The Theory of Granular Gravity

A granular model of the gravitational field

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Third Edition, February, 2019

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1. Introduction

Let us suppose that the universe is correctly described by the Prime Theory ([1] and [2]) and the newly introduced granular postulates and laws are all valid. The definition of gravity, as effect of the directional fluxes that have a sub-quantum granularity, is also kept. Clearly, the gravitational field is the fundamental, primordial field of the universe, the generator of all components of the matter - the elementary particles, being at the same time the cause and support for the propagation of all the other known fields. This field's energy shaped up matter and then concentrated it into large cosmic objects, i.e. into stars and planets; at a later moment, all these bodies formed some even bigger structures, the galaxies. Matter, in any form, has evolved and transformed, sometimes quietly, sometimes violently. Anyway, all of these changes were due to the special properties of this fundamental field called *gravity* and due to the existence of a spatial framework where its interactions can be exerted.

2. The three-dimensional space

Space will be further regarded as a dual concept, being at the same time a truly empty framework of Newtonian type and a granular fluid with particular properties. The number of dimensions of space is not a consequence of a cosmic "arrangement" generated by the balance of the primordial energy or matter. It is just a "given" of this universe, the effect of a phase transition occurred within the entire volume of *essence* - from a continuous form of organization to a discrete one. This change produced the well-known empty space, the cosmic vacuum in which the granules of essence may freely move on any direction. If we would use a reference system with three perpendicular axes (which seems natural, as we are understanding space in left-right, top-down and near-far parts) we could mathematically describe the movement of the objects on *any* direction within this framework. Our imperative need to formalize, associate, extrapolate and make everything abstract has led to the idea that there could exist, not only virtually, more than three dimensions. It is obvious that we could imagine models and make mathematical calculations in *n*-dimensional spaces, but the objective reality has nothing to do with them, it is fundamentally and definitively built as a *three-dimensional frame;* and this is the only place where matter can "work", i.e. can interact by obeying simple mechanical laws, much less exotic than previously thought. Humans are "looking" around and observe via their own senses a physical reality that may be described by a three-dimensional system, but we are dealing in fact with only one fundamental dimension of space, namely the *space* itself. And yes, we can say that it is *one-dimensional* in this perspective. Space is practically a "place" generated by the lack of matter (the raw material in contiguous form), a place that is currently filled with a fluid containing essence in granular form. Consequently, there is no an empty, isolated space somewhere in our Universe. As it was described in Chapter 1, at time zero, we could assimilate everything with an unlimited quantity of essence in motion. In order to maintain a dynamic equilibrium at the time of transition, multiple *gaps* were formed throughout the entire body of essence; they subsequently have fused together and their volume has rapidly increased. All of these have eventually created the *spatial frame* and the *granular-type matter*, i.e. the fundamental physical entities that will be farther used within this theory.

3. Characteristics of the granular fluxes

The granular fluxes have already been described in my previous works, but all their characteristics should be placed now in a uniform typology to allow us create a complete mathematical formalism of the gravitational field. Depending on the dimensional scale, a distinction should normally be made between the discrete, discontinuous nature of these granular fluxes (in time and space) and the final effect that results from their interactions with the structured matter (which is averaged and thus has continuous values). Once we know the granular nature of these sub-quantum fluxes and the rules governing their interactions, all the effects they produce may formally be expressed directly at the quantum scale; no important feature of the physical phenomena, neither as value nor as causality, can be lost in this way.

Fundamental properties:

a) If space is uniform, all granular fluxes propagate *rectilinearly* and their absolute velocity has a constant value (the speed of light in vacuum).

b) All of the granular fluxes that cross a specific space and which ideally have an equal intensity on any direction form the *gravitational field*.

c) The granular flows on a particular direction are generated at cosmic scale and therefore they do not have a local character; however, they act at any scale of matter, and in the same way.

d) The global intensity of these granular flows (in a state of equilibrium) is correlated with the average density of the granular medium at cosmic scale.

e) The granular fluxes may change their direction when areas of different granular density are crossed; moreover, they are fully reflected on the surface of elementary particles.

f) The directional uniformity of granular fluxes is deeply affected inside and in the vicinity of some massive cosmic bodies, and this thing produces the well-known phenomenon of *gravity*.

g) The actions of the gravitational field on matter have several consequences:

- the structural integrity, the form and the uniform motion of particles and material bodies are all maintained over time through the uniform transfer of granular impulse.

- different amounts of impulse are transferred due to the nonuniformity of the gravitational field, and this is equivalent to a force acting on the material bodies; therefore, they are being accelerated on a particular direction.

- the gravitational field generates the entire support and propagation means for all the other known fields.

All these characteristics allow us to describe the gravitational field as a three-dimensional *vector field*, continuous and omnidirectional; the interactions with matter may be quantified by the local, finite perturbations manifested in its uniform spatial distribution. These interactions and the effects they produce may be correctly treated only by using an absolute system of reference, as it was previously described in [2]. The relativity and its high-speed effects are present and they all can be used in the usual descriptions of the gravitational interactions with the material bodies and elementary particles.

The gravitational field may have these kind of perturbations:

a) *Additivity*. The intensity of this field in a certain direction can be increased by the presence of an additional flux or can be diminished by removing a part of the flux.
b) *Divergence*. The degree of divergence (which is zero normally) of this field changes in the vicinity of electrically charged particles.
c) *Reflection or absorption*. It is produced on the contact with any elementary particle's surface.
d) *Rotation*. It occurs during reflections, due to the granular movements.
e) *Diffusion.* A phenomenon that mostly occurs at the surface of any dense macroscopic body.
f) *Attenuation.* This global phenomenon occurs during the passage of granular fluxes through any material body.
g) *Deflection*. The directional fluxes change their direction in areas with nonuniform fields.

The effects of these perturbations on matter:

a) *Gravitational* interaction, which directly results from the local granular flux's nonuniformity.
b) *Electric* interaction is produced by the electric field and it results from the divergent fluxes reflected by the electrically charged particles.
c) *Magnetic* interaction, a resultant of the electric field's intensity variations.
d) *Photonic* interaction occurs on the photon-particle contacts (photons being granular structures that move at speed **c** due to the additivity feature).
e) *Strong/weak* interaction cumulates several types of field properties and perturbations.

4. Gravitational interactions

4.1. Granular fluxes

As it was already stated, the interactions of the granular fluxes with matter are present at any scale, starting from the quantum level up to the macroscopic world. These fluxes have actually created all elementary particles and gave them a stable form, being also responsible of all their interconnections through different fields. The elementary particles and all of their structures, from atoms to the biggest cosmic bodies, are "immersed" in the spatial granular fluid that governs in fact all their interactions. We can now try a graphical description of the actions caused by the gravitational field to matter, at all scales, paying more attention to the movement of material structures. We have to keep in mind three fundamental ideas for this analysis:

1. The granular fluxes do not have local sources; it can be assumed that they originate from points located at infinite distances.

2. They are propagating in an absolute straight line, at the constant absolute speed **c** (in a uniform medium).

3. All interactions of this fluid with the structured matter are only of mechanical nature.

In order to outline the particular characteristics of these interactions and to subsequently describe them by mathematical formulas, we have to analyze first all the specific situations in which they are present. Let us now consider an ideal flat surface of area **S**, as shown in Figure 1a, which will reflect all incident fluxes in accordance with the well-known law of reflection (optics). Both sides, **A** and **B**, will therefore reflect the fluxes coming from either the left or right side. The presence of this ideal surface, i.e. a fully reflective one, does not practically shield the incident fluxes and neither affects their even distribution; it would only change their point of emission. The surface of real materials, like the one shown in Figure 1b, reflects only a small part of the incident fluxes, while the part remaining crosses it unaffected. As the reflection occurs on the surface of all elementary particles and they have a dynamic and random orientation, the fluxes will come back on every possible direction, diffused ($\boldsymbol{\phi}_i$ is the *incident flux*, next to the *emerging* and *diffused* ones).

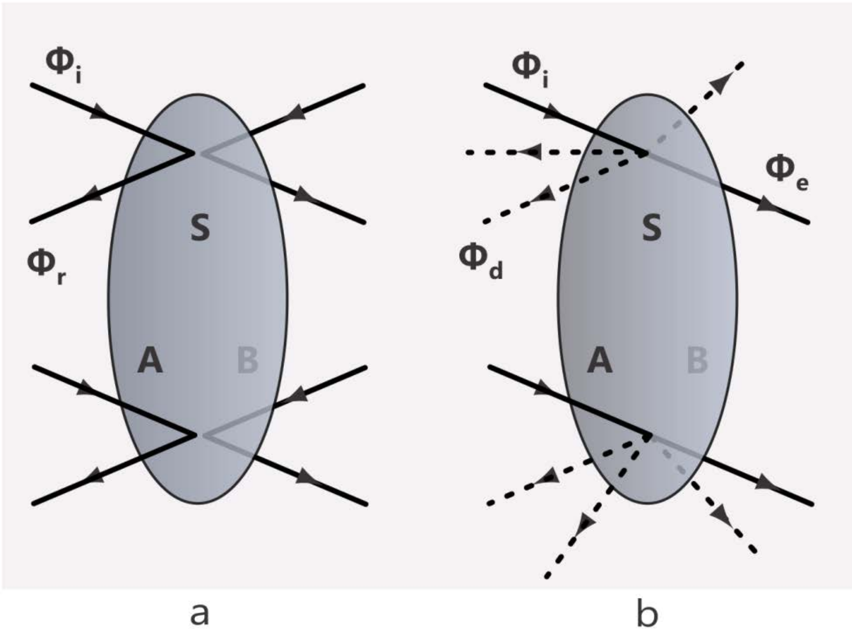

Figure 1 - *Reflection of the granular fluxes*

4.2. The electric field

This chapter tries to improve the descriptions and formulations that were previously made in my first books - Chapter 4 [1] and Chapter 6 [2].

If we are to analyze more closely the flux - elementary particle interaction, we may see a larger number of phenomena that could influence the granular fluxes. Let be a real elementary particle, for example a positron, as in Figure 2. The incident fluxes **A**, **B** and **C** will undergo a more complex reflection process, and here are some of its particular traits:

- reflection is of *relativistic* type, as any particle has a fast intrinsic precession and a global motion.

- there is a *rotational* component that adds to the reflected fluxes **A'**, **B'**, **C'** (indicated by the dotted lines) due to the conservation of the total impulse during collisions.

- the gradient of granular density around particles will additionally *curve* the incident and reflected fluxes all alike.

- the reflected fluxes will *diverge* due to the electric charge (curvature) of the particles.

We now may clearly see that an electric field (of a positive electric charge in this case) is in fact a perturbation of the uniform local flow; this perturbation has a rotational component (which is synchronous with the movement of the particle - the intrinsic rotation and global translation) and a nonzero divergence value. The variations of this electric field in space and time represent the magnetic field. Thus, we may say that the source of all known fields (including the electric one) is in fact *the perturbation or the nonuniformity of the local flux*.

