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MASS, GRAVITATION, AND DARK MATTER

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The Summary

In the context of the Newtonian laws of gravitation and mechanics, the mass of a body of astronomical dimensions cannot indicate the amount of matter contained by this body. In the context of these laws, the mass of a body represents its effective area that is an integral area of projections on a plane, perpendicular to the direction of action of the agents of action (e.g. gravitons), of the body's atomic nuclei surfaces facing the agents of action and unshadowed by other nuclei. Physical and astronomical bodies interact with gravitons and particles of the fluid ether with the same surfaces of the same effective areas. Just by this reason, one can explain the equivalence of gravitational and inertial masses. Every physical or astronomical body has its own gravitational capacity, which physical meaning consists in that continuously and in all directions, it emits a flow of gravitons of an integral strength evenly distributed over all these directions. The gravitational capacity of a body determines itself as its relevant constant of Kepler, which by its physical meaning stands for the strength of the full flow of gravitons generated by this body, distributed over the full solid angle of 4π with the vertex in the center of the body. The formula of the universal gravitation law $F = \frac{Gm_1m_2}{R^2}$ is quite correct, if therein F signifies the gravitational force exerted by body 1 with effective area of $m_1$on body 2 with effective area ofm_2, and the gravitational constant G - that of the body 1, which gravitational constant means a graviton emitting efficiency of a unit of the effective area m_1. The dark matter is real though unaccounted one for two reasons. Firstly, calculations based on the law of universal gravitation may be erroneous due to a deceptive use therein of the so-called universal gravitational constant, true only for terrestrial conditions. Ten and hundred-fold greater gravitational constants are inherent to the Sun and surely to other stars. Secondly, the universal gravitation law takes into account only that mass of astronomical objects which is contained in their superficial graviton emissive and graviton receptive layers. As concerns internal layers of astronomical bodies, the law of universal gravitation does not take into account the matter contained therein.

Introduction

Nowadays explications of gravitational effects base themselves on the Newtonian law of universal gravitation somewhat modernized by the general theory of relativity of Albert Einstein. Through the last centuries, the law of universal gravitation became the pivot of our understanding of gravitation, although some facts repeatedly incite us to think about its theoretical foundations missing from the very beginning and still missing today. Similarly, theoretical foundations are missing for the Third law of Kepler, empirically derived from data on motions of the solar system planets, particularly Mars.

The shortcomings of the law of universal gravitation, which determines it as fully dependent on masses of cooperating objects, are incomplete definiteness of the concept of mass and inexplicable equivalency of gravitational and inertial masses.

The law of universal gravitation does not fit in with the standard model asserting that every force in nature is carried from one body to another by special carrier particles called bosons. In the case of gravitation, the relevant carrier particle was called graviton, in spite of modern explorers have not yet registered any of them.

Recently immerged information about the existence in the cosmos of the so-called “dark matter” evoke additional doubts as to correctness of the modern views on gravitation. Astronomers and physicists assert today that everything we could observe in the Universe – planets, stars, galaxies – accounts for only 4% of all the matter it contains. The rest according to the official site of CERN is made up of invisible substances: the so-called “dark matter” (26%) and “dark energy” (70%). These substances do not emit electromagnetic radiation and this means that we cannot notice them directly by means of telescopes or other similar instruments. We become aware of them only through their gravitational effects, which substantially complicates the studies.

The first report about the dark matter existence came in 1933 when astronomical observations and calculations of gravitational effects made it clear that the Universe must contain more matter than that perceivable through telescopes. Scientists now believe that the dark matter gravitational effect enforces galaxies to turn around faster than expected and that its gravitational field deflects the light of objects situated behind it. Measurements of these effects show that the dark matter exists, and that these measurements can be useful to estimate the dark matter density, even though we cannot observe it directly.

In her article published in 1998 in *Scientific American presents* [1] astronomer Vera Rubin who for the first time had drawn attention to the existence of the dark matter, analyses contemporary views on its nature. “On the one hand, - she writes,- it could merely be ordinary material, such as ultra faint stars, large or small black holes, cold gas, or dust scattered around the universe—all of which emit or reflect too little radiation for our instruments to detect. It could even be a category of dark objects called MACHOs (MAssive Compact Halo Objects) that lurk invisibly in the halos surrounding galaxies and galactic clusters. On the other hand, dark matter could consist of exotic, unfamiliar particles that we have not figured out how to observe. Physicists theorize about the existence of these particles, although experiments have not yet confirmed their presence. **A third possibility is that our understanding of gravity needs a major revision**—but most physicists do not consider that option seriously.”

