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From the configurations including the gravitational phenomena permitting the observation of the Precession to configurations deduced through observations of objects (systems) that do not exchange gravitational interaction.

The present paper was prepared having in mind that the reader would be knowledgeable of the fundamentals of the Global Positioning System (GPS), but in order to make the paper accessible to readers with a minimum of basic background the following introduction has been added.

How the GPS is prepared from start

The GPS has emerged as a system capable to determine a precise real time map of the whole Earth and of tracing the position of a transmitter-receiver device through three-dimensional triangulation enacted in space by a number of satellites covering the point where the transmitter/receiver is present.

Note: I advice the reader to consult the Web where can be found abundance of descriptions of the GPS, here I limit myself to supply the bare essential information in the context of a simplified paradigm.

The GPS consists of a fleet of satellites placed in orbital movement allowing them to cover a large section of the Earth at any given time, under the condition that four of them also are present at any given time over the area on Earth where the point investigated is positioned.

These satellites are launched from Earth, each endowed of a clock which can resolve signals received and sent, to the precision of 1ns and synchronized on Earth with a clock of reference (for the whole system) also capable to transmit and receive at the same capacity of resolution, all clocks measuring the time with a precision of $\pm 1\text{ns/day}$.

As mentioned in [Ruggeri18](#), the clocks measure Newton's time on Earth through successive vertical collimations with a far away star over the time interval

of about 23hours 56minutes which takes into account the rotation of the Earth whilst revolves around the sun.

The satellites are positioned at a distance $\pm 20,000$ km from the surface of the Earth and their orbits are nearly circular (a fact highly in favor of the UDS theory since the interpretation of the phenomenon given by Einstein in function of the orbital eccentricity was falsified on [Ruggeri1](#)), a satellite orbits the Earth twice, before the point below on Earth returns in collimation with it.

Here I verify the GPS “a posteriori” knowing that it works, nevertheless in lack of a solid theory the GPS must be considered at the apex of a series of efforts of empirical nature. As it is now the GPS is the climax of a technical achievement and needs theoretical justification.

The precessional phenomenon justifies (in respect of Newton’s time), only the geometric advance and the relativistic time advance, but the fact that the satellite is in movement at orbital speed $v_0 \cong \text{const}$ (since the orbital path of the satellite is nearly circular), determines that it is endowed of equivalent inertial mass and therefore subject to time retardation (in respect of the Newton’s time) of the central M_{LGM} .

The value of geometric and temporal precession is calculated through the formula (see [Ruggeri1](#)):

Geometric precession ($v_0 = 3890$ m/sec):

$$\Delta v_P = 2\pi dr' = 2\pi \frac{v_0^3}{2c^2} = 2\pi \frac{3890^3}{18e16} = 2.054e-6 \quad \frac{\text{m}}{\text{sec}}$$

Which for a return in collimation after 23 hrs 56 min gives:

$$\Delta L_P = 86160 \cdot 2.054 e-6 = 0.177 \text{ m/coll}$$

The temporal advance at each collimation, for an interval of 0.177 m/coll run by the satellite at v_0 is:

$$\Delta t_P = \Delta L_P / v_0 \cong 45.5 e-6 \text{ sec/coll}$$

The temporal retardation per collimation, after 23 hrs 56 min, is:

$$\Delta t_R = \frac{v_0^2}{2c^2} 86160 = \frac{3890^2}{18e16} 86160 = 7.24e-6 \quad \text{sec/coll}$$

In total we have that the relativistic time of the GPS on a clock which was synchronized with the one on Earth consists of a temporal advance Δt_P

to which has to be subtracted the temporal retardation Δt_R .

Resulting in an overall temporal advance:

$$\Delta t_P = (45.5 - 7.24) \cdot 10^{-6} = 38.26 \cdot 10^{-6} \text{ sec/coll}$$

Which is the value used at present to alter the scale of the clock inside each satellite in orbit in order to synchronize it to the one of reference on Earth and permit both clocks to measure the Newton's time in synchronism.

