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THE IMPACT OF SPACE-TIME CURVATURE ON HOMOGENEITY IN THE CONTEXT OF GENERAL RELATIVITY

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Abstract

Gravity is the curvature of spacetime, the structural property of static gravitational field, a geometric field, in curved coordinates, according the functions guv, that express geometric relations between material events. Course, general relativity is a relational theory, however, gravity, a thinking category, has symetric physical effects with matter. We use, analitic and critic method of reread the general relativity, since the perspective of the history of the science and the philosophy of the science. Our goal is driver the debate on gravity, to the arena of the quantum physics, but without the ballast of the general relativity. We find that through of relativist aether was attempted transform spacetime in a substantia without succes, the consequence was return to problematic geometric field. The philosophy of the science intervenes, and according the best philosophical theory of substantivalism, spacetime is a inmaterial, geometric substantia. Then, the metaphysics arrives to a full solution in the super-substantivalism theory, that affirms: matter arises from geometric spacetime. Thus, it explains consistently the symetric physical effects between spacetime and matter. Surely, this solution is a medieval speculation. Our conclusion is that since general relativity do not defined physically spacetime leads necessarily to philosophical definitions of relationism and substantivalism on spacetime that are unacceptable physically. Therefore, gravity is not the curvature of spacetime.

Keywords: *space-time, homogeneity, general relativity*

INTRODUCTION

Gravity in general relativity is the curvature of space time. But, what is spacetime?. Both, general relativity and aristotle's philosophical school declare the contingent existence of spacetime with relation to matter, in relativity, and to aether, in Aristotle. The idea of aether between the medieval and current period had a profound development, in philosophy and in science. The scientific result is that the primitive substance of the aether passes to luminiferous and gravitational aether, that was substituted for the electromagnetic aether and, this was replaced for the relativistic aether, finally discarded by the field. Although, the static gravitational field, in a unknown and unacceptable hypothesis of Einstein, would be a energetic field, the fact is that according to the Einstein´s equations, the static gravitational field is a geometric field and spacetime, its structural property, course general relativity is a relationist theory. However, various physical considerations point out that spacetime must be a substantia, that valid the conception of the substantivalist interpretation of spacetime rival of the relationist theory; both theories were originated in the philosophical medieval discussion between Newton and Leibniz. The current solution of the philosophy and metaphysic declares the spacetime as inmaterial substance inside the context of general relativity, i.e. from geometric nature, with symetric physical effects between spacetime and matter. How can spacetime have physical effects?. The metaphysic super substantivalism says, because matter arises of spacetime and, last instance, also matter is geometry. Both, relationist and substantivalist theories affirm spacetime is of geometric nature; but, while for relationist theory, spacetime is a thinking category, in change, spacetime is real to substantivalism. Therefore, surely both philosophic solutions must be wrong. We reject spacetime as substantia, since the naked spacetime does not exist and consequently it has contingent existence. Due, to which in the nature only exist, the vacuum, matter and radiation (forms of material existence), necessarily, the spacetime must be, in the sense original of field, a internal state (like a property) of matter and gravity is not phenomenon of spacetime. Thus, gravity must be a material phenomenon and the most appropriate hypothesis: gravity is a quantum phenomenon, independent of the spacetime. This is the hypothesis induced, and that will be proposal in this work.

HISTORICAL DEVELOPMENT OF THE AETHER CONCEPT

Although aether was a recurrent concept among ancient people when they thought about the universe, it wasn't until the third century B.C. that it was formally introduced by Aristotle. This was in opposition to the philosophical thesis of atomism held by Leucippus and Democritus on atoms and the vacuum. This was done via the cosmology of the speculative philosophy-physics. The ontological reason for this introduction was that aether was a substance that was weight Its aether has a mechanical quality, and its vision has been active for more than twenty one millennia. The idea of ether began to move further into the realm of physics throughout the Renaissance period, eventually moving away from the realm of philosophy. It is contrary to reason to say that there is a vacuum or space in which there is absolutely nothing. In other words, due to a logical reason and since the action of forces is by contact, there is no action to distort space. In 1644, Descartes proposed aether as a continuous, made up of very small particles, transmitting forces from one object to another by collisions of the particles, that completely fills the space not occupied by solid bodies because there is Also in 1644, Torricelli realized their experiments that proved the existence of the vacuum and that the effects, attributed to the horror vacui, were actually due to the air pressure, encouraging the revival of atomism and scientific revolution that Galilei had inaugurated in 1604, mirabilis year, with the introduction of the method observation-experiment-induction.

