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The Universe

Absolute and Relative

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1. Introduction

The scientific knowledge helps us to decipher the secrets of all things from this Universe, to solve the mysteries of their emergence and of 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 said also 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 really opened the gates of human knowledge.

Science and philosophy progressed a lot since then; now, after more than two thousand years, we have a fairly complete picture of atoms. The 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 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 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 the outer space, has not 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 seems to be now even more difficult to understand.

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 on concrete aspects. The same thing is also happening at 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 named **Prime Theory** [6] that has been published a year ago. 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 remained in question, such as gravity, mass, electric charge, unified field, etc. The mechanisms of granular interaction have offered a common ground to describe all fields, including the gravitational one; it also allowed detailed explanations over the genesis, the shape and the stability of any elementary particle. We do not get back this way to the 19st or 20th century ideas, when the problem of space graininess was seriously taken into account; we rather make an important progress by inserting this necessary corollary of new principles into Quantum Physics. All the quantum mechanisms will therefore have a surplus of determinism and rational, 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, but 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 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 (much stronger) generated the first stable rotational structures and then imposed their interaction rules; the most part of particles in our Universe were produced 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, presuming a 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 further added to this deeply relative Univers, especially by the ***Theory of the Absolute*** chapter. As far 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, intended to succeed describing the physical reality in an exhaustively manner. My approach is clearly deterministic, entirely based on knowing the concrete nature of things; as we really understand their functioning mechanisms, we may write all the mathematical equations that could describe them precisely. There are causes and effects for any phenomenon. The mathematical equations, which are trying to express the rules by formalization, are not fixing at the same time the true meanings of things and phenomena, only their objective nature might do that! Thus, the 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: firstly, he gets to the basic meanings of reality, then analyzes and understands them, and finally he may try to elaborate the appropriate theories. Even this kind of theories, sometimes excessively abstract, must be continually corrected and improved while we are gaining more and more concrete knowledge of the physical phenomena.

2. Absolute and relative

2.1. Universe - Moment Zero

Let's analyze all things in a temporal and causal context, where 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 Primary Universe's creation: it all has started from an undefined "nothingness", which through an essentially mechanical process (like a fluctuation) has been separated at a given time in 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 Primary Universe's genesis may now be written:

$$\mathbf{0 = X - X} \quad (1)$$

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 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, it cannot be applied at this *zero 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 when you try to define and analyze its *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 in two parts, and this is the first mechanical movement that ever appeared. Those two halves started to move one to the other, within 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; whole phenomenon is naturally accompanied by the expansion of the spherical space – the frame where all this happened.

At the end of the division process, a virtually infinite number of infinitesimal granules will result 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 justifying formation of those two components of the Universe, which explains the granules and their movement, and which may further describe the creation process of all elementary particles by granular aggregation. This Primary Universe's birth model was built considering that the initial energy will remain constant throughout the entire process of division and expansion. Third Fundamental Law of PT shows that the sum of all granular energies in our closed Universe is constant over time (these fundamental laws do refer to any universe would be created, if there were several). If we accept the Law of global energy conservation (energy assumed to be only of mechanical nature), it results that this constant value reflects the exact amount of energy all granules held at their emergence moment, which is equal to that of the primordial granule.

We may say in this context that the primordial energy did not exist. According to the formula (1), it 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 bit later, the energy of that primordial matter was split during 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 geometrical space - the place where all granules are moving - which contains the other half of the energy.

The hypothetical First Bang and the Big Bang(s) 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 occurred dispersively in a very large volume of the primary material, while BB represents a sudden expansion of a smaller quantity of the same material being in a highly compressed state (called singularity in many current theories).

2. *Scale*: FB is a global event, involving the *entire* primordial material that fluctuated, while BB engaged only a part of this material, 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 very similarly, but the exact moment of the First Bang (when the process of granular division has just been completed) will be used as starting point to classify and characterize their future stages. Let us assume now that we are observers inside such a closed system called Universe. We must discover its specific laws of physics and establish precise units of measurement for the quantities involved. Some concrete systems of reference are also required to help us describe the motion, in either a relative or an absolute manner.

2.2. Universe - First Stage

We may imagine now the granular medium, shortly after its appearance: a cloud of free granules that are randomly moving at the same speed, constant over time. These granules in motion formed the omnidirectional, quasi-uniform granular fluxes, but any compact granular structures, such as elementary particles or photons, do not exist yet. On a slightly larger scale, all this can be seen as an amorphous substance of ultra-high-density (which decreases with space expansion), with no identifiable points or regions, with no marks. This fluid, which is made up of infinitesimally small granules, completely fills any available volume and dilates the three-dimensional space. The flow of time cannot be measured in this system, and there is no structured matter, neither mass nor energy with their current meanings. However, space does exist at that time, 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 terms such as mass, energy, impulse, but they are not used in their normal sense, as it was already stated. They are rather some reflections of the same terms employed by the macroscopic level physics, having similar meanings, but all were projected and adapted to the granular level. As we know for sure that there is movement, we automatically may use particular terms such as *relative* and *absolute*, having instead their usual meanings!

What can be said about the physical quantities at this stage?

1. *Granular space*: At first, the exact place where the Primary Universe appeared cannot be specified, the uniqueness of its emergence process prevent us from doing so. The same thing also applies to our Universe, the presumed "child": there is nothing to relate with in order to determine the position of its initial singularity. Space, as three-dimensional framework, does not yet exist at the moment of FB, but it was created immediately after that bang. We will further consider space as being a linear, uniform and isotropic frame, which is continuously expanding.

2. *Number of dimensions*: The primordial "nothingness" has an unknown number of dimensions; the derivate space and matter are three-dimensional things only in our perspective, as observers from inside the system. This aspect can be considered either as an illusion or as a geometric simplification, also because we cannot relate it to something similar.

3. *Movement*: It may be perceived if there are minimum two distinct material entities, by mutual referencing; but none of

them is really "fixed", it could only be considered as such in an acceptable simplification. At this very first stage, the granular movement may only be described in a global and relative manner, as granules against other identical granules, and therefore it cannot be clearly defined or localized in the system.

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

5. *Granular energy*: This type of energy can be seen as an infinitesimal part of the primordial matter's mechanical energy, which has been finally distributed to every granule, equally, through the division process.

6. *Mass*: As defined in PT, the mass property does not yet exist at this stage; it may only characterize solid granular structures, which will form later. However, we may intuitively give it the signification of *amount of substance* that each granule holds.

There are two types of physical quantities, both being related to the granular movement and being connected to each other:

- Speed, which would be given by the move on a hypothetical unit of length in a unit of granular time (a primary equation of granular physics), having the normal meaning;

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

These quantities and their laws represent the basis for any future transformation this system might be going through; thus, this very young universe seems to be deterministic and its evolution becomes predictable. At 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. Their movement is distributed throughout the space (which is continuously expanding) on each and every possible direction. Therefore, neither marks, nor units of measurement could be really set in this "world" of no distinct entities and no stable bounds. There are many laws of physics applicable at this moment, having concrete formulas; but they may only apply theoretically, in an abstract manner, as long as any experimental verification is truly impossible.

Considering the way this system appeared and its evolution during the first stage, a certain degree of *absolute* may also be identified in the physical quantities described above. Where this attribute did come from? And what is its level?

- Firstly, this system is **unitary**, as it holds a *fixed quantity* of primordial material and a *fixed* amount of energy. All these things will be found in the speed and size each granule got at the end of the stage, when any granular quantity will become *constant*.

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

- When the division process completes, this system will become **stable** as the size, speed and number of all its components will remain constant in time.

- The FB hypothesis assumes this system is **singular**.

Considering all these aspects, one or more physical quantities may be normally chosen to bear the attribute of *absolute*. They will be able to carry on the essence and the uniqueness of this initial system to the next stages, as any law of the granular physics will naturally extend to higher levels, providing the 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 global momentum), the granular speed got its final 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. All granules are exactly of same size, constant over time, and their collisions will always be 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 to certain movements through space. This type of time has only been introduced to help us define the absolute and constant speed of the granular motion.

Note 1:

- Time and space (as geometric framework) at granular level are abstract physical quantities, a sort of linear "reflections" of the macroscopic quantities bearing 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. We may thus correctly quantify later their potential variability in relation to this default regularity of the basic, granular level quantities.

2.4. Universe - Second Stage

First Stage took a very short time, in cosmic terms. As this period ends, the space now only contains a quasi-uniform, omnidirectional distribution of primordial energy, the granular energies. However, if certain regions of this space are seen at a lower scale, gradients and concentrations of the granular energies may be found in great number; these regions are randomly distributed and their density is higher than the average one. This practically means that the granular structuring has begun; it will further lead to the emergence of first elementary particles that will eventually form bigger and more complex structures. The *convergent* granular fluxes appeared at the same moment; they will facilitate transfers of elementary energies, allowing various interactions between particles and between systems of particles. In other words, the matter and its structures, as well as the fields that enabled their interactions, are in fact localized energy concentrations that became stable formations inside the granular space. Yet they all belong to the same global granular energy, being part of the cosmic zero-sum game that just started.

Countless stable granular entities, of different shapes and sizes, have emerged during this Second Stage (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 photons. When the extreme density and temperature have dropped enough, many of those quarks were able to bind together and, this way, the first composite particles, neutrons and protons, have simply start to emerge. These nucleons will soon attract the free electrons around, forming the first Hydrogen and Helium atoms. This creation process continues on a global scale, and there will finally result a quasi-uniform distribution of primary matter all over the space. This ordinary matter will then start to condense gravitationally and the spinning gas clouds will eventually give birth to the first stars in Universe.

As space contains elementary particles that move and interact in several ways, we may now speak of *time* in the real sense of this word. The quantum level interactions gave rise to different forces exerted on particles, and the effects will obviously depend on their current mass. The rotational movements, oscillations, transformations, accelerations, all these phenomena will thus have certain frequencies and intensities that are finally depending on the number of granules in each particle (this number results from the balance between their total granular impulse and the local flux magnitude). Therefore, the rate of this time is directly related to the intensity of local granular fluxes, and inherently to the granular density of the Universe at a given moment. The evolution of this rate cannot be estimated accurately and, starting with the Second Stage, any time interval the will be measured using our current time, which has a known and stable rate.

2.5. The Absolute Time

The simple existence of the *absolute speed,* as it was previously postulated, creates a connection between the granular time and the "normal" one, which are thus interfering.

Q. What does it mean *normal time* (the time we measure at a given point in space, associated to a real material body)?

A. We may say that a clock placed at that point, which describes exactly the same motion as the body, will show this normal time.

Q. Why do we need to associate time to a material body or to 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.

Comments

- At Universe's scale, the rate of the normal time has an average value that originally has been given by the speed of granular movements through space; this speed sets in fact the dynamics of matter at the quantum level and above. More exactly, the rate of time a body is experiencing in an absolute frame of reference is determined by the average granular density of the local space and by the asymmetry of the granular flux distribution. This kind of time gets an absolute character as it has an almost constant value within very large regions of space.

- At a lower scale, any isolated material system has a variable rate of the local time that is determined by its relative travelling speed. The time intervals between two events are differently perceived by an observer, and they will depend on the relative velocity system - observer. TR (Einstein) formulates the equations that describe this variable rate; but the value of the local time results from the Universe's time and from a certain time variation (due to the travelling speed, TA will show why).

The hypothetical time that is present in any absolute reference frame (assumed fixed with respect to the Universe) may be considered as reference rate. If the frame above would be located right in the center of the Universe, where all directional granular fluxes are uniform, we could establish the maximum possible rate of 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 Earth, which has a rate, we will see, not very much different from the universal one.

In conclusion, the ***C***-value of the granular speed may become an absolute and universal constant only if the three-dimensional space is assumed linear and uniform, while the reference time has an assumed constant rate. Naturally, any granular entity will have a lower speed, smaller than this value, simply due to the inter-granular collisions. The maximum speed such a structure may have is dependent on the ***C***-value and on the local granular density, as we have already seen in PT. If we consider the granular density as being constant over a large interval of time and space, the value **c** - the speed of light in vacuum - automatically becomes another absolute and universal constant.

2.6. The Absolute System of Reference

Considering all data of the last three subsections, a complete definition of the Absolute System of Reference (ASR) may be finally formulated as such:

The ASR is a stable virtual system of reference that may be considered as *fixed* in relation to the entire Universe and where the *absolute time* flows at a constant rate.

Comments

- ASR helped us to formulate the fundamental postulates of the Prime Theory; as its origin is the virtual center of the Universe, the value of the total granular impulse with respect to this system will always be zero.

- Any other reference system being at rest with respect to the ASR, at any distance, should be considered an *equivalent* system. Its local time may have the same value as of the absolute time.

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

- It is obvious that we cannot assign to the ASR an exact position in Universe at this moment; moreover, this position could be even outside of the visible (observable) region!

- It should be noted that there are no truly fixed marks in the Universe; however, all distant galaxies, which appear as "fixed", are no longer having the position where we actually see them!

- We are observing the Universe from a single "point", during a relatively small timespan; therefore, an accurate three-dimensional image of the current positions of galaxies and of their relative motion is almost impossible to be made. In these conditions, the average direction that might pinpoint to the actual cosmic "center" cannot be really identified, it only may be estimated by extrapolation.

- The redshift (see the Annex) of the light originating from distant galaxies may give a more precise information about their movement, but this should be analyzed from the perspective of TA, as it will be presented below; anyway, all the gathered data have to be adjusted that way in order to get the galaxies' current positions with higher precision.

