

Mercury's perihelion advance is caused by our Milky Way.

*Described by using
the Maxwell Analogy.*

T. De Mees - thierrydemees@pandora.be

Abstract

In this paper, I refocus on the first one of the findings that I described in: *Did Einstein cheat?* The unexplained advance of Mercury's perihelion can be found without any artifice, by using the motion of the solar system inside the Milky Way, just by applying the Maxwell Analogy (which has firstly been suggested by Heavyside) and by using the proper velocities' definitions.

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1. The Maxwell Analogy for gravitation: equations and symbols.

For the basics of the theory, I refer to : "[A coherent double vector field theory for Gravitation](#)". The laws can be expressed in equations (1.1) up to (1.6) below.

The electric charge is then substituted by mass, the magnetic field by *gyrotation*, and the respective constants are also substituted. The gravitation acceleration is written as \mathbf{g} , the so-called *gyrotation field* as $\mathbf{\Omega}$, and the universal gravitation constant out of $G^{-1} = 4\pi \zeta$, where G is the universal gravitation constant. We use sign \Leftarrow instead of = because the right-hand side of the equations causes the left-hand side. This sign \Leftarrow will be used when we want insist on the induction property in the equation. F is the resulting force, v the relative velocity of the mass m with density ρ in the gravitational field. And \mathbf{j} is the mass flow through a fictitious surface.

$$\mathbf{F} \Leftarrow m (\mathbf{g} + \mathbf{v} \times \mathbf{\Omega}) \quad (1.1) \quad \text{div } \mathbf{j} \Leftarrow - \partial \rho / \partial t \quad (1.4)$$

$$\nabla \cdot \mathbf{g} \Leftarrow \rho / \zeta \quad (1.2) \quad \text{div } \mathbf{\Omega} \equiv \nabla \cdot \mathbf{\Omega} = 0 \quad (1.5)$$

$$c^2 \nabla \times \mathbf{\Omega} \Leftarrow \mathbf{j} / \zeta + \partial \mathbf{g} / \partial t \quad (1.3) \quad \nabla \times \mathbf{g} \Leftarrow - \partial \mathbf{\Omega} / \partial t \quad (1.6)$$

It is possible to speak of gyrogravitation waves with transmission speed c .

$$c^2 = 1 / (\zeta \tau) \quad (1.7) \quad \text{wherein} \quad \tau = 4\pi G/c^2.$$

2. What is causing the classical Mercury's perihelion advance?

The Mercury's perihelion advance.

The Newtonian control calculation of the astronomic values of the perihelion advance was performed by Leverrier in 1859, and was reassessed and improved by Newcomb in 1895. The interpretable advances of Mercury's perihelion are due to:

1. the progress of the equinox which explains 5025'' per century;
2. the perturbation by the planets for total of 526'',7 per century.

Unexplainable compared with the overall astronomic observation is a surplus of 43'' per century.

The missing advance of Mercury's perihelion explained by the sun's motion in the Milky Way.

Let us examine which outcome is obtained with the Maxwell Analogy. Based on the theory of Heaviside, Jefimenko found that a mass which moves in relation to an observer, experiences an extra force. A moving mass induces a field, analogously to the magnetic field in electromagnetism. Heaviside however incorrectly considers this induced field in relation to the observer.

The vision of Heaviside and of Jefimenko must be corrected indeed. In my work [5] I have explained how important it is to define the local absolute speed. When we want to apply the Maxwell analogy equations on moving objects, the gravitation field which is the reference has to be known, and then becomes *the* appropriate reference for that speed. It is not a matter of *definition of the observer* like in the Relativity Theory or in the Heaviside/Jefimenko approach, but a matter of *definition of the local stationary gravitation field*. Only gravitation fields can be regarded as "local immobile" references.

For Mercury we must take into account the local stationary gravitation in which Mercury is immersed. The "immobile" gravitation of the sun can be a reference field with which the gravitation field of Mercury is in "interference", creating this way a field, similar to a magnetic field, called *gyrotation field*.

This is only possibly if the sun itself moves in a straight line, rotates, or is caught in an orbit. We can verify^[5] that the spin of the sun is virtually insignificant for this phenomenon. A rotation speed of 26 days on its axis is not sufficient to be perceptible in secondary effects. The sun has however got another motion. In my work [5] I have calculated, starting from the Maxwell Analogy, that all stars of our Milky Way revolute with a speed of roughly speaking 240 km/s. This was based on a galactic system of which the central bulge was valued on 10% of the total mass of the galaxy. The literature finds strongly divergent masses for this bulge, what makes an exact calculation difficult. At present one values the speed v_l of the sun between 220 and 250 km/s, what closely join our quick calculation.

Although the Milky Way's gravitation field might seem weak, nevertheless the weak field can play a sufficiently large role to oblige the sun to make a revolution around the centre of our galaxy in 220 millions years time.

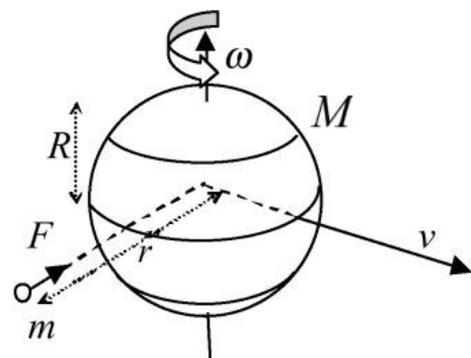


fig. 2.1

From the Maxwell Analogy follows the property, for an uniform moving spherical mass M (the sun) in a local gravitation field (the Milky Way), that an extra force is exerted on any mass that lays perpendicularly on the movement direction. We come to it as follows: if we isolate a random thin ring of the sphere in a plane,

perpendicularly on the rotation vector ω , the uniform motion v in a gravitation field will be associated with an extra force F on the mass m that is perpendicular on ω and v .