In 1981, Mordehai Milgrom from Veizman institute in Israel proposed one such revision explaining results that had incited the hypothesis of existence of the dark matter. The explanations proposed by Milgrom are based on that the cause of the registered by astrophysicists discrepancies in orbiting of galaxies is an incorrectness of the second law of Newton in the case of law speeds. The elaborated by him “Modified Newtonian dynamics” or MOND explains the said discrepancies purely mathematically without basing on any theoretical principles.

Here I propose another revision, which is principally different in that it contests the meaning of mass as of amount of matter, especially as concerns astronomical objects, particularly galaxies.

Graviton mechanism of gravitation and physical meaning of mass

One reason for the said absence of data about the existence of gravitons may consist in that they exist in an unusual for modern investigators form, for instance in form of specific waves or in that of vortexes studied as far back as since Kepler and Decartes. These vortexes could keep their form in fluid media with zero hydraulic resistance, and one of such media may be that ether by the existence of which scientists not long ago explained the nature of many physical phenomena, particularly the propagation of light. There exist arguments proving that the same bosons may play role of gravitons and long ago proclaimed by science photons.

Keeping this question aside, I nevertheless do not see any reason, which would hinder to use the principle of transferring gravitational action with help of bosons of this or any other kind.

Based on this principle, let us imagine that if a celestial body, e.g. the Sun, gravitationally acts on other bodies, e.g. planets, the action occurs thanks to that continuously and evenly in all the directions it emits a flow of gravitons of an integral strength Γ_S, and that any other body placed on the way of this flow of gravitons under the action of those, which collide with it, attracts itself to the emitting body. The value of the gravitational action of the Sun on a planet will be for sure dependent on which part of the full strength Γ_S transported by the flow of gravitons emitted by the Sun will fall on its surface. This can be expressed by

$$F = \Gamma_S \frac{s_P}{4\pi R^2} \qquad (1).$$

Here s_P stands for the effective area of the planetary surface facing the Sun that approximately equals the area of diametric section of the planet, and $4\pi R^2$ - for the area of a spherical surface of radius R equal to the distance between the planet and the Sun. Concerning the area s_P, we need to make some clarifications with regard to that the matter of terrestrial and astronomical bodies is not solid but composed with atoms, in which only a negligible part of space is filled with matter in form of atomic nuclei that alone can absorb the action of gravitons. For this reason, the area s_P has to be considered as an integral area of all surfaces of all atomic nuclei of the planet facing the flow of gravitons and unshadowed by other nuclei. It would be appropriate to mean this area as effective area of the planet and those nuclei surfaces that make it up as effective surfaces of these nuclei.

With reserve that here and further on, for more simplicity, I shall examine planetary motions as effective only by circular orbits, it would be appropriate to note that the force (1) balances itself with acting on the planet centrifugal force that equals

$$F = mR\omega^2 \qquad (2),$$ where

m is mass of the planet (inertial that according to numerous experiments equals gravitational), and ω is its angular velocity of revolving around the Sun.

Equaling (1) and (2), we obtain

$$\frac{m}{s} = \frac{\Gamma_S}{4\pi R^3 \omega^2} \qquad (3).$$

Given that $R^3\omega^2$ is Kepler constant for the solar system that we will further on mark as K_S, constant has to be all the right part of the equation (3), as well as the ratio $\frac{m}{s}$. The last signifies that **the relation between mass of a planet and an area closest to its area of diametric section is equal for all planets of the solar system.**

Having no explications to this at the first sight incomprehensive fact, I presume that

1) Physical concept of mass that for many centuries have been serving scientists to explain numerous physical phenomena and which physical meaning still remains unexplained is for an astronomical body, particularly a planet, nothing else as an area (let us call it effective area), close by its value to the area of its diametric section;
2) Effective area of a physical or astronomical body is the integral area of projections on a plane perpendicular to the direction of action of active agents (e.g. gravitons) of the body's atomic nuclei surfaces facing the active agents and unshadowed by the other nuclei;
3) If a planet revolves around the Sun, its gravitational and inertial masses associate themselves with the same effective area equal or very close to the area of its diametric section;
4) Given the gravitational and inertial masses of a body usually are the same effective area of the body, there is no reason to have any doubt as to their equivalency.