2.7. Universe - Third Stage

Let us imagine once again the sub-quantum medium at the moment it appears, as a concentrated fluid of free granules moving in random directions, with a constant speed. There are no elementary particles, neither photons nor other granular structures. Matter, mass and energy - in their current sense - do not exist in this primordial medium, and the time quantity cannot be expressed yet. However, for that the movement does exist, we may introduce at this granular scale the notion of relativity and its specific principles. All the PT's granular postulates include terms such as speed, energy, impulse, but these words do not possess their regular sense, as it has already mentioned. They are rather a reflection of the regular quantities used in macroscopic physics. Although they have similar meanings, all these terms were specially designed and adapted to the granular level. The 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 way space has appeared: the primordial material splits at first in two parts, the division process continues faster and faster, and all ends when the minimum granular size and maximum speed have been reached.

This kind of "primary" relativity, induced by the simple existence of countless granules and their assumed constant speed, may also be considered as a reflection of the same macroscopic-level term. In order to use this general concept, the absolute time and space (already defined above) must both be added here. The movement of any hypothetical object at this dimensional level needs to be associated with some reference systems, and the laws of relativity might be correctly expressed only with respect to them. The ASR has been defined exactly for this purpose, as it represents a fixed mark that directly derives from the presumed immobility of the primary material. This is in fact the only frame we could imagine now that allows a unitary formulation of the granular motion laws, valid at the beginning of the Universe or in the future.

In this model, we have presumed that numerous granular concentrations have been formed right in the first moments of the Universe (Stage 2), and they shortly have turned into stable elementary particles. Consequently, another aspect becomes relevant: starting with that moment, we can speak of particles, hence of some material, distinct entities that are located in the amorphous space. This opens the possibility to define certain "points" within that space, whether we do it only in a relative manner. As there some particles do invariably exist and they are always in motion, we consequently have the right to introduce other physical quantities, like time, speed, mass, energy, all having their current, well-known meanings. This initial system will thus become more and more complex over time. The constancy of the granular velocity causes an upper limitation of the speed of all elementary particles, also expressed with respect to the ASR. A theory of relativity - extended to the quantum level, along with a theory of the absolute – on any level, are now both perfectly operable, being necessary to describe correctly the motion of elementary particles. From now on we can start to write the real laws of motion of these particles - the laws of quantum physics, which all result from the granular mechanics' basic principles. Similar phenomena will happen, as time is passing and more particles are bound into atoms, on the macroscopic and cosmic layers of reality. The biggest cosmic bodies - the stars - appear during the Third stage of the Universe, and they will later form the largest known structures in cosmos, 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 it will operate identically at cosmic scale - as the speed limitation is maintained to any bigger structure.

These fundamental things, along with the absolute framework defined above, will definitely help us to build a complete model of our Universe's dynamics, working perfectly at any level and at any space-time coordinate.

3. Theory of the Absolute

3.1. Postulates

Due to the new dynamics of matter (introduced by the PT's Laws of the Universe), which directly results from the granular structure of space, the entire field of modern physics has to be changed and adapted accordingly; this operation can only be started by designing a new theory of space-time. Two more postulates are required for this purpose, both being variations and extensions of the Einstein's principles (TR):

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

will be changed into this:

The speed of light is an *absolute* constant; its value represents the upper speed limit of any granular structure (bodies, atoms, particles, photons) that moves in our Universe. However, observers from inertial frames of reference may measure different values of this speed, depending on their own velocity with respect to the ASR.

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 absoluteness and the constancy of the granular velocity (as PT postulated); these features are automatically inherited and revealed now, when the ASR is used as reference frame.

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 system moves with respect to ASR.

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

Note 2: The normal velocity addition will be used with the ASRs for relativization and relationing purposes; this does not mean that an object in ASR may have a value of the absolute velocity greater than **c**. Figure 1 shows the sphere that is formed by all velocity vectors of magnitude **v = c** in ASR.

Note 3: It appears that the *relative* speed of two bodies (or particles, or photons) in ASR will 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 rate of time's passage in ASR is greater than that of any other system in motion. Furthermore, from all of the ASR-equivalent systems, those that are having the origin in the Universe’s virtual center will manifest the maximum possible rate of time. The farther we get away from this center, the slower will be the 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, this rate variation may be disregarded.

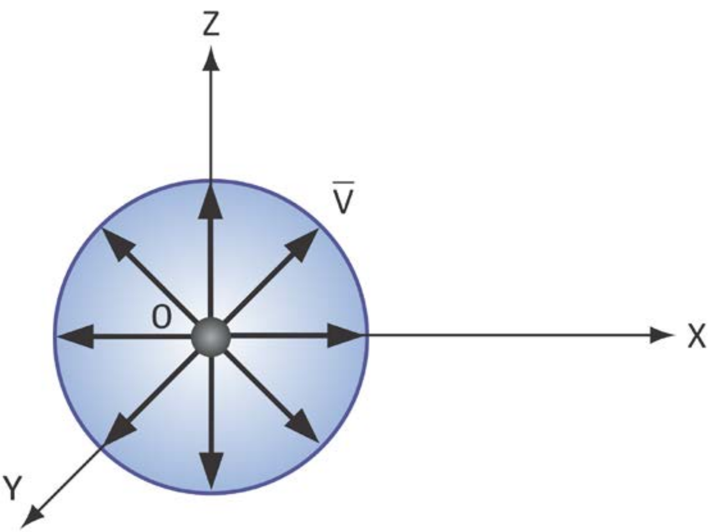

Figure 1 - *The speed of light in ASR*

Restrictive Postulate:

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

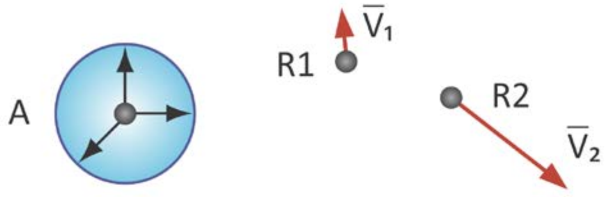

Figure 2 - *Example of different speeds*

Motivation

Let R1 and R2 be two systems of reference (Figure 2), R1 having a very small absolute velocity and R2 a relativistic one; we may therefore say that, with respect to ASR, the local time in R2 is dilated, while the time in R1 is normal, almost identical to that of the ASR. If systems R1 and R2 (they are equivalent according to the TR), which are moving with a *relative* speed close to **c**, are observed separately, the rate of time flowing in each one of them cannot be correctly determined.

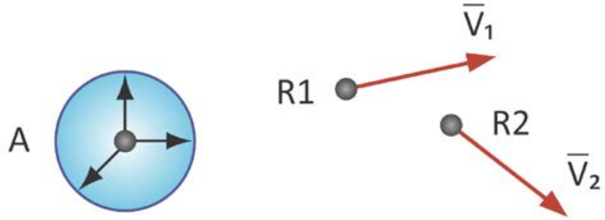

Figure 3 - *Example of equal speeds*

In case both R1 and R2 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 ASR's one, but they are of absolutely identical values.

Although the existence of this ASR seems natural, as it was already justified in PT, these two examples above suggest once more that we must definitely introduce and use it. The distinct time rate in each system (R1 and R2) cannot be fully described only on the base of their relative motion; if both systems of reference would be related to the ASR, their absolute velocities may univocally determine their "physics" and hence the local rate of time in each one of them will be perfectly known.

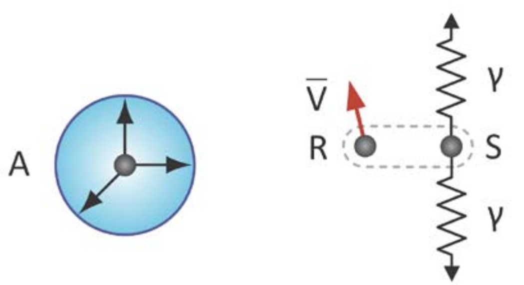

Figure 4 - *Two photons emitted by the source S*

Direct consequence

Let **R** be a 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 system will have, of course, the absolute speed **c**, regardless of their direction. An observer from another frame of reference will measure a different photon wavelength (**λ <> c/f**) because the source of photons moved during emission (the Doppler effect). Viewed from the ASR, the effects produced at source and receptor cumulates, and the global wavelength shift will depend on the velocities of both frames and on the angles made by photons with the 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 determine, by their relative movement, those separate Doppler effects to combine. However, if we want to know the "absolute effect" on photons in each frame, the relative speed of these systems is no longer enough, and thus their absolute velocities become both necessary.

Another motivation

As a thought experiment, let us assume now that the entire Universe would contain only a single material body. Obviously, TR cannot be applied in this particular case since we cannot relate to another system or to another object. This example immediately leads to the important idea that TR is at least incomplete; it does not help us learn something about the local time or about the mass of that body, because we simply do not know its relative speed to another system. However, by using the ASR concept, even this isolated body may have a certain absolute velocity, whose value automatically allows us to calculate correctly its local parameters (like time or mass).

Considering the case of several bodies or of separate material systems, it is also evident that TR does not allow a full description of their "status" (or of their "physics") based only on their relative motion's data. In order to determine the correct and complete status of each of them is therefore clearly necessary to relate their movement to the ASR. However, we may intuitively declare at this point that TR could be valid under certain circumstances, and it might be applied to any system, but only in relation to the ASR. Once the absolute state of a system was determined this way, it may be compared - in a relative, but correct manner - with that of any other system (the restrictive postulate).

Description

We will further presume that this postulate is true; thus, the TR may be applied with respect to the "truly" fixed system ASR, and this is the only way that allows us to describe completely the "status" of a body or of a system in uniform motion. We are still under the PT's general conditions, so the granular space will further have the exact properties this theory stated.

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 at constant speeds relative to the ASR, but in different directions. The travelling directions are not relevant to the description of their states; space is considered as isotropic, having a negligible variation of the local flux intensity, and thus all directions are equivalent. The absolute values of some physical quantities characterizing 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:	$\mathbf{v_2}$	$\mathbf{m_2}$	$\mathbf{\Delta t_2}$	$\mathbf{E_2}$

Now we may apply TR - with respect to the ASR - for these two moving objects. An additional assumption has to be made, that 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 ASR, the corresponding local time in those systems that contain the moving bodies may be given by these well-known formulas:

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

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

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 the equations:

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

In order to highlight the relative speed observed in ASR by using the normal velocity-addition formula, let us look now at the composition of velocities in these two systems.

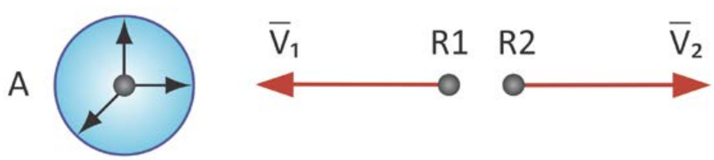

Figure 5 - *Opposite velocities*

- 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, seen from the ASR, 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 depends on directions like this (see Figure 6, where the semicircle of photon's velocity vectors has radius **c**):

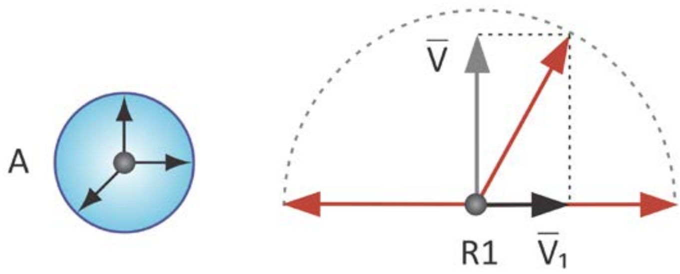

Figure 6 - *Relative velocities*

- 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 none of these relative speeds does not exceed, as it was expected, the value of **2·c**. If we make a graph of the relative velocity, in two dimensions, it may be easily noticed that this vector describes a circular surface (the section through a sphere of radius **c**) as shown in Figure 7.

Going down to the level of the sub-quantum world, we may also analyze the conditions on how an elementary particle (free), let's say R1, may contain granules that are moving (with speed ***C*** instead of **c**) in any possible direction, while the particle - as a whole - has a constant, determined speed, globally travelling in a certain direction.

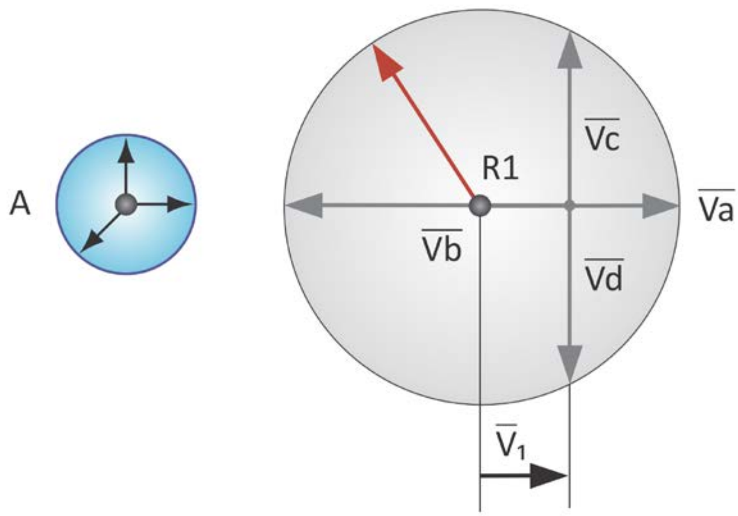

Figure 7 - *The sphere of velocities*

3.2. Space and Time

If we apply TR (with respect to the ASR) to a body (R1) that has the velocity $\mathbf{v_1}$, the local time's rate evolution may be described as a function of its speed (the graph shown in Figure 8). In full accordance with the well-known formula of relativity, the local time is identical to the ASR's time at lower speeds; as the speed increases and gets closer to **c**, the local time of R1 will dilate - it will flow more slowly, and its value will asymptotically tend to infinity.