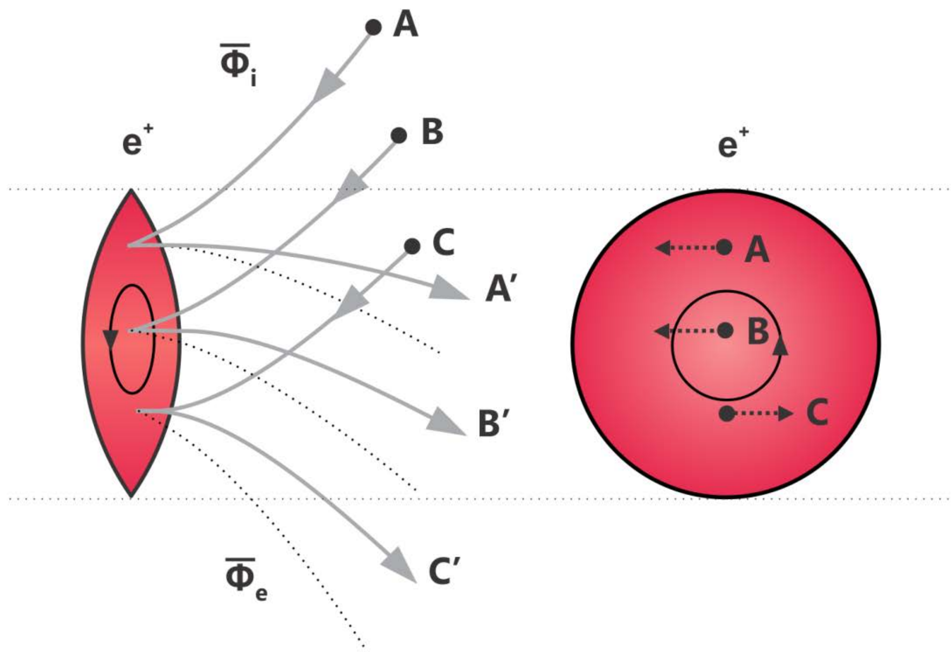

Figure 2 - *Granular reflections on electrically charged particles*

The local flux is perturbed by the presence of any particle - elementary or composite, with or without net electric charge. Consequently, the nearby particles are influenced in several ways through complex interactions (whose intensity changes with the distance). Thus, the force exerted on particles determines their movements and their trajectories in accordance with the well-known principles of mechanics; however, the final effects are also depending on the mass of each particle.

As it was already stated in [1], the mass of a particle depends on the number of constitutive granules. The acceleration one microscopic entity gets in a force field depends on its mass and on the impulse transferred by the field through granular collisions. A particle that is freely moving within the granular fluid of space constantly receives an even impulse from all directions and therefore it can maintain its current state of motion indefinitely (i.e. the intrinsic rotation and precession, along with the global translation). In conclusion, the granular fluid has the capability to preserve the uniformity of the movement of any particle or material structure; actually, the causality is better expressed in this way: the laws of mechanics are given by the properties of this fluid and of its fluxes.

But what happens when a supplemental flux acts on a particle? The additional momentum that is transferred to the particle's surface will change the angle of velocity of all internal granules; therefore, the particle will speed up, having a nonzero acceleration over the entire duration of the flux. The acceleration is directly proportional to the strength of the flux and inversely proportional to the particle's mass. All these things will be linear within the nonrelativistic range of speeds; however, the mass increases at relativistic speeds, reaching an infinite value at the speed limit **c**. What physical explanation has this relativistic phenomenon?

If the speed changes, from value $\mathbf{v_1}$ to $\mathbf{v_2}>\mathbf{v_1}$ for example, the future position of the particle on the moving direction will also change (it will be located a little bit farther away than usual). Due to this "jump" made within the surrounding fluid, the particle experienced a greater number of granular collisions on the average direction of travel, which means it has received a bigger impulse on that direction. In other words, the instantaneous "mass" of that particle (seen as the bigger momentum required by that change in speed) will increase, more as we are getting closer to the speed of light in this granular medium. If the particle would reach the speed limit **c**, a "wall" of granules would form in its frontal region and the "free" motion between the collision moments will no longer be possible. This is the logic explanation for the "infinite" value of mass gained once the speed limit is reached.

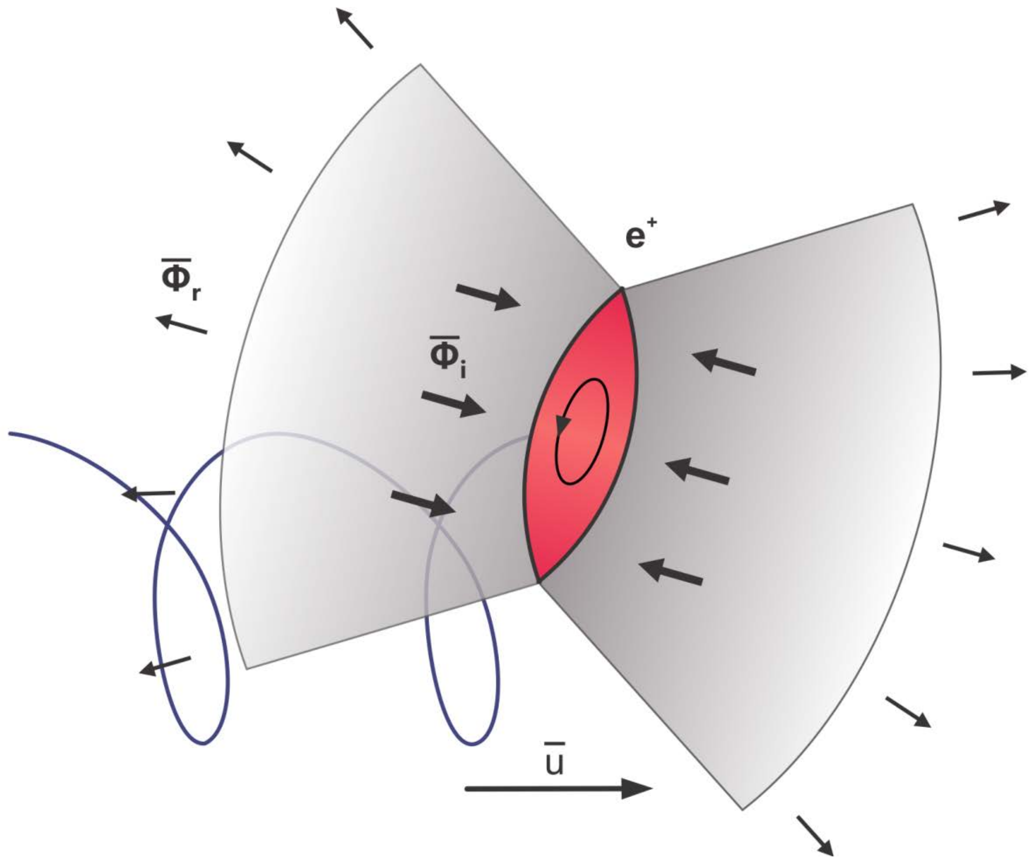

Figure 3 - *The electric field of positrons*

Simply put, we may consider that space surrounding a positively charged particle contains a rotating divergent field, exactly like the one shown in Figure 3. This electric field interferes with any other nearby charged particle and the intensity of this action will depend on the amount of charge, distance and on the instantaneous velocity and spin orientation. However, all these things are more complicated in fact and there are three more directions to follow in a comprehensive analysis:

a) The omnidirectional gravitational fluxes are reflected from the charged particles' surfaces in the same way the light reflects on a concave or convex mirror; therefore, some concentrated and focused fluxes form around the particle and propagate radially, as shown in Figure 4.
b) The charged particle emits this symmetric field off the both sides, in a continuous manner. As this field is synchronized with the particle's motion of precession, its averaged distribution will be nearly circular in shape; moreover, the field will be composed of some "wave bursts" that move on *spiral* paths away from the current location of the particle.

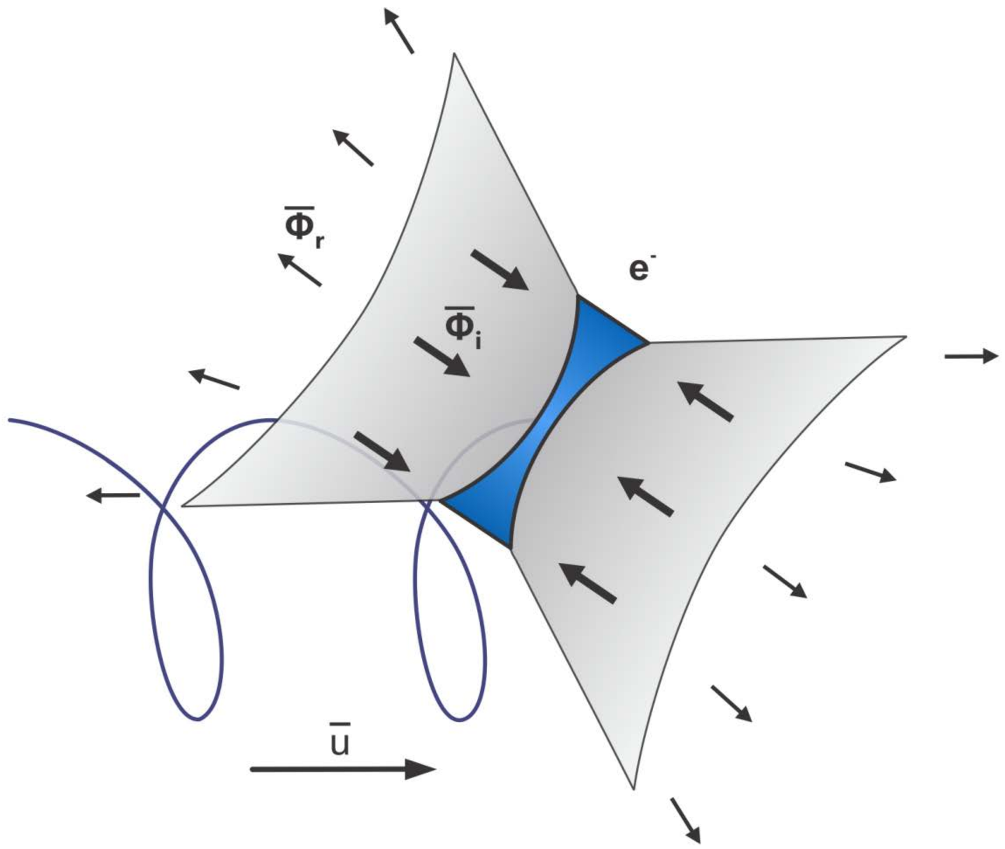

Figure 4 - *The electric field of electrons*

c) We also have to analyze the electric field and its action on other particles (with and without net charges) quantitatively, as function of distance, in order to have a correct picture on this kind of interactions at the atomic level.