Note: on Earth each receiving clock in a stationary position or in movement, also has to be synchronized to the one of reference.

Note: the geometric precession " ΔL_P " is a non alterable physical reality, geometric-temporal in nature.

Why precession is so important

In [Ruggeri1](#) was discussed how the interpretation of the precession phenomenon afflicting the mass of Mercury moving in an eccentric orbit ($e = 0.206$) whilst observed from our Earth (whose orbit is considered near circular) was incorrect since an unsatisfactory formula, was adopted, containing the number $3 / (1 - e^2) = 3.133$ assuming arbitrarily that the value of eccentricity of the orbit, can solve the precession (geometric and temporal of the object observed).

It was pointed that the limit case in which the eccentricity of the orbit is $e=0$ did not respect the physical conditions as and was suggested that if the phenomenon had to follow a physical coherent way of thinking, the value $\pi=3.14159\dots$ had to be substituted to the above mentioned value $3 / (1 - e^2) = 3.133$.

To explain the relativistic phenomena (geometric and temporal precession and time retardation in a system) a theory that denies the existence of the Ether/ESF was put forward.

That theory attributed to an empty space the capacity to contract or expand in function of presence of physical gravitational masses and postulate a four dimensional universe in which to the three metric dimension was added the time dimension, permitting the inclusion of the continuum phenomenon of transformation-degradation dependent from the time as dimension.

One can see from start that if I have correctly described the physics of the gravitational phenomena involved I have a chance to prevail.

The graphic in [Ruggeri7](#) (DELINEATIO MIRABILIS) and the formulations based on the existence of the Ether/ESF on an original analogical context, which were introduced in the paper [Ruggeri8](#) are proof and consequence of a dramatic advance obtained considering the Space of Euclidean character and containing substance (the Ether/ESF).

Under these conditions I can affirm that what I present are true advances made possible through my interpretations of physic phenomena.

Many concepts are clarified when a theory contains Truth and this is the case now, since a) the formulations can be compared analogically in the context of similar physical laws, b) concepts and conclusions, physically valid, are developed which were completely unknown and unsuspected, c) there appears to be a possibility of advance in the physical field after a stagnation over a time interval of about one century d) concepts become smoother and formulae are synthetic, therefore better presentable to the learners etc... e) the direct consequence of this advance is that it determines the end of the denial of the existence of the Ether/ESF and the falsification of the theory affirming the existence of a Space-time continuum, replaced by a theory sustaining the presence of substance inside an Euclidean space, in a context of continuous transformations-degradations dependent from time, of relativism and of absolute local measurements made by observers residing inside their own system etc....

Precession, presented as a simultaneous geometric advance during the orbital period and as temporal advance during the same, is a relativistic phenomenon affecting both the geometry and the period of the orbit, it happens in a gravitational context considering a large physical-gravitational mass at the center of a system (a mass M_{LGM}) which in our system is the sun, we can only observe from Earth, the geometric effect of the precession developed by the planet Mercury and we cannot (at least for now) determine the precessional time advance and the relativistic time retardation in Mercury, since, though on Earth we are measuring Newton's time of the solar system we did not develop the resources which could enable us to do so .

However, closer to us on Earth (with our Earth as the physical mass M_{LGM} , along the years was developed the Global Positioning System (GPS) a system of measurement of distances using the most modern technological advances which use and exploits phenomena whose nature is definitely relativistic.

The interpretation of the GPS that includes precession (both geometric and temporal) and the interpretation of the relativistic time retardation in a local absolute context, permits the falsification of the theory of space-time since the synchronization of time and time scales of measurement at twin clocks (one at the observer on Earth and the other inside the satellite in orbit) permits us to obtain conditions of simultaneity, which permits the measurement of distances through the measurement of a quantum of time necessary to the signal to move at a fixed speed c from the satellite to the observer on Earth.