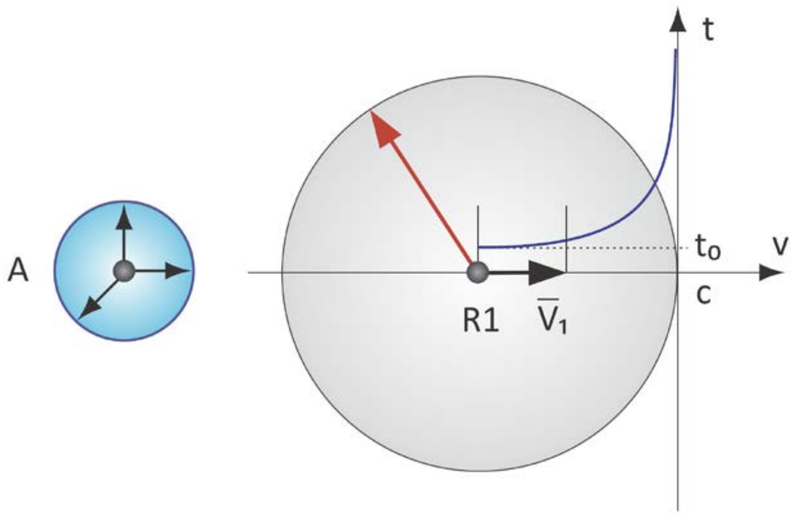

Figure 8 - *Evolution of the rate of time*

Let us now assume that an observer is located in R1 (which 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 (of value **c**), and then assumes that his absolute speed ($\mathbf{v_1}$) is much smaller than the speed **c**. He also believes that the existence of a limit for speed could affect the local time, which might change with speed, as well as distances. However, our observer considers at first that these quantities are not too much affected and the local time is not direction-dependent. In order to check all these facts, he tries to set up a concrete physical experiment. Thus, he starts 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 on these directions, he measures the time that passes until photons got to those distinct points on the surface (where some light sensors were 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 assumption that the relative velocities are obtained by normal composition. If R1 body would have been "at rest", the absolute "flight" time would have had identical values on any direction:

$$t_0 = s / c$$

It is obvious now that the measured intervals of local time vary around this latter value. Our observer thinks that its local time might have in fact the average value of all these durations, so 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 the Z-axis!

$$t_x = t_c = t_d$$

If expressed in relation to $\mathbf{t_0}$, we will get the well-known formula of the local time:

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

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

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

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

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

Two conclusions may be drawn at this point:

1. The average value of the local time depends on the absolute velocity value; its rate gets lower when the reference frame speeds up relative to the ASR, which is in accordance with the results given by TR's formula, if used 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 experience a significant deviation. At quantum level, however, each particle's local time may have a bigger variation - as its direction of travel changes more.

Moreover, how the observer from this mobile reference frame does "see" now the space and lengths around him, knowing that the local time changes with 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 be analyzed here, namely the empty space and the material bodies:

Case A - The empty space: all distances perceived by our observer are naturally contracting same way as the local time dilates, simply due to the constancy of the speed of light in vacuum. 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 suffer the same contraction process, which is now having a clear physical correspondence. The 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.

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, 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 a spatial "ether" by using the changes it would make to the propagation of light. My theoretical approach, while maintaining a great respect for their work, is an attempt to correct the errors they have made and to imagine new tools and devices, adapted to the PT's photon model.

Let us now assume that the R1 body is our very planet (Figure 9), and its absolute motion through space is made only with the 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 real absolute speed could be even 10 times greater). A beam of light is emitted from the planet's surface at moment $\mathbf{t_0}$, on a certain direction (drawn horizontally); all these photons will have the absolute speed **c**.

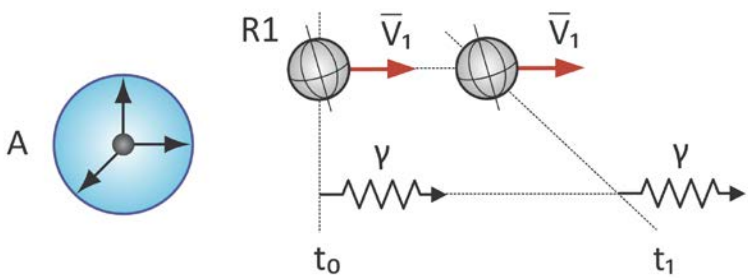

Figure 9 - *The absolute velocity of Earth*

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

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

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

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

Depending on the beam direction in regard to the Earth’s velocity vector, those photons travelled a relative distance that could be within the following range:

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

Therefore, the overall effect resulting from the composition of these velocities is seemingly measurable. Considering 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 $\mathbf{10^{-4}}$.

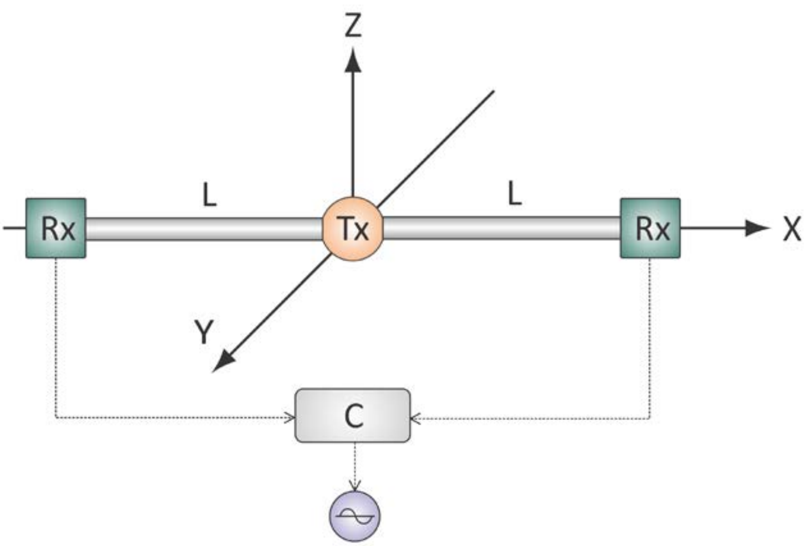

Figure 10 - *The measuring apparatus*

Here is a simple device we designed in order to demonstrate experimentally the above deviation of photon velocity, confirming this way that all the initial premises were correct and the ASR system 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, which cannot be actually measured under normal conditions.

Remarks

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

2. This apparatus can measure instead the deviation of the light beams from the sensor's centers, which may only confirm the absolute linear 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. It may be also observed the phenomenon of "pulling" or "dragging", i.e. the change in photon direction that occurs when the atmospheric air fills those tubes. In other words, the photons will undergo a deflection of their absolute trajectory, being "driven" by the average motion of 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 the same way as the planet Earth does. The air atoms and molecules are re-emitting the photons, and their linear trajectory will be thus 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 atoms travelled an infinitesimal distance that is equal (by average) to the movement of the planet's surface. As a result, all photons will globally move along a special "straight line", being "deflected" in fact by the relative motion of this system's material components (Figure 11).

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

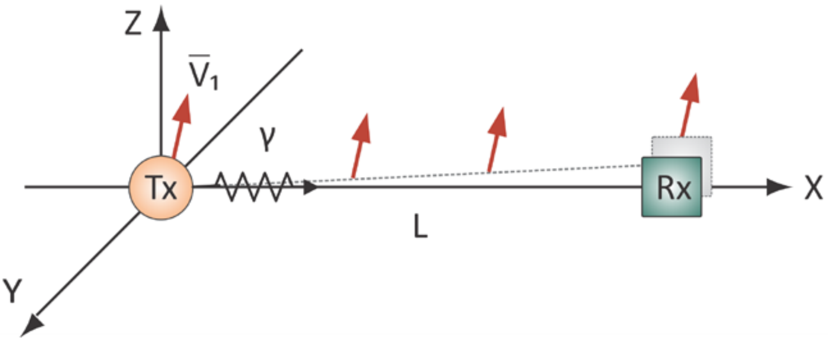

Figure 11 - *The photon's deviation*

5. As we cannot measure the photon delays, the setup above may be adapted specially to only compare the arrival moments of photons. When it is optimally oriented, this simple apparatus may detect at least the planet's periods of rotation and revolution.

6. In order to perform accurate measurements of the speed of light, this device must have a more complex configuration; as any experiment has to be performed in vacuum, the whole apparatus should be moved to space, on a geostationary satellite. More details of a new and improved design will soon be published on the PT's dedicated website, www.1theory.com

Conclusion

We assumed that TR might be applied in R1 (or any other frame of reference) with respect to the ASR; we also saw how an observer from R1 managed to determine the value 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 ASR:

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

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

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

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

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

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

Velocity vectors $\mathbf{v_1}$ and $\mathbf{v_2}$ have arbitrary directions in space; therefore, the difference of 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 it accelerates in a certain direction, 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 the need 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 system of reference moves in regard to other system considered as fixed, its local time will pass more slowly, space will contract along the direction of motion and the mass of a local body will increase. These variations would happen, according to the TR, due to the *relative* speed of the mobile frame, of higher, relativistic values. However, a body cannot reach a high movement speed instantly; it surely requires a certain period of acceleration. Considering all this, we may see that TR does not clearly explain how the local physical quantities of a system are depending on its past, on the way it accelerated relative to another system being at rest. This is a concrete example showing that the inertial systems are not equivalent; their local physical laws are connecting non-uniform quantities that in fact are depending on the direction these systems had previously accelerated.

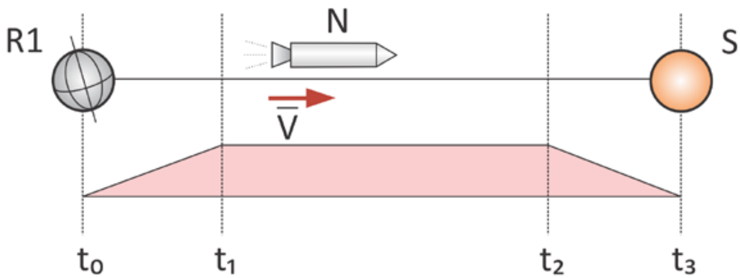

Figure 12 - *The spaceship*

Be a hypothetical spaceship **N** that departs from Earth (R1) at the moment $\mathbf{t_0}$, which then accelerates and reaches a relativistic velocity value **v** (e.g. $\mathbf{v = 0.8 \cdot c}$) at the moment $\mathbf{t_1}$, being on its way 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 (moment $\mathbf{t_2}$, 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.

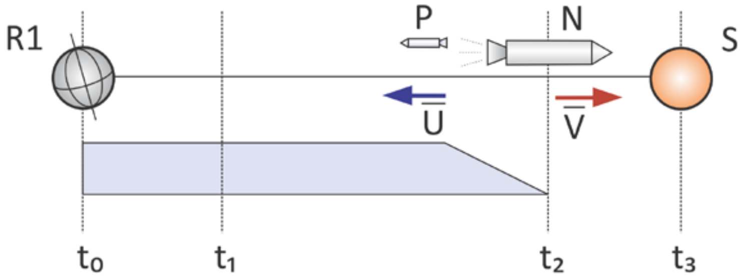

Figure 13 - *The additional rocket*

Let us assume now that just before the moment $\mathbf{t_2}$, 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 **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 as fixed), on the direction toward the Earth, until it reaches the speed **u** (slightly larger than the value **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**, moving relatively to Earth, by composing the velocities **u** and **v**. The resulting non-relativistic value will allow it a very slow return home, and therefore we can write this equality:

$$\Delta t_P = \Delta t_R$$

By combining the previous formulas of time intervals, it will simply result the following inequality:

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

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

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, absolute quantity denoted by **E**, called *the absolute energy of the movement (the kinetic energy)*:

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

Parenthesis on relative and absolute

As stated before, it is very difficult to build a device that would detect and measure very small differences in photons' speed; the involved mechanical and electrical precision must be extremely high. Moreover, all this should be specially designed to 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 the 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.

It is very hard to disconnect and then observe these two worlds, because we need to identify a special intermediary means; this special agent should experience the absolute movement and, at the same time, it must be observable from any frame of reference. All becomes clear now; the agent that moves and 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 macroscopic level, and they may eventually justify the existence and all characteristics of the ASR. However, photons could be replaced by particles (if they are accelerated close to the speed of light), but the experiment would be more difficult and some additional errors might appear.

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

Conclusion 1: We have seen that space, regarding the movement of the bodies through it (with respect to a normal reference system), became a non-isotropic medium.

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

Conclusion 3: It is not the existence of some virtual systems of reference, having a certain absolute velocity, that which matters in the context of this theory. Only the material bodies, whether fixed or mobile in these frames, are experiencing internal changes that depend on speed. Some physical quantities, such as time or mass, must always be expressed as characteristics of *certain bodies* or *concrete systems*. A theory of the absolute motion may operate with these quantities because the effects of motion are *real* to those respective entities. Thus, it may be said that the absolute motion changes, in fact, *the state* of all bodies and systems. This proper, particular state will no longer depend directly on the relative speed of a body (or system) in 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 approximative results. We may get accurate results instead by applying a general theory of the absolute motion; in order to do this we must know at least the absolute velocity of the observation 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, which 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 in regard to the ASR and they exhaustively describe the state and the dynamics of a body at a certain moment. Any other objects being at rest relative to this body will have identical values of the local time and of the global speed.

