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# DYADS AND GRAVITATIONAL DEFLECTION OF LIGHT

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ABSTRACT
The application of the dimensional discontinuity to the coordinates of space and time, through respectively the two minimum units MIN-S and MIN-T, of finite dimensions but with no submultiples, leads to the followings results inherent to the gravitational deflexion of light:
- Observations about the applicability of dyads.
- Description of the deflection features.
- Quantification of the deflection angle.

**Bibliografia**

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| E. Parzen | Modern Probability Theory |
| R. Feynman | QED – The strange theory of light and matter |

**0– Introduction**

A ray of light is a projection of photons in the space, which are waves and particles at the same time, endowed with energy and mass as functions of their frequency.
The reading of these pages implies the knowledge of previous articles published on The General Science Journal on http://www.wbabin.net/science/serafin.pdf , http://www.wbabin.net/science/serafin2.pdf , and http://www.wbabin.net/science/serafin3.pdf from witch the following formulas are derived, using values of $10^{-30}$ meters for the minimum space unity MIN-S and $10^{-38} / 3$ second minutes for the minimum time unity MIN-T.

**Dn** = ( **n** MIN-S, **n** MIN-T ) 0.1
**v** = L MIN-S / ( L + R ) MIN-T 0.2
$L = ( 7{,}35 \cdot 10^{-2} )^2 / \lambda$ 0.3
**Vd,** dyadic speed, is the quotient MIN-S / MIN-T equal to $3 \cdot 10^{8}$ m/sec verified for all dyads.
The meaning of the aforementioned formulas will be specified ahead.

**1 - Observations about the applicability of dyads**

Each pair formed by one unity of space and one unity of time is called **dyad** if, and only if, their arithmetic quotient results equal to the dyadic velocity.
The set of such pairs forms a discontinuous structure of quantification for physical phenomena and it is composed , as the formula 0.1 points out, of all possible integer **n** applied to the MIN unities.
We cannot deny that difficulties rise up in accepting dyads, mainly due to an instinctive reluctance to recognise the link between the spatial and temporal dimensions. Nevertheless let us try to illustrate this link and illustrate its legitimacy with examples taken from easily provable experiences.
Firstly let us consider the manner in which distances are quantified: this consists of establishing a spatial sample from which multiples and submultiples are obtained as necessary. In fact, a distance is directly quantified by the number of times it contains the designated sample.
Similarly, the quantification of durations involves choosing a time sample established by a known cyclical phenomenon, from which multiples and submultiples can be obtained as necessary. Using one of these, a duration is quantified by the number of times the cyclical phenomenon can be inserted into it. These operations are completely obvious and are simply repeating notions in daily use, especially with reference to practical units of measurement such as the metre and the minute second.
However, at this point we must take into account the substantial difference featured by the two measurement modes given above, one being spatial and the other temporal, and established by the different natures of their origins.
For example, let us consider the following spatial units: the centimetre, the decimetre and the metre, together with the temporal units represented by the tenth of a second, the minute second and the decasecond, made up of ten seconds grouped into a single unitary magnitude.

As can easily be understood, in the use of spatial samples each of their individual physical attributes can be perceived by our senses, in other words, both the centimetre or the decimetre and the metre or even greater and lesser measurement units, represent magnitudes which are perfectly ascertainable by touch or more particularly by sight.
Time exhibits a different case, that is while the minute second still represents a perceivable interval for senses and is parallel to mental processes connected to common activities such as walking, counting or giving a speech, the magnitudes of a tenth of a second or a decasecond are foreign to our senses of perception.
In fact, the sequence of tenths of seconds shown for example on digital clocks, appears as a rapid succession of indefinite signs, and on the other hand keeping account of a slow sequence such as the decasecond implies such strong mental concentration that one quickly loses the sense of sequence itself.
Without a doubt, the comparison between the two dimensional categories above highlights that, although the temporal category is a concrete dimension since it is closely involved in every physical phenomenon, it directly depends on a specific neurological function, that is a chronoma, a sort of "mind's eye" which prefers and imposes upon its own operations a basis of times featuring intervals close to the minute second.
As well as opening a window into physical reality, this chronoma also implies a close tuning into the specific frequency it features, to the detriment of all others.
Let us refer, for example, to music. Every score is read according to the timing set out by the composer in his directions, or through the use of "time" given by a metronome. This "time" can be speeded up or slowed down according to the player's musical taste, but it cannot differ too greatly from the original without risking the loss of its musicality.
It is not only a question of aesthetics, it is also an answer in keeping with our senses of perception and fundamentally an adaptation to the cadences most suited to human neurology.
Therefore, as well as being mono-dimensional and anisotropic, the flow of time also exhibits the characteristic of harmonising psychologically only with the cadence approximately divided by minute seconds, while being alien from all others.
Therefore, in order to formulate the representation of physical phenomena independently from human sensitivity and precisely to safeguard the equal concreteness of space and time shown above, the temporal dimension of the representation must be corrected by an artifice which allows an equal ratio between the two dimensions themselves. In practice, it must express a joint variation of their measurement units and this is the abstract world of dyads.

