RECYCLED RELATIVITY

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Abstract

The experimental verification of certain formulas of the theory of relativity concerning Einstein's ideas about relative time and space cannot be called into question. But it is otherwise with respect to assert the validity of the interpretation of Einstein. Although *proper* time and length are as essential in the theory of general relativity as the isotropic law and the constancy of the speed of light in the Galilean systems of special relativity, this does not preclude to stress three antinomies that bring contradictions, scratch the invariances and cast a harsh light on the shortcomings of Einstein's theory: the Allais effect that seems to make *vary* the gravitational potential and therefore the proper time; the Pioneer effect indicating that the energy decreases with distance; the apparent superluminal neutrino which takes a shorter path than the photon, what we term "neutrino's temporal oscillations". Several physicists deny the existence of these anomalies, others attribute them to technical failures or to experiment errors. We treat these three cases with the formulas of relativity with necessarily different points of views than Einstein, without, however, questioning the constant nature of the speed of light.

Keywords: theory of relativity, Allais effect, cosmic time, cosmologic time, Pioneer effect, apparent superluminal neutrinos, neutrino's temporal oscillations

1 Introduction

Einstein based his theory of relativity on the principle of the universal constant of the speed of light. He introduced the notion that space turns into time. Space and time being equivalent, we speak of a "space-time continuum" whose properties depend on the speed at which a mobile moves. He postulated the existence of clocks endowed with ideal properties, and considers their indications as natural measures of "cosmic time", so called because it remains reversible, like the time of classic physics. It is also named "proper time" [1].

In special relativity, the principle of isotropy of the propagation of light is used to define the proper time. In the metric of an observer regarded as immobile in a Euclidean space-time, the beatings of a physical clock in motion are all the slower than its speed is greater. The postulate of the universal constant of light, measured on simple distance could be experimentally verified only if the beatings of mobile clocks are slowed as provided by formula $\Delta\tau = \mu\Delta t$ (τ is the proper time of the fixed clock; $\mu = (1 - v^2/c^2)^{1/2}$; t is the clock in motion). The period $\Delta\tau$ of an event, as measured in the proper system, is smaller than Δt determined by a moving observer. This postulate was founded by two types of experiments that have verified the phenomenon of the slowing down of clocks: relativistic Doppler effect by the experiences of Ives and Stilwell (1941); average length of mesons checked by Rossi and Hall (1941) [2].

In general relativity, system where exists a gravitational field, the geometry is non-Euclidian. Interpretations and physical postulates come from certain deductions of the Lorentz formulas. The behavior of clocks and rules in accelerated systems or simple gravitational fields ensues from the concrete character which Einstein gave to the notions of *proper* time and *proper* length.

The experimental verification of certain formulas of the theory of relativity on Einstein's ideas about relativist time and relativist space cannot be called into question. Nor the validity of the interpretation of Einstein, it seems. For decades, numerous astrophysical observations rely on Einstein's theory of gravitation for their interpretation. However it should be noted that in parallel, in recent years, new experiences, new observations possess an antinomic character which provides for the violation of Lorentz invariance and highlights the insufficiencies of the Einsteinian theory, especially regarding a non-static ds^2. The anticipated Lorentz violation can be tested with the observations of high energy cosmic rays, astrophysical neutrinos and gamma-ray bursts, as well as the low energy phenomena such as beta decays, double beta decays and neutrinos oscillations.

In this paper, we discuss three other cases of exception: the Allais effect, the Pioneer effect and the superluminal neutrinos. Their existence highlights some paradoxical behaviors which, if they do not disprove the validity of Einstein's orthodox interpretation, bring to it a broader framework. The remaining part of this paper is organized like this. In Section 2, we present the Allais effect which entails a temporary variation in the gravitational potential. Section 3 presents the Pioneer effect and the energy which decreases with distance. Section 4 shows the apparent superluminal neutrino and we introduce the theory of "neutrino's temporal oscillation". We conclude in Section 5.