For better understanding of the proposed presumptions, let us examine the following example.

In objects of our everyday life, the most of the nuclei are open to the action of gravitons or other active agents, whereas only a negligible minority of them can be shadowed by other nuclei. In literature [3] there is examined a problem of how many carbon nuclei is it possible to notice in a small cube of carbon with edge of 1 cm, with an imaginary super microscope. It happens that independently of the point of view, because of scantiness of their dimensions, we will always notice a dotted image formed with all 10^{24} atomic nuclei contained in the small cube. Virtually developing the problem, we will progressively amass one cub upon another. Looking from above on the stockpile of amassed cubes, we will every time persuade ourselves that the numbers of nuclei images will be 2, 3 and more multiples of the number of nuclei images, previously noticed while contemplating only one cube. This will confirm the obtained from school manuals views that the weight of an object and consequently its mass is always proportional to the amount of matter contained therein.

However, continuing to amass one cub on another, we will come to a situation when numbers of nuclei images will end to be multiples of the number of those registered firstly. Numbers of images will be inferior to the real number of nuclei because some them will shadow the other, and later on, we will obtain such an uninterrupted image of the cube, in which there will be difficult to notice any of its components.

If now to abandon the cubes and overcome to the solar system planets, every of them if contemplated through the above-mentioned super microscope would represent itself as an integral disk with a front surface area practically equal to the area of its diametric section. It is clear, that it would be possible to observe the same image, if even instead of the planet we contemplated through the same super microscope a real disk of a sufficient thickness. In order to achieve such apparent integrity, this real disk would not however need the same thickness as the planet itself. How thick would have to be this disk, there would be possible to determine based on geometric dimensions of atomic nuclei, which however goes beyond the frames of the proposed study. Even so, we can assert that this thickness, which we can name as graviton receptive thickness is considerably thinner than respective dimensions of the real planet. Figure 1 presented here to illustrate the expressed ideas, contains a planet 1, opposed to the Sun by its graviton-assuming layer 2 that may contain only a subtle part of the matter contained in the planet itself. Beside the planet there is represented a disk 3 of a graviton-receptive thickness, making its equivalent for the purpose of calculation.

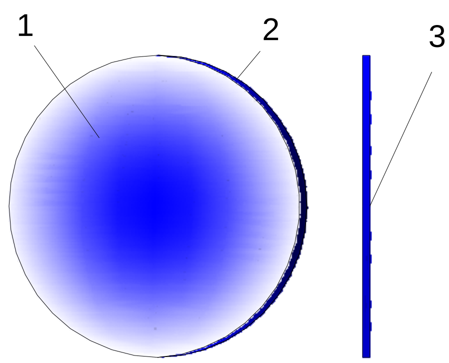

Fig.1

The difference between the amount of matter contained in a real planet and that contained in a disk of equal diameter and graviton-receptive thickness may represent at least a part of that dark matter for which are hunting modern explorers.

If the role of effective area as gravitational mass has to become clear from the exposed above, its role as inertial mass would need a clarification, as even the word "inertia" introduced by Newton in our everyday use and understood intuitively as resistance to acceleration. If to believe that the interatomic space as well as the space overall is void, it would be hard to understand the cause of this resistance and why it is so different for bodies of different mass. A proper clarification to these problems would be possible to find, if to imagine that the interatomic space as well as the space overall is filled with a fluid substance or rather ether similar to that fluid ether, which the existence did not give rise to doubt to scientists of the past beginning from Le Sage and René Descartes.

This fluid ether must lack any viscosity, and consequently have no resistance to regular movements of bodies. On the contrary, every acceleration provokes in it a resistance proportional to the amount of this acceleration and the effective area of the accelerated body, the amount of particles of the ether itself which in this case play role of active agents, being in relation to the amount of this area.