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 state of a body in uniform motion is given by the mean values of the physical quantities included in that palette; the averaging process is made in time and space on the very large number of body's component particles (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 (both magnitude and direction).

Corollary: If there are two or more bodies 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 be that of its own inertial frame of reference (where this body is at rest).

Note 2: TR may be applicable to any inertial reference system, but only with respect to the ASR (according to the restrictive postulate).

By applying TR in each system with respect to ASR, we may determine a relative, but correct relation between the proper states of those bodies. By using TR and their relative speed instead, we would not be able to describe the proper state for any of them accurately.

Note 3: The absolute velocities (the values and directions of these vectors) of macroscopic bodies may be found out from experiments where the speed of photons is measured in all directions (the axes of a SR for example).

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

Note 5: All spatial directions are equivalent in ASR. However, for a certain body in an inertial frame, at 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 (the state will also change relatively, in regard to other moving bodies).

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

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

Note 8: Most symmetries of particle physics (phenomena that are invariant to some changes of parameters) are still valid in the SRs with significant speeds. The motion of particles in different directions requires different actions on them in order to get the same results, because their mass depends on the absolute speed and on 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 reference frames.

3.6. Comments

Comment 1

Let be two bodies considered as fixed in relation to the frames R1 and R2; they have been accelerated from rest to the absolute velocities $\mathbf{v_1}$ and $\mathbf{v_2}$, which are also the velocities of their own reference systems (as shown in Figure 2). If we are observers from ASR, the fixed system in space, we may apply TR to these bodies and we may therefore obtain a relation (as we saw earlier) between their time rates, or between their masses, which will be dependent on the values $\mathbf{v_1}$ and $\mathbf{v_2}$. This is all we can say about these two bodies, and only if we know both speeds $\mathbf{v_1}$ and $\mathbf{v_2}$. We are not able to calculate the real values of their physical quantities only based on the relative speed, whether it would be observed from ASR or from one body's reference system.

Comment 2

We assume now that the frames R1 and R2 are initially overlapped in their points of origin, having the same absolute velocity $\mathbf{v_1}$ at a certain moment, as shown in Figure 14. We may declare - accordingly to the TA - that if two bodies are "bonded together", for example the Earth and a rocket on its surface, they will have the same variation of their physical quantities relative to the ASR (as we saw before), given by this $\boldsymbol{\gamma}$ factor:

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

Figure 14 - *Overlapped frames of reference*

The rocket R2 is launched at a given time, and it speeds up off the planet; at a later moment, when the speed value **u** is reached (relative to Earth), it stops accelerating. Figure 15 shows this exact moment, when the rocket got far away from the planet:

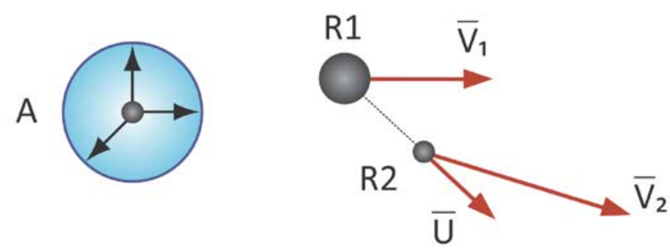

Figure 15 - *Separated frames of reference*

Thus, the rocket will reach the *absolute* velocity $\mathbf{v_2}$, which may be either relativistic or not. This absolute velocity, which really expresses the rocket's "state" of motion, may be calculated by using the relativistic composition of velocity vectors $\mathbf{v_1}$ and **u** (a formula that directly results from TR). In other words, the "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 once more 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

Be a body in its own reference system, having the absolute velocity $\mathbf{v_1}$, which starts to emit photons in all directions; analyzing the distribution of speed of these photons, we will rapidly discover that space has certain *anisotropy*. This property extends to the quantum scale, and thus we may realize the existence of a "privileged" direction for photons and for particles. Therefore, if a particle accelerates in this special direction and reaches a certain speed (within the relativistic range), it could even experience a mass decreasing. 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, there is a temporal averaging of those directions).

Comment 4

The absolute velocity of a photon, if combined with the motion of the emitting particle, generates to observers a change of the photon's wavelength. Photons, as successive layers of granules in motion, requires a non-zero period of time in order to be created. Let us assume that the photon source, a certain particle of an atom, has a global, non-relativistic speed. The

Doppler Effect, which we are talking about here, means a change of the photon's wavelength during emission and during reception. According to the TA, of course, the global intensity of the Doppler Effect (relativistic or not) is dependent on the absolute velocities of both the emitter and the receiver. Therefore, it will not be sufficient to know the relative speed between these two devices, but their absolute velocities are definitely needed. It may be interesting to analyze if this effect could be used in the previous experiment to measure the speed of light, or if that experiment is affected and to what extent. In my opinion, it will not be influenced at all; the reference frames R1 and R2 - represented by 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 reception end.

Comment 5

The way an observer perceives the simultaneity of certain events that are happening in another SR will be affected too. As expected, the simultaneity will not directly depend on the relative velocity, but on the absolute velocities of both reference systems (as values and directions). Figure 16 presents in space-time coordinates (the two-dimensional space in the XOY-plane and the value of time on the OZ-axis) the light cones that contain all the events happening in a system. In the upward side of each picture are the *future* light cones, while the *past* light cones, where the past events lie (that could have potentially influenced the future ones), are in the downward side.

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

Comment 6

TGR must also be adapted and changed with the introduction of the ASR. Any field, and hence the gravitational one, is exerting a certain force on a body or on a particle; this cause objects to accelerate, increasing their speed with respect to an inertial SR. 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 local flow uniformity and those generated by an additional granular flux.

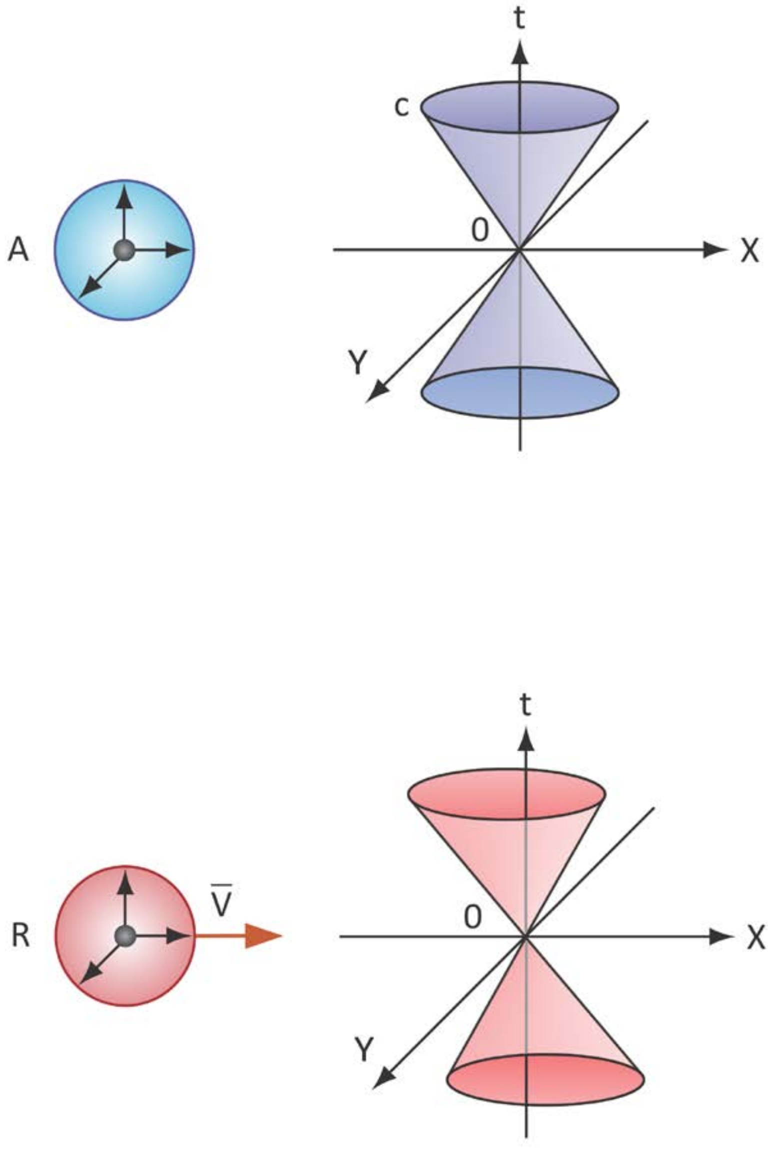

Figure 16 - *The light cones*

Comment 7

Mass and energy will become absolute quantities under TA, as they both directly depend on the speed that a certain body or particle has in ASR. Theoretically, these quantities will also be dependent on the direction that body moves or accelerates relative to an inertial reference system. 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 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 the laboratory's 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. 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 ASR. 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. More, 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, they 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 ASR.

The amount of energy consumed to change this "state" of a body also has different values, which will depend 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 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. Does the intrinsic uncertainty of photon's position affect our measurements? Does all this imply a limited amount of time, much less than the photon flying duration, and thus the overall 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 into 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 ASR helped us to 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 did specify that TR might be applied, but in a particular way, only relatively to the ASR. For a rigid body located in an inertial SR, the relation between its "state" and that of another body may be determined only if their absolute speeds are both known. If TR is simply applied using their relative speed, some important errors could occur, bigger as their absolute velocities are greater. Consequently, the inertial reference systems 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 SR.

Finally, the chain of **causation** in nature, which was perfectly defined by the PT, TA and their postulates, must be once more described 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 fix the rate of **local time** in relation to the absolute one. In a similar fashion, 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. It makes more sense only in case of composite particles or of 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 describe about the same global motion, in addition to the proper ones. As the absolute motions continuously change the state of a 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, significantly biased by the changing states of the objects with their motion. This "relative" type of quantum experiments could be used to obtain perfect random numbers, or to analyze the quantum entanglement phenomena, for example, but their generated numbers and the read values will contain *implicitly* a certain degree of correlation. They are practically irrelevant to any process or measurement implying 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 Annex 2 for more details).

4. The Movement of Elementary Particles

4.1. First Elementary Particles

Imagine that we travelled in time at the end of Stage 1, when the density of the granular medium has dropped enough and the development of stable granular formations just begun. Due to the predictable nonuniformity of the primordial fluid at quantum scale, some adjacent regions of space got different density values and many granular gradients were formed this way on certain zones. Such gradients caused a progressive deflection of the directional fluxes crossing these regions. When two opposite fluxes happened to bend simultaneously, concentrating within the same region of space, a new three-dimensional structure took shape; these circular formations started to spin and continued to move and rotate, remaining stable for a long 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 $\boldsymbol{\varphi_2}$, overlapping in a zone of high, but variable granular density (suggested by the shades of gray of the background), are forming this way the stable structure **P**; this round *particle*, of a discoidal shape, will immediately start to move. 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 created particles (quarks at first) will cause, when the temperature drops enough, the emergence of the first composite structures. As opposite-sign charged particles are attracting each other, they all started to move and accelerate on collision courses; eventually, when quarks got very close, the gluonic field appears and balances out these forces of electric nature. Structures of two or more quarks started to form, but only those made of three quarks proved to be very stable and they will persist in time - the well-known composite particles: neutrons and protons. The electrons and their antiparticles - the positrons - started to form at a later moment, the electrons being produced in a slightly larger number; having lower masses and charges of opposite sign, these two types of leptons got higher acceleration values and they were able to annihilate each other in pairs. Normally, at the end of this process, only a small part of the initial number of electrons remained. As the temperature continued to drop, some "cold" electrons were caught in the electrical field of protons, and thus the first hydrogen atoms have been formed. Huge numbers of **γ** photons have been produced in the above annihilation process, and they later create other electron - positron pairs; this way, the dynamic process of particle creation and annihilation has been considerably prolonged.

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 very long. 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 contain a really *enormous* number of granules in its inner structure. Regardless of how much this number decreased over time (and hence the mass) with the granular fluxes' intensity, the structure of particles was kept in balance, and we may simply predict now that this stability will be further maintained for billions of years.

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

Let us imagine two granules (we know at this point they are identical and they have the same absolute speed, of value ***C***) moving freely on straight trajectories that form an extremely small angle (i.e. nearly parallel). These granules will soon collide elastically, exchanging their momentum, and they both will continue to travel (as equivalent granules) on the same 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 this contact period ends, one of the granules may collide with another one from the neighborhood, and they will also exchange their impulses; eventually, first two granules might come closer again and the process above may continue the same way. Therefore, as this phenomenon keeps repeating itself, it results that some granules that are moving collinearly could remain "stuck together" over larger durations of time, until other collisions (under bigger angles) will separate them. This property of cohesion, a sort of mutual "adhesiveness", obviously extends to larger high-density groups of granules that have almost identical trajectories; all this may explain, in fact, how the granular groups are forming inside an elementary particle and also why all particles have their particular behavior.