**2 – A perfect homology**

In order to reinforce the reader's conviction regarding the specifics of transformations using dyads it is important to bear in mind the following homology among different visions produced by manipulating a film of an usual game.
Let us suppose we have a film showing the passage back and forth of a ping-pong ball during a match. The first film representation we can consider, without entering into the difficulty of its production techniques, is that of making a close-up of the images combined with slow-motion projection speed.
We can imagine a device which, while enlarging the picture, slows down the film speed with both actions carried out in linearly proportional manner and maintained as long as necessary.
What happens if these special techniques are used?
When the scene projected on the screen is enlarged by acting on the lenses it is as though a lesser spatial measurement unit is being used than the real case. For this purpose we can refer back to the inverse incidence between a quantified entity and its unity of measure.
In this case, because of the optical technique, we have the projection of a larger playing area, including of course the dimensions of the players and the ball.
Added to this action we have the contemporary slowing down of motions due to the slow projection of the film.
When these two effects, enlarged images and proportionally slowed scenes, are combined they maintain the velocity value of the ball and at the same time allow us to see the development of the ping-pong match from a point of view which offers some interesting comparisons, as shall be shown later.
The fact that the motion of the ball does not change is quite easy to demonstrate, since while the table lengthens due to the optical effect, it takes more time to travel across it due to the slowing down of the scene. That is, the film interventions balance each other out regarding velocity.
For the sake of clarity, let us suppose that the players are increased to twice their real size and that correspondingly the time of the match is doubled. Thus we would see the screen as though halved samples had been used for space and time, from the metre to the half metre and from the second to the half second, mathematically corresponding to double mass and energy values for the ball and half its acceleration.
The second representation, opposite to the first, consists of adjustments carried out in order to make the images smaller and at the same time accelerate the film speed, so that the table is shortened and the

motions accelerated.
In this case too let us suppose that both the optical and the film projection speed are given proportionally, therefore the scene we are watching is manipulated as if the space and time units in unison have both undergone an increase.
If the measurement units are doubled compared to the normal, we will see a table half its normal length and we will watch a game which takes place in half the time. Furthermore, still mathematically, the value of mass and energy of the ball are halved whereas its acceleration doubles.
It is quite simple to understand that the films above show three perfectly equivalent representations, and are so because, by using scale ratios, they maintain the exact reciprocal nature of their quantifications.
However, of the three representations, only the original satisfies our level of spatial-temporal perception, whereas the other two lie beyond human experience. Nevertheless, it is well known that our senses do not allow an absolute reference system for our knowledge of physical reality. In fact, it is more physical reality which conditions our cognitive capacity.
In these terms, therefore, it is evident that of the three films described above, and of any other examples we care to give, there is no single one to stand alone and take priority. All are equally representative of the physical events to which they refer and this is the crucial condition upon which the metrological reflections about the dyads are based.
It is important to note how the examples given above are the results of pairs of measurement units which are not dyads. They were used to describe the mechanics of passing from one dyad itself to the other, highlighting their similarities, and this mechanics is the explicit basis of the polymorphism inherent in every physical phenomenon.