2. Allais eclipse effect and Allais syzygy effect

Motion disturbances of a pendulum during a solar eclipse were observed for the first time by chance by Maurice Allais June 30, 1954, during measures of the azimuth of the plan of oscillation of a paraconical pendulum [3]. He observed a similar disturbance in 1959. This sudden change of the speed of precession of the plan of oscillation of the pendulum during an eclipse constitutes the Allais effect, also known as "Allais eclipse effect". He made two non-stop experiments during two periods of many planetary alignments, from 20 Nov. to 15 Dec. 1959 and from 15 March to 15 April 1960. In both experiments the azimuth had increased. On the other hand, Saxl and Allen (1970) observed with a torsion pendulum that these anomalies also applied to syzygies [4]. The latter are the phases of the lunar movement which find the Earth, the Moon and the Sun almost on the same line, that is to say, full Moon and new Moon. They bring the maximal height of tides. In 2002 and 2003, D. Olenici et S.B. Olenici, following the methodology of Maurice Allais, performed two non-stop experiments during periods of many planetary alignments [5]. All these experiments confirmed that the Allais effect appears during syzygies as well as during solar eclipses. An alignment without eclipse with a minimum of three celestial bodies is called a syzygy. The anomaly during alignment without eclipse with a minimum of three celestial bodies can be termed Allais syzygy effect [6]. The Allais effect becomes a general term that encompasses the Allais eclipse effect and the Allais syzygy effect (conjunction and opposition). The Allais eclipse effect is a special case of the Allais syzygy effect.

2.1 Mars blue clearing

We have described this phenomenon in our last article [7], in making for the first time a link between the phenomenon of "blue clearing", violent storms and the Allais effect of syzygy. American specialists have given the name of blue clearing to an upheaval that violently surprised them: when Mars is in opposition (Earth between Mars and Sun), the blue screen that hides the details of the planet in some filters, suddenly begins to disappear, during a few days. We see a close relationship between the episode of Mars blue clearing and the eclipse effect during solar eclipses observed by Maurice Allais. In the first case, we observe on the blue filter a brutal change of wavelength; the filter becomes fortuitously a sort of measure of the wavelength or frequency. In the second case, the paraconical pendulum is an instrument to study certain comportments of Earth's gravity.

We interpret the blue clearing as follows: the astronauts observed the Martian atmosphere with a blue filter to the exclusive observation of the Martian atmosphere. When the blue color, corresponding to a certain wavelength, disappears, the surface of Mars becomes visible. This frequency shift signifies an alteration of the gravitational potential of Mars. However, some confusion seems to surround the term "blue clearing of Mars". The tumult has nothing to do with strong dust storms giving way to a calm clarity or to an unexpected illumination of the planet atmosphere [8]. It simply eliminates the blue color of the filter of an observation instrument placed on Earth or in space. The unusually heavy storms during the syzygy turn out to be symptomatic of disturbances in the planet that could affect its rotation on itself and cause a variation in gravitational potential.

2.2 Variation of the gravitational potential

The vast majority of gravitational systems encountered in the physical universe are constant-total mass systems. But what about cases where the mass is variable? [9] There is some confusion in the literature about the correct equations to make in the case of variable mass systems motion, that is to say, systems that can gain or lose particles. Some authors assert, for example, that the Newton's second law can apply only to constant-mass systems.

Eclipses and syzygies are non-static cases where the mass may become unstable. During the eclipses experiments to measure the bending of light by the Sun, it was observed that there was always an arc residue compared to calculations. This residue means that the light-bending is a little different than what is predicted by general relativity [10]. It distorts the invariance of proper time relativity and implies that the growth or shrinkage of the apparent period of a solar atom could only be attributed to an effect of the gravitational field on electromagnetic waves that transmit the phenomenon of the Sun to the Earth [1].

Considered individually, the celestial bodies acquire their own dynamics that have the gravitational and electromagnetic two-fold character [11]. Note that the relativistic deflection of light near the Sun concerns electromagnetism in close touch with a gravitational potential. Electromagnetism goes hand in hand with gravity.