Regular movement of a ship needs only insignificant energy expenses comparatively with those for speeding-up and slowing-down, and the main reason here does not lie in the inertia of the ship itself, but in that resistance that the co-acting masses of water offer to their acceleration.

Constant of Kepler as criterion of gravitation

The expressed considerations lead to the idea that the ratio $\frac{m}{s}$, entering the equation (3) given the numerator and denominator are in the same system of units (either kg, or m^2) has to equal one. The last makes it possible to derive the Third law of Kepler in form

$$K_S = R^3\omega^2 = \frac{\Gamma_S}{4\pi} \qquad (4),$$

that allows to understand the physical meaning of the Kepler constant K_S as of that part of the strength Γ_S, which fits a unitary part of the solid angle 4π with vertex in the center of the Sun. It is clear that this part has to be constant and characterize the gravitation capacity of the Sun in the same way as the Kepler constants for other astronomical and physical bodies characterize gravitational capacities of them.

It is proper to note that constant of Kepler is not an exclusive attribute of astronomical bodies. Kepler constants of their own have all physical bodies, and particularly those used in experiments of Cavendish and his followers.

Internal layers of astronomical bodies and their contribution to gravitation

Similarly to the equivalency of planetary masses to their effective areas, in the context of its co-action with the planets, as mass of the Sun there ought to consider its area of diametric section that also cannot serve as indicator of the amount of matter contained therein. Similarly to the already stated views on planetary graviton receptive layers of graviton receptive thickness, the Sun can be also considered as a sphere only external layer of which can emit to cosmos those gravitons that can act onto other cosmic bodies, particularly planets, which layer has a graviton emissive thickness.

Gravitons emitted in the internal layers of the solar sphere shade and absorb themselves in the said external graviton emissive layer, which may help to understand that the gravitation of the Sun is never influenced by the matter contained in these internal layers.

It comes to mind that the same external layers of the Sun and solar system planets execute both the graviton emissive and graviton receptive functions while the internal layers of these astronomical bodies play no role in gravitational processes.

In spite of that according to modern views the Sun is 69.5% composed with hydrogen, 28% with helium, and only the rest 2.5% with carbon, nitrogen, oxygen, sulfur, silicon, and iron, the long ago collected data on presence in the solar spectrum of lines characteristic to most chemical elements could help make a better idea on the approximate amount of the solar matter.

Similar doubts inevitably arise concerning the existing views on internal layers of planets, especially great planets and their satellites, the Earth, the Moon, and certainly stars.

About the correctness of the Law of universal gravity

According to the Newtonian law of universal gravity the force applied by the Sun for instance to the Earth is determined by the formula

$$F = G\frac{M_S M_T}{R^2} \qquad (5), \text{ where}$$

G is the so-called universal gravitational constant, R – distance between the Sun and the Earth, and M_S and M_T - their respective masses.

According to the formula (1), the same force determines itself as$F = \Gamma_S\frac{s_T}{4\pi R^2}$, where s_T is effective area of the Earth that according to the previous presumptions stands for its mass in m^2. If to assume that the both formulations are equivalent and if the mass of the Earth and its effective area to measure in the same units, for instance in m^2, we would obtain$G\frac{M_S M_T}{R^2} = \Gamma_S\frac{s_T}{4\pi R^2}$, that after reduction will give

$$GM_S = \frac{\Gamma_S}{4\pi} \qquad (6).$$

The equation (6) and previously obtained equation (4) enable us to find out yet another formulation of the Third law of Kepler:

$$K_S = GM_S \qquad (7).$$

The constant of Kepler for the solar planetary system calculated based on the orbital parameters of the Earth equals $1.327 \cdot 10^{20}$ m^{3}s^{-2}. As to the universal gravitational constant, its magnitude according to tabular data makes $6.670 \cdot 10^{-11}$Nm^{2}kg^{-2} (m^{3}kg^{-1}s^{-2}). This allows with use of the equation (7) to calculate a value that according to the universal law of gravitation stands for the mass of the Sun: M_S =1.99$\cdot$ 10^{30}кг. The obtained value coincides with the literature data, which testifies to the correctness of the obtained formulation but in no way can testify that it indeed means the amount of the solar matter.

