

A NEW PERSPECTIVE ON THE FABRIC OF SPACE-TIME

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Physics, being a science on nature, is grounded in such fundamental categories as space, time, energy, mass, electric charge, spin, etc., without which no theory or scientific hypothesis can be built. However, notwithstanding that modern physics has achieved enormous success during its development, multiple issues concerning the essence of these fundamental categories remain open and underexplored.

Definitely, space and time hold the main and leading positions among these fundamental categories, since all forms of matter, existing as physical reality (PR), lie and exist in space and in time. Before the end of the nineteenth century, for more than three millennia, science had dominated by the view of a kind of continuous medium referred to as "ether", which fills all space and penetrates all objects, but remains intangible for a human being.

However, by the early twentieth century, the situation in science had dramatically changed. Following the famous Michelson and Morley's experiments, and according to A. Einstein's "special theory of relativity" (STR), the concept of "ether" was completely expunged from science because it was "unprovable" and later "unnecessary" (1, 3, 6). The electromagnetic waves (light) were thought to propagate in the absolute void, i.e., the vacuum.

Meanwhile, this situation had not lasted for a long time. With the advent of the "general theory of relativity" (GTR) and quantum mechanics, the need for some kind of medium that fills all space and represents physical reality reappeared. Such concepts as "physical field", "physical vacuum" were again proposed. The latter means a substance filled with so called "virtual particles" that appear and disappear as a result of physical vacuum "fluctuations" (2, 3, 4).

It should be noted that over the past century science has not been developed into anything substantial to solve this problem. Numerous efforts of "ether theory" adherents in its various variants turned out to be futile. Orthodox science declared all such theories and hypotheses a priori

"pseudoscience" (5, 6, 7). Evidently, the reason for this is not only the "unwillingness" of the foundational tenets of modern science to accept the concept of ether, but to no lesser extent the absence of such a theory of "universal medium", which would not only fit the laws and principles of modern physics, but would also give logical explanations for them.

Our proposed concept (11, 12) suggests that the space or the cosmic vacuum is not an absolute void, but is a physical system (PS) consisting of a certain physical substance, constituting the "fabric of space". This means that the space or the physical vacuum is a physical reality. Furthermore, we consider it "absolute physical reality" (APR) and all other forms of matter (starting from photon and other fundamental elementary particles) are "secondary" in relation thereto, as they consist of the same substance (i.e., "fabric of space"). When it comes to the name of this substance, we have decided to call it "space-time continuum" (STC).

We believe that the STC, as a physical system representing a continuous chaotic system, consists of the smallest particles (with the size probably equal to the Planck value), spherical in shape, having absolute hardness and elasticity. They are indivisible and indestructible. They exist in a state of constant chaotic motion and mutual collision. Such properties as "mass", "energy", electric charge and spin are not applicable thereto (to a particular particle). We believe elementary particles themselves with all their above properties to consist from them (their whirling). We have named them "graviton-momentum" or "amers" (this term was first proposed by Rene Descartes).

From this point of view the STC is very similar to the well-known in physics "ideal gas", which is a mathematical model of gas, which assumes that "the potential energy of interaction of molecules can be neglected as compared with their kinetic energy". The collision of particles with each other is absolutely elastic, and the interaction time between them during the collision is negligibly small as compared with the average collision time. Particles of the "ideal gas" are an absolutely elastic sphere in shape and collisions between them can feature "central" and "non-central" patterns.

Nevertheless, apart from the listed similarities, a very essential difference between the STC and the "ideal gas" exists. As contrasted with the constituent particles of an "ideal gas" (atoms, molecules) that have a

small but real mass and, therefore, momentum and kinetic energy, a single graviton-momentum does not have these properties! As a physical substratum of STC, they are only involved in the gravitational interaction (which explains why we called them graviton-momentum) and constitute a physical substratum of physical fields (gravitational, electromagnetic). As mentioned above, such properties as: spin, electric charge, mass, energy are inherent to the fundamental elementary particles, which are the swirling (rotary flow) of graviton-momentum (1, 6).

