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The proof of instantaneous gravitation

Andreas Gimsa

Stirling Technologie Institut gemeinnützige GmbH

Abstract
According to Newton, the changes in the gravitational field propagate instantaneously. If we examine the earth on its orbit around the sun and assume a light-fast effect of the gravitation, the following situation would occur: Through the sun, a force would not act directly on the earth's center of gravity, but on the point where the earth's center of gravity was 8 minutes ago, and through the earth, a force would not act directly on the sun's center of gravity, but on the point where the sun's center of gravity was 8 minutes ago. This time delay would cause the Sun-Earth distance to build up and the Earth to leave orbit. We would be dealing with unstable orbits of orbiting masses in space. However, this is not observed.

It is to be proved that the gravity with 1. the constant product of mass and time duration which passes on it, 2. the time dilation, and 3. the permanent enlargement of stable orbits can be described exactly by the Newton's basic law. Newton would continue to apply and describe gravity physically correct in accordance with observation. As a conclusion, there should be an instantaneous gravitational propagation.

Keywords: gravitation, gravitational propagation, instantaneous gravitation, time dilation

1. The constant product of mass and the time duration that passes on it [1.]
It is known that a moving mass m_b compared to its rest position m_0 is relativistically increased:

$$m_b = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \tag{01}$$

The frequencies of light emission on this moving mass must be increased to the same extent. This can be understood at the example of an emitting star as follows: The energy difference between two energy levels of electrons must be increased in the same degree as the relativistic energy of the mass. The light emission of the transition must now take place at a higher frequency. Because it is known $\Delta E = hf$:

$$f_b = \frac{f_0}{\sqrt{1-\frac{v^2}{c^2}}} \tag{02}$$

This approach is to be tested with time dilation. As is known:

$$f = \frac{1}{T} \tag{03}$$

Each time period t can be calculated from a certain number of n of periods T composed of:

$$t = nT \tag{04}$$

Equations (02), (03) and (04) are easily followed by equations (05) and (06):

$$T_b = T_0\sqrt{1-\frac{v^2}{c^2}} \qquad nT_b = nT_0\sqrt{1-\frac{v^2}{c^2}} \tag{05}$$

$$t_b = t_0\sqrt{1-\frac{v^2}{c^2}} \tag{06}$$

We see with equation (06) the known time dilation. However, this can be valid only if the velocity of the mass object is increased compared with its rest state or that of a comparison object. Then on this and only on this moved object the time passes more slowly. That means the time span t_b is reduced compared to the time span t_0 of the object at rest.

Equations (01) and (06) can be multiplied together:

$$m_b t_b = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} t_0 \sqrt{1-\frac{v^2}{c^2}} = m_0 t_0 \qquad (07)$$

This principle is universal, it is valid for every mass: If this becomes bigger, the time passes on it slower, respectively if it becomes smaller (e.g. by decay) the time passes on it faster. The product of mass and the time duration which passes on it remains constant. Equation (07) can be introduced into the calculation of the gravitational energy.

2. Gravity in harmony with time dilation

Gravitation for a two-mass system is to be investigated. For this purpose, the gravitational energy during the free fall of two masses from rest and a certain distance until the collision of their surfaces is used.

The gravitational energy released during the free fall of two spherical masses from rest to the contact of their surfaces can be calculated according to Newton as follows [2.].

$$E_{grav} = \int_{r_1+r_2}^{r} F_{grav} ds = -\int_{r_1+r_2}^{r} \gamma \frac{m_1 m_2}{s^2} ds = \gamma \frac{m_1 m_2}{s} |_{r_1+r_2}^{r} \qquad (08)$$

Thereby $r_1$und r_2 the mass radii and r their center distance. The integration limits are defined here from the center distance of both masses before the free fall to the contact of their surfaces.