The above found formulations of the constant of Kepler can be useful for comparing results following from the Law of universal gravitation and the proposed formula (1), for instance as concerns the gravitational force applied by the Sun on the Earth. **From the Law of universal gravitation it follows:**

$$F = GM_S\frac{M_T}{R^2} = K_S\frac{M_T}{R^2} \qquad (8).$$

If to place the constant of Kepler into the equation (8) in form of the product $R^3\omega^2$ with R and ω proper to the orbit of the Earth, it will take form of the acting on the Earth centrifugal force$F = M_T R\omega^2$.

From the formula (1), it also follows:

$$F = \Gamma_S \frac{s_T}{4\pi R^2} = K_S \frac{s_T}{R^2} \quad (9),$$

and if to keep in mind that the tabular value of the Earth's mass corresponds to its effective area in m^2 and the last is very close to its area of diametric section, we could for this case make the conclusion about the equivalence of the formula (1) to the Law of universal gravitation.

It would be necessary to note that such equivalence must need the stipulated by the equation (7) coordination between the mass of the Sun and the gravitational constant, which has been achieved by attributing to mass of the Sun such needed for this coordination but a dubious value.

The weight of a physical body of mass m on the surface of the Earth having the constant of Kepler K_T that can be determined based on orbital parameters of the Moon is established as $F = mg$, from which in view of the equation (9) one can conclude:

$$F = mg = K_T \frac{m}{R_T^2} \quad (10), \text{ and}$$

$$g = \frac{K_T}{R_T^2} \quad (11).$$

This means that **the constant of Kepler for the system Earth-Moon if divided by the square of the Earth's radius has to equal the acceleration of the Earth's gravity on its surface.**

It also means that **the value g, which we are accustomed to consider just as the acceleration of the Earth's gravity equals in addition that pressure that the Earth's gravitation exerts on a unity (that is on a m^2) of the effective area of a body.**

Similarly, the acceleration of solar gravity on the surface of the Sun will make

$$g_S = \frac{K_S}{R_S^2}.$$

From the formula (7), it follows that the so-called universal gravitational constant has to equal $G = \frac{K_S}{M_S}$. Given that according to the previous conclusions$M_S = s_S = \pi R_S^2$,

$$G = \frac{K_S}{\pi R_S^2} = \frac{g_S}{\pi} \quad (12).$$

The last casts doubts that the obtained value can be the **universal constant$G$.** It rather witnesses to be the gravitational constant for the Sun, as well as other astronomical bodies to have their own gravitational constants dependent on parameters of their own.

Moreover, the obtained equation reveals **the physical meaning of a gravitational constant as of the relevant constant of Kepler distributed on the effective area of the graviton emitting body, which also can be understood that it is an indicator of graviton emissive effectiveness of a unity of this area.**

Based on parameters of orbital movement of natural satellites of the Sun and planets of the solar system, there were calculated the relevant constants of Kepler and the proper to these systems gravitational constants (see the Table). Contrary to the established views, the constants differ one from other, which witnesses that the universal gravitational constant does not exist. This also leads to doubts whether the found in earthy conditions by means of numerous experiments so-called universal gravitational constant can equal the gravitational constant of the planet Earth.

On the other hand, the found data can be of use for examining still unknown relations between gravitation and for instance the temperature of external graviton emitting layers of celestial bodies, the existence of which may be noticeable from the visible difference between gravitational constants of the Sun and the solar system planets.

From the revealed above one can make the conclusion that **the formula of the Law of universal gravitation $F = \frac{Gm_1m_2}{R^2}$ may be quite correct if therein to mean under F the force of gravitation exerted by body 1 with effective area m_1 on body 2 with effective area m_2 , and under G - the gravitational constant or indicator of graviton emitting effectiveness of a unity of the effective area m_1.**

From here besides it follows that **the force exerted by body 2 on body 1 quite not necessarily equals the said force F and for the most of cases, they differ**. Here one could notice an infringement of the Third Newtonian law declaring the equality of action and counteraction, if not to take into account that gravitation by its basic nature is not a mutual action of two or more bodies. Gravitational actions are independent and in no way personalized, if only one could mean under persons celestial or other bodies.

