the general science journal

Yuri Dunaev
(Kyiv, Ukraine)

HIDDEN MASSES AND HOW MUCH OF THE 4-TH LAW OF NEWTON IS REALLY TRUE?

Key words: mass, hidden mass, gravitation, 4th Law of Newton, Solar system, the Sun, planets, dark matter

Abstract

The so called "gravitational masses" or masses tout court, that figure themselves in the 4-th Law of Newton, also known as the Universal gravitation law, are by their nature effective areas of gravitating objects, which effective areas are integrated surface areas of the atomic nuclei of interacting objects opposing other ones and unscreened by other nuclei. These so called masses that would be better to call "official" masses cannot measure the body's amount of matter. As we understand, the "entire" mass of an object or mass tout court is integrated volume of all atomic nuclei of the object. The entire mass is composed with the effective or visible mass, the projection of which onto a diametric section surface makes up the effective area, which by its nature coincides with the official mass, and the hidden mass, the projection of which laps over the effective area. In bodies of relatively small dimensions, such with which we are accommodated, the official masses have to be proportional to the entire masses, which explain the usual view on mass as on measure of the amount of matter. In bodies of relatively great dimensions especially in stars including the Sun, the part of the hidden mass in the entire mass of the body is quite important, which would claim revising the established views on their masses and structures.

Introduction

The proposed article is a continuation and further development of my article [1] posted in 2009 with the General Science Journal.

The article [1] was about the conception of mass in the context of gravitational interaction of material objects, particularly of such between the Sun and the Solar system planets.

There was indicated that the gravitational action of the Sun is provoked by him generated gravitons, my views on which were disclosed later in the article [2].

In the above mentioned article [1] there was in particular indicated that if a celestial body e.g. the Sun is gravitationally acting on other bodies e.g. planets, such an action takes place due to that in all the directions continuously and evenly, it is emitting a flow of gravitons with a full effortΓ_S, and that any other body placed in the way of such flow of gravitons under the action of those hurting it would be attracted to the emitting body. The value F of the Sun's gravitational action onto such or another planet will obviously depend on what part of the full effort Γ_S, transported by the emitted by the Sun's flow of gravitons would impart to its surface, which may be expressed as

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

Here s_P designates opposing the Sun effective area of the planet's surface and $4\pi R^2$ – the area of spherical surface of the radius R equal to the distance from the planet to the Sun. Referring to the area s_P the article indicated that due to that the matter, with which are built both terrestrial and celestial objects is not continuous but composed with atoms and molecules, in which only an insignificant part of volume is filled with matter in form of atomic nuclei which only by themselves can support the action of gravitons, the said effective area was recommended to estimate as integrated areas of all the nuclei surfaces opposing the flow of gravitons and unscreened by other nuclei. The above mentioned integrated area was acknowledged as the planet's effective area; while those nuclei's surfaces that make it up - effective surfaces of these nuclei.

Besides, the article [1] contained a very important and quite correct suggestion about the equivalence of the scientifically confirmed mass of a planet and its effective area. The suggestion was based on a joint analysis of the equation (1) and the here below disclosed equation (2) determining the eccentric force, whose balance with the force (1) ensures the stability of the planet.

If for more simplicity, to estimate the planets' motion as occurring along circular orbits, the said force (2) would equal

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

m is the scientifically approved mass of the planet (inertial one that according to numbers of experiments is equivalent to gravitational) and ω is its angular velocity of revolving around the Sun.

By equalizing (1) and (2), one obtain

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

$R^3\omega^2$ being the constant of Kepler for the Solar system, all the right part of the equation (3) must be constant, as well as the relation $\frac{m}{s_P}$. The last means that **the relation of the scientifically approved mass of a planet and its effective area is equal for all the planets of the Solar system**. From here there was driven a further conclusion about the **equivalence of the approved mass and the planet's effective area.**

__Analogies between the Equation (1) and the 4-th Law of Newton__

The here expressed conclusions bring to mind that the long ago enrooted views on mass as of the amount of matter are wrong, where from there would be only natural to stick to the view that the **Nature does not know any other physical concepts except those derived from distance and time**. All physical values and respective unities (area, speed, acceleration etc.) derive themselves from distance and time.