The electrophotons and their properties:

- The granular structure of all electrophotons is similar to the photon's spiral structure (Figure 5, where you may see several granular layers that were emitted at different moments during the particle movement of precession); electrophotons can propagate and thus produce the interactions of the electric field (electromagnetic in fact, the magnetic part results from the variations of these structures).

- Electrophotons are practically produces by the granular fluxes that reflect on the charged particle's surfaces, their internal structures being in fact successions of granular layers of variable density.

- Electrophotons may be represented by a divergent vector field that propagates within a certain range of solid angles.

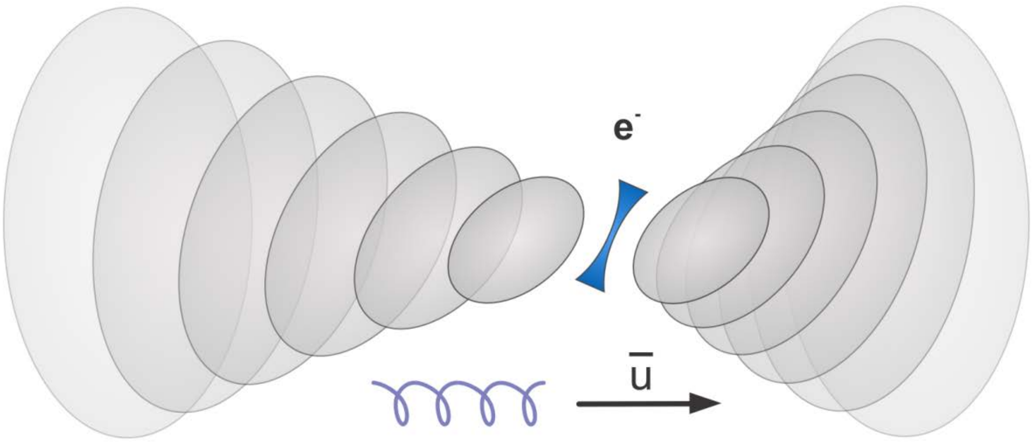

Figure 5 - *A few component layers of the electrophotons*

- The interaction mediated by electrophotons decreases in intensity with the square of the distance (due to the decrease of their granular density).

- All electrophotons move in a straight line with the speed of light, **c** (this speed is given by the local spatial fluid).

- Electrophotons are emitted continuously on almost every direction around the charged particle; they accurately follow its movements, the precession and global translation.

- No energy is required to create the granular structure of an electrophoton; its internal layers are simply built when a part of the local flux is concentrated during the reflection on the particle's surfaces. If there are no interactions with other electrically charged particles, all electrophotons dissipate after a while into space and their structures practically disappear.

- The granular layers of an electrophotons contain the exact polarity (the type of curvature) of the emitting particle.

- The electric field is additive; the independent actions of two or more electrophotons of the same polarity adds up, while the fields of opposite polarities subtracts.

- Photons of this kind are continuously emitted by any charged particle, whether it is elementary or composite, free or atomic. The succession of these divergent photons has a certain frequency, following in fact the emitting particle's intrinsic precession rate.

- In quantum physics, the electric field is being transmitted by some "virtual photons", special bosons that are known to be the force-carriers for the electromagnetic interaction; in contrast to this, the electrophotons above are real things, concrete objects with certain granular structures. The calculations that lead to the Coulomb's law (the electric field is proportional to the density of the virtual photons) are all correct if averaged quantities are considered, but we now have a complete physical explanation of this phenomenon.

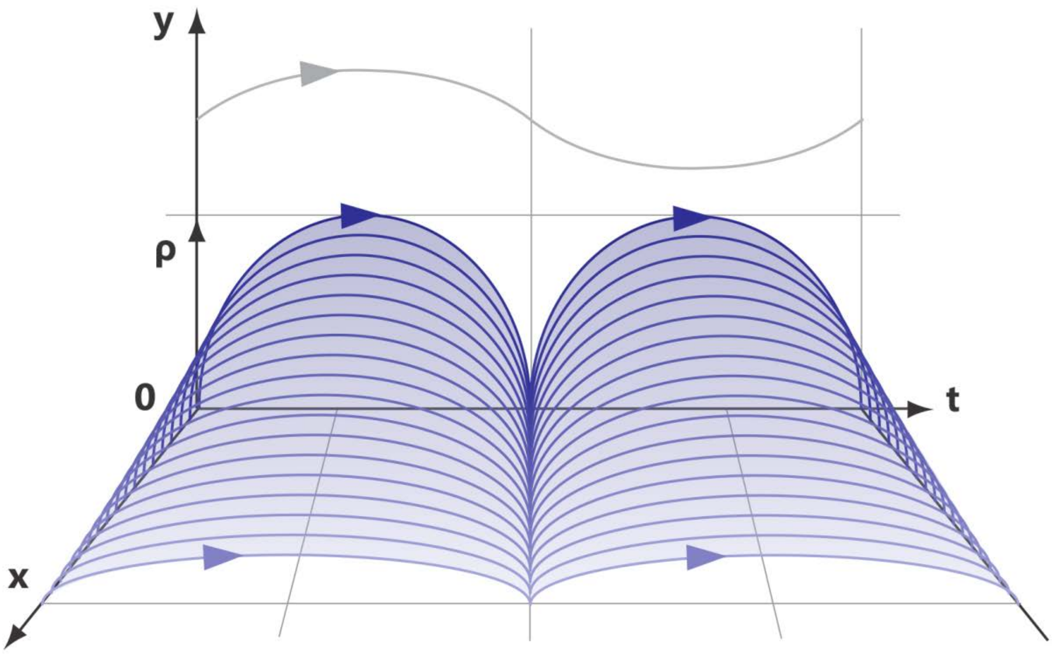

Figure 6 - *Propagation of electrophotons*

In conclusion, this particular kind of photon - the electrophoton - is a granular structure that is *continuously* emitted by any electrically charged particle in the surrounding space. As the trajectories of their component granules have a certain divergence, all electrophotons will feature a decrease in density during propagation (at the speed of light), slowly "dissolving" into the spatial fluid. Electrophotons are generated in pairs from the both sides of a particle and their *spiral-shaped* trajectories accurately follow the particle's movements of precession and translation. Two electrophotons are emitted by a particle while it makes a complete rotation (the precession), as shown in

Figure 6. We may see on the vertical axis the current value of **ρ,** the granular density of the photon; the blue lines are representing the decrease of density with the square of the distance **x** over time (the horizontal **t** axis).

A good analogy can be made between the flux reflected by the electrically charged particles, i.e. the way electrophotons are generated, and the light emitted by a lighthouse. Both of them are periodically spreading photons in the surrounding space as variable, but concentrated beams that are simply propagating over long distances.

The interaction of electrophotons with charged particles:

The internal layers of an electrophoton have the same shape as the surface of the emitting particle, the same polarity; therefore, the electrophotons may be described as positive or negative (concave or convex - relative to their direction of propagation). Being additional granular fluxes, this kind of photon interact with a nearby particle and transfer it certain granular impulse (proportional with flux's density). Direction of this global impulse will depend on the electrophoton's direction of propagation and on particle's polarity. The electrical interaction is a more complicated process and it has to be analyzed dynamically, taking into consideration a few key elements:

1) Electrophotons are emitted by the electrically charged particles; they propagate at the speed of light, their actions are independent and their effects are additive (the superposition principle applies).
2) Let us suppose now that a charged particle emits a single electrophoton during a complete precession cycle. This movement takes place at relativistic speed, very close to **c**. We may therefore assume that the frequency of the precession motion would be constant for a certain type of particles, and it is its wavelength that will only depend on the particle's global speed. This is why we are going to have a kind of synchronism between particles that interact electrically and a certain alignment of their spin vectors.
3) The interaction of electrical type depends on the relative speed of particles and therefore the relativistic effects will all be present at higher speeds.
4) The magnitude of the electric field at a point decreases with the square of the distance from source; this phenomenon, which happens due to the divergence of the beam of electrophotons, complies with the Coulomb's law (both scalar and vector forms): $\mathbf{E = e / 4 \pi \varepsilon_0 r^2}$

Similarly, the well-known formula of the electric force (both scalar and vector forms) **F = q E** will work fine at low speeds.

Let's consider the case of two positrons $\mathbf{e_1}$ and $\mathbf{e_2}$ that are electrically interacting, as shown in Figure 7. The first positron may be at rest or it may move slowly at speed **u**, while the second positron is at rest. A particular position has been chosen, as the particles continuously spin during precession, when the photon's plane is aligned with the positrons' plane of rotation. What happens exactly in this process? The electrophoton emitted by $\mathbf{e_1}$ (while it travels and rotates between the two positions **a** and **b**) "sweeps" the surrounding space and, as it propagates rectilinearly, brings a variable granular flux onto the surfaces of particle $\mathbf{e_2}$. Its granular layers of variable density (the gray semicircles, which have the shape of the emitting particle) interact with the particle $\mathbf{e_2}$ and transfer it a continuous impulse on a certain direction. This impulse varies in time, as magnitude and distribution, and therefore we will only consider its average value. We may easily notice how the granular layer that hits the frontal side of the particle $\mathbf{e_2}$ will transfer it a maximum amount of impulse (due to the "unmatching" type of concavity), while the layer coming from behind will have a minimum interaction with the particle's surface (as they both have the same shape). The continuous action of these electrophotons is equivalent to a force **F** exerted on their direction of propagation. If two electrons would interact electrically (they have negative charges), things will be quite similar - the same *repelling* force will be exerted. These repelling forces make the particles to move away from each other; the magnitude of the acceleration will be proportional to the strength of the forces above and inversely proportional to the masses of those particles.

The most interesting case is the interaction between particles of different electrical charges, as depicted in Figure 8. The electron $\mathbf{e^-}$ is subjected to the higher pressure of the granular layer from the rear (whose shape does not match the particle's surface) and therefore the equivalent force will have an opposite direction. These particles will *attract* each other, moving faster and faster on a collision trajectory (normal photons may be emitted in this process). A maritime analogy can be made in this case as well: the trajectory of a charged particle moving towards the source of opposite-sign electrophotons is similar to the path of a sailing boat that moves forward when the wind is blowing against it. If we are to consider a composite particle, the actions upon each of its components will add up; in the particular case of a neutral particle (as neutrons), the forces exerted on the components (quarks) of different electrical charges will cancel each other out.