As an attractive force, the gravitational force has a negative sign. With the definition of the value $r_b = r(r-h)/h$where r is the center distance and h is the surface distance, the gravitational work follows:

$$E_{grav} = \gamma m_1 m_2 \left(\frac{1}{r} - \frac{1}{r_1+r_2}\right) = -\gamma m_1 m_2 \frac{h}{r(r-h)} = -\gamma \frac{m_1 m_2}{r_b} \qquad (09)$$

As released energy, gravitational energy is also negative, because you have to spend positive energy to separate two masses from each other.

Here equation (07) $m_0 t_0 = m_b t_b$ is introduced:

From both sides of this equation we can now subtract the term $m_0 t_b$ can be subtracted:

$$m_0 t_0 - m_0 t_b = m_b t_b - m_0 t_b \qquad \text{or} \qquad -\Delta t\, m_0 = \Delta m t_b \qquad (10)$$

Consequently, for both masses it can be written:

$$\frac{\Delta m_1}{m_1} = -\frac{\Delta t_1}{t_{1b}} \qquad \frac{\Delta m_2}{m_2} = -\frac{\Delta t_2}{t_{2b}} \qquad (11)$$

The term Δt represents the time dilation and the term $\Delta t/t$ the specific time dilation, which here refers to the time span t_b in the moving state of the object.

The gravitational energy (potential energy) from the state of rest of both masses until the collision of the surfaces must be equal to the negative sum of the kinetic energies of both masses:

$$E_{grav} = -(E_{kin1} + E_{kin2}) = -\left(\frac{m_1 c^2}{\sqrt{1-\frac{{v_1}^2}{c^2}}} - m_1 c^2 + \frac{m_2 c^2}{\sqrt{1-\frac{{v_2}^2}{c^2}}} - m_2 c^2\right) \qquad (12)$$

$$E_{grav} = -[(m_{1b} - m_1)c^2 + (m_{2b} - m_2)c^2] \qquad (13)$$

For equation (13) can be written simply with (11):

$$E_{grav} = -\Delta m_1 c^2 - \Delta m_2 c^2 = \frac{\Delta t_1}{t_{1b}} m_1\, c^2 + \frac{\Delta t_2}{t_{2b}} m_2\, c^2 \tag{14}$$

What form must time dilation have so that equation (14) leads to equation (09)? For this, the time dilation must have the following form:

$$\frac{\Delta t_1}{t_{1b}} = -\frac{\gamma\, m_2{}^2}{c^2\, r_b\,(m_1+m_2)} \qquad \frac{\Delta t_2}{t_{2b}} = -\frac{\gamma\, m_1{}^2}{c^2\, r_b\,(m_1+m_2)} \tag{15}$$

The term $\Delta t_1/t_{1b}$ represents the specific time dilation on the first mass due to the second, the term $\Delta t_2/t_{2b}$ represents the specific time dilation of the second mass conditioned by the first. For the time dilations according to equations (15) it could be proved that they give better results than the time dilations of the relativity theories [3.] for all important performed experiments.

Equation (15) is to be compared with the velocity-induced time dilation on the mass m_2: $\Delta t_2 = t_{2b} - t_{20} = t_{20}\sqrt{1-\frac{v_2{}^2}{c^2}} - t_{20} = t_{2b} - \frac{t_{2b}}{\sqrt{1-\frac{v_2{}^2}{c^2}}} = t_{2b}\left(1 - \frac{1}{\sqrt{1-\frac{v_2{}^2}{c^2}}}\right)$ (15a)

$$\frac{\Delta t_2}{t_{2b}} = 1 - \frac{1}{\sqrt{1-\frac{v_2{}^2}{c^2}}} \tag{15b}$$

If equation (15) is correct, equating (15) and (15b) must lead to the correct velocity v_2 of the mass m_2 when both masses fall on each other from rest with center distance r and their surfaces touch. Equation (15) can also only be correct if both the conservation of energy and the conservation of momentum hold.

$$\frac{\Delta t_2}{t_{2b}} = -\frac{\gamma\, m_1{}^2}{c^2\, r_b\,(m_1+m_2)} = 1 - \frac{1}{\sqrt{1-\frac{v_2{}^2}{c^2}}} \tag{15c}$$