Calculating masses of planets the modern science serves itself with the 4-th Law of Newton, according to which law, the force applied by the Sun to the planet is determined by the formula

$$F = G\frac{M_S M_p}{R^2} \quad (4), \text{ where}$$

G is the so called universal gravitational constant, R is the distance from the planet to the Sun, and M_S and M_p are respective masses of the Sun and planet.

The formula (4) can be compared with (1)$F = \Gamma_S \frac{s_P}{4\pi R^2}$, and if to suggest that the both of them determine the same value, and that$M_p = s_P$, one may conclude that the value $\frac{\Gamma_S}{4\pi}$ is equivalent to GM_S and that in reality the **4-th Law of Newton deals with effective areas named by Newton as masses**.

Basic data

In the article [1] with regard to comparatively important dimensions of the planets, there was expressed an opinion about the equivalence of their effective areas to those of their diametric sections, which had to find its confirmation in that the relation between the last and the masses of planets calculated with the formula (4) had to be at least approximately equal for all of them. The opinion has not found its confirmation, which is shown with the data placed in the column 8 of the here below Table 1. There exposed relations between the scientifically approved (official) masses and the diametrical section areas M_o/S have been obtained using the data about the diameters and masses of the Sun and Solar system planets in km and 10^{21} kg posted on Wikipedia site [3]. In columns 3, 4, 5, and 7 of the Table 1 are shown the amounts of diameters, diametric section areas, volumes and scientifically approved masses of the Sun and planets in relation to the same data concerned the smallest of them – Pluto. The column 9 presents data about the relations of the scientifically approved masses and volumes (M_o/V) of the Sun and planets that coincide with the approved by modern science data on average density of their matter.

Table 1

Bodies	Diame-ters, km	Relative			Masses (M_o)		M_o/S	(M_o/V)
		Dia-meters (D)	Diametric section areas (S)	Volumes (V)	10^{21}kg	Relative		
1	2	3	4	5	6	7	8	9
Pluto	2 372	1	1	1	13.105	1	1	1
Mercury	4 879	2.0569	4.2308	8.7024	330.2	25.196	5.9555	2.895
Mars	6 779	2.8579	8.1676	23.342	641.85	48.977	5.9967	2.098
Venus	12 102	5.1020	26.030	132.807	4868.5	371.499	14.273	2.797
Earth	12 742	5.3718	28.8561	155.010	5973.6	455.826	15.797	2.940
Neptune	49 244	20.761	431.019	8948.39	102430	7816.10	18.135	0.8734
Uranus	50 724	21.384	457.274	9778.38	86832	6625.86	14.490	0.6775
Saturn	116644	49.175	2418.17	118914	568460	43377.3	17.938	0.3648
Jupiter	139 822	58.947	3474.74	204826	1,898,600	144876	41.695	0.7073
Sun	1392684	587.13	344720.83	202396414	1,988,550,000	151739794	440.19	0.7496

There exist two factors which might affect the relations between the scientifically approved masses and diametric section areas. The first may be the difference between the planets matter densities. The other might become clear from the Examples exposed in the next Chapter.

Shadow effect

Example 1

If a sheet of transparent glass of an area s has on its surface an amount of chaotically scattered dirty spots of integral areaF_1, which area we might mean as its screening or effective area, then the specific screening area (SSA) of this sheet of glass will be equal$f_1 = \frac{F_1}{s}$. If to cover this sheet of glass with another of the same area but with spots creating SSA off_2, the value of the integrated SSA of the packet of two sheets will make$f_{1+2} = f_1 + f_2(1 - f_1) = f_2 + f_1(1 - f_2) = f_1 + f_2 - f_1 f_2$.