Gravitational actions between terrestrial objects. Experiment of Cavendish

It would be interesting to trace the link between the Fourth law of Newton and the relations declared by the formula (1) for conditions of the experiment of Cavendish. The said experiment [4] consisted in measuring an attractive force acting between two lead spheres of masses $m_1$and m_2, separated by distance R, and calculating the gravitational constant G, using a formula analogues to the formula (5). The said conditions were particular in that in contrast to the conditions of application of the formula (5) the experiment was made on the surface of the Earth with spheres of the same material and under the same temperature. According to the Fourth law, the attractive forces acting between the two spheres had to be the same and equal

$$F = \frac{Gm_1m_2}{R^2} \quad (13),$$

while in accordance to the formula (1) the attractive forces applied by the firsts and by the second spheres had to make

$$F_1 = \frac{\Gamma_1 s_2}{4\pi R^2} \quad (14), \text{ and}$$

$$F_2 = \frac{\Gamma_2 s_1}{4\pi R^2} \quad (15).$$

Given the existing analogies to the relation (6), the masses m_1 and m_2 could be represented as $m_1 = \frac{\Gamma_1}{G4\pi}$ and$m_2 = \frac{\Gamma_2}{G4\pi}$. If the areas of the equations (14) and (15) to associate with the relevant masses, they could be transformed to

$$F_1 = \frac{\Gamma_1}{4\pi R^2}\frac{\Gamma_2}{G4\pi} = \frac{G}{R^2}\frac{\Gamma_1}{G4\pi}\frac{\Gamma_2}{G4\pi} = G\frac{m_1m_2}{R^2},$$

$$F_2 = \frac{\Gamma_2}{4\pi R^2}\frac{\Gamma_1}{G4\pi} = \frac{G}{R^2}\frac{\Gamma_1}{G4\pi}\frac{\Gamma_2}{G4\pi} = G\frac{m_1m_2}{R^2}.$$

The result of the accomplished operation witnesses that:

1) Under conditions, close to those of the experiment of Cavendish the formula (1) obtained based on graviton nature of gravitation and the formula of the Fourth law of Newton lead to the same result;
2) The declared by the Fourth law of Newton equality of the forces F_1 and F_2 explains itself by that under the same conditions the gravitational constant G is the same for the both bodies;

3) Contrary to astronomical bodies, the masses m_1 and m_2 of the spheres used in the experiment of Cavendish represent the amounts of matter contained therein, but the conditions of this experiment in no way represent those of gravitational action of astronomical bodies.

Returning now to gravitational actions of astronomical bodies, particularly the Sun and our Earth, we could see that their gravitational actions one on another, quite similarly to the examined example will be determined by the formulas in which, as in the past, the values indexed $_S$ relate to the Sun and indexed $_T$ – to the Earth. The double indexes $_{S-T}$ and $_{T-S}$ indicate direction of gravitational action (from the Sun to the Earth and from the Earth to the Sun).

$$F_{S-T} = \frac{\Gamma_S s_T}{4\pi R^2} \text{ and}$$

$$F_{T-S} = \frac{\Gamma_T s_S}{4\pi R^2}.$$

Given $m_S = \frac{\Gamma_S}{G_S 4\pi}$ and $m_T = \frac{\Gamma_T}{G_T 4\pi}$, we can obtain

$$F_{S-T} = \frac{\Gamma_S}{4\pi R^2}\frac{\Gamma_T}{G_T 4\pi} = \frac{G_S}{R^2}\frac{\Gamma_S}{G_S 4\pi}\frac{\Gamma_T}{G_T 4\pi} = G_S\frac{m_S m_T}{R^2},$$

$$F_{T-S} = \frac{\Gamma_T}{4\pi R^2}\frac{\Gamma_S}{G_S 4\pi} = \frac{G_T}{R^2}\frac{\Gamma_T}{G_T 4\pi}\frac{\Gamma_S}{G_S 4\pi} = G_T\frac{m_T m_S}{R^2},$$

This results in:

$$\frac{F_{S-T}}{F_{T-S}} = \frac{G_S}{G_T}.$$

The obtained result witnesses that:

1) Under conditions of mutual action of astronomical bodies, the formula (1) and the formula of the Fourth law of Newton analogues to the equation (3) lead to results formally analogues but principally different as to the use of factors representing gravitational constants;
2) The declared by the Fourth law of Newton equality of the forces F_{S-T} i F_{T-S} is not respected, which results from the disparity of the gravitation constants relevant to the interacting objects;
3) The masses m_S and m_T of the formula of the Fourth law do not represent the amount of matter contained in astronomical bodies. Instead, they represent the areas of their effective surfaces.

