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RESEARCH ARTICLE

And If the Time to Passes Relativity Different for Insects? Unfolding of Einstein's Theory of Relativity: the Dilation of Time to Different Systems of Inertial References as a Function of the Inertial Mass

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Abstract:

This insight discusses a possible development of Einstein's theory of relativity as to the concept of simultaneity. Starting from the idea that if gravitational fields deform the space-time tissue, affecting objects as a function of inertial mass. Thus, two objects or ecosystems equidistant in the same field, with significant differences in inertial masses, would be subject to relativistic effects.

Keywords: Theory physics, Einstein's theory of relativity, Simultaneity, Inertial space-time.

Classical physics and modern physics

Einstein's relativity theory changed our understanding of reality through a revolution in the theoretical-conceptual foundations of physics. What we now know as classical mechanics has dominated an entire scientific paradigm for at least 3 centuries under the shoulders of giants such as Galileo, Newton, Lagrange, and Hamilton among others, who through his works allowed us to develop theories that substantiated concepts such as energy, strength, and movement, contributing significantly to the technical-scientific improvement of humanity [1][2].

In 1905, Henri Poincare writes about space and its three dimensions [3][4], influenced by the paradigm of Newtonian Physics, which was still in the theoretical framework of classical mechanics to understand the time like an absolute parameter, this meant that regardless of any other parameter of nature this would always be invariant. Einstein changed this perception by understanding that the speed of light is a speed limit that cannot be exceeded, that is, that the speed of light is a constant of nature. This understanding, together with the investigation of the intimate constituents of matter, provoked a great scientific revolution contributing to the origin of Modern Physics, a new branch of research that encompasses quantum mechanics and the theory of relativity [5][6].

One of the consequences that Einstein's works caused was a drastic revision in the conceptual bases of physics, modifying our understanding of light, which was once conceived as a wave, and after his essay on the photoelectric effect began to have corpuscular characteristics, and another radical consequence was as to our notion of time, which lost its status as absolute. This last aspect of the theory of relativity involves the understanding that time is intrinsically linked to space and that gravity, different from the Newtonian conception, is not a force but is produced by the deformation of the space-temporal tissue that is caused by the concentration of matter, that "pushes" objects as a function of this sinuosity generated by large massive bodies [7][8].

Relativity in perspective

More than a century after Einstein's first publications, today we can say that his theory has already been incorporated into society through culture, either through technologies such as GPS on mobile phones and computers that map positions on the globe with amazing precision, through satellite scans positioned kilometers from Earth, or through the significant impact that his ideas have had on the arts and literature, or as a raw material for new fields of research, as in an attempt to find a great theory of unification among the four fundamental forces. The proposal of this essay can be better understood, if we trigger the ideas starting from what is already established by the scientific community as concrete and tested, that is, that the dilation of time can occur depending on two conjectures, that is, the relative velocity between the inertial references, and another refers to the position of inertial references on a gravitational field. There is a vast literature in the public domain about these two propositions described by relativity theory, which we will briefly describe below. We can analyze the first proposition, when we put two synchronized clocks submitted to the following experiment, one is left in a fixed location over a certain inertial reference, the other is put inside a vehicle to travel at a high speed, and when the clocks are paired again after a time, it is verified that the clocks are no longer synchronized, the clock that traveled was now lagging behind the one that was fixed over the inertial reference (twin paradox). We can analyze the second proposition when two synchronized clocks are placed equidistant from the same gravitational field and no variation of time is verified between them because they are conditioned in the same settings on space-time, but if there is a difference in the position of the clocks about the gravitational field, the settings will change, and the time will pass differently, slowing down the closer to the field, a direct consequence of the change of referential concerning distortion the space-time caused by the field. Therefore, when the clocks are paired again, the one closest to the field will be delayed about what was stationary. From this last position, we can understand that the relativistic effect on time occurred as a function of the variation of the distance between the clocks in the direction of the gravitational field. Einstein never received the Nobel Prize for the theory of relativity, but only for his essay on the photoelectric effect, both of which triggered important revolutions in science. On these two propositions, we can find many works of scientific dissemination explaining these two situations [9][10][11].

A possible new relativistic conjecture

"If at first the idea is not absurd, then there is no hope for it." *A. Einstein*

And if there is another possibility of time becoming relative beyond the two situations discussed above, depending on the relative velocity between the inertial references and their position in relation to the gravitational field. And if we could infer another proposition, another conjecture has not yet been addressed. And if there is another possibility of time becoming relative beyond the two situations discussed above, depending on the relative velocity between the inertial references and their position concerning the gravitational field. And if we could infer another proposition, another conjecture has not yet been addressed.

Starting from this last example discussed, to which time becomes relative as a function of gravitational potential *(h),* but using another problematization, now changing another parameter, preserving the same distance *(h)* and changing only the inertial masses for the same gravitational field. So, what would change in this new configuration?

To better glimpse this idea, we can think of the following proposition. How do two objects with significantly different masses M>>>m "perceive" the time distortion when placed equidistant from the same gravitational field $\vec{G}$?