Moreover, our proposed concept suggests that graviton-momentums can also be considered as a physical substrate of MOTION. It is the flow of graviton-momentums that originates the motion of any material particle and the transfer of motion (acceleration) and can be considered as a physical substrate of MOTION! Any movement (motion) of a material particle (body) in space may only occur under the action of the directed flow of these particles (10, 13).

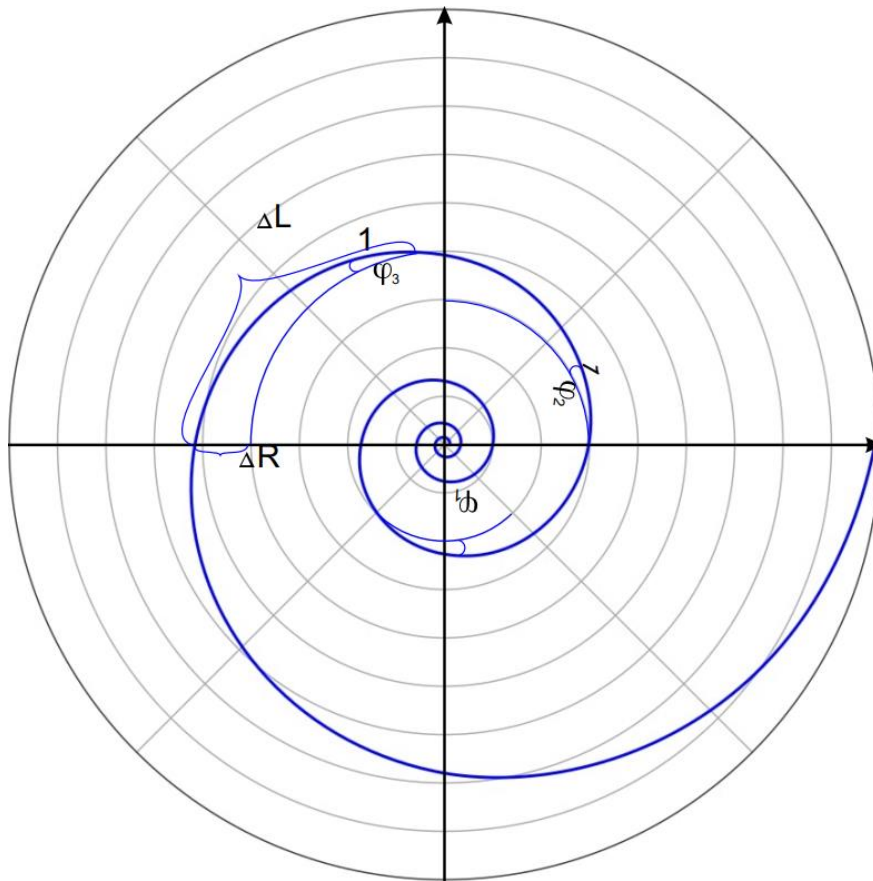
It is worth noting that a particular graviton-momentum cannot be visualized or registered. All existing methods of visualization and registration are known to be based on reflection or absorption of photons (electromagnetic waves) or other elementary particles. A particular graviton-momentum, being incommensurably small as compared with photons, cannot interact with them and, therefore, is not registered by the observer.

STC as a PS in the form of a chaotic continuous medium, the particles of which exist in a state of continuous chaotic motion and collision, have an internal pressure of the medium (IPM), the value of which is determined by the density of the medium (STC) and the extent of chaos. The latter can vary from absolute chaos ($X=1$) to complete orderliness ($X=0$), when all constituent particles of the medium (graviton-momentums) are in unidirectional motion (including whirling), i.e., there is "flow" or "preferential motion direction" (PMD). The latter is the state opposite to chaos and is associated with the occurrence of energy in the given part of the medium. This phenomenon, the development of a whirling zone in the form of a STC flow in the direction of motion following a moving material particle (the so-called "acceleration zone"), is exactly what underlies mechanical motion (10, 14).