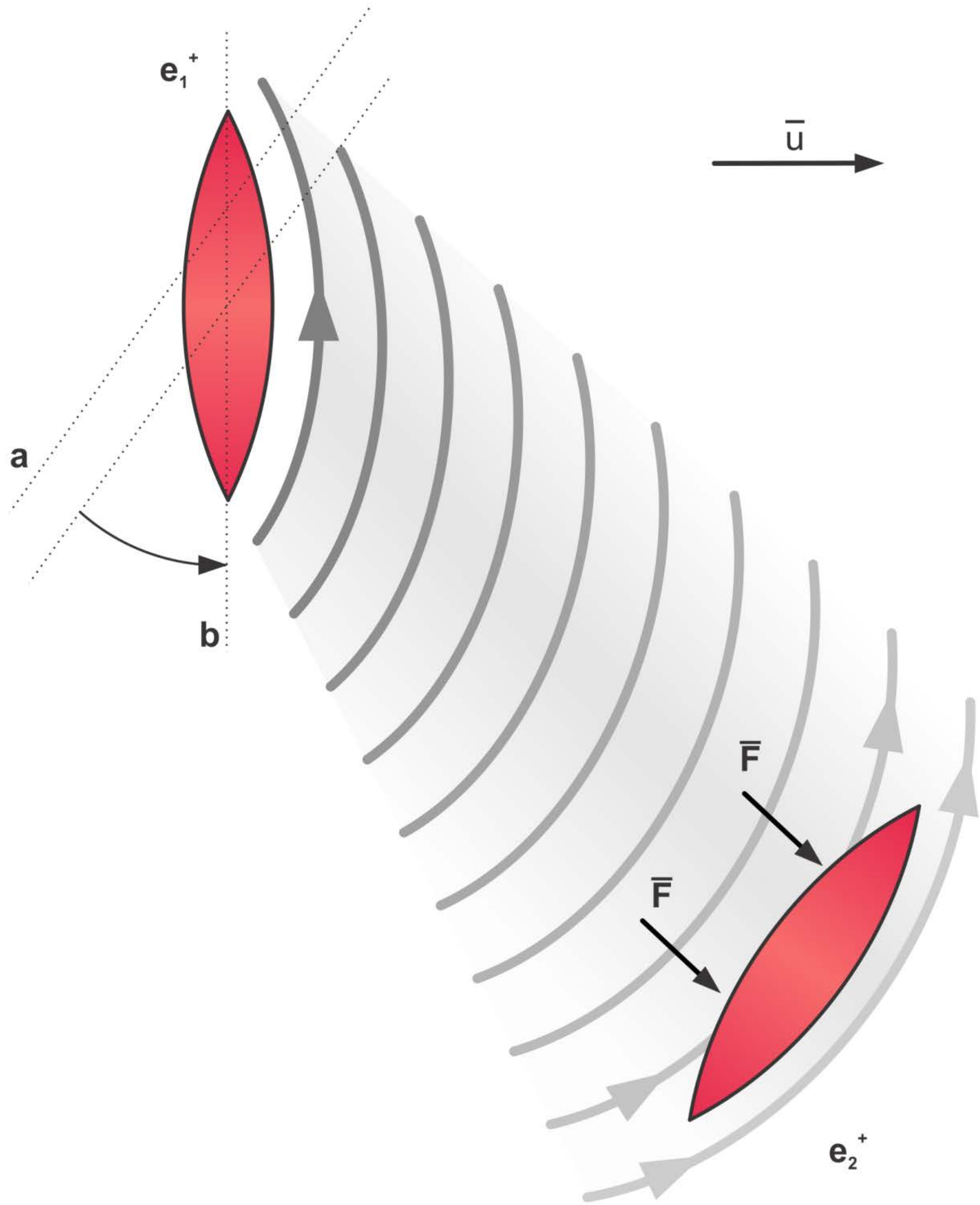

Figure 7 - *The positron - positron interaction*

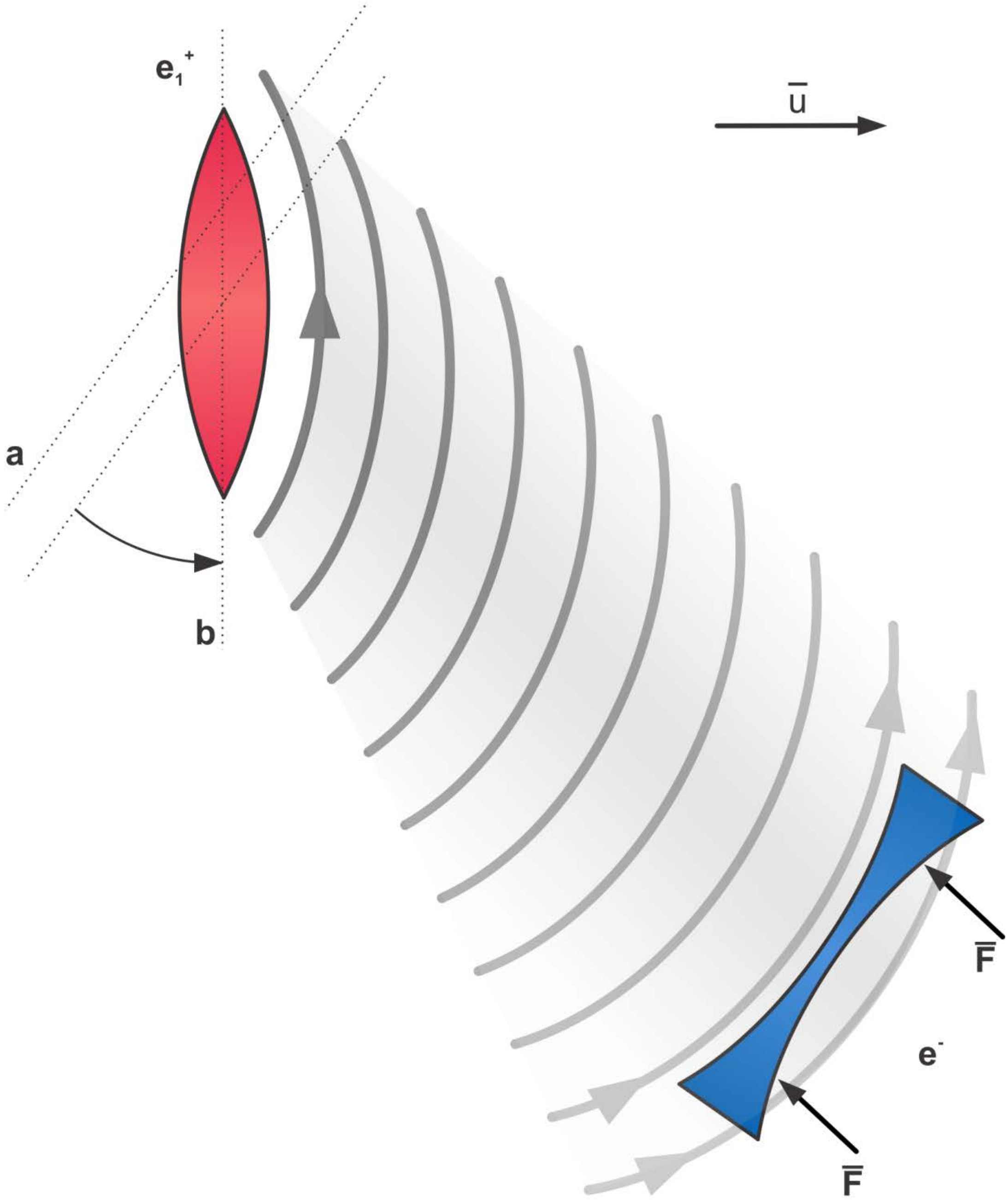

Figure 8 - *The positron - electron interaction*

4.3. The magnetic field

In order to give a correct description to this field, there are a few aspects that have to be mentioned at this point (implicitly assumed in this subsection):

1) The magnetic field is only produced by the electrically charged particles *in motion*.

2) All magnetic interactions are transmitted by the same granular structures described above, the *electrophotons*.

3) Similarly to the electric interactions, the magnetic interaction propagates at the speed of light and its effects will depend on the relative velocity of the electrically charged particles that are involved; therefore, the well-known relativistic phenomena will all be present.

4) As the nature of this granular interaction is purely mechanical, the effects of the magnetic field produced by two or more electric charges in motion will combine each other.

5) The parameters of a magnetic field and its effects on particles depend on the amount of positive and negative charge that is involved.

Let's consider a simplified representation of two positrons, $\mathbf{e_1}$ and $\mathbf{e_2}$, as shown in Figure 9. The first particle moves upwards with the global speed $\mathbf{u}$ (measured in our laboratory's frame of reference), while the second particle is at rest. At time $\mathbf{t_a}$, the first positron emits an electrophoton that "catches" the other particle and, as described above, exerts an electric force on it ($\mathbf{F_a}$). At a later time $\mathbf{t_b}$, the first positron emits another electrophoton toward the second positron, but from a different position and under a different inclination angle. As both particles have performed their intrinsic precession movement between those moments, they now have a different orientation in space. At this moment, a new force of magnitude $\mathbf{F_b}$ is exerted on the positron $\mathbf{e_2}$, on the direction that currently connects the particles.

Seen as a dynamic process, the electrical interaction was continuously exerted on the interval between those two moments we have considered, producing an additional effect upon the second particle due to the *change in direction* of the electric force.

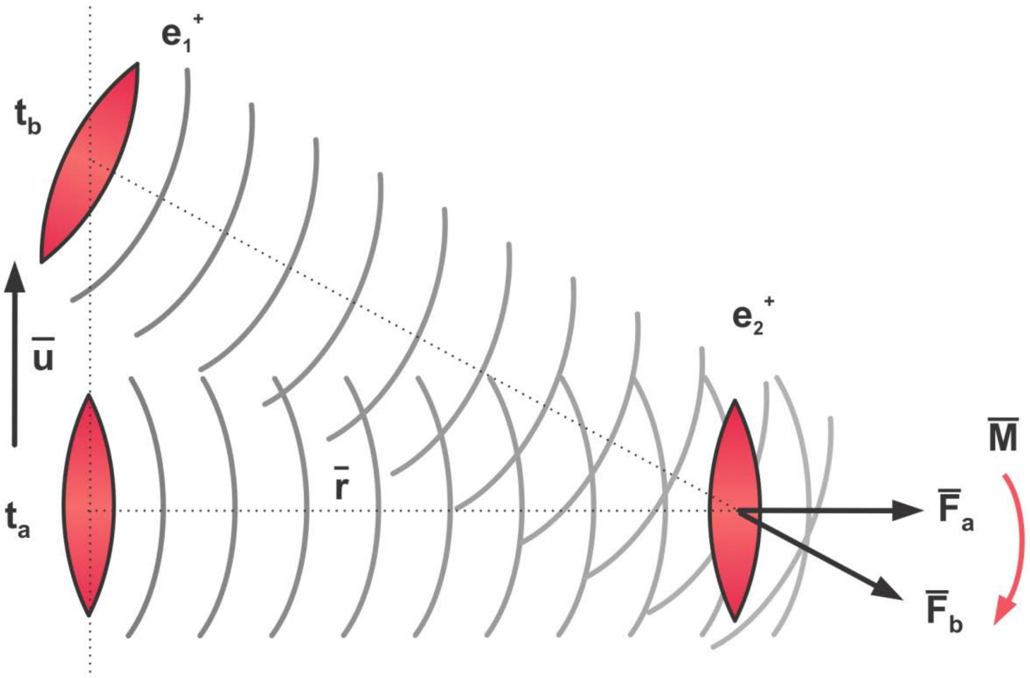

Figure 7 - *The magnetic interaction of two positrons*

An additional, averaged torque **M** acted this way upon the second particle and caused it a slight *rotation*. If this particle would have been in motion, having a nonzero component of velocity in the plane formed by the $\mathbf{e_1}$'s velocity vector and the $\mathbf{e_2}$'s position, it would have described a circular trajectory (helical if seen in space) with a radius that would depend on the intensity of this new *magnetic* field. If its velocity were perpendicular to that plane, no magnetic interaction would exist - as the sequence of electrophotons tries to rotate the particle $\mathbf{e_2}$ in the exact direction it already rotates intrinsically. We therefore notice that a charged particle, under the action of a certain magnetic field, is not practically subjected to an acceleration force - as only the direction of its velocity vector rotates. It can be geometrically inferred that this torsion momentum, called magnetic induction and denoted with **B**, is proportional with the electric charge and the speed of the emitting particle and inversely proportional with the distance: $\mathbf{B = q\, \mu\, v / 4\, \pi\, r}$