Correlation between the used systems of unities. Dimentions of elementary particles

Finally, it would be interesting to get to know the existing correlation between the system where as the unity of area (or of mass) serves m^2 and the system where as such unity serves kg. As a value with measures in the both systems could be the often-mentioned so-called **universal gravitational constant** that according to experimental data equals $6.670 \cdot 10^{-11}$ $m^3 kg^{-1} s^{-2}$. If to estimate the gravitational constant for the Earth of 3.15 ms^{-2} calculated according to the formula $G_T = \frac{g}{\pi}$ (see the equation (12)) as equal to the universal gravitational constant (which, as was mentioned, is doubtful) the ratio of these values will make the relation between the both systems. It equals

$$k = \frac{3.15}{6.670 \cdot 10^{-11}} = 4.723 \cdot 10^{10} \text{kg/m}^2, \text{ or}$$

$$\frac{1}{k} = 2.117 \cdot 10^{-11} \text{m}^2/\text{kg}.$$

Given the areas of diametric sections of the Earth and the Sun make respectively $1.278 \cdot 10^{14}$ and $1.52 \cdot 10^{18}$ m^2, the masses of the respective disks of graviton receptive thickness have to equal $1.278 \cdot 10^{14} \cdot 4.723 \cdot 10^{10} = 6.036 \cdot 10^{24}$ kg and $1.52 \cdot 10^{18} \cdot 4.723 \cdot 10^{10} = 7.179 \cdot 10^{28}$ kg.

The last result substantially diverges from the previously calculated value of M_S =1.99· 10^{30}кг. The cause of this divergence is that the gravitational constant of the Sun significantly differs as compared to the accepted for previous calculations gravitational constant of the Earth (taken as equal to the so-called **universal gravitational** constant). Consequently, the mass calculated by the formula (7) has to be 27.75 times less and correlate itself with the just obtained result.

One can use, though with some reservation, the obtained results for calculating dimensions of subatomic particles. Insomuch as the masses of electron and proton make $9.11 \cdot 10^{-31}$ and $1.673 \cdot 10^{-27}$kg, the occupied by them areas have to make $1.929 \cdot 10^{-41}$ and $3.542 \cdot 10^{-38}$ m^2.

What the dark matter may be

The expressed ideas make it possible to indicate at least two reasons why a matter really existing in astronomical bodies could be unaccounted for and interpreted as a dark matter.

Firstly, the calculations made based on the Law of universal gravitation could have been erroneous because of unjustified use therein of the **universal gravitational constant** correct only under terrestrial conditions. As there was indicated the solar gravitational constant is 27.75 times greater than the **"universal".** There are grounds to expect that other stars brighter than the Sun would have gravitational constants tens and hundreds times greater.

Secondly, the law of the universal gravitation accounts for just that mass of astronomical objects that exists in their superficial graviton emitting of graviton receptive layers. As regards the internal layers of astronomical bodies, the matter contained therein is by the law of universal gravitation disregarded.

Conclusions:

1) In the context of the Newtonian laws of gravitation and mechanics, the mass of a body of astronomical dimensions cannot indicate the amount of matter contained by this body;
2) In the context of these laws, the mass of a body represents its effective area that is an integral area of projections on a plane, perpendicular to the direction of action of the agents of action (e.g. gravitons), of the body's atomic nuclei surfaces facing the agents of action and unshadowed by other nuclei;
3) Physical and astronomical bodies interact with gravitons and particles of the fluid ether with the same surfaces of the same effective areas. Just by this reason, one can explain the equivalence of gravitational and inertial masses;
4) Every physical or astronomical body has its own gravitational capacity, which physical meaning consists in that continuously and in all directions it emits a flow of gravitons possessing an integral strength evenly distributed over all these directions;
5) The gravitational capacity of a body determines itself as its own constant of Kepler, which by its physical meaning stands for the strength of the full flow of gravitons generated by this body, distributed over the full solid angle of 4π with the vertex in the center of the body;
6) The constant of Kepler for the system Earth-Moon if divided by the square of the Earth's radius equals the acceleration of the Earth's gravity on its surface. This value , which we are accustomed to consider just as the acceleration of the Earth's gravity equals in addition that pressure that the Earth's gravitation exerts on a unity (that is on a m^2) of the effective area of a body;