If for instance the stained area makes up a half of the whole area of the one and the other sheets, that is if $f_1 = f_2 = 0.5$, the SSA of the packet composed of two sheets f_{1+2} will equal $f_{1+2} = 2\text{x}0.5 - 0.5^2 = 0.75$, which leave transparent 1- 0.75 = 0,25 of the packet's area.

Quite clear that f_{1+2} does not make the sum of f_1 and f_2 because a part of spots of the both sheets would overlap one another. This overlapped or hidden part of spots form hidden screening area (HSA) that will make $f_{sh} = f_1 f_2 = 0.5^2 = 0.25$. The sum of visible screening area or screening area tout court (SA) and hidden screening area of the packet will make its entire screening area (ESA), which is equal to the sum of SA of both separate sheets.

If a packet of two such sheets to cover up with the same two-sheets packet the obtained packet of 4 sheets will have SSA of$f_{2(1+2)} = 2\text{x}0.75 - 0.75^2 = 0.9375$, which leave transparent 1- 0.9375 = 0,0625 of the packet's area.

The hidden screening area of the 4 sheets packet may be calculated as a sum of HSA of two packets plus HSA obtained as a result of the last operation of overlaying two packets$f_{sh(1+2)} = 2\text{x}0.25 + 0.75^2 = 1.0625$. As was expected, $f_{2(1+2)} + f_{sh(1+2)} = 2$.

If to keep overlaying the stained packets further and further on the resulted one will become practically opaque and its HSA could become much greater than its SSA.

Example 2

A glassy cub is interspersed with opaque particles, which makes it half transparent similarly to the glass sheet of the Example 1. If to overlay the cub with other half transparent one, the SSA of the obtained bar if to look at it from above, in the same way as for the 2 sheets packet will make$f_{1+2} = 2\text{x}0.5 - 0.5^2 = 0.75$.

Nevertheless, if to look at the bar from a side, its SSA will remain the same as for only one cub that is 0.5.

Because the volumes of surrounding ourselves material objects are mainly filled with opaque atomic and molecular nuclei, then based on the lately expressed, one might make the conclusion that non-spherical objects had to weight differently depending on their orientation relatively to the center of the Earth, which is certainly wrong. The explication to this imaginary paradox hides in that, on one side, the atomic and molecular nuclei are comparatively too small, and on the other side, that the distances between these nuclei comparatively to their dimensions are too great. Therefore from what side to look at the object, we will all the same notice practically the same amount of nuclei.

If for instance to imagine that the area screened by the atomic nuclei of the last cube makes 0.001s, then the combined SE of two overlaid cubes will make$f_{1+2} = 2\text{x}0.001 - 0.001^2 = 0.001999s$, which only imperceptibly differs from 0.002s, and which will indicate that the weight of two cubes is indeed twofold weight of one.

<u>Example 3</u>

In the last Example we overlaid cubes one upon one and determined changes in their integral SSA for only one direction. If to widen the same cub with screening area of 0.5s in all three directions, that is to build a similar cub but with 8-fold greater volume, its SSA in all three directions will also rise to 0.75.

Instead of cub we can take a sphere with a mean screening area of 0.5s and twice increase its diameter, as well being aware that the SSA of the increased sphere will also rise to 0.75.

<u>Basic formulations</u>

The here above disclosed divergences between the scientifically accepted notion of mass and its above expressed understanding as screening or effective area of a body, make ground for extremely important conclusions, but prior to pass over to further deductions let us make point on some basic formulations. Our study mainly concerning the Sun and the planets of the Solar system, such formulations will specifically concern spherical bodies, although with some necessary corrections they will suit other bodies of different types and forms.

If to temporarily ignore the Einstein's "invention" of masse-energy equivalence, the modern scientific understanding of mass seems dual because on one hand, mass makes measure of inertia and gravitation capacity, and on the other hand, it makes measure of the amount of matter. In our view these two measures or these two masses have different nature. If the first is the just expressed screening or effective area of a body, whose unities must be those of area, e.g. m^2, the second must be meant as summarized volume of its nuclei and have unities of volume, e.g. m^3.