The effect is shown in fig. 2.2 where only an isolated ring of the sphere has been showed, but replaced by a squared ring. Two sides of it are parallel with the velocity v in relation to the Milky Way and two sides are parallel with the distance r . The replacement by a squared ring is an allowed approach, because a circle can always be replaced by a succession of perpendicular straight lines.

The rotation of the sun is not considered here, only the translation. Then, the mass m gets two parts of the gyrotation field acting on it. Only the parts of the square ring which are parallel to the velocity play a role in generating a gyrotation field in fig. 2.2. The average distance is r which is large compared to the sun's diameter. From my work [5], the left hand of (13.3), it follows that the gyrotational force equals v^2/c^2 times the gravitational force. And, in any orbital position of mass m , it is possible to adapt fig. 2.2 so that at each time, we can observe how the gyrotation acts on m . So, we find that when the orbital position of mass m is 90° before or behind the position of fig. 2.2, no gyrotation force at all act on m . This means that only half the positions will result in the gyrotation factor v^2/c^2 . Thus, the gyrotation force acting on m equals

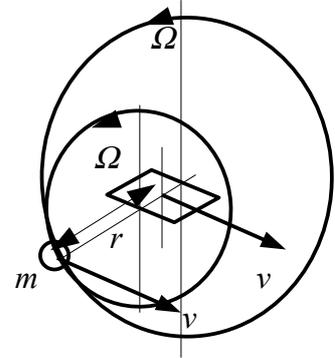


fig. 2.2

$$-F_{\Omega a} = G \frac{m M}{2 r^2 c^2} v^2 \quad (2.1)$$

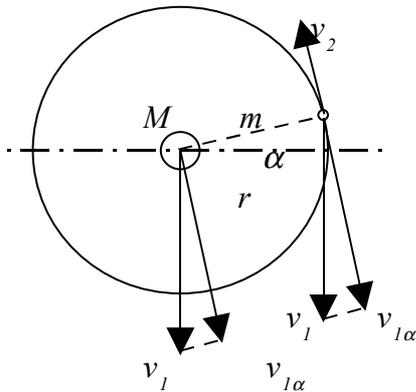


fig. 2.3

But there is another effect here as well. The mass M will work as a dipole because of the rotation vector ω and will exert a supplementary force on mass m (see fig. 2.3), which is equal to

$$-F_{\Omega b} = G \frac{m M \omega R^2}{5 r^3 c^2} v_{1\alpha} \quad (2.2)$$

(see (4.2) of [5] for the basics of the calculation).

In fig. 2.3, the sun with mass M and radius R is considered at an average distance r of Mercury, which has mass m , and resides at a certain instant under angle α in relation to an axis going through the centre of the Milky Way. We approximate the elliptic orbit by a circular one.

All these forces are attractions: the law of Newton, the force originating from the uniform movement v_1 , and the one of the spin ω of the sun. Under the angle α , Mercury experiences therefore the following forces by the sun :

$$-F_{\alpha} = G \frac{m M}{r^2} + G \frac{m M}{2 r^2 c^2} v_1^2 \cos^2 \alpha + G \frac{m M \omega R^2}{5 r^3 c^2} v_1 \cos \alpha \quad (2.3)$$

The first term corresponds to the law of Newton. It appears that the last term can be neglected (gyrotation), because of the slow spin of the sun. The second term however interests us particularly.

When we know that Mercury revolve with an average speed v_2 equal to 47,9 km/s, and the sun with a estimated velocity v_1 equal to 235 km/s in the galaxy, what means that, expressed in v_2 , we can write that $v_1^2 = 24 v_2^2$. The second term of (2.3) can therefore be written as:

$$-F_{\alpha 2} = 12 G \frac{m M}{r^2 c^2} v_2^2 \cos^2 \alpha \quad (2.4)$$

When we integrate this over α from $-\pi/2$ to $+\pi/2$ we get half of the total impact. Doubling this result gives the total effect over the whole circumference (it does not annihilate with the first half circumference because the velocity vector changes sign). Dividing the result by 2π gives us the average over the whole circumference :

$$-F_2 = 6 G \frac{m M}{r^2 c^2} v_2^2 \quad (2.5)$$

this brings us to:

$$\delta = 6 v_2^2 / c^2$$

This result, obtained by using the Maxwell Analogy, is exactly the value which was obtained by Einstein by using the Relativity Theory.

I must admit that I have chosen the sun's velocity v_1 exactly equal to 235 km/s, so that I obtain the aimed result. In fact we probably should choose the real speed v_1 somewhat lower, but also correct the result for δ with some arc seconds because of the gyrotational perturbation by the other planets. They indeed also exert the three described forces on Mercury, of whose the force related to the orbit speed is the most important one, following the Newton force. Of course, Leverrier originally could only take into account the Newton forces, as we did.

3. Conclusion: the Maxwell Analogy explains Mercury's perihelion advance.

With the classical application of the Maxwell Analogy, it is perfectly possible to explain Mercury's perihelion advance completely. Not the bending of the universe, but the motion of the sun and Mercury in the Milky Way is responsible for it.

4. References and interesting literature.

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[Fast spinnings stars' and black holes' dynamics.](#)
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