However, despite Torricelli's experiments the discussion between the plenists (no vacuum is p) continued. Nevertheless, in 1678 and 1690, in analogy with sound, Huygens presented its theory ondulatory of the light, second physical reason to luminiferous aether, like medium of propagation of this wave, and he said on particles of aether, between which act mechanical forces, they are hard elastic things which transmitted impulses, without being themselves displaced, and distinct from gravitational aether which circulates around the center of the Earth, the cause of gravity, its third ph In 1687, when Newton formulated, at Mathematical Principles of Natural Philosophy, the laws of motion from Galilei the vacuum became an essential component of the Universe, it introduced the action to distance instant, and to conserve the principle of relativity and the energy-momentum conservation law, the Galileo-Newton vacuum must be assumed to be absolutely empty. However, Newton it contradicted, in 1704, in his paper on Opticks and at its updated second edition Newton declared in 1717 that the aether (gravitational aether) is a stationary tenuous medium, compound by particles, with a variable density, most dense in empty space than in the vicinity of massive bodies, to explain gravitational effects. Certainly, the introduction of vacuum, in the classical physics did not eliminate initially to the aether, but it became its dangerous rival. In the year 1748, Le Sage postulated that the aether is made up of very small particles that are referred to as corpuscles and that circulate in all directions at an extremely high speed. Young published his theory that aether is a gas in absolute rest in the year 1801. In 1817, Fresnel presented the transverse wave theory of light, which was followed by Young's proposal of a periodic transverse displacement of aether particles. Both of these discoveries were caused by the discovery of the polarization of light. Aether flowed through the interstices of material bodies even on the smallest scale, according to Fresnel, but without that matter has a little tugging effect on aether; the density of aether in a material body was different than in the free aether. Cauchy postulated an aether dynamic between the years 1828 and 1839. This dynamic was based on the fact that aether undergoes changes in both its density and its elasticity. As a result, aether is contractile or labile and possesses a negative compressibility, which is now referred to as a negative. Green brought up the idea that Cauchy's contractile aether would be unstable and would always have a tendency to reduce its size. In 1845, Stokes coincided partially with Fresnel because aether flows almost unhindered through all matter, whose implication is that aether flows through mass of bodies, but the matter in motion of rotation or translation drags aether, which means that the Earth drags the aether. Since aether flows almost unhindered through all matter, Stokes and Fresnel came to the same conclusion at the same time. In the decade of 1860, Maxwell formulated the electromagnetic aether, having the properties specified by its equations as a quasi-material elastic stationary medium, as the preferred frame of reference in which light propagates with constant speed in all directions; however, the question of whether the aether is continuous or discrete remained unanswered at the time. In 1889 and 1891, FitzGerald proposed that the forces binding the molecules of a solid are modified by motion of the solid through aether in such a way that the dimension of the arm of the interferometer, in Michelson-experiment, Morley's would be shortened in the direction of motion and that this contraction neutralizes the optical effect sought; this discovery coincided with Michelson-discovery, Morley's which was made in 1887, of the constant speed of light.

Aether not only alters the path that objects take (as gravitational aether does), but it also alters the size of objects. As a result, aether produces the relativistic effect of shortening the length of any object, with this shortening taking place in the direction of motion and in proportion to the speed through aether. In the year 1895, Lorentz improved FitzGerald's hypothesis, and he also improved Maxwell's electromagnetic aether by the immobile special frame, where the laws of electrodynamic are valid; given that the atoms of all solids are held together by electrical forces; therefore, the motion of a body, according to Maxwell's mechanic, superposes upon the electrostatic forces between the atoms a magnetic effect due to the motion; the result would be a contraction. As electromagnetic aether constitutes the carrier substrate of the electromagnetic wave and provides the special frame in which Maxwell's equations are valids and as gravitational aether, an anachronistic concept after of Maxwell, i.e. luminiferous aether, acts as an interaction force on particles and bodies, carries the action in contact, and produces the gravitational effect, this was driven to by the evolution of the concept of aether. Newton provided an explanation for the movement of light over space using his corpuscular theory. Aether was used to sustain light. Huygens, Young, and Maxwell came at some of the same conclusions as he did. But, they corrected and added that aether is the medium of propagation of the light wave (the electromagnetic wave of Maxwell), and as a result, aether becomes physically necessary; Newton said that light rays consisted of a stream of particles in rectilinear motion and that the light particles stimulated, or were accompanied by, vibrations in an all-pervading aether. They also said that aether is the medium of propagation of the electromagnetic wave of Maxwell. Huygens developed the wave theory of light, which postulated that light waves travel longitudinally, at a speed that is finite, through an aether that is immobile. Euler and Young were in agreement with this theory. The idea that light is an electromagnetic wave was first proposed by Maxwell, and it was inspired by Faraday's lines of how electrical and magnetic forces interact. According to Maxwell, there were tubes of aether revolving on their axes along the lines of force. As Faraday hypothesized in order to explain the electric and magnetic forces that attract and repel one another, the centrifugal force that results from such rotations leads the tubes to expand laterally while contracting longitudinally.