In our view the **mass** or the **entire mass** (**M**) of a body should be understood as the integrated volume of all the nuclei placed therein.

The projection of the mass (**M**) onto a diametric section of a spherical body will make its **effective area (E)**, that plays the role of mass or the **official ma**ss (**M_o)** in the 4-th Law of Newton. I also believe that the same **effective area** have also to play the role of mass in the 2-d Law of Newton

One has to understand that depending on the matter density of the body, the said projection of mass may consist of one, two or even more fragmentized layers, the one opposing the interactive factors e.g. gravitons would represent its **visible effective area (VEA),** which may be named as **effective area (E)** tout court**.** The other layers make up **hidden effective area (HEA)**. The sum of **effective area (E)** and **hidden effective area (HEA)** will make **entire effective area (EEA).**

The **effective area (E)** divided by the area of diametric section **(S)** makes the **specific effective area (SEA) - (E/S)** that would be a dimensionless value.

The **entire mass** (**M)** of a body is composed with the **visible mass (M_v)** and **hidden mass (M_h).** The first of the two corresponds to **visible effective area (VEA),** and the other – to **hidden effective area (HEA).** The **visible effective area (VEA)** coincides with the **official mass M_o.**

The **entire mass (M)** divided by the body's volume makes its **real density (M/V).**

In bodies of relatively small dimensions as well as in those of spherical form with homogeneous distribution of matter the **effective areas**, as a consequence of smallness and significant dispersion of the nuclei, are equal independently of chosen projection plane.

In bodies of relatively small dimensions, to which are related those with which we deal in our everyday life the **official masses** (**M_o)** have to be proportional to the **entire masses** (**M),** which explains the established view on mass as the measure of matter's amount.

One would see somewhat different scenario in bodies of considerable dimensions such as the Sun and the planets of the Solar system, but beforehand let us contemplate the one that may be proposed by spherical models.

Shadow effects in spherical models

Approximating our exploration to the scales proper to the Solar system bodies, let us calculate the **specific effective areas** (SEA) of spheres with progressively twofold increased diameters in the case when the initial spheres have the relations of their effective areas to the areas of diametric sections (**E/S)** i.e. their initial SEA equal 0.1, 0.01, and 0.001. The every twofold increasing diameter makes it possible to use a simple formula coordinating with the Example 1

$$f_{n+1} = 2f_n - f_n^2 \qquad (5).$$

The obtained results are shown in the Table 2.

Table 2

Sphere's diameter	**E/S** of spheres (absolute and relative) provided the Initial **E/S** equals					
	0.1		0.01		0.001	
1	2	3	4	5	6	7
1D	0.1	1	0.01	1	0.001	1
2D	0.19	1.9	0.0199	1.99	0.001999^{-}	1.999
4D	0.3439	3.439	0.0394	3.94	0.003994	3.994
8D	0.569533	5.69533	0.077255	7.7255	0.007972	7.972
16D	0.81467	8.1467	0.148542	14.8542	0.01588	15.88
32D	0.96565	9.6565	0.275020	27.502	0.03151	31.51
64D	0.99882	9.9882	0.474404	47.4404	0.06203	62.03
128D (2^7)	0.999999	9.99999	0.723749	72.3749	0.120212	120.212
256D (2^8)	1	10	0.923685	92.3685	0.225973	225.973
512D (2^9)			0.994176	99.4176	0.400883	400.883
1024D (2^{10})			1	100	0.641059	641.059
2048D (2^{11})					0.871161	871.161
4096D (2^{12})					0.983401	983.401
8192D (2^{13})					0.999724	999.724
16384D (2^{14})					0.999999	1000

The SEA of taken as examples spheres of different diameters provided the SEA of the initial spheres are 0.1, 0.01, and 0.001, are presented in columns 2, 4, 6 of the Table 2, whereas the same values compared to the SEA of the minimal diameter spheres – in columns 3, 5, and 7.