7) The formula of the universal gravitation law $F = \frac{Gm_1m_2}{R^2}$ is quite correct, if therein F signifies the gravitational force exerted by body 1 with effective area of $m_1$on body 2 with effective area of m_2, and the gravitational constant G - that of the body 1, which gravitational constant means a graviton emitting efficiency of a unit of the effective area m_1;
8) If contrary to the law of universal gravitation the gravitational constants of the bodies 1 and 2 differs, different would be the gravitational efforts exerted by the bodies one to another;
9) The dark matter is real though unaccounted one for two reasons. Firstly, calculations based on the law of universal gravitation may be erroneous due to a deceptive use therein of the so-called universal gravitational constant, true only for terrestrial conditions. Ten and hundred-fold greater gravitational constants are inherent to the Sun and surely to other stars. Secondly, the universal gravitation law takes into account only that mass of astronomical objects which is contained in their superficial graviton emissive and graviton receptive layers. As concerns internal layers of astronomical bodies, the law of universal gravitation cannot take into consideration the matter contained therein.

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3) Дж. Б. Мэрион, Физика и физический мир, Москва, 1975, с. 81 (Russian translation of the book: Jerry B. Marion, Physics and the Physical Universe, 1971, John Wiley & Sons, Inc.)
4) Idem, pp. 177-178

See also the web-site www.physicsofether.kiev.ua

The Table

Central body of the satellite system	Satellite	Distance from the satellite to the central body (R) in m	Angular velocity of the orbital revolving of the satellite (ω) in s^{-1}	Constant of Kepler ($K = R^3\omega^2$) in m^{3}s^{-2}	Radius of the central body in m	Area of the diametric section of the central body (s) in m^2	Gravitational constant ($G = \frac{K}{s}$) (graviton emitting capacity of the unity of area) in ms^{-2}
1	2	3	4	5	6	7	8
Sun	Earth	$1.496 \cdot 10^{11}$	$1.991 \cdot 10^{-7}$	$1.327 \cdot 10^{20}$	$6.955 \cdot 10^{8}$	$1.520 \cdot 10^{18}$	87.303
Earth	Moon	$3.844 \cdot 10^{8}$	$2.662 \cdot 10^{-6}$	$4.025 \cdot 10^{14}$	$6.378 \cdot 10^{6}$	$1.278 \cdot 10^{14}$	3.149
Mars	Phobos	$9.378 \cdot 10^{6}$	$2.182 \cdot 10^{-4}$	$3.927 \cdot 10^{13}$	$3.396 \cdot 10^{6}$	$3.623 \cdot 10^{13}$	1.084
Jupiter	Io	$4.22 \cdot 10^{8}$	$4.109 \cdot 10^{-5}$	$1.269 \cdot 10^{17}$	$7.149 \cdot 10^{7}$	$1.606 \cdot 10^{16}$	7.902
Saturn	Titan	$1.22 \cdot 10^{9}$	$4.545 \cdot 10^{-6}$	$3.751 \cdot 10^{16}$	$6.027 \cdot 10^{7}$	$1.141 \cdot 10^{16}$	3.287
Uranus	Umbriel	$2.66 \cdot 10^{8}$	$1.818 \cdot 10^{-5}$	$6.221 \cdot 10^{15}$	$2.556 \cdot 10^{7}$	$2.052 \cdot 10^{15}$	3.032
Neptune	Thalassa	$5 \cdot 10^{7}$	$2.327 \cdot 10^{-4}$	$6.769 \cdot 10^{15}$	$2.476 \cdot 10^{7}$	$1.926 \cdot 10^{15}$	3.515
Pluto	Charon	$1.96 \cdot 10^{7}$	$1.14 \cdot 10^{-5}$	$9.785 \cdot 10^{11}$	$1.195 \cdot 10^{6}$	$4.486 \cdot 10^{12}$	0.218