The force exerted upon a certain particle (which determines its continuous rotation) is thus proportional with its charge, speed and with the magnetic induction **B** at that point:

$$\overline{\mathbf{F}} = \mathbf{q}\, \overline{\mathbf{v}} \times \overline{\mathbf{B}}$$

What we can say in conclusion about these fields, the electric and magnetic ones? Practically, they are a single physical phenomenon that is generated by the charged particles and mediate by the divergent granular structures called electrophotons (positive or negative). The key feature of these fundamental interactions is the nature of the intrinsic motion of all charged particles; this special motion allows them to execute extra translations, rotations and oscillations under the influence of the different types of electrophotons. The electric field may be seen now as a simple emission of divergent granular structures - the electrophotons - which is characteristic to any charged particle. If the charged particles have a certain relative speed, their electrophotons will be emitted on different directions; thus, these photons are dynamically creating small granular vortexes that constitute in fact the magnetic field, as shown in Figure 10 (there is my new graphical representation for these vector fields). If some charged particles enter into a region of uniform magnetic field, their velocity vector will rotate, but its magnitude will not change; the direction of rotation is given by the polarity of the electrophotons and by the sign of the particle's charge. Moreover, a change of the magnetic field is equivalent to a change in position or speed for the particles that generated it, which is in fact a change in their electric potential. Therefore, an electric current can flow in case of electrically conductive materials and, consequently, we may see a virtual reciprocity of these two fields transported by electrophotons (**rot E = - dB/dt**).

The great importance of the explanations for this type of granular interactions is only exceeded by their effects at quantum and higher scales. These fields represent the working mechanism of all atoms in the universe, building in fact the materiality of this world and the variability of its chemical elements. We may notice once more that the granular fluxes and their spatial structures, the normal photons and the electrophotons, guarantee the stability of all components of matter and allow their various interactions - as concrete manifestations of the fields described above.

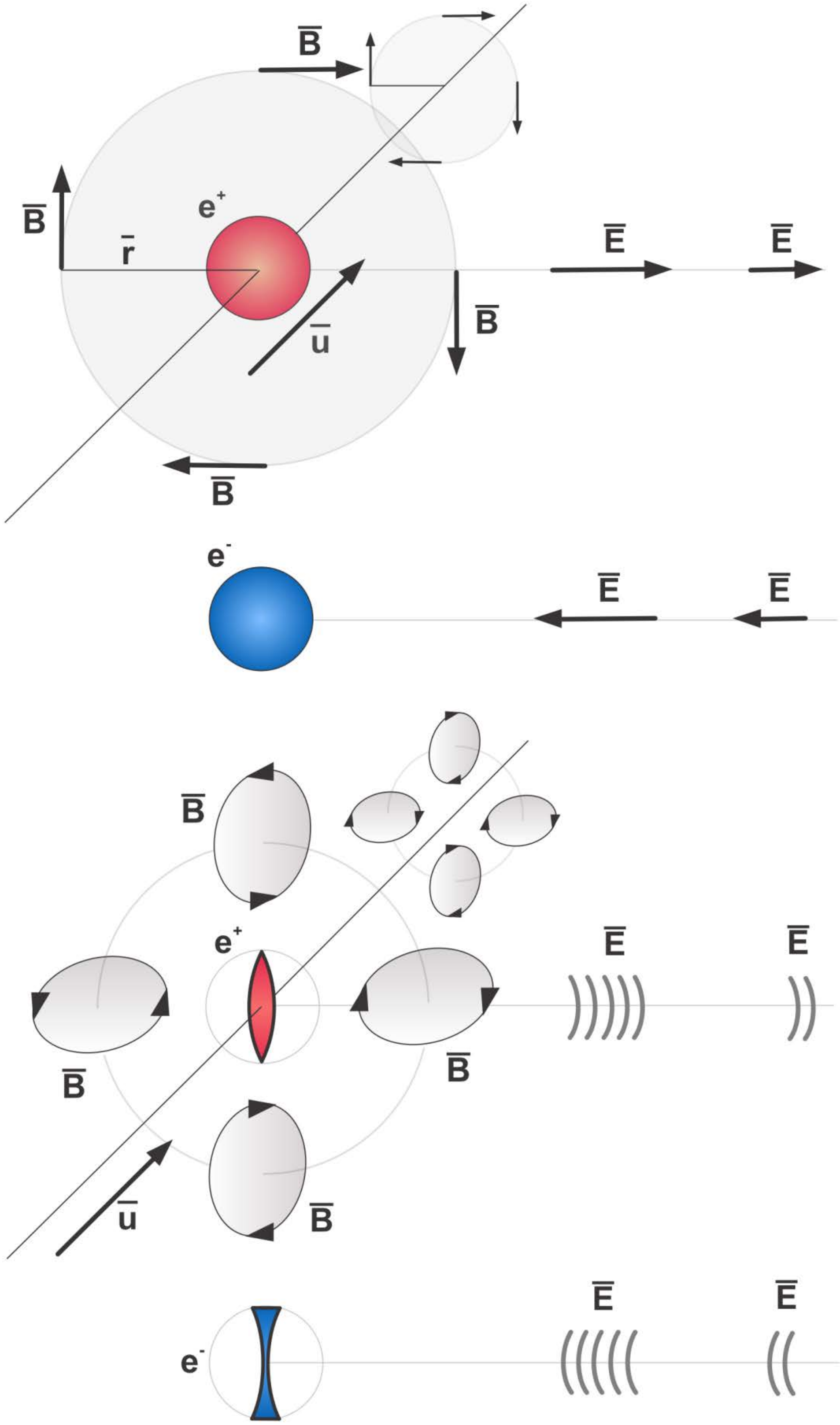

Figure 10 - *New symbols for the electric and magnetic fields*

4.4. The gluonic field

There is another fundamental interaction, namely the strong interaction, which also acts between elementary particles as a field - the gluonic field. It can be found at the level of the atomic nucleus, holding together the constituent quarks of protons and neutrons. Considering the new perspective on the electric field (Chapter 4.2), the Annex 2 of [1] has to be adapted and completed by the following statements:

- Once two quarks got very close under the influence of their electric fields (the electrical attraction between charges of opposite signs), the space between them is rapidly filled by the gluonic field. Therefore, the electric force **F2** (the force that corresponds to the electric field) is getting very weak and it practically no longer counts in the dynamic equilibrium of the whole structure. The granular density increases very much in the region between quarks, preventing the electrophotons to form and propagate properly.

- The gluonic field and the gluons that mediate its actions are thus creating a stable balance between the "external" pressure of the granular fluxes (which may be considered of gravitational nature due to the mutual shielding of particles) and the "internal" one (created and multiplied by the repeated granular reflections on the quarks' surfaces).

- The same type of equilibrium also exists inside the atomic nucleus, between protons and neutrons; it is maintained by neutrons, which are shielding most of the electrophotons that would normally exert repelling forces between protons. Positive electrophotons are still emitted outside the nucleus; therefore, its total positive charge is entirely exposed and conserved.

4.5. The gravitational field

Seen as a group of granular fluxes crossing a specific region of space ([1], Chapter 5.2), the gravitational field is responsible for the mechanisms behind the formation of elementary particles and for their stability in time; at the same time, this primary field is the physical support for all the other known fields. Let's imagine an isolated area of space, a place where is a minimum influence of the cosmic bodies and the distribution of the granular fluxes may be considered uniform. It is very likely that the perfect symmetry of these fluxes and their granular consistency could allow us to identify their *unitary intensity*. Taking into consideration the granular size and impulse, it is obvious that we may only work with meaningful time and space-averaged quantities. Let's add in that region an ideal material surface $\mathbf{S_u}$ (that has, for example, an electron-like area size); its faces will be evenly pushed by the equal fluxes $\boldsymbol{\phi}_\mathbf{u}$ (i.e. the number of incident granules within a specified period of time) that flow inside a certain solid angle $\mathbf{\Omega_u}$. The granular flows acting within this solid angle onto our material surface are equivalent to a constant force $\mathbf{F_u}$ (the force component that is perpendicular to the surface) that continuously pushes and compresses it.

Figure 11 shows all these physical quantities above for the upper hemisphere (of radius $\mathbf{r_u}$), a region of space that is bounded by the plane of our surface $\mathbf{S_u}$. The solid angle included in this hemisphere (of value $\mathbf{2\pi}$ sr) may be divided into a very large number, let's say $\mathbf{n}$, of unitary solid angles $\mathbf{\Omega_u}$ (i.e. $\mathbf{n\,\Omega_u = 2\,\pi}$), specially chosen to cover its whole interior. A certain solid angle has the inclination angle $\boldsymbol{\beta}$ to the surface $\mathbf{S_u}$. The pressure exerted onto that surface by the granular fluxes that flow inside those solid angles is cumulative and may be assimilated with some forces that act simultaneously on all possible directions; therefore, the total force shall be given by the resultant, the vector sum of all these unitary forces $\mathbf{F_u}$.

