothetical force cancel the gravity effects?

- Could it repel two bodies, as the force existing between identical magnetic poles does?

Gravity, according to PT, is the very essence of space and matter, is the force that shaped the particles and then held their structures, the force that created the stars and galaxies and kept them in balance. It has the same effect on particles as on the antiparticles, and therefore this *anti* prefix of the hypothetical opposite force named *anti-gravity* is not related to antimatter.

It is obvious that the antigravity - as a force exerted by an inverted, negative gravitational field, which would repel the matter - *is simply not possible*! Such a force cannot exist in our Universe, as long as the granular fluxes cause the interactions and maintain the integrity of all particles.

Essentially, these omnidirectional fluxes are continuously "pushing" on the matter, being the key to its structural stability. Therefore, if the matter is present somewhere in space, the local granular fluxes will be automatically diminished in certain directions and their presumed uniform spatial distribution will be changed, becoming asymmetrical.

If we are to consider the effects of gravity in a two-body system, a planet and a moon, for example, we may see how distinct gravitational fields surround each of them, "pulling" any physical object toward their surfaces. Analyzing the global distribution of these fields and their resultant along different pathways, we discover the existence of some points where the forces exerted on a small object are canceling each other. This null value of the gravitational force over a specific region between these two bodies does not mean that there the gravity disappeared (the gravitational fluxes). It is still present, but the "opacity" of these bodies diminishes the fluxes that are passing through and their intensity may equalize in certain regions. This is not antigravity; this is a simple intensity modulation of the local flux, made by those two celestial bodies. Taking things to the extreme, let's consider that the object is placed on the surface of a black hole; we may observe a bulge-shaped distribution of the granular fluxes, but a null flux value is still not reached in any direction. Moreover, if the object would be located between two very close black holes, the distribution may contain almost null fluxes along the line connecting the centers of these stars. Even in this peculiar case, of an almost null flux within a certain solid angle, we still cannot talk about antigravity.

However, is there a way the antigravity might be simulated? Could we cancel the directional fluxes in a specific region?

My very short answer is *no*, the granular fluxes cannot be canceled. As space is filled with granules, these fluxes will always exist in our Universe. Could we modulate their intensity at least? Could we concentrate or disperse them as any charged particle does? The answers to these questions are also negative. Any macroscopic body would be created for this purpose, a part of the incident fluxes will pass through it and the other part will be reflected. These phenomena will lead to diffuse fluxes, spread in various directions, as all the particles are differently oriented in their continuous and variable motion.

Let's imagine a gravitational "mirror" that is made of a special material capable to stop and reflect the granular fluxes. Now, we will use this mirror to cover a small house. An observer located inside this house expects that an important part of the fluxes coming from the sky to be stopped, to no longer "push" on him. However, in order to create a "gravity-free" environment, the granular opacity of this special roof should be comparable to that of the entire planet to the same flux. As this kind of opacity depends only on the object's mass, it simply results that the mass of the roof has to be almost equal to that of the entire planet! We might invent such a dense material, which could contain for example a few layers of neutrons bonded together, but this will certainly not happen anytime soon (can you calculate how much would weigh a square meter of this thin foil?). Therefore, even the simulation of antigravity on the Earth's surface, by modulating the incoming fluxes, remains a utopia.

This hypothetical antigravity, as a force that opposes gravity, is only theoretical speculation. As long as gravity is the direct consequence of the granular consistency of our Universe, this kind of opposing force cannot appear and act somewhere.

A single amendment may be brought to this enunciation:

The omnidirectional gravitational fluxes are present at any point of the Universe, but their intensity may vary in a certain direction, within a solid angle or at a global level. This phenomenon depends on the position in the Universe (or in a FR) and on the proximity of massive celestial bodies that may block a part of the local fluxes. In these conditions, some spatial regions may feature a certain gradient of the gravitational field; therefore, the local space appears to be "curved", or "distorted" if the granular density varies and the distribution of local fluxes is not uniform. Let's now imagine a special device that is able to measure the intensity of gravitational fluxes at any point in space, including inside the celestial bodies. This device will not be affected by temperature or pressure, and the measurement itself will not depend on the gravity level. If we could use this apparatus inside a supermassive black hole, we may find some regions having very low or no gravity at all (no granular fluxes). This means that the directional fluxes cannot get into the depths of this star, as presumed in PT, and we may conclude that most laws of physics are inapplicable in these places. In addition, if a perfectly "empty" region would exist inside this star, then we could finally affirm that there is no gravity, or its value is zero. Anyway, the gravitational force in that region is not canceled by an opposite force; it simply becomes null due to the barrier of superdense granular matter. Moreover, no material body could exist in that region, in an absolute empty place; any hypothetical body that would be placed in this region will be immediately shattered, and not by gravity, but due to the lack of it. Similarly, if a hypothetical particle would be placed in this zone, it will be instantly dispersed into granules, as there is no granular pressure to hold it together.

8. Epilogue

Prime Theory and *Theory of the Absolute* may constitute an exhaustive theoretical description of the material reality of our Universe. The new sub-quantum layer, along with its specific laws and postulates, truly helped us to build a unitary model that can be used as a reference for all branches of current physics. This theoretical supplement, which is compatible with most of the fundamental laws, offers complete explanations for all known phenomena and interactions; at the same time, it provides a rational, deterministic and causal framework needed to understand the essence of nature and its real dynamics. A new light has been shed on time, mass, space and energy; the emergence of the Universe, as well as its future evolution, now becomes much more clear things, less mysterious. The whole dynamics of matter can now be seen as a reflection of the granular mechanics' laws, where the two specific attributes of movement, absoluteness and relativity, have both been fully integrated. The foreseeable conclusion is this: *Granular Physics*, if we may combine PT and TA into this unique name, does really provide the adequate mechanism that must be connected to current physics in order to make it complete, to finally unify and universalize it.