The SEAs of the Table 2 **E/S** = **M_V/S** must be proportional to the visible masses of the bodies. Concerning the entire masses of the bodies that are proportional to their volumes, the relations of these masses to the diametric sections area **M/S** must be proportional to their diameters. Therefore if visible masses are proportional to **E/S,** the entire masses are to be proportional to the bodies' diameters.

Concerning the Solar system bodies the above expressed assertion would mean that if the matter densities were equal for all of them, the relations of the amounts of therein contained matter, which we as well as the whole science mean proportional to their volumes, to the areas of their diametric section surfaces, which in this case would be equal to the entire specific effective areas – (ESEA) would be the same as the relations of their diameters (see column 3 of the Table 1). However, the relations of the scientifically established Solar system bodies masses to their diametric section areas (column 8) are noticeable different from the data of the column 3.

Shadow properties of the Solar system bodies

Based on the shadowy effect calculations for abstract spheres with gradually increased diameters (Table 2), let us make analogues calculations for spheres with diameters equal to those of the Solar system bodies, which spheres we will subsequently name "modeled" Solar system bodies.

If to presume, for instance, that the SEA or **E/S** of the smallest of the modeled bodies Pluto makes 0.1 the further operations would be so:

1) **E/S** of Mercury whose diameter makes 2.0569 of that of Pluto one determines by means of summarizing **E/S** of the modeled planet with 2-fold diameter of Pluto taken from the Table 2 and the additional effect created by addition of 0.0569 of the Pluto's mass according to the formula:

$f_{2.0569} = f_2 + 0.0569 f_p (1 - f_2)$, where

f_2 – is the **E/S** of the modeled planet with twofold diameter of Pluto,

f_p – is the **E/S** of Pluto.

$f_{2.0569}$= $0{,}19 + 0.0569\text{x}0.1\text{x}(1 - 0{,}19) = 0.1946089.$

Mercury's ESEA because of the above mentioned proportionality of spheres' ESEA to their diameters has to make 0.20569. Then the hidden specific effective area of Mercury (HSEA) has to make 0.20569 - 0.1946089 = 0.011081, which makes 5.39% of its ESEA.

2) The same for Mars

$f_{2.8579} = f_2 + 0.8579 f_p (1 - f_2)$= $0{,}19 + 0.8579\text{x}0.1\text{x}(1 - 0{,}19) = 0.2594899$

HSEA of Mars will be 0.28579 - 0.2594899 = 0.0263, which makes 9,2% of its ESEA.

3) In the same way for Venus but at the beginning summarizing E/S of the sphere with the diameter 4D with E/S of sphere with the diameter1D, and adding to the result E/S of the diameter 0.1029D:

$f_5 = f_4 + f_1(1 - f_4) = 0.3439 + 0.1(1 - 0.3439) = 0.40951,$

$f_{5.1029} = 0.40951 + 0.1\text{x}0.1029\text{x}(1 - 0.40951) = 0.415586.$

HSEA of Venus will make 0.51029 – 0.415586 = 0.094704, or 18.6% of ESEA.

4) For Earth

$$f_{5.3718} = f_5 + 0.1\text{x}0.3718(1 - f_5) = 0.40951 + 0.01\text{x}0.3718(1 - 0.40951) = 0.4314644$$

HSEA of the Earth will make 0.53718 – 0.4314644 = 0.1057, or 19.7% of ESEA.

5) For Neptune

$$f_{20} = f_{16} + f_4(1 - f_{16}) = 0.8147 + 0.3439(1 - 0.8147) = 0.878425$$

$$f_{20,761} = f_{20} + 0.1\text{x}0.761(1 - f_{20}) = 0.878425 + 0.1\text{x}0.761(1 - 0.878425) = 0.8876768$$

HSEA of Neptune makes 2.0761 – 0.8876768 = 1.18842, or 57.2% of ESEA.