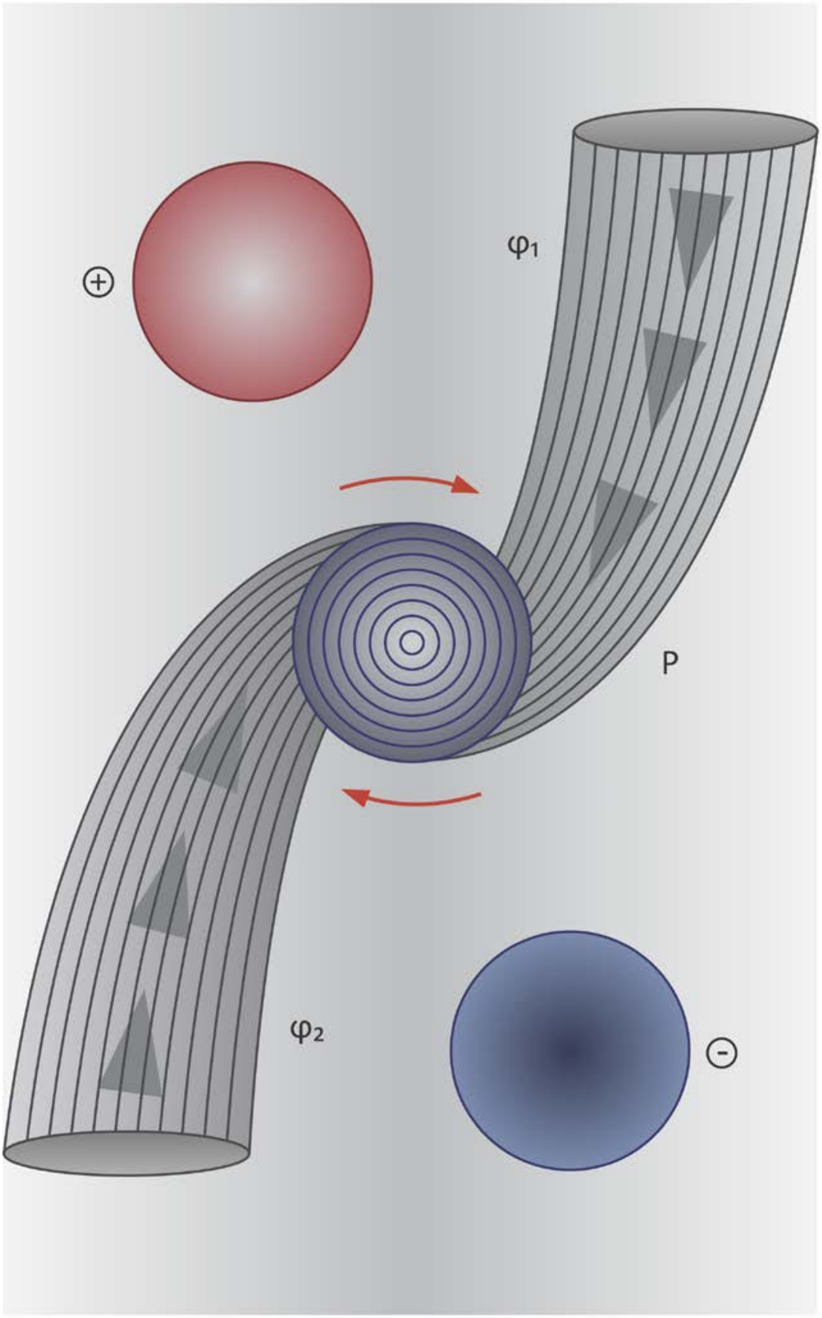

Figure 17 - *Creation of the elementary particles*

As all the granules (that have a quasi-identical direction, in regions of high concentration) are remaining in contact with each other over large time intervals, the granular groups they formed will feature certain "hardness", or a kind of solidity. Therefore, these special clusters will act together as a whole, as a distinct entity that may manifest a bigger "mass" during the external collisions (with other granules or with similar groups).

The "cohesion" property described above determines the entire dynamics of any granular group; more, this special mechanics does maintain continuously the internal structure of all elementary particles, as well as their stability over time.

This particular dynamics also establishes the behavior of the external granules that collide with a particle. Thus, depending on the movement 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 (PT showed that it approximately obeys the laws of reflection)

- 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)

- One or more granules are detached from the group that has been bumped by the external granule.

As the granular density near the surface of a charged particle seems to be variable and any particle rotates while performing the intrinsic precession, a few other effects may be added to the granular reflection description:

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

- The change of the reflection angles at relativistic speeds

- The gluonic field emergence, as a result of the incident and the reflected fluxes that are concentrating repeatedly

- A rotational component of the reflected fluxes

We wrote several simulation programs in order to verify the stability of any possible granular structure, which all implemented the basic rules of granular collisions that were described above. At first, a uniform (two-dimensional) granular medium was simulated by this software in 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, regardless they were free or in structures. That particle has started spinning and immediately displayed the tendency to become more compact, yet keeping its initial shape over time; it has also shown a secondary motion, a global rotation in the plane. At this point of our tests, it clearly resulted that the simulations should be only performed in three-dimensional boxes and by using significantly more granules.

Here are the math formulas (along with a few short descriptions) we used to simulate the group collisions:

Let us consider the collision between two granular groups (or clusters), whose impulse vectors (of values **a** and **b**) are forming the angles $\mathbf{\Phi_1}$ and $\mathbf{\Phi_2}$ with a specific axis. Direction of the global momentum to that axis is given by the tangent of angle $\mathbf{\Phi}$:

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

and the final impulse vectors of the 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 returns immediately 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 regular PCs is not sufficient to simulate a particle in real-time, we had to turn to a simpler model, which implements the same properties and mechanisms, but only at the particle's structure level (seen as a whole). Considering the shapes that are proposed by PT for charged elementary particles, the current version of the simulation program (***Particle Simulation***, it may be directly downloaded from the theory’s website **[5]**) can show some animations of the real flux - particle interactions and of the gluonic field emergence (the field existing between the quarks of a nucleon).

4.2. Flux - Particle Interactions

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

Case 1: Fixed particle in ASR, perpendicular flux.

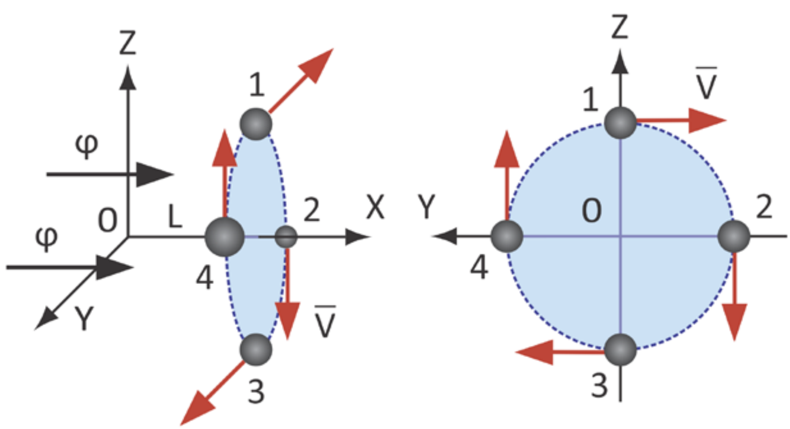

Figure 18 - *Perpendicular flux*

Let be a generic discoidal particle at rest in ASR, 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**, which all are rotating on the edge of the particle at the absolute speed value ***C*** (the velocity vectors are red). We will assume that each of them is moving at this maximum speed, regardless the duration of its internal granular collisions. At a given moment, an additional flux **φ** starts to flow along the X-axis from the left and it hits the particle; consequently, all velocity vectors of those granular groups will evenly undergo an inclination to the right. This angular deviation could be calculated the same way PT did, by applying the impulse conservation formulas; thus, the particle - seen as a whole - would be simply shifted along the X-axis. However, this hypothetical case is highly unlikely to occur and we will not insist on it.

Case 2: Fixed particle in ASR, oblique flux.

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

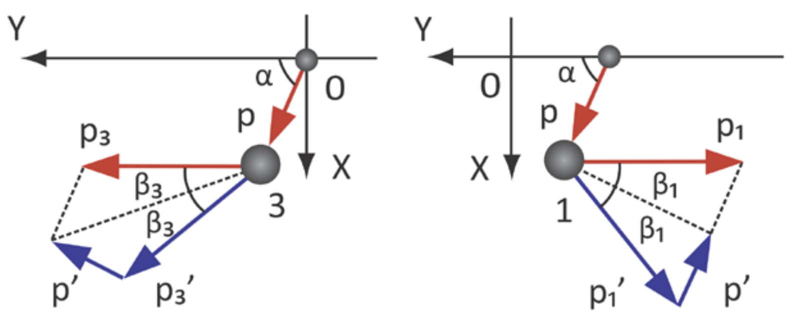

Figure 19 - *Collisions with the clusters 1 and 3*

Once those collisions are ended, the velocity vectors of each granular group got certain deviations, as shown in Figure 19. The angles formed between the initial impulse vectors $\mathbf{p_1}$, $\mathbf{p_3}$ and the resultant ones will be $\boldsymbol{\beta_1}$ and respectively $\boldsymbol{\beta_3}$. Now, the final impulses $\mathbf{p_1'}$ and $\mathbf{p_3'}$ will be inclined by the angles $\mathbf{2\cdot\beta_1}$ and $\mathbf{2\cdot\beta_3}$ relative to their original directions, angles that can be easily calculated this way:

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

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

The angles $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_3}$ are both in the XOY-plane. As for the granular groups **2** and **4,** they will form two *identical* angles, $\boldsymbol{\beta_2}$ and $\boldsymbol{\beta_4}$, but the resultant velocity vector will have components along all the axes (OX, OY and OZ). The concrete XOY-plane situation is shown in Figure 20:

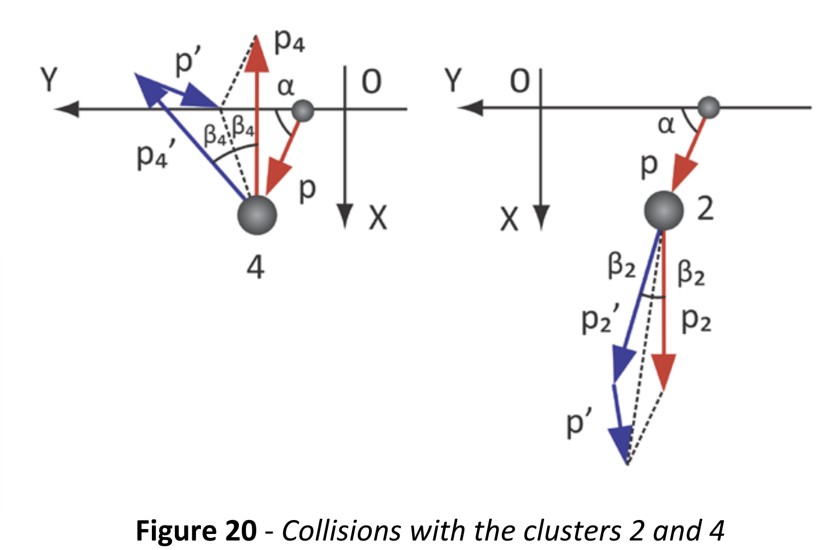

Figure 20 - *Collisions with the clusters 2 and 4*

$$tg\ \beta_2 = tg\ \beta_4 = p / p_2 = m / n$$

Let **k** be a constant, **k = m/n**, that shows the total number of granules to collide, i.e. the applied impulse magnitude in relation to that of the bumped group (**k << 1**). We can replace the final impulses $\mathbf{p_1'...p_4'}$ with velocity vectors (of value ***C***) and it results that those vectors will have the same deviations, equal to the initial velocity angles: $\mathbf{2\cdot\beta_1}$...$\mathbf{2\cdot\beta_4}$. The new position of the particle is shown in Figure 21.

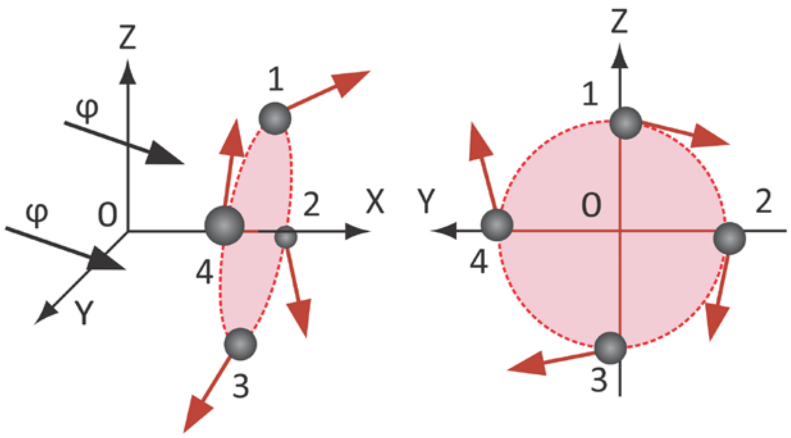

Figure 21 - *Oblique flux*

Let us now analyze the components of groups' (**1...4)** velocity vectors, 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:

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

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

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

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

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

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

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

and it simply appears now that $\mathbf{v_{3x} > v_{2x} > v_{1x}}$.

The projections of all velocities along the X-axis were *zero* prior to the flux action. We may compute the Z-axis components by using the well-known formula **cos 2x = 1 - 2 sin2x**:

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

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

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

The apparent slower rotation in the YOX-plane is illustrated by these equations:

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

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

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

But we have seen (Figure 20) that **tg $\boldsymbol{\beta_2}$ = k**. Let us suppose now that the impulse vector $\mathbf{p_2}$ is no longer making a right angle with **p** (just after collision), and this angle increases by the value **γ** (**γ > 0**). The resultant momentum vector will form a new angle **β'**:

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

and $\mathbf{p_2'}$ will have the deviation **2·β'** from its original direction.