Conforming to general relativity, in a system at constant mass, the space of Schwarzschild is invariant

$$\mathrm{R} = t_{\mathrm{inv.}}\, c = \mathrm{GM}_{\mathrm{inv.}} / c^2. \qquad (1)$$

The cosmic time t of the Schwarzschild ds^2 is defined by the conditions imposed by the law of gravitation, $\mathrm{R}_{ik} = 0$ (cancellation of the contracted Riemann-Christoffel tensor), and other conditions, more or less arbitrary. When this coordinate t appears in a ds^2 only by the square dt^2 of its differential (as for example in the Euclidean ds^2 or the Schwarzschild ds^2), we say that ds^2 is *static*. The proper time t of the expression (1) is an *invariant*, like space ds^2. The mass and the speed of light are also some invariants. The frequency of the light is independent of the source. These are static cases where the mass is stable.

The Allais eclipse effect and the Allais syzygy effect are a kind of temporary spontaneous static state breaking. We pass to a non-static state, which implies the passage from a non-variable mass to a variable mass and from an invariant proper time to an irreversible "cosmological time". According to the theory of Relation [12, 13], the Schwarzschild space varies in a variable mass system

$$\mathrm{R} = t_{\mathrm{var.}}\, c = \mathrm{GM}_{\mathrm{var.}} / c^2. \qquad (2)$$

When the gravitational potential is changing, it is not c^2 that varies but t and M. The integrable cosmic time of relativity does not apply because it is about non-static cases where the mass is unstable. The proper time is replaced by the cosmological time. The latter is dependent upon the gravitational potential of the source [v^2 from $(1-v^2/c^2)^{1/2}$]. The speed of the wave propagation remains the speed of light. The frequency of the wave depends on the velocity v of the source, namely the reaction rate at the center of the atoms of the star-emitter of electromagnetic waves.

One can imagine the Earth animated of a free falling motion towards the Sun of which the passage of the Moon could make vary the mass by adding or subtracting of elementary masses with transfer of momentum (that is to say, with braking or acceleration)

$$\text{acc.} = \mathrm{GM}/\mathrm{R}^2 = c^2/\mathrm{R} = c/t = \mathrm{GM}/t^2c^2. \qquad (3)$$

In the case of a constant gravitational field manifested on the surface of a celestial body (like the Earth or Mars) that varies suddenly, the vibration time

$$\tau = \mathrm{T}/(1-\gamma/2c^2)^{1/2} = \mathrm{T}/(1-gl/c^2)^{1/2} = \mathrm{T}/(1-v^2/c^2)^{1/2}, \qquad (4)$$

is suddenly altered [14]. v^2 decreases (negative) or increases (positive). The proper time τ came under the control of cosmological time. It becomes

$$t_{\text{cosmo.}} = \mathrm{T}/(1-\gamma\boldsymbol{\varphi}/2c^2)^{1/2} = \mathrm{T}/(1-gl\boldsymbol{\varphi}/c^2)^{1/2} = \mathrm{T}/(1-v^2\boldsymbol{\varphi}/c^2)^{1/2}. \qquad (5)$$

φ will have a sign + or −, depending on whether there are more gravity (redshift) or less gravity (blueshift) during the eclipse.

3 Pioneer effect and the energy which decreases with distance

The Pioneer anomaly (or Pioneer effect) refers to the difference between the observed path and the expected trajectory of a number of unmanned space probes traveling outside the solar system or on its edges, notably probes Pioneer 10 and 11. Until 2011, there was no universally accepted explanation for this phenomenon and the possibility that it is a completely new physical phenomenon was also envisaged. End of 2012, however, the scientific community seemed to agree on a new explanation, linked to thermal emissions powered by radioactive decay. Note that it is a plausible explanation based on computer simulation, but no direct experimental verification has found a conclusive cause. The anomaly is measured using the Doppler effect. It measures a tiny deceleration outward, but constant, which is interpreted as an acceleration towards the Sun in the range of (8.74 ± 1.33) x 10^{-10} $\mathrm{m{\cdot}s^{-2}}$, as a blue shift for both probes.

It was found that the Pioneer spacecraft has lost speed and that its position is closer to the Earth than what is calculated. The time between two beeps from the radio signals from the probe is shorter than what is calculated by the theory. An undulation of wavelength λ, emanated from an atom situated on the Sun (or on the Earth) at a point of abscissa $x_o = R_o$, should reach the probe Pioneer with a constant wavelength. But, if we assimilate the mass of the probe material into space to an electromagnetic wave, we must recognize that the acceleration (GM / $\mathrm{R^2_{Sun\text{-}Pioneer}}$) of the gravific solar field modifies, in each point of the field, the speed of the probe and also the frequency of the wave, but not its *static* speed of propagation c. Because of a loss of energy in the vacuum, it must be admitted that on arrival at the Pioneer probe of two successive lengths of waves, the latest arrival should be a bit longer than the previous.