These revolving tubes move electrical particles along in what may be thought of as a type of transverse undulations at the speed of light. The particles go from one tube to the next and the next as they progress from one tube to the next. Even though there were examples of small revolving tubes, aether was considered to be a static material. Because electrodynamics was conceptualized in the same way as the mechanics of fluids, the aether was envisioned as still water. It was conceived of as a medium that permeates the cosmos and permits electromagnetic waves to travel in all directions.

The concept of gravity was derived from aether by Descartes, Newton, Huygens, Le Sage, and Laplace. According to Descartes and Huygens, the aether is a sea, of vortices in motion, carrying the bodies and that is what causes the gravitational effects; according to Newton, the gravitational effects are caused by impulses of a stream of aether particles, hitting bodies, or by variations in an all-pervading aether. Newton's repeated attempts to unify the various branches of physics led him to the concept of wave-particle duality as well as to a model of gravity in which the gravitational field could be described as a density gradient, and in which the deflection of light or matter by the field was modelled as the effect of a variation in refractive index. Both of these discoveries are attributed to Newton.

Due to the fact that this explanation of gravity was not included in Principia, it is not recognized as part of his work on physics. However, in singly-connected space, this approach can be topologically equivalent to a curved-space model of gravity, while general relativity is a curved spacetime model of gravity (Baird, 2013). The kinetic theory of gravity that Le Sage developed was based on the corpuscles of the Sage. Laplace stated that the density of the aether is proportional to the radial distance from the center of a body and that the force of gravity is generated by the impulse of such aether medium. Additionally, he stated that the effect of gravity is propagated with a speed that is between 7 million and 100 million times that of light; however, this disproves the idea that the flow of the medium itself is involved in the cause of gravity.

With the gradual transition of aether from the realm of philosophy into the realm of physics, aether as the substrate of electromagnetic waves that propagate transversely at an extremely high speed, and the fact that aether also produces gravitational effects, the ether would have ridiculously mysterious nature and mechanical properties, such as being massive, weightless, stationary super fluid, also with very high speed, gelatinous with very high elasticity, very high rigidity, and incompatibility. With this gradual transition, the After the development of Maxwell's electrodynamics, the luminiferous aether is superseded by the electromagnetic aether. Despite this, Maxwell still attempted to explain his field theory mechanically by employing mechanical ether models. These attempts, however, rapidly faded into the background after Heinrich Hertz's depiction, which was free of any superfluous additions. As a result, in this theory, the field ultimately assumed the basic place that the material points had had in Newton's mechanics. Yet, at this early stage, this holds true only for electromagnetic fields when they are present in vacuum. The theory, in its early stages, was quite unsatisfactory for the interior of matter. This was due to the fact that in this region, two electric vectors needed to be introduced. These electric vectors needed to be connected by relations that were dependent on the nature of the medium. However, these relations were inaccessible to any theoretical analysis. A situation quite similar to the one described above occurred in connection with the magnetic field, as well as in the relationship between the electric current density and the field Likewise, each and every attempt to explain the electromagnetic phenomena in motion, with the assistance of the motion of the ether, motion through the ether, or both of these movements, was fruitless. This was the case regardless of whatever motion was being considered.