Remark

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

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

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

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

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

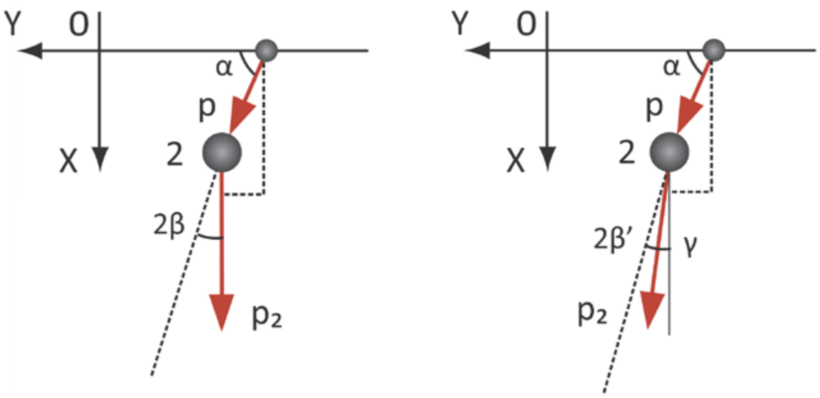

Figure 22 - *Deviations of the impulse vectors*

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 $\boldsymbol{\varphi}$ on its surface (angle of incidence $\boldsymbol{\alpha}$), a particle will start rotating along the Y-axis, and the increase of its peripheral speed is $\mathbf{\Delta v}$ (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 $\mathbf{K^2}$ and **sin 2α.**

2. We have shown that, in the flux direction, particles will also get a translational motion with speed **v'**. If **γ = 0**, we will have:

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

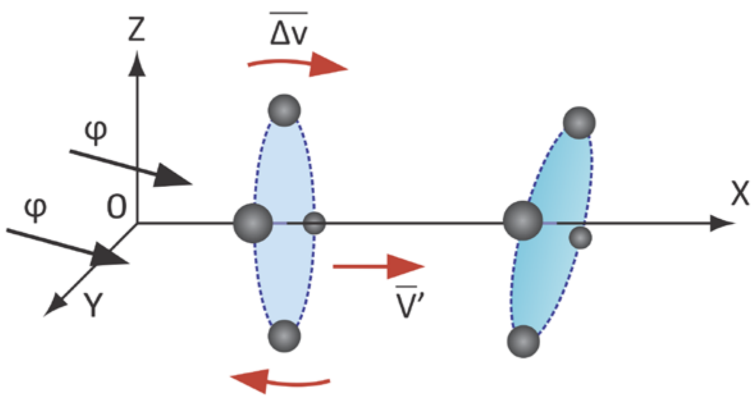

Figure 23 - *Movements of the particle*

However, **tg β' ≈ k** and therefore we get:

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

The conclusion would be that the translational speed has a quasi-linear dependence on the constant **k**.

3. Overall, the effects of the applied flux will be averaged and balanced throughout all over particle's body. That particle will describe a composite motion, rotational and translational, which is added to its internal granular rotation. In conclusion, the particle (seen as a whole) will have a helical movement that consists of these simpler components:

- a translational motion in a certain direction, plus

- a rotational motion; the particle's center will describe a circular motion in the same direction as the internal granules do.

These two distinct movements are correlated, and their speeds - the linear and angular - are both depending on the intensity and direction of the flux, as well as on the instantaneous speed of the particle. In 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 translation and rotation movements.

4. It may be noted that, at higher speeds, a certain increase in speed requires a larger moment to be applied, i.e. a more intense flux is needed for a similar effect. This represents, in fact, that the mass of a particle increases with speed, and this phenomenon simply results from the total momentum conservation law.

However, precise calculations of the particle's response to any flux require a more complex model and a lot of computing power.

5. The intrinsic motion of a particle is very complex; at the inside, various granular groups describe 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 discoidal particle, caused by the particular shape of its surfaces, could be now explained by the movement of all internal granular groups, as it has been also assumed in Chapter 2.3, Stage 2. After the first interaction with a granular flux, a presumed cylindrical-shaped particle is "forced" to self-adjust its lateral surfaces; it will turn this way into a very stable structure, of either concave or convex shape. These three-dimensional configurations seem to be the only ones that allow a limited directional deviation, being compatible with the global movement of elementary particles as it was described above. The exact equations of these special surfaces could also be obtained by running numerical simulations. The electrical charge, due to its geometrical specificity that resulted from 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 (when the local flux is uniform). Those two proper motions composing the helical one (the possible degrees of freedom of particles in this kinematic model) practically "memorizes" the global ***state*** of motion. The average inclination angle of the granular velocities stores, by its value, the translation speed, while the small difference of velocity's direction between diametrically opposed groups will store the rotation speed. The particle's state of motion, as part of its *proper state*, will be therefore given by the magnitude and the direction of these vectors describing the movements of intrinsic nature. All of the state parameters, expressed in regard to the ASR, constitutes a formal uniform framework where the particle's motion may be accurately and completely characterized, allowing a real comparison to the motion of other particles and systems.

4.3. The Spin of Particles

As it was extensively presented in PT, an elementary particle cannot be assimilated with a classical point-like particle; it is in fact a complex granular structure, virtually representing a tiny universe. We saw in the previous chapter why all particles have a special dynamics, characterized by their intrinsic motion, the precession. Basically, from an inertial SR, we may observe that the center of a particle has a helical motion, which normally consists of translations and of perpendicular rotations. Referring to the physical reality, both these movements derive from the granular nature of particles, a nature that imposes the particle's "external" behavior in relation to the 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 will only depend on the particle's speed. If a particle has an electrical charge, it may be subjected to some electric or magnetic fields (it is all about the action of different granular fluxes). However, the isolated particles are maintaining their state of motion unchanged (both speed and direction), as well as the other state parameters (the rotation axis, i.e. the proper spin).

A generic particle that describes the helical movement presented above is shown in Figure 24 (the blue disc from the upper picture). The average angular speed of the granular rotation is **ω**, and the particle's center has the instantaneous velocity vector **v** (whose translation component is the velocity **u**). This particle will describe a helical trajectory (of pitch value **p**) inside the gray cylinder of radius **r**. The particle's spin (the red vector **S**), which happened to have the same direction as the global movement, is shown in the middle picture. This vector may have a quite different direction, as in the bottom picture, where it forms an angle **α** with the global direction of movement.

Let us now take a closer look at the actions of different fields on a concrete particle (which may be treated as a whole, but we will not ignore its internal dynamics).

Possible effects:

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

If this force is continuously applied, the particle is speeding up. If this force is constant, then the acceleration will be constant as well, but only within the non-relativistic speed range. Over the relativistic limit, the mass, as 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 (this value that cannot be exceeded by the particle as a whole).

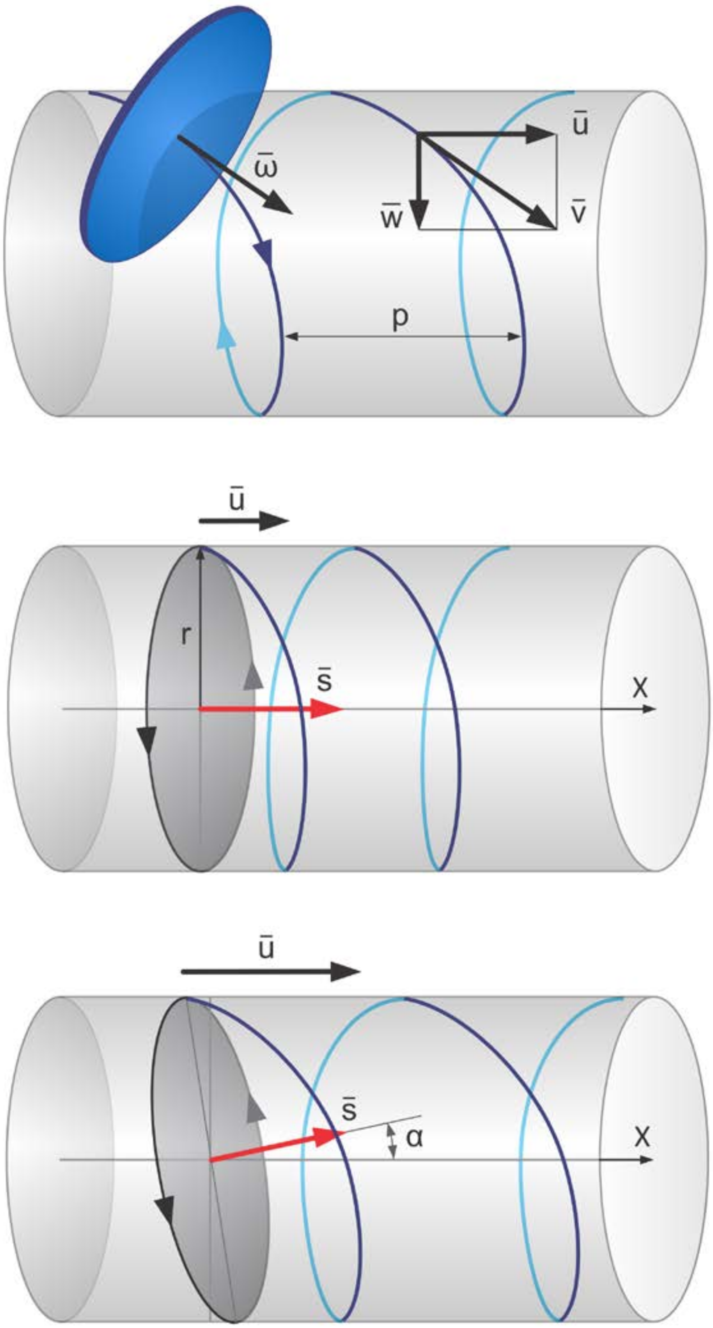

Figure 24 - *The trajectory of a particle*

2. Let us now analyze some specific cases:

- The force is applied along the direction a particle globally moves: it leads to an accelerated movement;

- 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, of a certain radius that may be calculated.

If we are to analyze a short time interval (the duration of two turns, for example, as in Figure 24), considering that 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 perpendicularly forces will not be identical (fluxes $\boldsymbol{\varphi_1}$ and $\boldsymbol{\varphi_2}$ are having the same intensity on the surface projections). Moreover, this phenomenon occurs within a very wide range of particle speeds, not only in the particular case of $\boldsymbol{\alpha = 45^\circ}$.

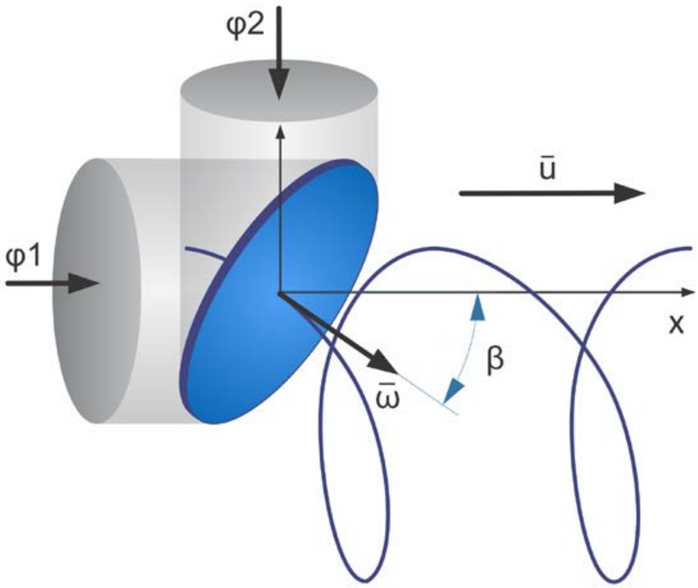

Figure 25 - *The effect of perpendicular fluxes*

However, the mass has an intrinsic relativistic mechanism and a global medium value (due to the precession movement of the particle, which certainly has to be taken into account - as PT explained). While spinning, both side surfaces of particles 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 all depend on direction. This is in fact a source of fundamental uncertainty on position/speed quantities of particles, which may validate their "wave" property as assigned by QM. Moreover, if it is corroborated with the objective observational limitations, we may even validate the *probabilistic* approach of QM that tries to describe the movement and position of an elementary particle.