Two consecutive passages of the maximum of the propagated undulation are separated by the searched apparent period $\mathrm{T_P}$. With $\mathrm{T_S}$ indicating the real time on the Sun and $\mathrm{T_P}$ designating the apparent period on the Pioneer probe, we have perceptibly

$$\mathrm{T_P} = (1 + \mathrm{GM}/c^2\mathrm{R_S})\,\mathrm{T_S}, \text{ or}$$
$$\mathrm{T_P} = \mathrm{T_S} / (1 - \mathrm{GM}/c^2\mathrm{R_S}). \qquad (6)$$

The apparent period $\mathrm{T_P}$ grows, according to relativity of the time flow. This extent is added to the undulation of wavelength λ. There is a progressive lowering of the frequency. The characteristic of this radiation is a non-constant wavelength λ.
There would be a gradual reduction in the frequency of light radiations due to their path through space. Many astronomers had acknowledged it for a long time, long before the

Pioneer anomaly. Einstein admitted ether in general relativity. Various astronomical observations lead to support the existence of a "substratum" whose properties would vary from one point to another in space [15, 1]. We do not question the static propagation of speed *c*, but the frequency. There is loss of energy of the electromagnetic wave with distance [16]. If the speed of propagation of light does not change, we can't say the same about the velocity *v* of the source.

4. Apparent superluminal neutrino

In September 2011, a team of researchers of the Opera experiment, at CNRS Lyon, announced that "superluminal neutrinos", very light particles, can travel faster than light. The CERN particle accelerator in Geneva sent a beam of high-energy neutrinos, produced by the decay of protons on a solid target, to Gran Sasso National Laboratory in L'Aquila, Italy. Researchers have clocked that the trip of neutrinos of 730.5 km through the Earth's crust had surpassed the speed of light in a vacuum. They arrived on average with 60 nanoseconds (60 billionths of a second) earlier than expected from luminal speed. The departure of neutrinos was measured with a precision of a billionth of a second. The 730.5 km gap between both locations were measured close to 20 cm. Clocks at CERN and Gran Sasso were synchronized with a precision better than a billionth of a second by adjusting to the atomic clock of a GPS satellite visible at the same time on both sites. It was expected that the neutrinos pass unhindered through the kilometers of Earth's crust that separate the two scientific facilities at nearly the speed of light, a journey of at least 2.5 milliseconds. Neutrinos passed through the earth's crust with a journey time of just 2.4 milliseconds [17].

The work of French researchers has withstood six months of checks by external colleagues called in to try to discover an error in the experiment. Then, laboratories around the world, including the other experiments at Gran Sasso − nicknamed Borexino, ICARUS [18] and LVD − as well as the MINOS experiment in Illinois [19] and the T2K project in Japan, tried to reproduce the OPERA findings. None was able to do this: every time, neutrinos appeared to obey the speed limit of light. In 2012, the team which had reported these troubling results announced that neutrinos "respected the cosmic speed limit." The researchers, having identified and repaired an optical cable not properly connected and also the bad tempo of a Master Clock, took back their tests. Opera scientists [20] think their original measurement of "superluminal neutrinos" can be removed, although they do not claim to have determined the precise speed of the neutrinos relatively to the speed of light.