This happens when the observer is in conditions of vertical collimation with a far object (a fixed star), but produces a phenomenon in which successive geometric collimations made at the fixed interval of collimation ± 23 hrs 56 min on Earth, accumulates the geometric error (that in the beginning could be overlooked) due to the geometric displacement of precessional nature until a situation arises in which is necessary to register again the system to an initial line of collimation (resetting the measurements to the vertical line of collimation with the far object).

This re-registration or empirical correction or reset, can be done each time a collimation is made or after many collimations (many days in the case of the GPS) when the error starts to be measurable and becomes obnoxious.

The end of the road for the concept of space-time and associated theories

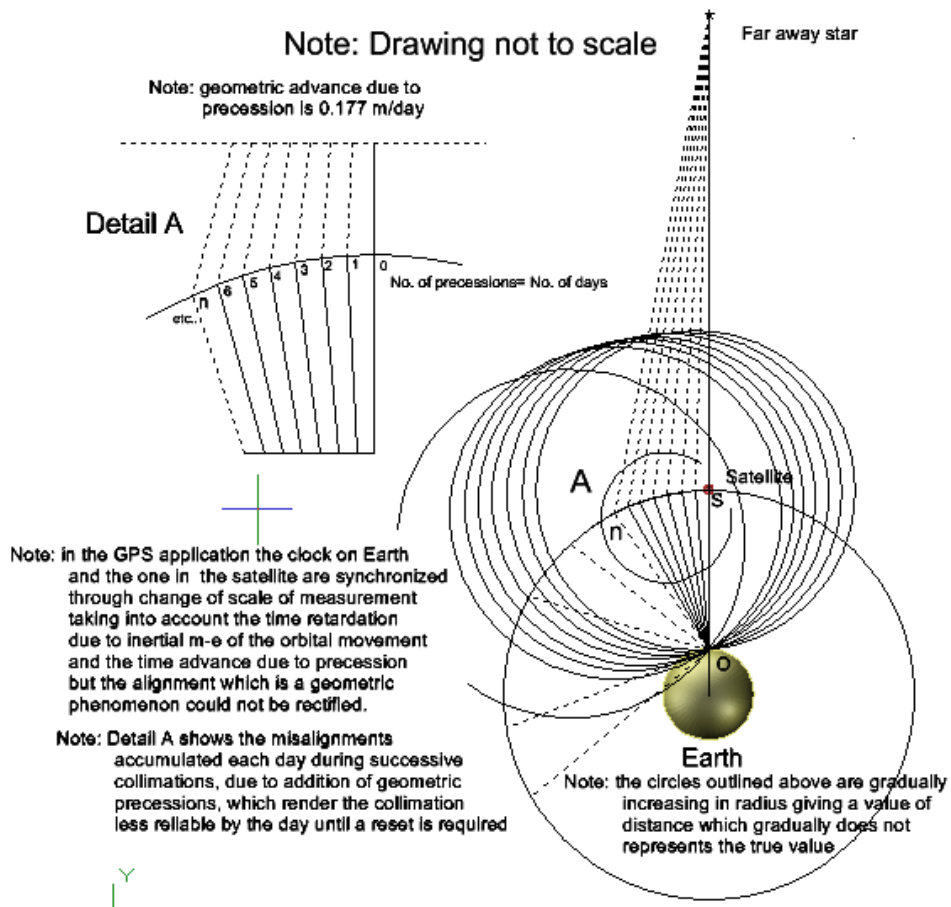
Based on the empirical observation of the geometric and temporal precession and on the relativistic time retardation as explained in [Ruggeri18](#) and on the explanation in physical terms that the build up of errors depends from the geometric precession phenomenon accumulating in such a way to produce misalignment, there is evidence that the space is Euclidean and the ESF contained inside it, gives body to it and permits justifications in rational terms of the phenomena of temporal-relativistic nature, (due to the presence of Static Force in orbit causing geometric precession and relativistic time advance of universal physical phenomena) and that to presence of inertial m-e associated to the orbital velocity, is associated a relativistic time retardations of the same universal physical phenomena (just mentioned) inside the system observed from another one in near circular orbit around the central M_{LGM} .