**3 – Description of the deflection features**.
As is known, a ray of light emitted by a star passing in proximity to the sun is subjected to an attraction that causes it to follow a trajectory which deviates slightly towards the sun itself.
The phenomenon is known as gravitational deflection of electromagnetic radiation and has been calculated according to Newtonian theory and using General Relativity.
The apparent movement of stars which this effect brings about can be observed from the Earth only in the case of a total eclipse of the sun, otherwise the intense light of the sky obscures its evidence.
The first experimental verification of light deflection was carried out in Brazil during the eclipse of 29/5/1919 and the results obtained confirmed quite approximately the figure foreseen by Einstein of 1.75 degree seconds.
For both the above-quoted theories deflection level is not influenced by the frequency of the luminous ray, while it depends in an inverse manner on the distance of its path from the surface of the sun.
In this chapter, the matter is taken up once more to bring it into line with the intermittences foreseen for velocities developed by photons and with the already-noted equivalence between dyads and pairs of photons, given by the equality founded on their respective MIN dimensions.
As is shown in diagram CC, we must consider a ray of light travelling along a rectilinear path in proximity of the Sun and that in point (p) shown by the orthogonal straight line (o), it deflects at an angle $\alpha$ formed by the catheti $L_1$ and $L_2$ .
These two catheti represent the L parameters corresponding to two different velocities: $L_1$ stands for the parameter referring to the ray of light and $L_2$ for that of a transversal motion due to gravity acting on the photon mass.
As shown in the second article above mentioned, we know that every pair formed of one anterior and one posterior photon, separated by a perfect wavelength, crosses the space on straight line for the distance equal to $L_1$, composed by a certain number of “steps” MIN-S, at the end of which it establishes an immobility represented by a single MIN-T; course that repeats cyclically.
In such terms we know that only the posterior photon undergoes an MIN-T arrest at the end of the “steps” of $L_1$, whereas the anterior photon develops an uninterrupted sequence of MIN-S “steps”. Thus it can be seen that only the second photon, taking part in each pair of identical photons of the ray of light, when stops at point (p) can entirely manifest the extension of $L_1$ as well as energy and mass of the pair, which is so attracted by the Sun.
Two MIN-S “steps” depart contemporaneously from the said MIN-T “stop” at the end of $L_1$ : one “step” for each direction of the two $L_1$ and $L_2$ parameters; and because of this contemporaneity they can only move orthogonally to each other in order to avoid overlaps which would be inadmissible submultiples of themselves. However, in addition to the orthogonality, the two parameters given above must also develop a perfect starting and finishing simultaneity in their spatial-temporal extensions. That is they must contain the same quantity of MIN elements.
From the formula 0.3, we note that this equal quantity is established by the following equality : $(L\ 10^{30}\ \text{MIN-S})\ .\ (\lambda\ 10^{30}\ \text{MIN-T})\ \mathbf{=}\ (7{,}35\ 10^{-2}\ 10^{30}\ \text{MIN-S})\ .\ (7{,}35\ .10^{-2}\ 10^{30}\ \text{MIN-T})$ , where the first term defines the area of a rectangle and the second term gives the area of a square.

This square is also and most importantly an exact dyad, the only one able to be an electromagnetic wave and able to determine precisely a transversal motion created by a radiation corresponding to the fossil wave, as it is explained in the second manuscript above cited.
Such radiation is active during only one wave, so that it diverts the parameter $L_1$ for the aforesaid angle $\alpha$ likewise to a centripetal force of rotation.

**4 - Quantification of the deflection angle**.
Through the respective extensions of $7{,}35 .10^{-2}$ m and $9 .10^3$ m, the second being a value relative to yellow light, the parameters $L_2$ and $L_1$ lead to the formation of an angle $\alpha$ with a trigonometric tangent equal to:

$$\text{tang}\ \alpha = L_2 / L_1 = 7{,}35 .10^{-2} / \ 9 .10^3 \qquad 4.1$$

which in degree seconds becomes:

$$\alpha = \text{tang}\ \alpha\ [( 3600 . 360 ) / 2\pi ] = 1{,}6853 \qquad 4.2$$

a result very close to that previously given from the observations during the eclipse.
We must also remember that small angulation differences could derive from the difference in frequency of the chromatic dominant of the ray of light, from which its typical L parameter is formed. In fact, as is indicated by the formulae, the deflection angle is inversely proportional to the electromagnetic frequency, whereas it is independent from the distance of its path from the Sun.
Due to this independence, the deflection of luminous rays can also be activated in areas extremely remote from the gravitating star, or at least for the distance in which its attraction field is not altered by the presence of other sidereal masses.
In the case of the Sun, the deflection created at great distances can be observed from the Earth only for very low values, or it affects areas external to the terrestrial orbit, from which it is therefore invisible.
Finally it is useful to repeat that a ray of "light" can only be deflected by gravity at the moment when it passes perpendicular to the star attracting it, whereas it is excluded from this action for all the remaining oblique approach or departure path due to the restricting orthogonality of parameters $L_1$ and $L_2$.
In terms of geometric expression this essential condition, that has to be worth for the whole rectilinear segment $L_1$ implicates however that the arrow on a chord of the length equal to $L_2$ in a circumference of D diameter must be smaller than $L_2$, which is the minimum spatial unity of the deflection phenomenon and the minimum real distance at the same time.
Using simple trigonometric passages we obtain the following formula:

$$L_2 > ( L_1 )^2 / \ D \qquad 4.3$$

where the minimum diameter of an astronomical body suitable to produce deflection of yellow light has to be:

$$D > L_1^2 / L_2 > 9000^2 / 7{,}35 . 10^{-2} \geq 1{,}1 . 10^6 \text{ Km} \qquad 4.4$$

For its diameter of around $1.4 . 10^6$ Km, the Sun is a star that can induce deflection, produced independently of the intensity of its gravitation.
From the 4.4 it can be inferred that planets of the solar system are not able to deflect the light because of their reduced dimensions, moreover the Sun cannot deflect gamma-rays, whose parameter L can be wider than the same solar diameter.

DIAGRAM CC