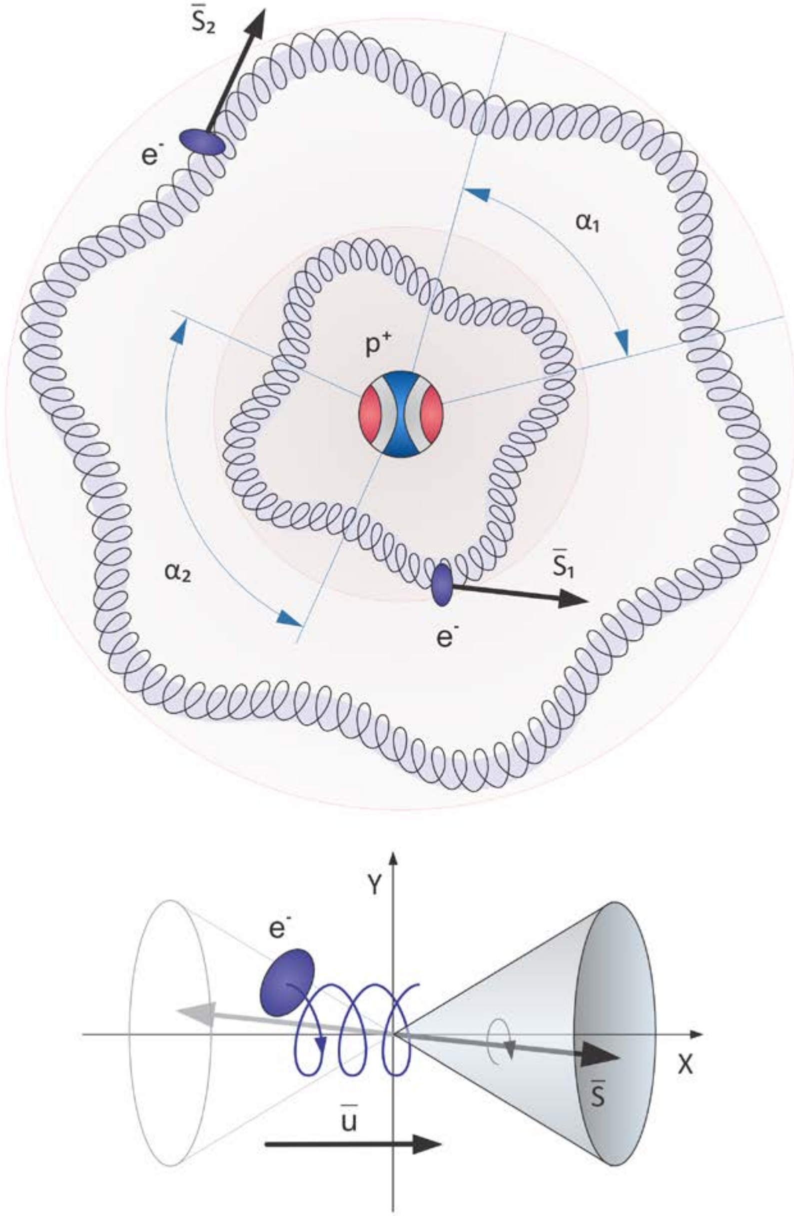

Figure 26 - *The trajectory and spin of orbital electrons*

The trajectory of a particle may actually be deformed in several ways. 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 one more helical motion that is added to the particle's precession, of a bigger "wavelength"; thus, the global form of the orbit will be a double helix. Moreover, these things may continue on a larger scale, with other translational and rotational motions. Practically, the movement of a charged particle continuously adapts itself, and it will always "resonate" with the configuration of fields to which the particle is subjected.

All these things are very important, they allow us to analyze more precisely the movement of electrons in the atomic orbitals (Figure 26, where are shown 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 electric charges from its surroundings. The electron trajectory (rectilinear if it would be isolated) bends as the particle continuously "falls" towards the atomic nucleus; it is maintained in a region where the tangential velocity creates a centrifugal force big enough to balance the pull of the positive charge. At "internal" level, the particle's spin vector has a certain, averaged inclination; its oscillations "resonate", getting in sync with the applied fields. Within this orbital, the electron's inertia is always balanced by the electro-magnetic field; therefore, the particle is stable here and it may continuously rotate, its energy level being constant. The electrons are thus located inside an "electron cloud", and QM can now give their position only by the means of the probability distribution.

At sub-quantum level, all the explanations for the movement of particles are based on the direction-dependent effects produced by the granular fluxes. Being in the nucleus' potential field, an electron normally tends to move and accelerate toward the atomic center. It would gain speed this way, while its direction would be changing; but the change of direction would modify the average angle of the 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; this also represents the basic motivation, at the granular level, for quantifying 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' side, one wavelength-wide segment is "seen" under the 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 average trajectory or to 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 - Brief data about the half-integer spin particles:

1. All the internal granular layers of particles are continuously spinning in a certain plane, at a linear velocity of value ***C***. We may 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 neither parallel to the instantaneous direction of travel. The average angle this vector will form with the global travelling direction is dependent on the particle's linear velocity, and its current values may vary between two fixed limits (see the Annex 1 of PT).

2. Due to their intrinsic motion of precession, all particles will describe a helical trajectory - as superposition of the rotation and translation movements on the travelling direction. The rotational motion (a half-integer spin particle gets the same orientation after two complete revolutions, i.e. total angle of 720 degrees) will have a spin vector, named *proper spin*, which may be oriented in these ways:

- in the same direction as the global velocity vector, and we're going to have a right-handed helicity;

- in the opposite direction, and we're going to have a left-handed helicity;

If the rotation plane is not perpendicular to the velocity vector (Figure 24, the bottom picture), the proper spin vector will form a certain **α** angle with the direction of motion. This angle may be constant or it may vary during movement, even on two spin intervals. 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 system; 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 with no real equivalent, which would only describe mathematically an abstract rotation! The special degree of freedom approach is also a non-precise description! We saw that the quantum spin has a clear correspondence in the physical reality, being directly associated with the intrinsic motion of all particles, as it was described thoroughly in a chapter of PT.

3. All elementary particles are continuously executing this special movement through space, due to their physical nature; but in regard to the global traveling direction, their instantaneous velocity may have a certain, variable angle, and they may even move backwards sometimes. This does not mean that a particle may travel in time, that it may "know" the future, or that some identical copies coexist in parallel universes. Particles do not choose the future. Particles are only describing this special movement all the time, and their interactions (including the electric and magnetic ones with some other particles from vicinity) are all based on deterministic rules. Their laws of motion are exactly reflected at 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 waves, but it is also true that their special, repetitive trajectories may be eventually described as waves, and their positions in space as values of the probability density.

5. Photons

This section is supposed to be an improvement of the initial PT's photon model (all fundamental features will be identical).

5.1. The Photon Generation Process

As the movement of the elementary particles was widely described in Chapter 4, we may now make a better analysis of the photonic interaction and of the photon generation process. PT has showed us how a photon is generated by a charged particle while it accelerates or decelerates. Let us revise the photon generation process, getting into details on the electron jump to a lower energy level. This simple atomic transition may occur spontaneously or it may be stimulated; either way, a small change or a perturbation of the electron energy may trigger its escape from the stationary orbit. The electron's potential energy (in the system that it forms with the atomic nucleus) 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 accelerates the electron; its speed rapidly increases to relativistic values, very close to the limit **c**. Meanwhile, the electron's proper spin aligns perpendicularly to that of the positive nucleus due to variations of the electric field. Once the electron got to a "lower" trajectory (it almost reached the speed of light and its movement direction became tangential to the temporary orbit), the acceleration process finishes. It should keep the last direction and speed, but this is not actually happening with an electron that belongs to a system. In order to reach a state of dynamic balance on 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; the new level it reached "resonates" with its current parameters.

During the acceleration and deceleration periods, as it has been widely described in PT, the electron radiates continuously, generating this way a complete photon. This photon's granular distribution will reproduce exactly the motion and the trajectory described by the particle over that time interval, and its granular density will be directly proportional to the value of instantaneous acceleration. These periods of acceleration and deceleration are not identical, nor their variation pattern over time. The point is, though, 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 of 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 electric force's effect on such larger mass will not significantly affect the photon generation process. In my opinion, the emitted photon is in fact an accurate, three-dimensional replica of the moving pattern described by the electron during its "jump", from the intrinsic movement up to the global 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 values at the initial and final moments of the jump. Therefore, the sequences of granular layers will render exactly the helical motion and the structure of the emitted photon will even preserve a "matrix" of the instantaneous speed values that electron had during the jump.

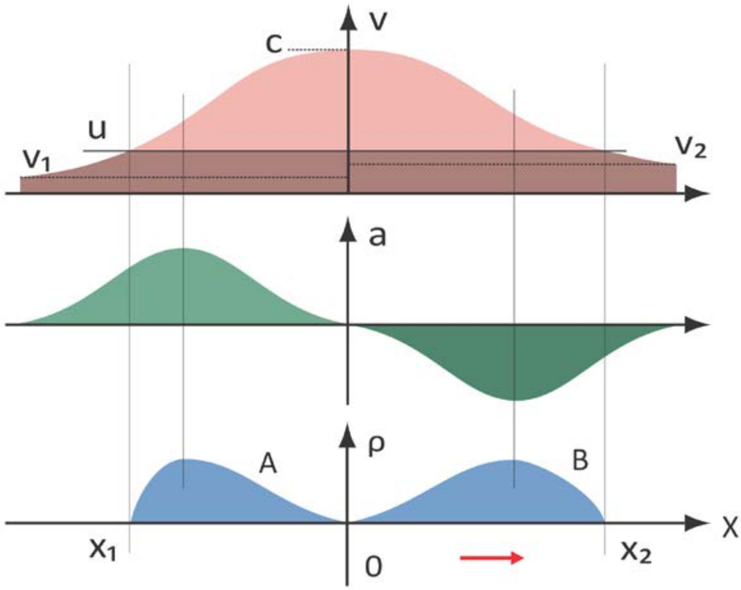

Figure 27 - *Emission of a photon*

Another interesting aspect: a photon contains two distinct zones, **A** and **B**, which correspond to the time intervals while the emitting particle sped up and slowed down, as shown in Figure 27 (the bottom side graph, where the blue areas represent the granular density **ρ**). The frontal part **A** was generated during the acceleration period (**a > 0)** and it includes denser granular layers followed by some of almost the average flux density. 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 more than just a simple "modulation" of the flux, it is a structured supplement of granules moving 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 may have in fact a more complex formula, not a simple proportionality with the particle's acceleration. However, the successive granular layers (which accurately reproduce the double-helical path of the electron) will certainly have a variable pitch, in direct proportion to the instantaneous speed; it easily results that the largest distance between layers are in the middle part of the photon.

Let us assume that an electron from a higher orbit has the initial velocity of value $\mathbf{v_1}$ (in a kind of semi-classical approach). It accelerates and, at a given moment, its speed exceeded the value **u** (which is a relativistic threshold). The electron starts radiating, but it will continue to gain speed until the limit **c** is reached; at that moment, its acceleration will become zero for a while. Subsequently, the slowing down process begins; when the speed drops to the threshold value **u**, the photon generation process comes to an end and the electron will start to rotate on the new orbit at the lower speed $\mathbf{v_2}$ (but $\mathbf{v_2 > v_1}$).

A photon is emitted during the jump of an atomic electron to a lower orbit, while the particle either accelerates or decelerates and its instantaneous speed is greater than the relativistic limit.

The electron's spin orientation is approximately constant during this time interval; therefore, due to the relativistic reflections on the particle's surface, a denser structure may be formed, whose granular layers are all concentrated and emitted in a single direction. This structure has a three-dimensional shape, a kind of curved "tube" with an almost constant diameter, and it is composed of numerous granular layers of variable density, arranged on a helical trajectory of variable pitch. All parameters of this geometrical structure (length, width, pitch, density, etc.) are storing in fact the variation of the emitting electron's energy, along with the spatial trajectory it described during the jump.

If the atomic electrons do not satisfy one of the above conditions, the denser granular structures cannot be created and no photons will be generated. An electron (either free, orbiting or being in an acceleration field) will always reflect and concentrate the granular fluxes on certain directions, because this is the true nature of its electric field. These directions are normally included in very large solid angles, and for this reason the compact granular structures cannot be formed. We saw that the three-dimensional structure of the photon may be produced only in relativistic conditions, and the change of the emitting particle's energy will be found in photon's energy. How this energy is stored into photons? As described in PT, the physical length of the photon is associated with 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 proportionally found in this new generated wave's *frequency*.

5.2. The Photon Absorption Process

Figure 28 shows an excited hydrogen atom, in which the electron transition between energy levels generated a complete photon; the **γ** photon then travels in straight line, until it is absorbed by the electron of another atom. Thus, this electron gets a surplus of energy and it will immediately jump into a higher orbit, getting farther away from the atomic nucleus. The photon-particle interaction, also described by the PT, has some special characteristics. Practically, a photon may transfer a certain momentum, whose value only depends on the degree of synchronicity between its density variations and the receiving particle's movement (the intrinsic one plus that imposed by the system where it belongs).