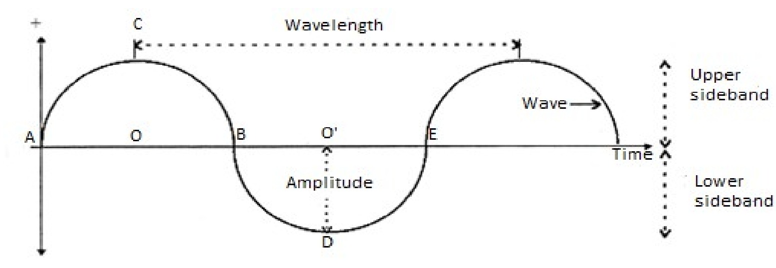
Is this negative result definitive? The error was welcome for those who were afraid that the discovery had consequence to challenge the theories, the financing, the policies, the research projects. Many, disappointed not to see unbolted relativity, had the satisfaction of discovering a neutrino going at the speed of light. Others believe many questions remain. Were all the counter-experiments carried out with sufficient data? Have we over-interpreted a series of limited data for the benefit of an established order? Did they replace an error of negligence by an error of interest? Is there a sterile neutrino without rest mass? It seems that researchers missed the target and that the neutrino at the speed of light, through matter or space, follows a shorter path than light. So far the oscillation theory was done for massive neutrinos, with limitation or dead end for massless neutrinos. We propose a complementary theory that explains the behavior of massless neutrinos, such as "sterile neutrino". It does not claim to be an alternative theory to challenge or replace the current theory of neutrino oscillations. We term it "neutrino's temporal oscillations".

4.1 Theory of "neutrino's temporal oscillations"

A temporal oscillation of neutrino means time savings generated by a neutrino wave intrinsically less broad and longer than the standard undulation. And also the introduction of new entity tagged boson-neutrino. This neutrino at the speed of light is classified a boson. This implies an "intrinsic" mass and also the probability of a change of state of new kind of flavors: photon and graviton. For the rest, we shall limit ourselves to the first part of the definition, a shorter time by using a radial path.

Current science defines a straight line through the path that follows the photon. As it is the shortest path acknowledged, it was inferred that the neutrino at the speed of light would inevitably follow the path of the photon. However, no one has been able to determine the path taken by the neutrino and we never made a direct experimental observation of neutrino oscillation. According to us, the massless neutrino follows a radial path (or longitudinal) which is equivalent to a straight line which propagates while the photon follows a transversal path tantamount to the concentric sinuosity of the propagation of the vibration.

The sinusoidal curve ACBDE from the following figure schematizes the electromagnetic wave.



It shows two semi-circumferences ACB and BDE. One above the other, they form a concentric circle, the diameter d (AOB = BO'E) divides the circumference and the circle into two equal parts. The radius OC, OB, BO', O'D are equal.

The photon follows a transverse wave at the speed of light. Its measurement between A and E is that of the sinusoid ACBDE, or the circumference of the concentric circle having O or O' at the center. The metage of the neutrino at the speed of light between A and E is the radial line (or longitudinal) AOBO'E. When the photon has traveled the metric of the sinusoid ACBDE equivalent to the circumference of a circle with O (or O') at the center, the neutrino has traveled radially πd, as if we undid the circumference for stretch it in a straight line. We suggest the photon associated with the circumference and the diameter connected with the neutrino.

It has been known since Thomas Young that light is a transverse wave and vibrations of the electric and magnetic vectors, perpendicular to one another, are also perpendicular to the direction of propagation. The transverse vibration is propagating in the direction of the radius with an equal speed. Before Young, the light was generally, but wrongly, considered a longitudinal wave. We have reason to think that the massless neutrino should be considered a "longitudinal" vibration: the direction of the shaking of the wave would be the same as the direction of propagation [21].

Thus, while the photon will have traveled a circumference, the neutrino will have traveled radially about three times the diameter of this circumference. We name "neutrino's temporal oscillations" this confusion of distances. The speed of light is respected, but if we keep photonic light as a standard measure, the longitudinal second of the neutrino is about one third of the transverse second of the photon. When scientists capture a photon at a place, they also expect to capture the neutrino in the same place while it is possibly three times farther. The suggestion that the neutrino travels radially ~π times the distance of the photon may seem farfetched, but we must remember the mocking appreciation when was proposed the massive neutrinos transmutations (or oscillations); it was formulated that a mouse would be spontaneously metamorphosed into an elephant and vice versa.