SPACETIME

But, the ultimate stance of Einstein on space time is in terms of him, but not for the science. Return us to the historic evolution of field that Einstein stated like the ontological immediate support of the spacetime. At the time that the fields were introduced, it was said: It is characteristic of the fields mentioned that they occur only within a ponderable mass; they serve only to describe a state of this matter... where no matter was available there could also exist no field... when light was regarded as a wave-field, completely analogous to the mechanical vibration field in an elastic solid body. It was thus thought essential to introduce a field, that could likewise exist in "empty space" in the absence of ponderable stuff. .. in line with its genesis, the field notion looked to be constrained to the description of states in the inside of a ponderable body... that every field is to be treated as a state capable of mechanical interpretation, and thus presupposed the presence of matter. One so felt driven, even in the space which had heretofore been considered as empty, to assume everywhere the existence of a type of substance, which was dubbed "aether". .. in connection with the discoveries of Faraday and Maxwell it became more and more evident that the explanation of electromagnetic processes in terms of field was immensely preferable to a presentation on the basis of the mechanical conceptions of material points. Through the advent of the field idea in electrodynamics, Maxwell succeeded in predicting the presence of electromagnetic waves... As a result of this, optics was, in principle, swallowed by electrodynamics. Yet, it was at first taken for granted that electromagnetic fields had to be regarded as states of the aether... Yet when these efforts invariably met with defeat, science gradually evolved acclimated to the concept of surrendering such a mechanistic interpretation... The aether-theory brings with it the question: How does the aether behave from the mechanical point of view with respect to ponderable bodies? Does it take part in the motions of the bodies, or do its pieces remain at rest comparatively to each other? Numerous innovative experiments were tried to decide this topic. The following important facts should be mentioned in this connection: the "aberration" of the fixed stars in consequence of the annual motion of the earth, and the "Doppler effect", i.e. the influence of the relative motion of the fixed stars on the frequency of the light reaching us from them, for known frequencies of emission. H. A. Lorentz was able to explain the outcomes of all of these facts and experiments, with the exception of the Michelson-Morley experiment, by making the assumption that the aether does not participate in the motions of ponderable bodies, and that the components of the aether do not have any relative motions at all with respect to one another. Hence the aether appeared, as it were, as the embodiment of a space perfectly at rest. .. H. A. Lorentz demonstrated, in reference to the experiment conducted by Michelson and Morley, that the result obtained does not, at the very least, contradict the notion of an aether that is at rest. In spite of all these lovely results the condition of the theory was not yet entirely satisfying, and for the following reasons. Classical mechanics... teaches the equivalence of all inertial systems or inertial "spaces" for the formulation of natural laws... Classical mechanics... teaches the equivalence of all inertial systems and Classical mechanics... Electromagnetic and optical tests taught the same thing with remarkable accuracy.

Yet the fundamentals of electromagnetic theory taught that a certain inertial system, namely that of the luminiferous aether at rest, had to be given precedence. This was the teaching that formed the basis of electromagnetic theory. This perspective of the theoretical underpinning was far too unsatisfying... for example, would classical mechanics support the equivalence of different inertial systems (the special principle of relativity)? The answer... is the special theory of relativity... The postulate states that the laws of nature remain unchanged regardless of the Lorentz transformations applied to them. This means that the whole material of the special theory of relativity is incorporated in the postulate. (Einstein, 1954). Because of this, the outcome is the superfluous aether, and it is obviously relevant that the field was originally conceived of as a theoretical tool for the description of the states of matter, which was the direction followed by general relativity. This is because spacetime is the structural property of static gravitational field, and static gravitational field is the metric field, which through the use of Einstein's equations, describes the geometric of matter.

In contrast to general relativity, which is based on the general covariance (general equivalence principle between inertial system, accelerated system, and gravitational system) and in the mathematical development of tensorial differential geometry, when Einstein both introduced the relativistic ether as when he replaced it by the metric field, he it supported only in new arguments, i.e. in the reflective interpretation of his previous works. General relativity is based on the general covariance. Likewise, free of the gravity of mathematics, when Einstein embraced the field, he stated secret tears that had been residing in their thoughts: How could the geometric gravity have physical effects? And it was quite evident that he expressed his goals via quantum gravity, which was unified with electromagnetic field, from the perspective of material phenomena, providing randomly the following hypothesis inside a future vision: At the beginning, when we were trying to get beyond a purely mechanical perspective and into the realm of field notions, we found the most success in the study of electromagnetic phenomena. It was determined how to build the structural laws for the electromagnetic field; these laws connect occurrences that are very close to one another in space and time... In later years, general relativity was used to create the laws of gravity. Once again, they are structural rules that describe the gravitational field that exists between individual material particles... Matter and the field each constitute one of our realities. There is no question that at the present time, we are not capable of imagining the entirety of physics being based on the idea of matter... Both of these ideas are acceptable to us for the time being. Is it possible to think of matter and field as two separate realities, each with their own characteristics? If we were given a relatively small particle of matter, we may, in a naïve fashion, envisage there being a distinct surface on the particle at which point the particle would cease to exist and its gravitational field would emerge. In our illustration, there is a sharp divide between the part of the picture that depicts the application of field rules and the part that shows the presence of matter. Nevertheless, in terms of physics, what are the characteristics that set matter apart from field? Before we were familiar with the theory of relativity, we may have approached this question in the following manner in an effort to find an answer: The difference between matter and field is that matter has mass. Field symbolizes energy, matter represents mass... The theory of relativity has taught us that matter is a representation of huge reserves of energy, and that energy is a representation of matter. Due to the fact that the distinction between mass and energy is not a qualitative one, we are unable to make a qualitative distinction between matter and field using this method. The amount of energy that is concentrated in matter is by far the biggest; nevertheless, the field that surrounds the particle also represents energy, albeit in a magnitude that cannot be compared to the amount of energy that is contained in matter. Hence, we may argue that matter exists in places where there is a high concentration of energy, while fields exist in places where there is a low concentration of energy... It makes no sense to think of matter and field as two distinct properties, especially considering how closely they are related.