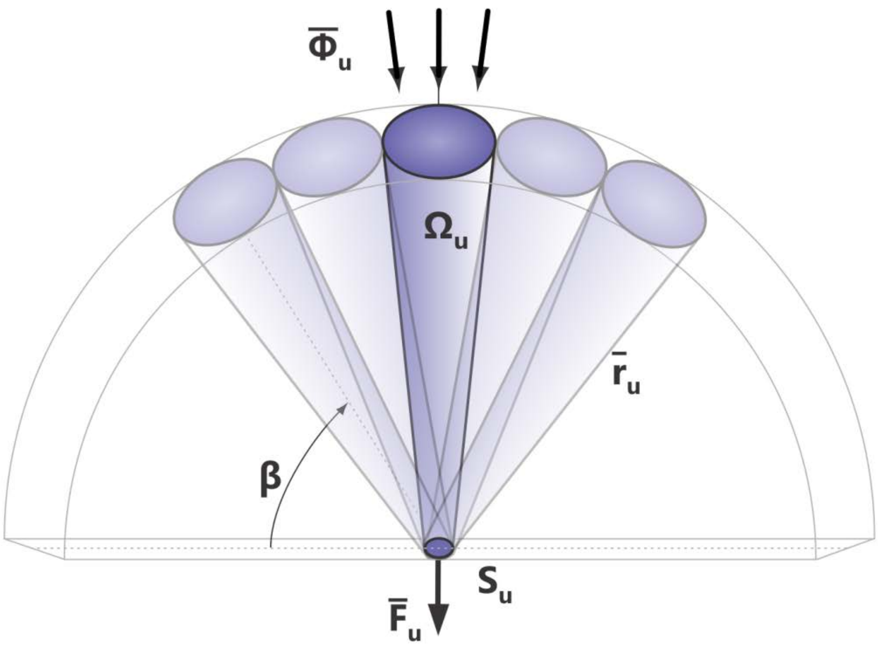

Figure 11 - *The unitary gravitational field*

This sum may be expressed as either a vector or a scalar equation:

$$\overline{G}_A = \sum_{i=1}^{n} \overline{F}_{ui} \qquad G_A = \sum_{i=1}^{n} F_{ui} \sin \beta_i$$

G_A is the resultant gravitational force acting on side **A**, as shown by the upper picture of Figure 12 in a simplified two-dimensional representation. Due to the absolute spatial symmetry, this force equals **G_B**, the force acting in the opposite direction on side **B**. The sum of all normal components is a force that presses on the surface, while the tangential components cancel each other out and compress the same surface. Globally seen, these omnidirectional unitary forces of equal magnitudes press onto the whole surface of real elementary particles and help them maintain a perfect stability over time.

If there is a significant nonuniformity in the distribution of the unitary forces, as the presence of a massive body (the star **S_1**) in the proximity of our surface could produce, the resultant force **G** will no longer have a zero magnitude (Figure 12, the lower part):

$$\overline{G} = k\,(\overline{G}_B - \overline{G}_A)$$

and its vector will point towards the center of the star (considered a body of uniform density). The constant **k** is a multiplication factor that expresses the area of surface **S** relative to **S_u**, i.e. **$S = k\ S_u$** (an area of a small value). The unitary forces from within the solid angle that star disk covers are smaller than the usual ones, as all the granular fluxes coming on these directions are diminished by the stellar matter. In fact, this is the secret of *gravity* **G**, the traditional "attraction" between a material body and a large cosmic mass.

More explicitly, the unitary force is acting on every direction and on any material surface, mostly on the baryonic matter composing the object. Each elementary particle, free or not, is uniformly "pushed" by **F_u** from all directions (the total force exerted on the particle is zero) and this maintains the particle's perfect stability over time. All the constituent particles of a material body are evenly affected by the gravitational field in this way. However, if there is an irregularity in this field (as **S_1** has produced and which we actually call gravity), it will affect each particle and will cumulate throughout the whole body, giving rise to the well-known force of gravity (all the atoms in that solid body are presumably bound by electromagnetic forces).

Does this asymmetry of the gravitational field change the shape and the movement of the elementary particles, considering their particular disk-shaped structure? The answer is composed of three parts:

1) The nonuniformity of the gravitational field, under normal circumstances, is very low in comparison with the magnitude of the unitary force acting on the same surface. This irregularity produces very weak forces at quantum scale, much smaller than those of electromagnetic nature.

2) Any elementary particle has a special dynamics, it continuously executes the intrinsic precession movement; therefore, that asymmetry in question here will exert an evenly distributed action on the two sides of a particle, under all possible angles - so its effect becomes practically negligible in time.

3) A more important effect may be observed in the trajectory of the free particles; no matter of their type, they "fall" at exactly the same rate under the influence of gravity, having a constant acceleration.

As most of elementary particles have discoidal shapes, the gravitational force exerted on them will directly depend on their surface area and indirectly on their mass (which is proportional in fact to that area). In case of the larger and denser objects, where some granular fluxes are blocked and reflected, the formula of their opacity is more complex. A simple analogy for the gravitational field intensity could be the degree of white in the X-ray pictures - which is brighter in those areas where the exposed object is denser. The real intensity of the unitary force may be correctly estimated at the scale of the atomic nuclei; for instance, this force pushes on the external side of a quark and equilibrates the strong force from the other side. Normally, if we choose a fixed value for the area $\mathbf{S_U}$ and a large enough **n** (to accurately describe any variation of the gravitational field), the force $\mathbf{F_u}$ could be declared a *universal constant* in our region of universe, at this moment of its evolution. Gravity is a subquantum-scale phenomenon that has effects at any scale, from the elementary particles up to the universe. As the ratio of the largest scale to the smallest scale in our Universe is really huge, the number used to "split" the gravitational effects of the granular fluxes should be huge as well.

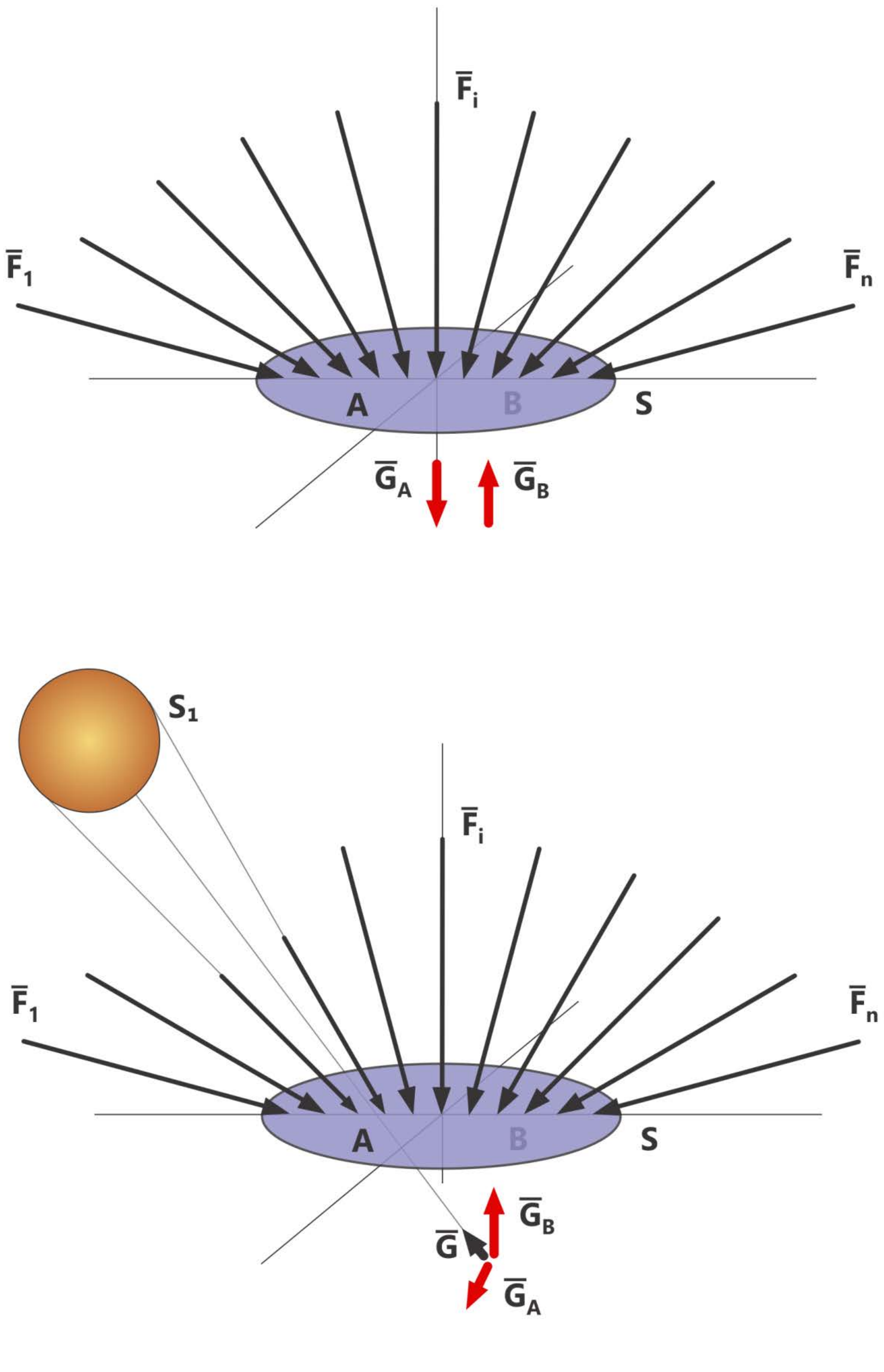

Figure 12 - *Gravitational forces on real surfaces*

Figure 13 shows the deformations in the spherical distributions of the unitary forces near a normal star $\mathbf{S_1}$ and a black hole $\mathbf{S_2}$. These deformations have simple shapes, but the passage of granular fluxes through stars is a much more complex phenomenon; we have to know the exact "opacity" and whole dynamics of the stellar mass, as it was mentioned above. It may be easily to observe that the attenuation of the granular fluxes coming from the black hole has almost reached an *absolute maximum* value (a point of saturation), causing a maximum level of gravity ($\mathbf{G_2}$, the red arrow) at distance **r** from star.