5 Conclusion

Relativity is a cornerstone of modern physics and was checked with a high degree of accuracy. [1] It is a fundamental theory describing the symmetry of Lorentz's spacetime, which is a consequence of the homogeneous and isotropic spacetime and of the principle of relativity between different inertial frames of reference. However, even though factual results are at the *rendez-vous*, the interpretation of the postulates is controversial. This work presents three phenomena that seem to violate Lorentz invariance while preserving the constant of the speed of light: the Allais effect, the Pioneer effect and the apparent “superluminal” neutrinos. With these three anomalies, the behavior of clocks and rules in the accelerated systems or in the simplest gravitational fields does no longer correspond completely to the physical character that Einstein gave to the notions of proper time and proper length. The existence of a different metrics that these anomalies would bring would impose a serious modification of the interpretations and the postulates of Einstein as well as certain deductions of Lorentz-Einstein transformations. One wonders, ultimately, if these new disagreements between Einsteinian predictions and the measurements are not preparing to inflict to Einstein's physics the treatment that this one has done to Newtonian physics.

References

[1] Dive, Pierre, *Les interprétations physiques de la théorie d'Einstein*, Dunod, 13, 17, 75, 76 (1945).

[2] Mavridès, Stamatia, *La Relativité*, Que sais-je? Presse universitaire de France, 71-76, 102 (1988).

[3] Allais, Maurice, *L'Anisotropie de l'Espace,* Edition Clément Juglar, 50, 212, 255, 326, 330 (1997).

[4] Saxl, Erwin J., Allen, Mildred, *1970 Solar Eclipse as 'Seen' by a Torsion Pendulum*, Physical Review D, Vol 3 N°4 (1971).

[5] Olenici D., Popescu V. A., Olenici S. B., *A confirmation of the Allais and Jeverdan-Rusu-Antonescu effects during the solar eclipse from 22 September 2006, and quantization of behaviour of pendulum,* Proceedings of the 7th European SSE Meeting, Roros, Norway, August 17-19 (2007).

[6] Glotz M., *La gravité*, Sciences du Monde, Librairie Jules Tallandier, 34-41 (1969).

[7] Bagdoo, Russell, *MARS BLUE CLEARING AND ALLAIS EFFECT*, The General Science Journal, viXra (2015).

[8] Persson, John-Erik, *Blue Clearing without Allais Effect*, The General Science Journal (2015).

[9] Rocard, Jean-Michel, *Newton et la relativité*, Que sais-je? Presse universitaire de France, 29 (1988).

[10] Bagdoo, Russell, *Link between Allais effect and General Relativity's residual Arc during solar Eclipse*, Scribd, Issuu (2010), General Science Journal (2011).

[11] Heckel, Pierre, *L'homme et les influences astrales*, Epi s.a. Editeur, Paris, 17-18 (1973).

[12] Bagdoo, Russell, *The Pioneer Effect: a new Theory with a new Principle*, Scisprint, Gravitationalanomalies (2008), Issuu, Scribd (2010), General Science Journal (2011), viXra (2012).

[13] Bagdoo, Russell, *THE ENERGY IN VIRTU OF THE PRINCIPLE OF COMPENSATION*, The General Science Journal, viXra, ResearchGate, Internet Archive, Academia. edu, Issuu, Scribd.

[14] Born, Max, *Einstein's theory of relativity*, Dover Pub., Inc., 339, 352 (1965).

[15] Esclangon, Ernest, *La Notion de Temps*, Gauthier-Villars, 75 (1938).

[16] Michaud, André, *EXPANDED MAXWELLIAN GEOMETRY OF SPACE*, SPR Books, Fourth Edition, 197, 23.9.4, 23.9.5, 251, 29.2 (2010).

[17] Brumfiel, Geoff, *Particles break light-speed limit*, Nature, 23 Sept (2011).

[18] Antonello, M. et al., *Measurement of the neutrino velocity with the ICARUS detector at the CNGS beam*, arXiv: 1203.3433v3, 29 March (2012).

[19] Adamson, P. et al., *Measurement of the neutrino velocity with the MINOS*, arXiv: 1408.6267v1, 26 Aug (2014).

[20] Adam, T. et al., *Measurement of the neutrino velocity with the OPERA detector in the CNGS beam*, arXiv: 1109.4897v4, 12 Jul (2012).

[21] Resnick-Halliday, *Ondes, optique et physique moderne*, Éditions du renouveau pédagogique, 284 (1980).