We are unable to conceive of a surface that would definitively divide matter and field in this way. The charge and its field are both affected by the challenge in the same way. It does not appear feasible to provide a clear qualitative criterion that can differentiate between matter and field or charge and field. Our structure laws, that is, Maxwell's laws and the gravitational laws, break down for very large concentrations of energy or, as we may say, where sources of the field, that is, electric charges or matter, are present. These concentrations of energy and sources of the field can be thought of as equivalent. ... the split into matter and field is something that is arbitrary and not clearly defined after the knowledge of the equivalence of mass and energy. Might we not instead construct a physics based solely on fields and do away with the idea of matter? What seems to our senses to be matter is, in reality, a very high concentration of energy packed into a very tiny volume of space. It's possible that we might think of matter as the areas in space where the field is extraordinarily powerful... The explanation of all natural phenomena by structural laws that are consistent at all times and in all places would be its ultimate goal. A field is said to be in a state of change when an object, such as a stone that is being thrown, is moving across space at such a rate that the states in which the field is at its most intense move along with the stone. Due to the fact that the field is the only thing that is real, our new physics would not have room for either matter or the field. This new viewpoint is suggested by the significant advancements made in the field of field physics, by our success in expressing the laws of electricity, magnetism, and gravitation in the form of structure laws, and finally by the discovery that mass and energy are essentially equivalent to one another. The ultimate challenge for us would be to revise our field laws in a way that would prevent them from being invalid in areas where there is an exceptionally high concentration of energy. Yet, to this point, we have not been successful in carrying out this program in a persuasive and consistent manner. The time has not yet come to determine whether or not it will be feasible to carry it out; that choice will be made in the future. At this point in time, it is necessary for all of our actual theoretical creations to continue assuming the existence of two realities: field and matter. Basic concerns are still before us. It is common knowledge that there are just a handful distinct types of particles that make up all matter. How are the many different types of matter constructed from these fundamental building blocks? What kind of relationships do these fundamental particles have with the field? In the course of looking for answers to these concerns, new concepts, which are now known as quantum theory concepts, were brought into the field of physics. (Einstein and Leopold, 1938).

Einstein believed the static gravitational field to be distinct from the geometric field, treating it more like the physical field, which is composed of quantas, in this idea, which is ignored by the standard scientific community on purpose. Then, the mathematical growth of general relativity would be different to the existing theory, and general relativity would be a physical theory on gravity, i.e. a theory that is different to geometric general relativity. In other words, general relativity would be a physical theory on gravity. In an objective sense, the logical chain is as follows: As part of the thesis of general relativity, which is a relational theory, relativity provides the following, in ontological terms: matter, geometric and causal linkages between material events, metric field, static gravitational field, curved spacetime, and gravity. Matter and spacetime can be thought of as a category of thinking; for example, gravity can be thought of as a "category of thinking," yet it also has physical consequences. In practice, we are able to generate a gravitational field only by modifying the coordinate system (Einstein, 1916). According to the general theory of relativity, gravitation plays a unique role in comparison to the other forces, particularly the electromagnetic forces.