The conversion to v_2 leads to the following expression:

$$v_2 = c\sqrt{1 - \frac{1}{\left[1+\frac{\gamma\, m_1{}^2}{c^2\, r_b\,(m_1+m_2)}\right]^2}} \tag{15d}$$

Let us now have a look at the conservation of energy and the conservation of momentum. For two-mass systems, which fall on each other from rest with a certain distance, equation (12) is valid on the one hand and on the other hand the following equation of the conservation of momentum:

$$m_1 v_1 + m_2 v_2 = 0 \tag{15e}$$

In order to make the calculation mathematically manageable, the conservation of energy according to equation (12) is converted into the following form by means of known Taylor series expansion:

$$E_{grav} = -\gamma\frac{m_1\, m_2}{r_b} = -\left(\frac{m_1 c^2}{\sqrt{1-\frac{v_1{}^2}{c^2}}} - m_1 c^2 + \frac{m_2 c^2}{\sqrt{1-\frac{v_2{}^2}{c^2}}} - m_2 c^2\right) = -\frac{m_1}{2} v_1{}^2 - \frac{m_2}{2} v_2{}^2 \tag{15f}$$

From (15e) and (15f) follow directly the velocities which both masses have at the collision: $v_1 = \sqrt{\frac{2\gamma\, m_2{}^2}{\frac{m_1}{m_2}+1}\frac{1}{r_b}}$ $\quad v_2 = \sqrt{\frac{2\gamma\, m_1{}^2}{\frac{m_2}{m_1}+1}\frac{1}{r_b}}$ (15g)

With the already mentioned Taylor series expansion can be written:

$$\frac{{v_2}^2}{2} = \left(\frac{1}{\sqrt{1-\frac{{v_2}^2}{c^2}}} - 1\right) c^2 \qquad \text{oder} \qquad 2 = \frac{{v_2}^2}{c^2} \frac{1}{\frac{1}{\sqrt{1-\frac{{v_2}^2}{c^2}}}-1} \tag{15h}$$

If now the value 2 from (15h) is inserted into (15g), it follows after some conversion:

$$v_2 = c\sqrt{1 - \frac{1}{\left[1+\frac{\gamma\, {m_1}^2}{c^2\, r_b\,(m_1+m_2)}\right]^2}} \tag{15i}$$

This is exactly the velocity derived above according to equation (15d). Of course, the procedure can be applied in the same way for the velocity of the mass m_1. Thus it is proved that for the velocity calculation according to equation (15d) not only the conservation of energy but also the conservation of momentum according to (15e) is valid.

Equation (15c) shows the equality of gravitational time dilation of mass m_2 at rest with its distance to m_1 and its velocity-dependent time dilation at collision. It can be concluded that in the rest state a purely gravitational time dilation is valid, which gradually changes into an increasingly velocity-dependent time dilation after the acceleration of the masses. At the collision, the velocity-dependent time dilation corresponds to the gravitation-dependent time dilation in the state of rest before the acceleration.

To prove the validity of equations (15), substitute them into (14):

$$E_{grav} = \frac{\Delta t_1}{t_{1b}} m_1\, c^2 + \frac{\Delta t_2}{t_{2b}} m_2\, c^2 = -\frac{\gamma\, {m_2}^2}{c^2\, r_b\,(m_1+m_2)} m_1\, c^2 - \frac{\gamma\, {m_1}^2}{c^2\, r_b\,(m_1+m_2)} m_2\, c^2 \tag{16}$$

The specific factoring out quickly leads to the result according to Newton's equation (09):

$$E_{grav} = -\frac{\gamma\, m_1\, m_2}{r_b\,(m_1+m_2)}(m_1+m_2) = -\gamma\frac{m_1 m_2}{r_b} \tag{17}$$