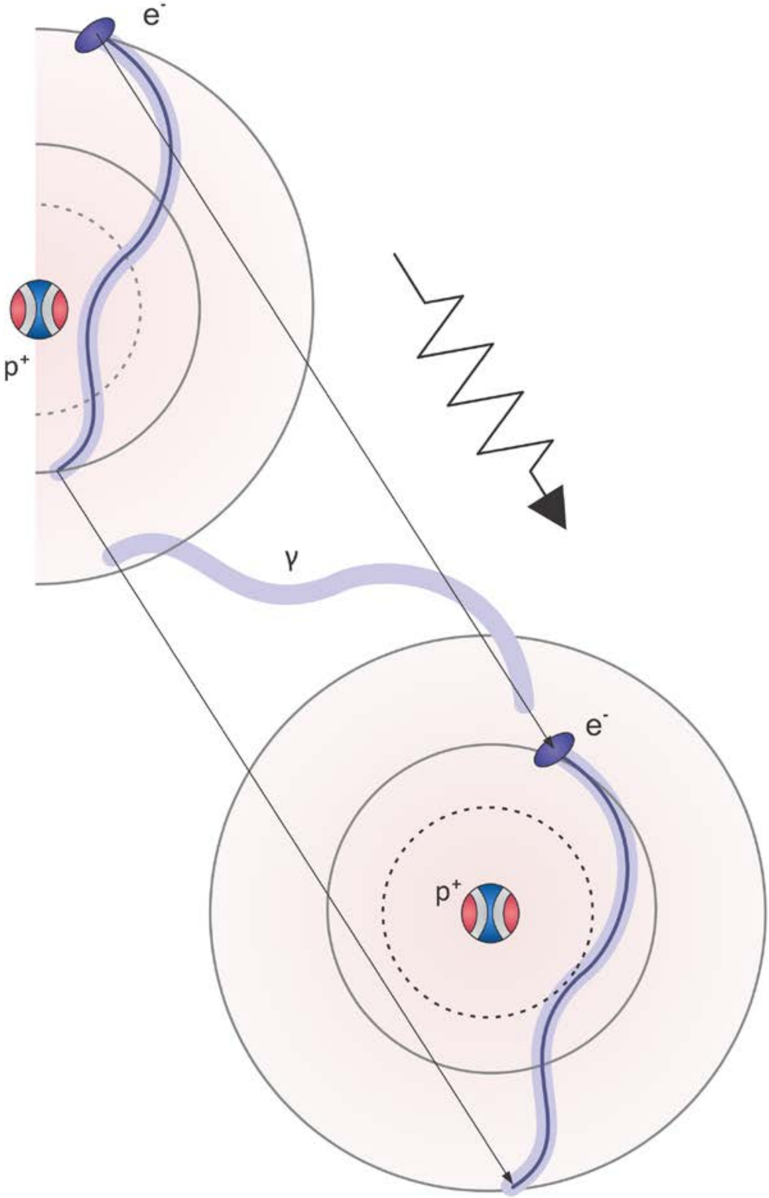

Figure 28 - *Absorption of a photon*

The successive collisions of various photon layers with the particle's surface may eventually produce an accelerated or a decelerated motion, depending on their temporal correlation and on their relative positioning in space.

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

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

A. A photon may interact with an electron, for example, if just after their initial contact moment they got into synchronicity. This means that 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" the movement of the emitting particle. In other words, the photon momentum can only be transferred if a special state of real "**resonance**", of maximum coupling is reached.

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

The electron may even change its current direction while follows the 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" to an orbit of a larger radius. No laws of conservation are violated during this simple phenomenon.

Note 1:

Due to the same resonance reasons, an orbital electron will only interact with photons of the right frequency (very precise value), whose energy can propel it on a higher energy level.

Note 2:

If two or more photons of different frequencies would be simultaneously interacting with an orbital electron, only that one of the right frequency will be absorbed.

Note 3:

The absorbed photon and the re-emitted one 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, based on the assumption that this density only depends on the emitting particle's acceleration.

Note 5:

The photon's mass cannot be defined same way PT did to a compact granular structure of maximum density. Photons, as structures of granular layers in motion, have a special character; they hold certain energy in their internal distribution of granular layers, whose value depends on the global oscillation wavelength. 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. We could assign photons a special mass parameter, 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 the first dense structure of circular shape; more, their certain inclination angles will cause a curvature to the emerging particle's surface, and therefore an electric charge. The remainder of the photon will generate another particle, which similarly gets an inversely curved surface, thus an electric charge of opposite sign. This is happening due to the pure mechanical balance that simply results from the rotational symmetry of the new structures.

6. Quantum Entanglement

6.1. Quantum Uncertainty

Let us make a *thought experiment:* imagine an isolated spatial framework, with no external interactions, which may contain various quantum objects, such as particles or photons, being in definite quantum states (all their parameters are known). This micro-universe is completely deterministic, as PT also presumes (a future state of the system is completely determined by the prior states); we know the 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 continuously occupying all the intermediate positions on the trajectory. Everything is measured from a reference system that is considered as fixed relative to this experiment's spatial framework.

All parameters of the photons are known:

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

- The travelling direction and the speed of value **c**;

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

- The geometrical 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 will not interact with each other, regardless of their parameters; they may pass one through the other without any interference. After colliding with 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, it is assumed that 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.

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

This whole system is therefore characterized by *realism*: all properties of the component quantum objects have pre-existing values, whether they will be observed or not. However, as QM states, there is a real uncertainty degree of these pairs of quantities: position / momentum or energy / time; it arises from the interaction with other quantum systems, which includes the case these quantities are observed and measured with an apparatus. Uncertainty, as fundamental quantum phenomenon, represents a relativization induced by a simple fact: any measurement performed at the quantum level (a limit of the ordinary matter structure) implies an interaction with other quantum objects and systems, even if they are included in larger devices. More than that, as particles are continuously executing the intrinsic movement (proved by PT), their accurate localization seems to be theoretically impossible. Therefore, the existence of the QM's *uncertainty*, as a quantum property reflected to 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 made by an observer *will not only depend* on the accuracy of the measuring apparatus he may use.

6.2. Entangled States

This micro-universe is characterized by realism and it 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 evolve in time, and the states and positions of their component objects are continuously changing.

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 that we will get 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 the quantum objects can be used to store and then retrieve information. This quantum information uses a unit of information named QUBIT. Let us 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 particle's spin directions could be, or the photon polarization states.

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 objects 1 and 2:

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

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

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

$$|\psi_1\rangle|\psi_2\rangle = a_1\,a_2\,|00\rangle + a_1\,b_2\,|01\rangle + a_2\,b_1\,|10\rangle + b_1\,b_2\,|11\rangle$$

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

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

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 the 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 distant systems, located at a distance that is higher than a certain threshold value, the states of these systems may be completely separable.

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 that is made 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 consequently that distance threshold 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 measurement outcome could be real, objective (as much as possible at the quantum level). This measurement is equivalent: in whichever system it would be made, it will also give the outcome of an eventual measurement in the other system (which has to be reversed, as direction for example). Thus, the entangled objects offer an informational redundancy. This thing could be useful when some information is transmitted at a distance, as you may check at source the emission correctness; in order to have an accurate reception, we only have to be sure that the quantum objects are still entangled.

6.4. Experiments and Errors

Let us consider the photon case: if there are no particles to interact with, a photon will maintain 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 variations of the electric and magnetic fields that propagate; they are in fact special 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 information 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 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 remains uniform; in other words, these granular structures can "carry" their initial states at any distance, and hence the associated information.

The experiments measuring the states of the entangled pairs of photons, where the distribution of probability analysis (related to the Bells' inequalities checking) gives results that are not consistent with the normal statistics, they all have systematic errors on several levels, and therefore they are not eloquent.

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. After they are reflected and 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

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 development of quantum cryptography.

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

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

The measurement of their state at a given moment, which implies an interaction that will finally lead 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, the quantum 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 complete all this by reflecting the entire new paradigm at the reality's normal, macroscopic scale.

7. Antigravity

The mechanical interaction between all 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 origins is the planetary center and tips on a sphere); they were generated by the momentum that all the granular fluxes have transferred 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:

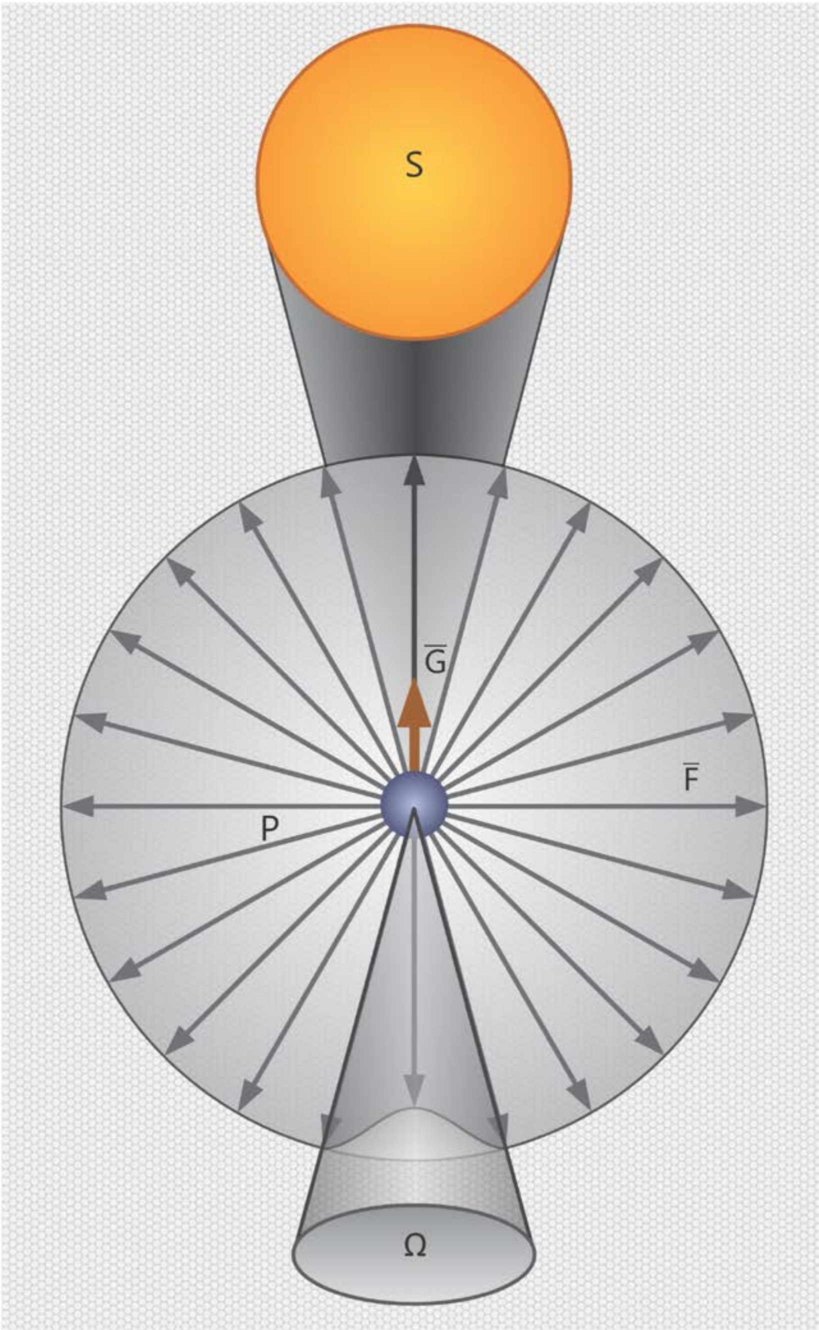

Figure 29 - *The gravitational force*

- 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 then 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 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 all the matter interactions and maintain the integrity of all the particles.

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

If we are to consider the effects of gravity in a system of two celestial bodies, a planet and a moon for example, we will see there are distinct gravitational fields that surround each of them, which will "pull" any physical object to their surfaces. Analyzing the global field distribution and the resulting force along different pathways, we will discover the existence of some points where the forces exerted on a small object are cancelling each other. This null value of the gravitational force over a specific area 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 resultant intensity may equalize in certain regions. This is not antigravity; this is a simple modulation of the local flux intensity, made by those celestial bodies. Taking things to extreme, let us consider now that the object is placed on the surface of a black hole; we may observe a bulge-shaped distribution of the granular fluxes around it, but a null flux value is still not reached on 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 between 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 reflecting particles are differently oriented in their continuous and variable motion.

Let us imagine that we have already built a gravitational "mirror" from a special material that could stop and reflect the granular fluxes. We will then use this material to make the roof of a small house. An observer located inside this house expects that an important part of the fluxes coming from the sky will 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 those fluxes coming from above the house. As this kind of opacity depends only on the object's mass, it simply results that the mass of the roof has to be equal to that of the entire planet! We might invent such a special material, which contains for example a few layers of "glued neutrons" bonded together, but not in the near future (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 downward granular fluxes, yet remains a utopia.

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

A single amendment may be brought to this enunciation:

The omnidirectional gravitational fluxes are present in any point of the Universe, but their intensity may vary on a certain direction, within a solid angle or at global level. This phenomenon depends on the point position in Universe (or in a SR) and on the presence in the close 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 us imagine a special device, which 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 a 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 the 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 becomes null due to the barrier (shielding) effect produced by the superdense granular matter. Moreover, no material body could exist in that region, in an absolute empty place; any hypothetical body would be placed in this region, it will be immediately shattered, and not by the 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 the component 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 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 dynamics of matter can now be seen as a reflection of the granular mechanics' laws, where the specific movement's absoluteness and relativity have been both 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 a 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 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 travelling 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 attempts to create models in order to explain the material fabric of the cosmos, by using scientific theories and mathematical equations, has 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, the life itself. Therefore, only the 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.

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Annex 1

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

- According to TA, due to the absolute speed of the galaxy and of the observer. The value of the 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, 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 crossed through 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 the granular density over time (which is equivalent to the expansion of space). Photons have been emitted by the 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, different as of the transmitter; thus, the re-emitted photons will have an additional spectral variation, caused by this speed (also due to 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 the accuracy of the measuring apparatus, 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 of the evolution in time of our visible Universe.

Annex 2

If we are to reconsider the Twin Paradox in the new light of TA, all things could turn into an entirely different story, even more interesting. Let us 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 speed evolution and on the concrete ship's trajectory, the astronaut twin will have on return a large 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)

b) he will be about the same age

c) he might be older, if the ship's absolute speed was lower, on the 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), which is explained by the lower rate of time any material system gets if it accelerates and reaches absolute relativistic speeds, on a certain direction.

Acronyms and Conventions

ASR - Absolute System of Reference

The velocity of any object or system in regard to the ASR 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.

SR - System 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

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