This is because the 10 functions guv representing gravitation define immediately the metrical properties of the region that contains four dimensions (Einstein, 1916). That in general, the Laws of Nature are able to be stated through the use of equations that are valid for all coordinate systems, or which are covariant, meaning that they remain the same regardless of the transformations that are applied to them. It is self-evident that from the perspective of the postulate of general relativity, a theory of physics that meets this postulate will present no grounds for disagreement. Since among all substitutes there are always to be found those that correspond to all relative movements of the coordinate system, and this is the case in every single instance (in three dimensions). As can be seen from the following reasons, the existence of this condition of general covariance, which strips space and time of any remaining traces of the physical objectivity that they formerly possessed, is a natural need. The conclusion that can be drawn from all of our well-supported theories on space and time is that space and time coincidences exist. If, for example, the event consisted of the movement of material points, then for this particular scenario, nothing else is truly observable other than the interactions between two or more of these material points. The findings of our measurements are nothing more than well-established theorems regarding the coincidences of material points, of our measuring rods with other material points, coincidences between the hands of a clock, dial-marks, and point-events that occur at the same location and at the same time. (Einstein, 1916). There is no such thing as a distinct existence from matter for time, space, or gravity. Since physical things do not occupy space, it is possible to say that these items extend into space. The idea of "empty space" is rendered meaningless when seen in this light. (Einstein, 2017).

In the theory of general relativity, the relationship between gravity and spacetime is inextricably bound together. Although these are indirect classifications, they are necessarily induced due to the fact that general relativity does not have an explicit conceptual definition of space-time but does have a definition of gravity that is similar to the curvature of space-time. Both space-time and gravity can be thought of as gnoseologically significant categories of the thinking process. Space-time, along with the structural attribute of the gravitational field, is not a conceptual definition of it; nonetheless, whether it is a specification on it, like also is other specifications, its contingent nature, they might be elements that define it. As an effect of the impact on the bodies, of the gravitational aether corpuscles, spacetime is operationally defined in general relativity, similar to how Newton defined gravity. This is because Newton's explanation of gravity as an effect of the hit on the bodies is no longer considered to be legitimate. Mathematical definitions are used to describe spacetime, which is analogous to a mathematical model of a physical dynamic system that incorporates space and time into a manifold consisting of four dimensions. In geometric terms, the bodies have relative position, direction, and sense. Space is the three-dimensional continuous that, by coordinates x1,x2,x3, geometrically represents the place occupied by the universal set of bodies (substantiality model), or constructed by universal set of relations between bodies (relationist model). Time is the one dimension that, through the coordinate x4, represents the instant in which the events occur. Events can be arranged in time as an order of succession, according to the substantialist model, or they can be considered to be non-distinct from things that exist in time, according to the relationist model. In geometric terms, events have a relative order of the past, the present, and the future. So, according to the substantialist model, everything is arranged in time according to the order of succession, and everything is arranged in space according to the order of circumstance (Newton, 1729). Alternatively, to put it another way, according to the relationist concept, space is something purely relative, just like time is. In the same way that time is an order of successions, space is an order of coexistences (Leibnitz, 1717).

where η_{ij} is a symmetric tensor. In the special case where (x^1, x^2, x^3) are the Cartesian coordinates, x ct and

$$(\eta_{ij}) = (1,1,1,-1)$$

The pseudo-Euclidean geometry is represented by the space-time metric. As space-time cannot be defined in a physical sense, it must correspond, in some way, to the philosophy of science. Although general relativity was initially conceived as a relational theory founded on the geometric and causal connections between material occurrences, in general relativity spacetime is not composed of immaterial points like it was in Newton's theory, and spacetime is a category of thought, the study of which, according to philosophy, falls under the purview of metaphysics; however, it is the philosophy of science that is responsible for the development of the relationist theory. In this instance, the philosophy of science has elaborated the substantivalist theory, and metaphysics has elaborated the theory of super substantivalism. Both of these theories correspond to the field of metaphysics. Also, to the metaphysic corresponds the spacetime that is considered like an immaterial substance according to the philosophical rival conception. These two philosophical theories, relationism and substantivalism, arise out of an old ontological discussion on the nature of spacetime, since spacetime is a problem that must be resolved before the philosophy can transcend to general relativity. However, due mainly to the fact that this theory has various mathematical models and experimental measurements about the symmetric physical effects of spacetime on matter and matter on spacetime, these measurements surely lead to spacetime like a substance, since spacetime acts on matter (Guillen, 2013). Certainly, the deep reason to treat spacetime like a substance is not an argument of advanced substantivalism on the inertial real structure, but rather it is because of the symmetric real interactions between spacetime and Matter that are obtained from general relativity.