Note: a particular mention must be made in regard of the geometric side effect related to precession since as shown here is accumulated as a collimation succeeds the other and is cause of increasing misalignment.

If we consider only the second geometric alignment there is no cause of concern since the geometric precession is very small (0.177 m/coll) but we need to accept the existence of the misalignment caused by the geometric precession and is in the base of calculations (related to the theory of the Ether/ESF) that we reset the reading of the phenomenon every time we observe it, or when the error which the misalignment introduced by it becomes an hindrance to the functioning of the smooth operating of the GPS, as shown in figure 1 below.

The configuration in presence of the gravity of a central physical mass M_{LGM} containing gravitational m-e $M_0 = M_{RM} + M_{ESCM}$ and permitting us to sort out the precession as gravitational phenomenon between the two masses in circular orbit around the M_{LGM} , has been presented here above for two orbits nearly circular (with the proviso that the precession, between successive collimations, does not varies excessively for orbits of eccentricity like the planet Mercury $e=0.206$ and beyond, up to values to be determined, and the proviso that the observer on Earth, measures the time of the whole solar system or Newton's time related to the sun, see [Ruggeri18](#)).

Nevertheless, when the eccentricities become very large and orbits become extremely elongated, the fact that the precession over the total orbital period remains constant or varies little has to be investigated



Note: the observer, in this case, in order to facilitate the observations, can calculate the values of geometric and relativistic advances due to precession (between successive collimations) referring to circular orbits equivalent to the elongated ones.

Note: the squares of the orbital velocities, according to Newton, are inversely proportional to the radius of these circular equivalent orbits and the secondary transformations-degradations caused by oscillation of values of v_0 , usually are overlooked.

Note: with the increase of the radius of the orbit equivalent we have a reduction of values of precession geometric and temporal and of relativistic time retardation per unit of time.

As soon the orbits get more elongated, the radius of the equivalent circular orbits increases and the relativistic effects, per unit of time, tied up to gravitation through precession (geometric and temporal) and to orbital velocity tend to zero and eventually the gravitational interaction is lost and a representation in absence of gravity (as per the DELINEATIO MIRABILIS) can be substituted to the one in presence of gravity.

We see now that the explanation of the physical phenomena, as it should be in physical Science, has a range containing at one extreme the gravitational case in the limit condition that the orbits are near circular and at the other extreme the case in which there is no gravitational interaction and prevail only phenomena of transmission of signals between masses containing inertial m-e M_{ESCE} .

In the DELINEATIO MIRABILIS an additional condition is made, requiring that the observer resides inside a system near to absolute quiet (see [Ruggeri18](#)).

It is pointed out now that in the theories presently adopted, the physical perceptions are not well stated, as it is done here, and the two theories of relativity in vogue, tied up to the spatial-temporal phenomena, have been given names which are confusing, since we could accept to call "Special Relativity" the physical side of the phenomena tied up to representations of simultaneity of events in absence of gravity, but to call "General Relativity" the gravitational case alone is arguable since we must state that both the cases (in absence of gravity and in presence of it) are associated to "Special Relativistic conditions of a General Relativity encompassing both", the first is concerned with an extreme of the range of representations in which the precessional phenomena have no representation and the second is concerned with the other extreme of the same range, in which all the relativistic phenomena geometric and temporal and the time retardation due in this case to presence of inertial m-e in orbit are present.

The case in absence of gravitational interaction which interests the whole observable objects surrounding the observer, (presently going under the name "Special Relativity") could be considered a case more general than the gravitational one, restricted to the surroundings of the System containing the M_{LGM} in which the observer resides.

In the other hand from the physical point of view the gravitational case and the one in absence of gravity have a comparable degree of complexity.

Whereas the scientist concerned with these representations has the option to judge if and how much the phenomenon he investigates is close to one of these two extreme paradigms.

At present the values used in the GPS for the changes of clock rates would confirm the theory of space-time if it wasn't for the geometric discrepancy accumulating an error of $\Delta L \cong 0.177$ m/day along the line of collimation (since each day there is collimation).