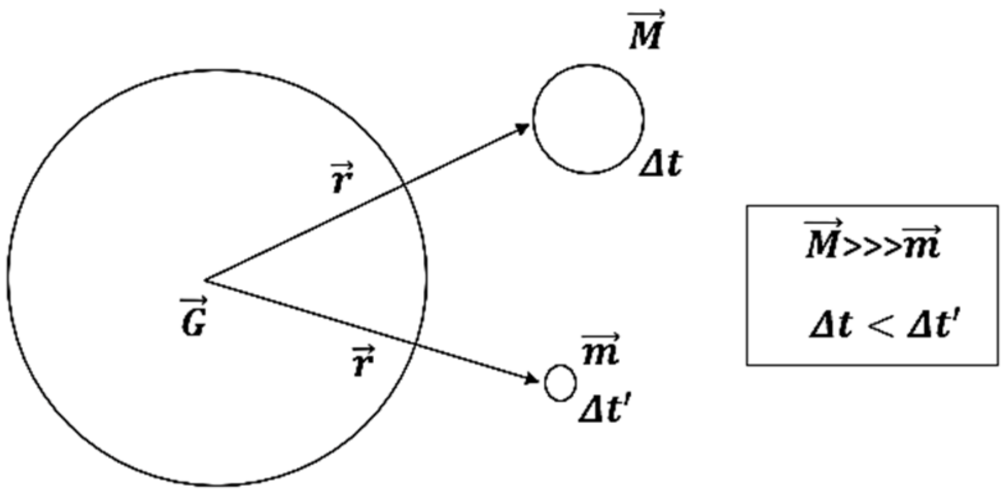

Figure 1- configuration for the space-time-inertial distortion for different systems of inertial masses.

Faced with this question, we know that the greater the mass of a body, the greater the influence it will suffer on the outskirts of a gravitational field produced by the distortion of the space-time tissue referring to a large concentration of mass at some point in space. So, I believe that the answer to the above question is that objects with significantly distinct masses perceive distortion also differently due to a change of shape in a geometry corresponding to the greatness of their masses, therefore, the higher the mass of an object, the greater the chances of it "slipping" in the direction of the field $\vec{G}$, considering the interaction of mass M to a more marked space-time sinuosity (*system M*), otherwise, for an object with significantly lower mass, which will perceive the space-time geometry less distorted and will be less conducive to the influence of the effects of the field (*system m*).

The idea of this essay is that within this perspective the most important consequence is that the same relativistic effect that is produced in the famous paradox of twins is also repeated here, but not as a function of speed, and not as a function of potential, but as a function of the difference in the inertial mass of objects in the vicinity of the gravitational field.

A mental experience

So, to better exemplify our idea, I propose the following mental experience. Let's say that our civilization is living in a historical period in which our technical-scientific parameter is so advanced that we were able to develop such a technology that "fantastically" we could miniaturize things in the order of millimeters or micrometers, not only that, we also made these things come back again the same dimensional conditions, with all the same physical structures intact. Then, two twins will go through an experiment after synchronizing their watches, just one of the twins undergoes the process of miniaturization while the other suffers nothing. After some time, the technology is triggered and "brings back" the twin who had been miniaturized, and to the astonishment of this, realized that his brother, who eagerly awaited his return, was relatively older, that is, the experience modified the simultaneity of time.

From this perspective, we can infer a relationship of interdependence between the space-time-inertial configurations.

$$(x, y, z, t, m) \longrightarrow (x', y', z', t', m') \qquad (1)$$

The consequence of the dilation of time for the twin that was miniaturized stems from having been placed in a condition in which the mass-space-time, or space-time-inertial configurations, changed radically, thus producing the same relativistic effects of time dilation predicted in the theory of relativity.

"A new Lorentz transformation"

In an attempt to solve the incongruities that appeared in the problems of electromagnetism involving inertial references, Lorentz developed a system of equations, which later significantly corroborated with Einstein's theory of special relativity, being possible to verify the relationship of time for different inertial references. Therefore, analogously the Lorentz factor for relativistic velocities between inertial references, also for this possible new configuration, there must be a correlation factor $\Upsilon(M, m)$as a function of inertial mass, which can connect systems space-time-inertial and determine time dilation.

$$Were \quad \Upsilon(M, m) = \textit{relativistic-inertial factor.} \tag{2}$$

$$When \quad M >>> m \quad \longrightarrow \quad \Delta t < \Delta t'$$

Therefore, from this correlation factor, theoretically, we could verify the estimation of a possible dilation of time as a function of the respective inertial masses for different systems in the same gravitational field.

Conclusion

On the whole, our idea proposes that if two objects with significantly different inertial masses located equidistant from the same gravitational field can be affected by the space-time distortion produced by the field in a differentiated way. This configuration could otherwise create the same relativistic effects of time already known as a function of speed and gravitational potential. In other words, could the time pass relatively differently between two planetary systems equidistant from the center of a galaxy or black hole as a function of a considerable inertial mass difference between systems? Or could the time pass relatively differently between the insects compared to humans? Considering the influence of the same gravitational field and the great difference between the inertial masses, in a summarized way this is the core of this essay.

Just as relativity has united time with space that before are disconnected, within a space-time conformation, this same perspective is expanded through a more complex and comprehensive understanding, incorporating into the relativistic model an intrinsic relationship of the reference system with the inertial mass of the object.

Therefore, the idea resulting from this essay broadens our perspective of understanding reality, as well as to other fields of research, such as biology, because if we admit that time can be relative to different ecosystems, even minimally, we also have to assume that life has appropriated any advantage within a chain interconnected by random and evolutionary events. Also, for quantum physics and quantum chemistry, the problematization of its works is in the interface of a conjecture that connects the micro to the macrocosm. Finally, we hope that, if confirmed our hypothesis, it is contributing to scientific progress towards further unraveling a small part of our intriguing and complex reality.

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