All this theoretical determinism, which is now deeply involved in the interpretation of reality, opens the way toward causal rationalism that will work at any level. The exotic abstraction coming from the QM's field, which might change the clarity of the minimal materialistic philosophy of the world, is no longer necessary. Unfortunately, the pure substantial logic of our Universe and its mechanistic perspective - started at the granular level and now reaching the cosmic scale - will be accompanied by some unwanted side effects. Thus, there will be fewer speculations about parallel universes and other dimensions, time travel, antigravity or spaceships traveling with superluminal velocities. Everything seems to be "colder" in this new paradigm, even more "finite" if we could say so, but all the future steps we have to take in getting more knowledge will be truly reliable.

Our many attempts to explain the material fabric of the cosmos, to create models, to use scientific theories and mathematical equations, have led us now to an almost perfect understanding of its nature. This is the rational way to follow if we want to comprehend everything, including the most complex form of matter, life itself. Therefore, only science may reveal how the first living cells emerged from matter, how they evolved and how they eventually shaped the actual supreme being, the human.

***

Annex 1

The redshift (or blueshift) of photons coming from distant galaxies is caused by several factors:

- According to TA, due to the absolute speeds of the galaxy and of the observer. The value of Earth's velocity is not much higher than 300 km/s, so the effect, in this case, is not relativistic; however, many of the distant galaxies can reach relativistic velocities (apparently), so the Doppler Effect in their case is mostly relativistic.

- When the observation is made from Earth, photons will be slowed down by the local gravitational field, but the lower gravity of the Sun, Moon and Milky Way galaxy will also count. If photons entered and crossed other gravitational fields, they mainly suffered a curvature of their trajectory, while their change in speed is almost entirely compensated on the exit.

- Due to the gravitational gradient across the Universe. Over the huge distances we are talking about here, of up to 13 billion light-years, photons can travel through intergalactic regions that have different gravity values (the asymmetry of the granular fluxes described in PT). As in the previous paragraph, this fact may change the speed of photons, and thus their wavelength, but a slight change in their direction may occur as well.

- Due to the change of granular density over time (which is equivalent to the expansion of space). Photons have been emitted by distant sources several billion years ago, when the granular density of space was higher (causing a lower speed of light). Therefore, if we are to analyze the speed of photons during this long journey, we will notice that its mean value has continuously increased.

- Due to the clouds of cosmic dust (or regions containing different gases such as hydrogen and helium); this factor may change the color and direction of photons, because they actually cross a different medium, with a different speed value, where some refraction and diffraction phenomena could appear. One more thing: this medium may have its own absolute velocity, which may differ from the transmitter's one; thus, the re-emitted photons will have an additional spectral variation, caused by this speed (also the Doppler Effect). This region actually works as a relay, but the photons passing through it are losing their original color information; hence, the speed of their primary source may no longer be retrieved.

It can be easily observed that there are many factors influencing the redshift of the light coming from distant galaxies, and some of the measured data may be affected. Therefore, regardless of the accuracy of the apparatuses, the correct speed of emitting sources cannot always be computed. It is very important, however, to have accurate speed estimations, because we need a clear picture of the past and the evolution in time of our visible Universe.

Annex 2

If we are to reconsider the Twin Paradox in the new perspective of TA, all things could turn into an entirely different story, even more interesting. Let's now assume that Earth would travel through space at a higher absolute speed, of relativistic value. And one of the twin brothers leaves the planet, using a spaceship that accelerates and also reaches relativistic speeds during its journey. Depending on the evolution of speed and on concrete ship's trajectory, the astronaut twin will have on return a larger palette of possible ages:

a. he might be younger than the "fixed" brother, as the time on the ship dilated, on the average (the absolute speed of the ship has been bigger than the Earth's one)

b. he will be about the same age

c. he might be older, if the ship's absolute speed was lower, on average, than that of the planet.

The classic - and concrete - case of this paradox, where our planet has a very small absolute speed, has the same ending as usual (as described at point a.) and may be explained by the lower rate at which time flows in any material system that reaches absolute relativistic speeds, on a certain direction.

Acronyms and Conventions

AFR - Absolute Frame of Reference

The velocity of any object or system in regard to the AFR will be named absolute velocity. The same "absolute" attribute may also be used with other physical quantities, such as mass, time and even with the direction of travel.

FR - Frame of Reference

TR - Theory of Relativity

TGR - Theory of General Relativity

TA - Theory of the Absolute

PT - Prime Theory [6]

QM - Quantum Mechanics

Q / A - Questions and Answers

"ABC" - Figurative language

FB - First Bang

BB - Big Bang

References

[1] Gallon, Ian L. October 2005. An Investigation into the Motion of a Classical Charged Particle. Physics Note 15.

http://www.ece.unm.edu/summa/notes/Physics.html

[2] K.A. Olive et al. (Particle Data Group), Chin. Phys. C, 38, 090001 (2014). The Review of Particle Physics

http://pdg.lbl.gov/

[3] P. Laurent, D. Götz, P. Binétruy, S. Covino, and A. Fernandez-Soto. Phys. Rev. D 83, 121301(R) - June 28, 2011. Constraints on Lorentz Invariance Violation using integral/IBIS observations of GRB041219A

http://sci.esa.int/integral/48879-integral-challenges-physics-beyond-einstein/

[4] Oscar Dahlsten, June 30, 2005. An introduction to Entanglement Theory - Transfer Essay I, London

[5] Microsys Com, 2015. Particle Simulation, computer software

http://www.1theory.com/software.htm

[6] Laurențiu Mihăescu, January 2015. Prime Theory, Premius Publishing, Fifth edition

http://www.1theory.com/PrimeTheory.pdf