6) For Uranus

$$f_{21} = f_{20} + f_1(1 - f_{20}) = 0.878425 + 0.1(1 - 0.878425) = 0.8905825$$

$$f_{21.384.} = f_{21} + 0.1\text{x}0.384(1 - f_{21}) = 0.8905825 + 0.1\text{x}0.384(1 - 0.8905825) = 0.8947841$$

HSEA of Uranus makes 2.1384 – 0.8947841 = 1.24362, or 58.2% of ESEA

7) For Saturn

$$f_{48} = f_{32} + f_{16}(1 - f_{32}) = 0.9657 + 0.8147(1 - 0.9657) = 0.993644$$

$$f_{49} = f_{48} + 0.1(1 - f_{48}) = 0.993644 + 0.1(1 - 0.993644) = 0.99428$$

$$f_{49.099} = f_{49} + 0.1\text{x}0.099\text{x}(1 - f_{49}) = 0.99428 + 0.1\text{x}0.099(1 - 0.99428) = 0.994337$$

HSEA of Saturn makes 4.9099 – 0.994337 = 3.91556, or 79.7% of ESEA.

Without further calculations there become clear that the SEA of the modeled Jupiter as well as that of the Sun, if for Pluto it equals 0.1 will make values so close to 1, that the shadowing of their diametric section areas would be practically full.

HSEA of Jupiter in this case $f_{58,947}$ will make 5.8947 – 1 = 4.8947, which will make 83.036% of ESEA, and that of the Sun $f_{587,13}$ 58.713 – 1 = 57.713 or 98.3% of its ESEA.

Substantially different values, as it might be expected from the analysis of the Table 2, one may obtain in the case when the relation of the effective area to the diametric section area of the modeled Pluto to presume, for instance, equal 0.00001. Then

1) **E/S** of Mercury

$$f_{2.0569} = f_2 + 0.0569 f_p(1 - f_2) = 0.00002 + 0.0569\text{x}0.00001\text{x}(1 - 0{,}00002) = 0.000020569$$

2) **E/S** of Mars

$$f_{2.8579} = f_2 + 0.8579 f_p(1 - f_2) = 0{,}00002 + 0.8579\text{x}0.00001\text{x}(1 - 0{,}00002) = 0.0000285788$$

3) **E/S** of Venus

$$f_5 = f_4 + f_1(1 - f_4) = 0.000039999 + 0.00001(1 - 0.000039999) = 0.0000499986,$$

$f_{5.1029} = 0.40951 + 0.1\text{x}0.1029\text{x}(1 - 0.40951) = 0.0000510275.$

4) **E/S** of Earth

$f_{5.3718} = f_5 + 0.1\text{x}0.3718(1 - f_5) = 0.0000499986 + 0.00001\text{x}0.3718(1 - 0.0000499986) = 0.0000537164$

5) **E/S** of Neptune

$f_{20} = f_{16} + f_4(1 - f_{16}) = 0.000159988 + 0.00003999(1 - 0.000159988) = 0.000199971$

$f_{20,761} = f_{20} + 0.00001\text{x}0.761(1 - f_{20}) = 0.000199971 + 0.00001\text{x}0.761(1 - 0.000199971) = 0.0002075795$

1) **E/S** of Uranus

$f_{21} = f_{20} + f_1(1 - f_{20}) = 0.000199971 + 0.00001(1 - 0.000199971) = 0.000209969$

$f_{21.384.} = f_{21} + 0.1\text{x}0.384(1 - f_{21}) = 0.000209969 + 0.00001\text{x}0.384(1 - 0.000209969) = 0.00021380819$

2) **E/S** of Saturn

$f_{48} = f_{32} + f_{16}(1 - f_{32}) = 0.00031995 + 0.000159988(1 - 0.00031995) = 0.0004798868$

$f_{49} = f_{48} + 0.1(1 - f_{48}) = 0.0004798868 + 0.00001(1 - 0.0004798868) = 0.000489882$

$f_{49.099} = f_{49} + 0.1\text{x}0.099\text{x}(1 - f_{49}) = 0.000489882 + 0.00001\text{x}0.099(1 - 0.000489882) = 0.000490872$