3. Gravity in harmony with the permanent enlargement of stable orbits

Let us take the orbit of the moon m_2 and earth m_1 around their common center of gravity. Here the equality of the amounts of gravitational and centripetal forces is valid:

$$\gamma\frac{m_1 m_2}{r^2} = \frac{m_1 {v_1}^2}{r} + \frac{m_2 {v_2}^2}{r} \tag{18}$$

The velocities remain constant. For the other physical quantities from (18) and all period lengths T the following temporal developments apply [4.]:

$$m_{1/2} = \frac{m_{1/2\,0}}{1+\frac{\Delta t}{t_{uni}}} \qquad r = r_0\left(1+\frac{\Delta t}{t_{uni}}\right) \quad \gamma = \gamma_0\left(1+\frac{\Delta t}{t_{uni}}\right)^2 \qquad T = T_0\left(1+\frac{\Delta t}{t_{uni}}\right) \tag{19}$$

Thereby Δt is the time span in which the physical quantity changes (e.g. the mass) and t_{uni} is the age of the universe. The amounts of gravitational force F_{grav} and centripetal forces must therefore evolve in time according to equation (20):

$$|F_{grav}| = \frac{|F_{grav\,0}|}{\left(1+\frac{\Delta t}{t_{uni}}\right)^2} \qquad F_{z\,1/2} = \frac{F_{z\,1/2\,0}}{\left(1+\frac{\Delta t}{t_{uni}}\right)^2} \tag{20}$$

The amount of gravitational energy must fall proportionally to the mass:

$$|E_{grav}| = \frac{|E_{grav\,0}|}{1+\frac{\Delta t}{t_{uni}}} \tag{21}$$

All these developments are caused by the mass and structure decay with simultaneous time formation [5.]. The universe can expand without dark energy with all masses without contradiction, in that all objects and space distances become larger, all masses become smaller and the amount of the total gravitational energy also becomes smaller. However, because it becomes larger (less negative), this can happen in accordance with the conservation of energy, because the sum of mass energy and gravitational energy remains constant [6.].

$$E_{mass} + E_{grav} = m_{uni}c^2 - \frac{\gamma {m_{uni}}^2}{r_{uni}} = 0 = const. \qquad (22)$$

So, all orbits of celestial bodies become larger with the time and the instantaneous gravitation affects all other masses without time delay. Taking the orbit of the earth around the sun as an example, the gravitational force of the sun acts instantaneously on the center of gravity of the earth and vice versa. Therefore, the orbit remains stable even though it increases slightly over time. According to (20), the gravitational force and the centripetal forces become smaller to the same extent. The orbital velocity of the earth remains constant.

Is it possible to prove the increase of distance? This is possible, and I have already done it in [7.] at the example of the system Earth-Moon:

The energy released by the tides is taken from the rotational motion of the earth and thereby the angular momentum of the earth's rotation is L_1 around its own axis with period T_1 the orbital angular momentum of the moon L_2 with the period T supplied. Thereby the day is to be extended by $16.5\ \mu s/a$ and the distance earth-moon shall increase correspondingly by $\Delta r = 3.8\ cm/a$ increase.

The total angular momentum of the system Earth-Moon must be preserved. The angular momentum of the moon's rotation around its own axis, which is bound to the moon's orbit, is comparatively small and can be neglected in this consideration. The total angular momentum at the current time (index a) must correspond to that after one year (index b):

$$L_1 + L_2 = const. \qquad L_{1a} + L_{2a} = L_{1b} + L_{2b} \qquad (23)$$

For the calculation of the earth angular momentum the earth is considered as an isotropic sphere with the radius r_1 is considered. In order to consider the different mass distribution in shell and core in the moment of inertia, a reduced mass $m_{1red} = 0.83\, m_1$ is taken as a basis [8.]. Equation (23) leads with the applied parameters to the following expression:

$$\frac{2}{5} m_{1a\,red}\, {r_{1a}}^2 \frac{2\pi}{T_{1a}} + m_{2a} v_2 r_a = \frac{2}{5} m_{1b\,red}\, {r_{1b}}^2 \frac{2\pi}{T_{1b}} + m_{2b} v_2 r_b \qquad (24)$$