Concerning IPM, it consists of two components with opposite action directions: (a) centrifugal (P_{cf}); (c) centripetal (P_{cp}). Being in the state of absolute chaos ($X=1$), they are balanced and neutralize each other completely ($P=P_{cf} + P_{cp} = 0$). Any disturbance of chaos in a certain part of medium (STC) with occurrence of "flow" or whirling (rotational flow) is associated by reduction of centrifugal pressure (P_{cf}) in this section and development of centripetal pressure (P_{cp}), in other words, Bernoulli effect can be observed.

Here is another key difference between STC and "ideal gas". As contrasted with to the latter, a material barrier (a limiting wall) does not and cannot exist for STC, since the particles composing it permeate all space, down to the intermolecular and interatomic boundaries. Therefore, the STC cannot be compacted by compressing it in a confined space. Its compression (density increase) can only happen in one way, i.e., by whirling. We assume that since the STC (our Universe) has no boundary and is an open PS, it exists in a state of constant expansion due to a slight predominance of centrifugal pressure (due to the absence of "limiting boundaries" of the universe). Moreover, STC expands uniformly in all its points. Any point of it can be regarded as the "center" of expansion. As pertains the nature of space expansion, we suppose that it expands according to a logarithmic spiral principle.

Fig.1 shows a STC schematic extension "on a cross-section" of a sphere, i.e., on a two-dimensional dimension:



As can be seen from Fig.1, any movement in space along any direction that corresponds to the logarithmic spiral arc (ΔL), is associated with a simultaneous movement along the radius of the spiral (ΔR), which corresponds to movement in time. At the same time, the arc expansion angle (φ) on all turns of the spiral remains constant and is less than 90 degrees (φ -constant), which is typical of a logarithmic spiral. The ratio of a certain segment of the arc of the spiral corresponding to the segment of the radius expansion also remains unaltered ($\Delta L/\Delta R$ is a constant).

Our proposed concept (1) suggests that space, or space-time continuum, that generally is three-dimensional (the fourth dimension is time), consists of countless and nearly two-dimensional layers that comprise three-dimensional space totaled up (just as a book, consisting of sheets that are nearly two-dimensional, generally is three-dimensional). Though, when examined in detail, each layer has a small, but specific thickness (the third dimension), albeit a small one. We called them "space-time layers" (STL). At that, considering that if the layer surface (two-dimensional dimension) describes space, its thickness (along the radius) corresponds to time.

It should be noted that any PR, or PS, occupies a certain place in the STL, which is to say that any PS (from a photon to galaxies) exists and is in the layer of space and time occupied by it. If each STL is conventionally considered as a two-dimensional dimension, or a plane of a sphere, it is possible to admit that any point of it can be considered as the center of this plane. Herewith, the movement between STL, in fact, is the movement in time!

As mentioned above, the STC (our Universe) exists in the state of constant expansion, which can be described as a continuous flow (movement) of momentum (graviton-momentums) from one STL to another, starting from the "center" of the Big Bang . Besides, the STC is expanded continuously and simultaneously in all four dimensions (both in space and time). For any form of matter, or PS (distinctive physical reality) located (existing) within a particular STC layer, i.e., STL, the previous STLs are considered as the "past", the STL which it occupies is the "present", and the subsequent STLs are its "future".

Our proposed concept (4, 6) thus suggests that the basis of the Universe is the STC, which is a physical system (or APR) in the form of a continuous chaotic medium consisting of graviton-momentums existing in the state of dynamic chaos and continuous expansion. All other fundamental physical categories (energy, momentum, charge, mass, spin) are inherent to fundamental elementary particles, which, being the APR, as such consist of constituent particles elements of STC and are "secondary" relative to STC.

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