The unsustainable intellectual tension between relationism and substantivalism, which, in the case of Einstein, resulted in the relationism's ultimate victory, in change, paradoxically, in the arena of philosophy, within the context of general relativity, was ultimately won by substantivalism, first with the sophisticated substantivalism, and then finally with the super substantivalism (Guillen, 2013). The vast majority of scientists agree on this conclusion. Due to the lack of its physical definition, general relativity, which was inherited from classical physics, maintains the medieval philosophical dispute that took place on spacetime between Leibnitz and Newton. This is the reason why general relativity conserves this conversation. Although the solutions to vacuum of Einstein's equations permit a substantivalist interpretation, of course the solution of the theory of substantivalism on spacetime transforms the theory of general relativity into another theory. General relativity was designed as a relationist theory in the beginning, but this does not prevent the theory from being transformed into another theory. Yet, such a transformation is scientifically justified by the fact that in general relativity, functions guv are creating physical consequences from geometric relations between material events (because metric records all of the geometric and causal structure of spacetime). Yet in all honesty, this win for substantivalism is a Pyrrhic one because it begs the question, "How can metaphysical spacetime effect on physical matter?" How, exactly, can metaphysical spacetime be affected by the actions of physical matter? The worst effect of supersubstantialism is that, as a consequence of general relativity, material being is transformed into geometric being. This occurs because material being is transformed into spacetime; more specifically, geometric spacetime causes material actuality in geometry to vanish (Guillen, 2013).

Gravitation in Flat Space-Time

In this concise explanation, the covariant theory of gravity in a flat spacetime is presented. The metric that describes a space-time that is flat is

$$(ds)^2 = -\eta_{ij} dx^i dx^j$$

We put

$$\eta = \det(\eta_{ij}).$$

The gravitational field is described by a symmetric tensor (g_{ij}). Let (g^{ij}) be defined by

$$g_{ik} g^{kj} = \delta_i^j \text{,,,,}$$

and put analogously to

$$G = \det(g_{ij})$$

The correct time, which is denoted by the quadratic form, is then defined in the same manner.

$$(dc\tau)^2 = -g_{ij} dx^i dx^j.$$

The metric that is used in general relativity. The following equation describes the gravitational field's Lagrangian:

$$L(G) = -\left(\frac{-G}{-\eta}\right)^{1/2} g_{ij} g_{kl} g^{mn} \left(g^{ik}_{/m} g^{jl}_{/n} - \frac{1}{2} g^{ij}_{/m} g^{kl}_{/n}\right)$$

where the bar to the right of the slash indicates the covariant derivative with respect to the metric. Due to the fact that Equation describes the metric, we note that general relativity does not have a Lagrangian that corresponds to the form. Put

$$\kappa = \frac{4\pi k}{c^4}.$$

After then, the kinetic energy and momentum of the gravitational field are as follows:

$$T(G)^i_j = \frac{1}{8\kappa}\left(\left(\frac{-G}{-\eta}\right)^{1/2} g_{kl} g_{mn} g^{ir} \left(g^{km}_{/j} g^{ln}_{/r} - \frac{1}{2} g^{kl}_{/j} g^{mn}_{/r}\right) + \frac{1}{2}\delta^i_j L(G)\right)$$

It might be thought of as a tensor regarding this theory. In general relativity, the energy-momentum concept does not correspond to a tensor. The tensor of energy and momentum of matter may be written as

$$T(M)^i_j = (\rho + p) g_{jk} u^k u^i + \delta^i_j pc^2.$$

Homogeneous, Isotropic, Cosmological Model

The pseudo-Euclidean metric Equation with Equation is the one that we will employ. The equation for the matter tensor may be written as

$$u^i = 0 (i = 1, 2, 3)$$

and

$$p = p_m + p_r, \rho = \rho_m + \rho_r$$

where m and r stand for the categories of matter and radiation, respectively. These are the equations of state:

$$p_m = 0, p_r = \frac{1}{3}\rho_r.$$

By virtue of Equation, the gravitational field possesses homogeneity, and isotropy, which gives it the form.

$$\begin{aligned} g_{ij} &= a^2(t), (i = j = 1, 2, 3) \\ &= -1/h(t), (i = j = 4) \\ &= 0, \ (i \neq j) \end{aligned}$$