The orbital velocity of the moon $v_2 = \frac{2\pi\, r}{T} \frac{m_1}{m_1 + m_2}$ remains constant. In order to determine the annual distance increase between moon and earth caused by the variable quantities according to (19), equation (24) is converted to r_b and the difference to r_a is formed:

$$\Delta r = r_b - r_a = \frac{\frac{2}{5} m_{1a\,red}\, {r_{1a}}^2 \frac{2\pi}{T_{1a}} + m_{2a} v_2 r_a - \frac{2}{5} m_{1b\,red}\, {r_{1b}}^2 \frac{2\pi}{T_{1b}}}{m_{2b} v_2} - r_a = 2.8\ cm/a \qquad (25)$$

Another method to determine the annual distance increase is the simple calculation according to (19), which refers only to the time-varying distance:

$$\Delta r = r_b - r_a = r_a \left(1 + \frac{\Delta t}{t_{uni}}\right) - r_a = 2.8\ cm/a \qquad (26)$$

The agreement between (25) and (26) is very good, so equation (25) is subsequently used to determine the fraction of distance increase due to tidal friction.

For this purpose, the lengthening of the day is determined as the growth of the rotation period of the earth. $\Delta T_1 = T_{1b} - T_{1a}$ which would occur after one year without tidal friction:

$$\Delta T_1 = T_{1b} - T_{1a} = \mathrm{T}_{1a}\left(1 + \frac{\Delta t}{t_{uni\,a}}\right) - \mathrm{T}_{1a} = \mathrm{T}_{1a}\frac{\Delta t}{t_{uni\,a}} = 6.3\ 10^{-6}\ s/a \qquad (27)$$

The observed annual lengthening of a day, however, is $16.5\ \mu s$ [9.]. That means the part of the tidal friction, which slows down the earth and which increases the distance earth-moon, amounts to $\Delta T_1 = 16.5\ \mu s - 6.3\ \mu s = 10.2\ \mu s$ ($T_{1b} = T_{1a} + 10.2\ \mu s$). If now equation (25) is used in such a way that the masses m_1, m_2, the earth radius r_1 and the orbital period of the moon T_2 around the earth remain constant, one gets the pure tidal influence on the distance increase. It amounts to:

$$\Delta r = r_b - r_a = \frac{\frac{2}{5}m_{1\,red}\,{r_1}^2\frac{2\pi}{T_{1a}} + m_{2a}v_2r_a - \frac{2}{5}m_{1\,red}\,{r_1}^2\frac{2\pi}{T_{1b}}}{m_{2a}v_2} - r_a = 0.9\ cm/a \qquad (28)$$

Consequently, the influence of tidal friction is much smaller than assumed today. The calculated total growth of the Earth-Moon distance from equations (26) and (28) is: $\Delta r = (2.8 + 0.9)\frac{cm}{a} = \mathbf{3.7\ cm/a}$. This value is very close to the measured value of $\mathbf{3.8\ cm/a}$ and is plausible.

4. The imaginary time and the imaginary speed of light

Newton has described the physical effect of gravitation correctly. Only the cause of gravitation, which also allows a direct explanation of its instantaneous effect, was given neither by Newton nor by Einstein.

The imaginary time span t_i occurs in the imaginary time as fifth space-time dimension and universal reference system [10.]. It can be represented also with the help of the time span t_b, which is reduced by gravitational effect or a high object velocity. Thereby holds:

$$t_b = t_0\sqrt{1 - \frac{\mathrm{v}^2}{c^2}} \qquad \text{and for} \qquad t_i = t_0\sqrt{\frac{\mathrm{v}^2}{c^2} - 1} = it_0\sqrt{1 - \frac{\mathrm{v}^2}{c^2}} = it_b \qquad (29)$$