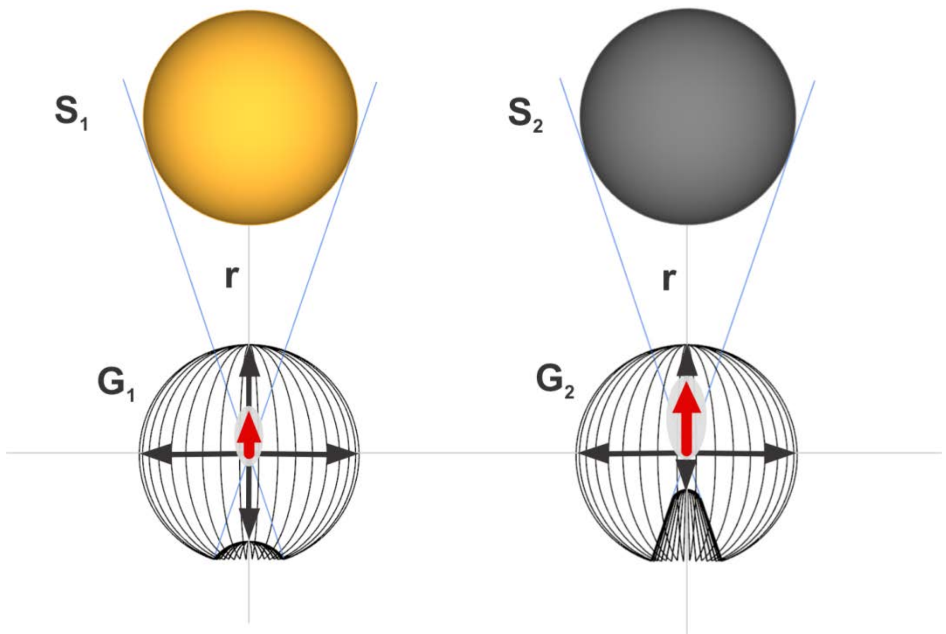

Figure 13 - *The distribution of the gravitational field*

As shown before, the diffusion of granular fluxes on stars creates a certain divergent and rotational components in their gravitational field. Any regular star contains, at least in its upper layers, some structured matter - quarks (most probably), atoms and molecules that move continuously. Furthermore, as all these layers are quickly spinning (at relativistic speed in case of some black holes), a certain circular modulation pattern is imprinted on the reflected fluxes. The reflected fluxes are also dispersed at granular level, and this seemingly increases the granular density around these cosmic bodies. Figure 14 shows a planet **P** and the nonuniform distribution of granular fluxes (**ϕ**) that is produced by the black hole **S**. A very strong force of gravity (**G**) pulls the planet and distorts it to the shape of a pear. The enormous gravitational gradient produces the so-called "spaghettification" of the nearby objects; during their fall into the star, there is a certain moment when they pass beyond the point of no return - the event horizon. Besides this part with diminished fluxes, the diffusion process adds a rotational component to the fluxes reflected on the star. A certain point **C** will therefore be "swept" by fluxes of variable granular density (the shades of gray in the circular detail) with the star's angular speed **ω**. Over long periods, this thing will cause significant tangential forces that will synchronize the movement of the planet (this dragging-effect may be the explanation for the particular rotation of stars in galaxies with supermassive black holes at their centers). Furthermore, the dispersion of these fluxes changes the granular density around the star, which will additionally curve the trajectory of the photons crossing this region.

The extreme gravity also produces the dilation of the local time for any physical body that lies in this strong, non-homogeneous field. The nonuniformity of the flows that cross the body causes significant variations of the instantaneous "mass" of its particles, which will thus be dependent on the direction of travel; therefore, these particles will move, rotate and oscillate slower, with lower speeds and accelerations - and this thing is equivalent with a dilation of the local time. Any granular flux, either normal or additional, propagates at the same speed light does in this granular fluid. Therefore, any granular structure these fluxes would form ("rigid" or not) and which may be assimilated to a wave of some type, it will have the same speed (of value **c**); all the same, it results that the information associated with the presence or absence of some gravitational fluxes will have the same maximum speed. A celestial body creates certain asymmetry to the fluxes crossing a specific point in space, and this variation depends on its opacity and on its solid angle (the magnitude decreases with the square of the distance). Considering the cosmic distances, any gravitational influence a star would have (black holes included), it eventually gets under a certain limit and integrates into the background "noise" of the spatial fluid.

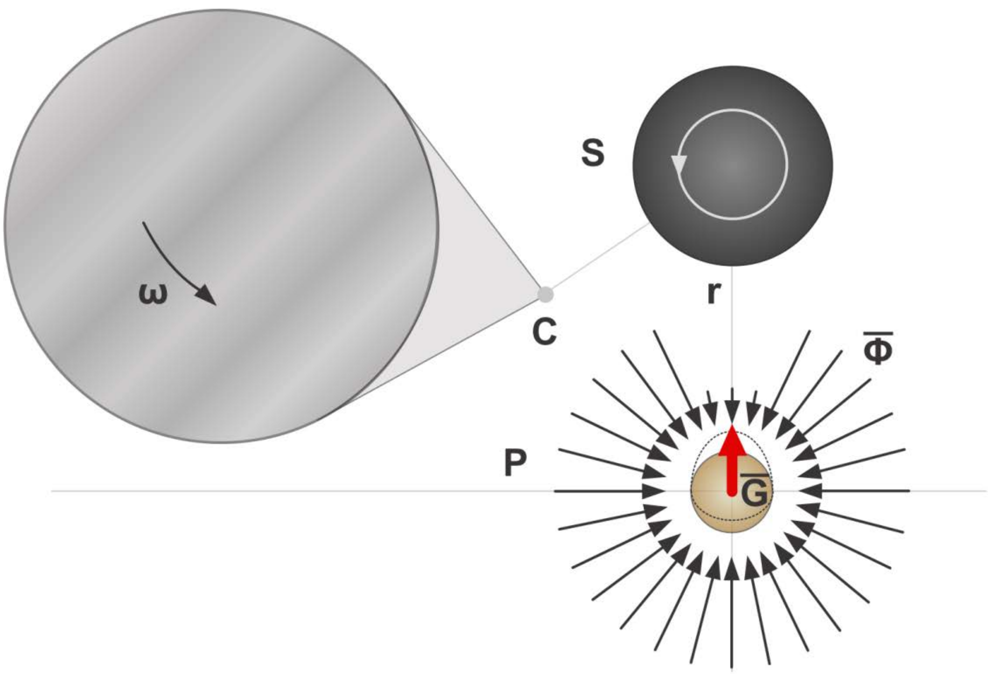

Figure 14 - *Effects of the gravitational field*

Remark 1

From a technical perspective, it seems impossible to separate and isolate the granular fluxes crossing a certain point in space on a particular direction, in order to measure their intensity. We can only observe their *global variation* in the vicinity of a massive body being at rest or during its movement. Gravity, seen as the force exerted on a test body at that point, has an *averaged direction* and its value is *much smaller* than that of the unitary forces whose resultant vector it is in fact.

Remark 2

It is obvious that the value of the unitary force is not constant throughout our Universe. The gravitational field in a certain point of the universe generally means:

- the intensity of the unitary force, which mostly depends on the granular density in that region of space and on the other characteristics of the granular fluxes (divergence, form, dispersion).

- the distribution of this force on every direction, which may be uniform or not.

It was previously assumed [1] that there is a global gradient of the unitary force across the universe, its magnitude getting lower to the edges; its spatial nonuniformity increases to the edges, and this might be the explanation for the recession of distant galaxies (now explained by the presence of the hypothetical dark energy). However, large variations of these parameters may be seen in all galactic regions or near the supermassive black holes, along with some other intrinsic nonuniformities of the universe due to its emergence process. If there is a tendency in this not so uniform universe for the granular density to get uniform (based on the divergent propagation and eventual dissipation of fluxes), we should notice that these "settling" processes are not instantaneous, they have the speed of light in that region. Therefore, it seems natural that, at the huge scale of the cosmic distances, some nonuniform regions of space still exist; moreover, all actual galaxies are continuously perturbing the distribution of the local granular fluxes.

Remark 3

Significant differences may exist between the effects of the gravitational field and those of a generic field on a certain body, not only as intensity, but also as physical quantum and subquantum phenomenon. And we will no longer consider here the fundamental role of the gravitational field as general support and stabilization means for matter. We have to discuss now about another important thing, the equivalence between the "gravitational mass" and the "inertial mass" of a body, namely about the acceleration produced by the different types of forces (fields). Are these fields equivalent? Or, is the "mass" (seen by different fields) of a material object always the same?

Let's make our analysis on free solid objects of regular shapes, with a uniform distribution of mass; considering their macroscopic dimensions, the effects of the gravitational field will be compared with those of a generic force field (and we will also check if Newton's third law of motion applies).

Case 1: Small bodies, the orders of magnitude of their size and mass are meters and respectively kilograms.

The force of gravity is acting evenly upon all the molecules of these bodies and exerts - due to the asymmetry of the granular fluxes - an identical action on each of them. These fluxes push on the surfaces of each particle; the effective areas involved in this process are directly proportional to the mass of the respective particles. This thing is totally equivalent to a new force (the sum of all of these forces) that would be exerted on the whole rigid body (on its total mass). According to *Newton's second law of motion*, this force will cause certain acceleration to that body; if a molecule were separated from that body, it would have the same value of acceleration (the field is considered uniform).

A pushing force (caused by another field) that would act upon that body as a whole, of the same magnitude as above, would determine the same acceleration. This new force would be distributed through the intermolecular bonds to every molecule of the body, and thus it would "see" the same value of mass - so generating a perfectly equivalent effect. Therefore, these two types of forces are acting upon the same mass at quantum level.

Case 2: Medium celestial bodies, the orders of magnitude of their size and mass are solar radiuses and masses (yet less dense than neutron stars).

The atomic nuclei block some of the granular fluxes crossing these bodies, especially in their central regions. The intensity of these fluxes will therefore decrease, as well as their possible asymmetry caused by another cosmic body. As the forces exerted on the central baryonic matter are smaller than those acting on the surface, the overall value of the gravitational force will be lower than the normal value, so the acceleration it will produce.

A pushing force of mechanical nature would have a uniform effect, evenly distributed across the matter of that body, and the inertial mass computed from the acceleration this force produces should be considered a real, correct value.

Case 3: Celestial bodies of maximum density (the black holes), whose inner layers are presumed to be made of unstructured granular material.

In this case, the granular fluxes are only crossing the upper layers of the star (those made of very close quarks and nucleons), being reflected or absorbed by granular accretion. This type of star has an actual mass significantly greater than the value that would result from its gravitational influence over a nearby cosmic body.

Considering all these cases above, there are some more parameters to be included into the formula expressing the gravitational force. The exact situation is depicted in Figure 12 (the lower part); we know the area of the surface **S**, the unitary force and surface, $\mathbf{F_u}$ and $\mathbf{S_u}$, also the area of a normal cross section through the star $\mathbf{S_1}$, denoted by **P**. In real terms, the value of **P** is much bigger than **S**, **P >> S**, and thus we may write $\mathbf{S = k\, S_u}$. There are **n** vectors of unitary force inside the entire solid angle covering the sphere, which all should be added in order to obtain the resultant force **G**:

$$\overline{\boldsymbol{G}} = \sum_{j=1}^{k}\sum_{i=1}^{n}\overline{\boldsymbol{F}}_{uij} = \boldsymbol{k}\sum_{i=1}^{n}\overline{\boldsymbol{F}}_{ui}$$

(due to the superposition principle), and $\boldsymbol{F_{ui}} \leq \boldsymbol{F_u}$.