3) **E/S** of Jupiter

$f_{56} = f_{48} + f_8(1 - f_{48}) = 0.0004798868 + 0.000079997(1 - 0.0004798868) = 0.0005598454$

$f_{58} = f_{56} + f_2(1 - f_{56}) = 0.0005598454 + 0.00002(1 - 0.0005598454) = 0.000579834$

$f_{58,947} = f_{58} + f_{0,947}(1 - f_{58}) = 0.000579834 + 0.00000947(1 - 0.000579834) = 0.0005893$

1) **E/S** of Sun

$f_{576} = f_{512} + f_{64}(1 - f_{512}) = 0.005106941 + 0.000639798(1 - 0.005106941) = 0.0057434716$

$f_{584} = f_{576} + f_8(1 - f_{576}) = 0.0057434716 + 0.000079997(1 - 0.0057434716) = 0.00582300913$

$f_{586} = f_{584} + f_2(1 - f_{584}) = 0.00582300913 + 0.00002(1 - 0.00582300913) = 0.0058428927$

$f_{587} = f_{586} + f_1(1 - f_{586}) = 0.0058428927 + 0.00001(1 - 0.0058428927) = 0.005852834$

$f_{587,13} = f_{587} + f_{0,13}(1 - f_{587}) = 0.005852834 + 0.0000013(1 - 0.005852834) = 0.0058541266$

In the same way one calculates the expected **E/S** of the modeled celestial bodies provided the relation **E/S** for Pluto will also make 0.01, 0.001, and 0.0001. The entire results are shown in the Table 3.

Table 3

Bodies	Bodies' E/**S** calculated provided that for Pluto equals				
	0.1	0.01	0.001	0.0001	0.00001
1	2	3	4	5	6
Pluto	0.1	0.01	0.001	0.0001	0.00001
Mercury	0.19461	0.020458	0.002056	0.00205689	0.000020569
Mars	0.25949	0.028308	0.002855	0.000285773	0.0000285788
Venus	0.41559	0.049985	0.005091	0.000500911	0.0000510185
Earth	0.43146	0.052542	0.005360	0.000537061	0.0000537164
Neptune	0.88768	0.188313	0.020557	0.00207405	0.000207558
Uranus	0.89478	0.193377	0.021167	0.00213622	0.00021380819
Saturn	0.99434	0.389488	0.047843	0.0048084	0.000490872
Jupiter	1.0	0.447077	0.057272	0.00587762	0.0005893
Sun		0.997260	0.444270	0.0570254	0.0058541266

Relations between the E/S amounts of the Table 3 and those of Pluto are brought to the Table 4, in whose column 7 are placed for comparison the values M_o/S imported from the column 8 of the Table 1 and obtained as it had been mentioned on the basis of official data.

Table 4

Bodies	Relative values of bodies'E/**S** provided those of Pluto equals					(M_o/S) relative official
	0.1	0.01	0.001	0.0001	0.00001	
1	2	3	4	5	6	7
Pluto	1	1	1	1	1	1
Mercury	1.9461	2.0458	2.056	2.0569	2.0569	5.9555
Mars	2.5949	2.8308	2.855	2.8577	2.8579	5.9967
Venus	4.1559	4.9985	5.091	5.0091	5.1019	14.273
Earth	4.3146	5.2542	5.360	5.3706	5.3716	15.797
Neptune	8.8768	18.831	20.557	20.741	20.756	18.135
Uranus	8.9478	19.338	21.167	21.362	21.381	14.490
Saturn	9.9434	38.949	47.843	48.084	49.087	17.938
Jupiter	10	44.708	57.272	58.776	58.93	41.695
Sun		99.726	444.27	570.25	585.41	440.19

The character of the correlations between the data of the column 7 seems to be in the greatest measure similar to the correlations of the column 4, which suggests that the Pluto's density has to be approximately equal 0.001.