This build up of an increasing departure from the accurate initial measurement which eventually renders useless the measure of distance made through the synchronized clocks is the one damning the existing theory of space-time since the introduction of error in the measurements which up to now had no explanation, is in agreement with calculations made on the basis of an Euclidean universal space occupied by Ether/ESF.

In fig 1 the scales related to the phenomena have been exaggerated on purpose and the intention is to show that through successive collimations over a number of days the satellite in orbit adds continuously the effect of precession to the measure made by a clock residing in the satellite which although is

synchronized to the time of the observer sends a signal from a position which, at any successive collimation, continuously shifts from a geometric point of view.

Note: every 23hrs 56min the clock on Earth returns on vertical alignment in position O (with a far stellar object) and the clock on the satellite which is synchronized with the one on Earth shifts of a geometric distance (the Geometric precession $\Delta L \cong 0.177$ m/day) and at the moment of alignment after a number n of days the clock is to be found in the position n distant $n\Delta L$ from the line of alignment.

Therefore if in the fig 1 the clock is in position n after n successive alignments the delay of transmission Δt_n happening at constant speed c and measured at the clock on Earth is greater than the Δt_1 measured the first day:

$$\Delta t_n > \Delta t_1$$

The situation ensuing results acceptable if the difference between the distances

$$1) \quad \overline{O_n} - \overline{O_1} = \varepsilon$$

is small enough that ε built in the phenomenon remains within a limit of error that can be accepted but since Δt_n increasingly becomes bigger than Δt_1 we have discrepancy of measurement of distance in alignment, since for:

$$\Delta t_n c = \overline{O_n} \quad \text{and} \quad \Delta t_1 c = \overline{O_1}$$

is valid the relation 1) above, we have to decide the magnitude of error ε that we can accept before resetting the measurements to acceptable values (make empirical corrections which bring again a measure $\varepsilon \cong 0$ or small enough that can be accepted).

I can figure out that there is need of reset through empirical corrections but I cannot detail the technicalities and the choices the engineers made along the years, and carry on making to keep the system working and possibly improving it, therefore I have to stop here.

What I can safely add is that the GPS (on the basis of the results obtained) falsifies any concept of space-time for dimensional continuum and permits to bring the field of physics back to the path of discovery and advance, it proves that to obtain answers in the physical field, is necessary to maintain a simple way of reasoning and very simple mathematical relations (without indulging into complicated mathematical relations which though can be of use, especially when data must be manipulated statistically, are sure cause of error during the process of search and development of new concepts and mental categories).

It results that in relativity as in phenomena which can overlook relativity the Space is Euclidean and the Ether/ESF is a physical presence and gives body to it.

I know that these results will be resisted and many will find difficult to accept them or plainly will refuse to investigate them, nevertheless from my point of view I am satisfied that they are true and they are part of a theory which although presents to me all the time new and challenging questions to which not always I have been able to give an answer, (together with a certain amount of doubt which I accepts as part of the process of discovery and advance), has consistently given to me satisfactions and renewed interest.

One day in the future this paper will be remembered as the first (though may be incomplete) convincing presentation producing the substantial arguments which resulted able to falsify the non physical four dimensional space-time hypothesis and the theories which derived from it.

What I want to add is to point that if proofs are required we have to remember that the precession of the planet Mercury in its orbital path is geometric-temporal and depends from a relativistic phenomenon in orbit caused by presence of the gravitational field of the central M_{LGM} , and there is no reason to justify it in any other manner, whereas the GPS which involves transmission of signals from a source whose physical status is known, produces the proof that the temporal relativistic part of the phenomenon is correct.

In the whole when a satellite is in orbit around the Earth (as center of the system) in the conditions above described, a local absolute situation develops in which thanks to technical advances, permitting a very precise measurement of the time phenomenon and transmission of signals, directs to the unraveling of the physical problem, with a theory which if not perfect certainly, in respect of the existing ones, is closer to the truth.