We may write $\boldsymbol{F_{ui}} = \boldsymbol{\alpha_i}\,\boldsymbol{F_u}$, where $\boldsymbol{\alpha_i} \leq \mathbf{1}$ is an opacity coefficient that has value 1 for those unitary angles that are not enclosing any part of the star's surface. As it was already specified, the granular shielding is a complex phenomenon that includes at least three components: attenuation, reflection and absorption; these components will be further denoted by **β**, **γ** and **δ** (all having subunitary values). Therefore, the final force formula is:

$$\overline{\boldsymbol{G}} = \boldsymbol{k}\sum_{i=1}^{n}\boldsymbol{\alpha}_i\,\overline{\boldsymbol{F}}_{\boldsymbol{u}} = \boldsymbol{k}\sum_{i=1}^{n}(\boldsymbol{\beta}_i + \boldsymbol{\gamma}_i + \boldsymbol{\delta}_i)\ \overline{\boldsymbol{F}}_{\boldsymbol{u}}$$

4.6. Gravitational waves

We have observed that the celestial bodies (planets, normal stars, supermassive black holes) change the homogeneous distribution of the granular fluxes in their vicinity, increasingly more as their mass is bigger. As we have previously seen, a precise formulation [1] would have to state that the perturbation depends on the degree of transparency that body has to granular fluxes. Therefore, it should be about the average area of the baryonic matter contained in that body, which, until the density (particles are overlapping on a certain direction) reaches an upper threshold, is in fact directly proportional to the mass (this phenomenon also depends on the actual distribution of mass within that cosmic body).

The spatial perturbation of granular fluxes approximately copies the shape of the celestial body and, seen as field magnitude, decreases proportionally to the square of the distance. This granular unevenness around a celestial body (distribution and density) represents the way all the gravitational fluxes interact with matter; actually, the surrounding space is not "distorted" at all and its geometry is not changed. However, the nearby bodies and even the photons will undergo different effects due to the nonuniform gravitational field. A body that freely moves through space (a spheroid that may rotate or not on its axis, for example), does neither consume nor radiate energy; it only creates gravity - a certain nonuniformity in the nearby gravitational field to be more precise. If another body cosmic comes close enough, we may now easily describe how the forces are acting in this binary system. By mutual reference, the new body will have a certain potential energy in the conservative gravitational field created by the other, energy that will directly depend on the distance.

Let's consider a fixed black-hole-like body **S** that is situated at a great distance from Earth (Figure 15, top-left). As we know its mass and the distance, an object **C** from our laboratory will be attracted by the force **F** that can be easily calculated. If the star would have a circular orbit (as in the top-right picture), the magnitude of this force would have an approximately sinusoidal waveform, of the same frequency as the star's revolution. What if this star will be part of a binary system, orbiting around a twin star at a known distance (as represented in Figure 15, the bottom-left picture)? For simplicity, the inclination of its plane of rotation to the earth-star axis will be considered very small. The resultant force **F** will have a similar evolution, only its magnitude is now greater. The average distance between the stars $\mathbf{S_1}$ and $\mathbf{S_2}$ decreases substantially over time (mostly due to the tidal effect), and stars will spiral toward each other until they finally merge. Between the beginning and the end (1 and 2) of this process, the resultant force **F** has a sinusoidal oscillation of increasing frequency and intensity; after the merger time (2), when the newly born star is no longer moving, the force **F** will be having again a constant value.

This scenario and the evolution of the resultant force are similar to the cosmic event that was detected by the **LIGO** observatory on September 14, 2015, when the first-ever direct observation of "gravitational waves" (a signal from the collision of two black holes) has been made. The astronomical data and the exact parameters of the measuring devices are fully described in [7]; now, only a few personal observations will be added, all being related to the physical phenomena and quantities that have been measured at that moment. First of all, it has to be mentioned at this point that it *is not* about traditional "waves", neither in the classic nor in the quantum sense of physics. The space between the test masses did not "stretch" neither "contract", meaning these objects did not have any measurable displacements. Space is not an elastic medium where the mechanical waves may propagate, as the sound waves travel through air; moreover, the gravity propagates at granular level as simple fluxes, not as complex structures (like photons or electromagnetic waves)! The signals recorded by the LIGO detectors are all real, but they actually represent the manifestation of the gravitational field that propagates through space over large distances (of the *asymmetry* caused to granular fluxes by the presence of the two black holes). And here is a forced analogy: the LIGO detectors measured something similar to the height of a tidal wave made by the Sun and Moon on the surface of the Earth. While this variation were very slow (like the majority of cosmic phenomena), its faint signal was very difficult to be detected and evaluated; the speed of that merger, however, has brought this process in the range of the measurable frequencies, about tens up to hundreds of Hertz. The divergent gravitational fluxes coming from those black holes (their infinitesimal and variable decrease on our direction, more precisely) had insignificant effects on the test masses and on the atoms they contain. The small variation of the granular fluxes has neither accelerated nor moved the atoms on such a large distance that would become measurable with the laser interferometers. In my opinion, the granular fluxes that were modulated by the accelerated movement of the black holes have all propagated through space as "waves" and eventually reached the region crossed by the laser rays of the LIGO detectors, producing an extremely low variation in the *granular density* of that space. These changes have affected the *speed* of photons in those rays and this effect has become measurable due to the high sensitivity achieved by the resonant optical cavity built in the arms of the detector.

This wave is not in fact a normal wave, for which a certain amount of energy would have been consumed at source; it is just a simple propagation of the variable gravity produced by those two stars. These stars neither consume nor radiate "gravitational" energy while rotating on their circular orbits; they only cause a change in the local flux, a variation that spreads on all directions and decreases in intensity with the square of the distance. Prior to the merger phase, the potential energy of the stars has gradually turned into kinetic energy - which has been finally assimilated into the new body in the form of mechanical and thermal energy. The masses of these two stars practically added up and there was no part of the total mass which turned into "gravitational energy" (in accordance with the famous formula of equivalence), even if this process reached relativistic speeds. Moreover, no quantum phenomena involving a transformation of mass and a release of energy happened, there was only a unification of pure mechanical nature. Some quarks in the upper layers of stars could have recombine during the transition period before the merger, and some radiations and particles could have escaped the fuzzy event horizon, but these things will not significantly affect the total stellar mass. Also, some jets of matter can be ejected from the poles in certain cases. If the final mass is proved to be smaller than the sum of the initial stellar masses, the explanation may be found in Remark 3, namely that the gravitational mass and the inertial mass (that directly depends on the quantity of matter) do not increase similarly. Therefore, the variation of mass in that cosmic region has only generated a major perturbation of the local granular fluxes, a "wave" that propagates radially with the speed of light.

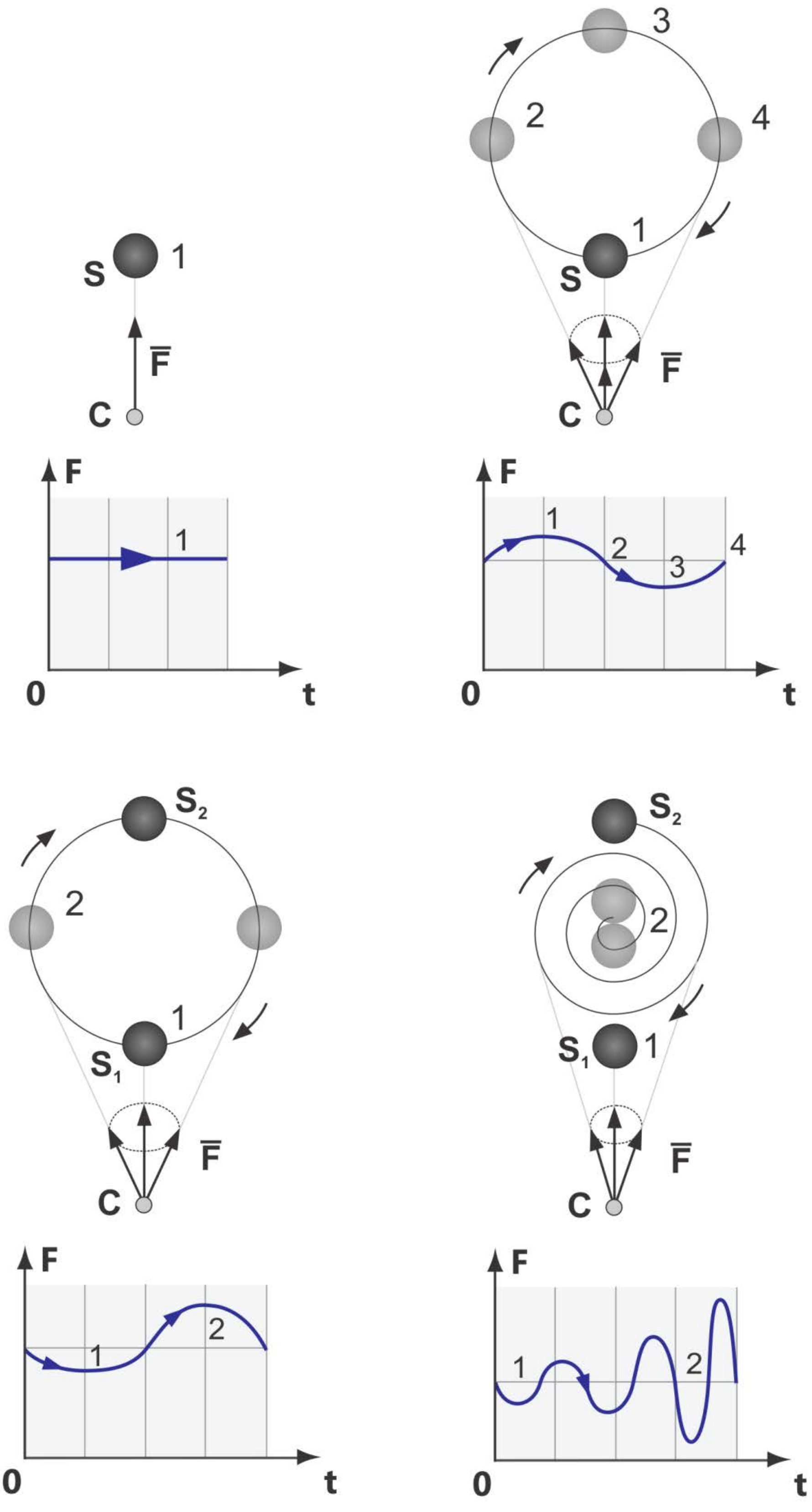

Figure 15 - *The merger of two black holes*

5. Conclusion

This article tried to formulate fundamental explanations for fields and for their interactions with matter, my goal being to clarify the granular structure and the working mechanisms of nature at the lowest possible scale. The materiality of this world and its mechanics, the determinism and causation that govern everything are fully explained in my new vision over the land of physics; and there are still no scientific experiments to contradict any of the hypotheses described in my *Prime Theory* and *The Universe* books. Neither the new astronomical observations of the distant galaxies, nor the observation of the so-called gravitational waves contradict my model of the Universe, in which the granular spatial fluid virtually impose all the laws of physics in a simple and predictable manner. The gravitational field has proved to be in fact the macroscopic reflection of the mechanics of this medium; the way we will globally define it, as meaning and as formalism, would therefore be very important in explaining all the other laws of nature. And every law should include the rules of relativity (as all material structures are moving) and another essential thing: the absolute character of our Universe's genesis and the energy this process gave to the granular level of reality.

6. References

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