The four-velocity is given by

$$(u^i) = (0, 0, 0, c\sqrt{h}).$$

The initial conditions at present time $t_0 = 0$ are

$$\begin{aligned} a(0) = h(0) = 1, a'(0) = H_0, h'(0) = h'_0, \\ \rho_m(0) = \rho_{m0}, \rho_r(0) = \rho_{r0}. \end{aligned}$$

In this case, the prime indicates the t derivative, H0 is the Hubble constant, and h'0 does not occur when general relativity is used since h (t) = 1. According to the flat space-time theory of gravity, the condition h (t) = 1 is impossible to achieve. After more computations, the field equations and the principle of the conservation of total energy finally produce results.

$$\left(\frac{a'}{a}\right)^2 = \frac{H_0^2}{\left(2\kappa c^4 \lambda t^2 + \varphi_0 t + 1\right)^2}\left(-\Omega_m K_0 + \Omega_r a^2 + \Omega_m a^3\right)$$

where λc^2 s is a constant that describes the relationship between the total energy and its conservation, m and r are density parameters that describe matter and radiation, and

$$\varphi_0 = 3H_0\left(1+\frac{1}{6}\frac{h'_0}{H_0}\right), \Omega_m K_0 = \frac{1}{12}\left\{\frac{8\kappa c^4\lambda}{H_0^2} - \left(\frac{\varphi_0}{H_0}\right)^2\right\}.$$

Furthermore, it holds

$$a^3\sqrt{h} = 2\kappa c^4 \lambda t^2 + \varphi_0 t + 1.$$

The existence of non-singular solutions is a logical conclusion that may be easily deduced given the condition.

$$\Omega_m K_0 > 0.$$

The inequality (3.10) implies

$$2\kappa c^4 \lambda t^2 + \varphi_0 t + 1 > 0 \ \text{ for all } t \in \mathbb{R}.$$

Relation (3.7) gives at present time $t_0 = 0$

$$\Omega_r + \Omega_m = 1 + \Omega_m K_0.$$

Let us furthermore assume

$$\Omega_m K_0 << 1.$$

Relation (3.7) implies the existence of a constant a_1 with a $0 < << 1$and

$$\Omega_r a_1^2 + \Omega_m a_1^3 = \Omega_m K_0.$$

Hence, there exists a time $t_1 < t_0 = 0$ such that

$$\frac{a'}{a} = \mp \frac{H_0}{2\kappa c^4 \lambda t^2 + \varphi_0 t + 1}\left(-\Omega_m K_0 + \Omega_r a^2 + \Omega_m a^3\right)^{1/2}$$

Thus, the general theory of relativity and the flat space-time theory of gravity both produce essentially the same conclusion for the expanding, flat space. However the outcomes of both cosmological models are significantly different when it comes to the beginning of the universe, which is to say that there was not a big bang but rather a bounce. It is important to note that the claims would not need to be revised in order to accommodate the inclusion of a cosmological constant. In addition to this, the cosmological theories of gravity that are based on a space-time that is flat also allow for the interpretation of a space that is not expanding. In this particular instance, the redshift may be understood in terms of the conversion of many forms of energy into one another, whereas the principle of the conservation of total energy continues to hold true. It is common knowledge that the theory of general relativity can only be empirically confirmed for very weak fields. You may find further information on the theory of gravity in flat space-time as well as the received findings in various papers written by the author as well as in the book "A theory of gravitation in flat space-time," which will be published in the near future in Science PG.

CONCLUSIONS

Because spacetime does not exist, the only thing that is necessary is contingent. Yet, the structural quality of a geometric field that does not exist in spacetime is an ideal geometric entity. Hence, spacetime must inherently be a characteristic of the Matter, similar to a state, in the sense that field was originally intended. As the curvature of spacetime is a characteristic of matter, gravity is not the same thing as the curvature of spacetime. As a result of the fact that the static gravitational field is not a geometric field, we may conclude that it is a material field and that it is, in all likelihood, analogous to the static electromagnetic field. If it is considered that the gravitational field is static, like a geometric field, then it leads to absurd medieval theories, similar to the dualist theory that Descartes had on the soul. Descartes believed that the immaterial soul acted on the material body through the pineal gland, which was located in the sella turcica, a bone in the skull. If it is considered that the gravitational field is static, then it leads to absurd medieval theories. The vacuum possesses similar physical properties to the luminiferous aether in the sense that it transports the electromagnetic wave, and it possesses similar physical properties to the gravitational aether in the sense that it must transport the static gravitational action, just as those who believed in the gravitational aether had intended it to do.

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