From this it follows directly for the square of the imaginary time span:

$$t_i{}^2 = i^2 t_b{}^2 = -t_b{}^2 \qquad (30)$$

Gravity, whose interaction particles are special imaginary photons, which are in the imaginary time, can unfold its effect on the objects in space and time according to equation (30) over this temporal dimension. A quantum physical derivation is shown in source [11.]. The effect of gravitation is not bound to the speed of light and can therefore be instantaneous. For the imaginary speed of light the following relation is valid.

$$c_i{}^2 = i^2 c^2 = -c^2 \qquad (31)$$

Summary and conclusions

"In Newton's theory of gravity, the strength of the gravitational attraction exerted by one body on another is determined solely by the mass of the bodies involved and their distance. Completely irrelevant to the strength of the force is how long the objects are in each other's presence. That is, if their mass or distance changes, then according to Newton they must experience an instantaneous change in their mass attraction. For example, if the Sun suddenly explodes, then the Earth, some 150 million kilometers away, would have to experience an instantaneous deviation from its usual elliptical orbit, according to Newton's theory of gravity. Although the light of the explosion needs eight minutes for the distance from the sun to the earth, according to Newton's theory the knowledge of the explosion of the sun would be transferred immediately to the earth by the sudden change of the gravitational force responsible for the earth's motion. This conclusion is in direct conflict with the special theory of relativity, which claims that no information can be transmitted faster than the speed of light, and that instantaneous transmission is a decisive violation of this condition." [12.].

In this publication the instantaneous effect of Newton's gravity could be proved with inclusion of the constant product of mass and time duration as well as the time dilation. This means that the Newtonian gravitation theory is still valid and both the special and the general relativity theory of Einstein are wrong.

References

1. Gimsa, A., The correct derivation of the realtivistic Doppler effect, International Journal of Scientific Research and Management, Volume 10, Issue 06, Pages AA-2022-103-106, June 2022, DOI: 10.18535/ijsrm/v10i6.aa01
2. Gimsa, A., The proof of mass decay, International Journal of Scientific Research and Management, Volume 09, Issue 02, Pages AA-2021-49-56, February 2021, DOI: 10.18535/ ijsrm/v9i2.aa01
3. Gimsa, A., Dual mass systems under the influence of gravitation, pages 18-21, published by the author, Potsdam, Germany, 2017, ISBN 978-3-00-057218-0
4. Gimsa, A., The metric of space-time, 2nd edition, pages 32-43, published by the author, Michendorf, Germany, ISBN 978-3-00-064784-0
5. Gimsa, A., The direction of time, International Journal of Scientific Research and Management, Volume 08, Issue 10, Pages AA-2020-32-35, Oktober 2020, DOI: 10.18535/ ijsrm/v8i10.aa01
6. Gimsa, A., Symmetries in the mathematical and physical desription of nature, International Journal of Scientific Research and Management, Volume 08, Issue 11, Pages AA-2020-36-48, November 2020, DOI: 10.18535/ ijsrm/v8i11.aa01
7. Gimsa, A., Development oft he distance Earth-Moon, International Journal of Scientific Research and Management, Volume 08, Issue 03, Pages AA-2020-10-13, March 2020, DOI: 10.18535/ ijsrm/v8i03.aa01
8. Parameters of Earth Rotation and Global Dynamical Systems, Federal Agency for Cartography and Geodesy, Frankfurt am Main, Germany, 2020
9. Greiner W., Theoretical Physics, Classical Mechanics I, p. 280, Scientific publisher Harri Deutsch GmbH, Frankfurt am Main, 2008
10. Gimsa A., The imaginary present - the universal frame of reference, published by the author, Michendorf, Germany, ISBN 978-3-00-058828-0
11. Gimsa A., The metric of space-time, 2nd edition, pages 46-55, published by the author, Michendorf, Germany, ISBN 978-3-00-064784-0
12. Greene, B., Das elegante Universum, p. 75, Siedler Verlag Berlin, 2020, ISBN 3-88680-699-5