<u>How large areas are occupied by official masses?</u>

An important conclusion from the previous Chapter is that the relation between the officially accepted mass (in unities of area) and the diametric section area of Pluto may be estimated close to 0.001. This means that 13.105×10^{21} kg of Pluto's mass have to be at least approximately equivalent to its $0.001 x\pi \frac{2372^2}{4}$ km^2.

In other words 13.105x10^{21} kg of mass have to occupy an effective area of $0.001x\pi\frac{2372^2}{4}$ km ^{2}, and 1 kg of mass has to occupy $0.001x\pi\frac{2372^2}{4}$: 13.105x10^{21} = 3.372x10^{-19} км^2 , which gives the relations

3.372x10^{-13} m^2/kg and 2.966x10^{12} kg/m^2.

The found out relations allow at least approximately appreciate atomic nuclei dimensions.

<u>How great are true masses of celestial bodies and where hides itself the dark matter?</u>

In the above Table 4 there was made comparison between the found by ourselves specified effective areas (SEA) of the modeled Solar system bodies and the analogues values calculated based on the official masses. Even more interesting there would be to compare with such values the entire screening areas of the modeled bodies, because this would help to find out relations between official and entire masses of the Solar system bodies.

There also would not be without interest to determine the hidden effective areas and to compare them with the entire effective areas.

As it was already mentioned, the relations between the heavenly bodies' diameters are also those between their entire effective areas. Therefore if for instance the EEA of the modeled Pluto is 0.1 the EEA of the modeled Mercury would be 0.20569 (see column 4 of the Table 5). The obtained from Table 4 specified effective area (SEA) of Mercury is 0.19461; therefore its hidden effective area (HEA) must be 0.20569 - 0.19461 = 0.01108 (column 6 of Table 5). The results of the analogues calculations for other heavenly bodies provided SEA of Pluto equals 0.1, 0.01, and 0.001 are also put to Table 5.

The values (M_o/S) are the analogues of Solar system bodies' SEA calculated based on official data and do not account for the shadow effect. Multiplying the values M_o/S by relations β = EEA/SEA (column 7) one may become aware how much would rise the bodies' specific official masses if they really do.

The values put into the columns 9 and calculated provided M/S of Pluto equals 0.1, 0.01, and 0,001 represent specific official masses calculated taking into account the shadow effect, which makes them quite different from densities M_o/V. They show the importance of hidden masses, especially in bodies of important dimensions. Hidden masses that by their nature play the role of the so called dark matter, have to be especially important in stars of middle and great dimensions.

Table 5

Bodies	Diame-ters (D)	EEA	SEA	HEA	β = (EEA:SEA)	(M_o/V)	β x (M_o/V)
1	2	4	5	6	7	8	9
Pluto	1	0.1	0.1	0	1	1	1
Mercury	2.0569	0.20569	0.19461	0.01108	1.0569	2.8954	3,0602
Mars	2.8579	0.28579	0.25949	0.0263	1.1014	2.0982	2.3110
Venus	5.1020	0.51020	0.41559	0.09461	1.2277	2.7973	3.4344
Earth	5.3718	0.53718	0.43146	0.10572	1.2450	2.9406	3.6613
Neptune	20.761	2.0761	0.88768	1.18842	2.3388	0.8734	2.0430
Uranus	21.384	2.1384	0.89478	1.24362	2.3899	0.6775	1.6194
Saturn	49.175	4.9175	0.99434	3.92316	4.9455	0.3648	1.8040
Jupiter	58.947	5.8947	1.0	4.8947	5.8947	0.7073	4.1695

Sun	587.13	58.713	1.0	57.713	58.713	0.7496	44.019
Bodies	Diameters (D)	EEA	SEA	HEA	β = (EEA:SEA)	(M_o/V)	β x (M_o/V)
1	2	4	5	6	7	8	9
Pluto	1	0.01	0.01	0	1	1	1
Mercury	2.0569	0.020569	0.020458	0.000111	1.0049	2.8954	2.9096
Mars	2.8579	0.028579	0.028308	0.000271	1.0096	2.0982	2.1183
Venus	5.1020	0.051020	0.049985	0.001035	1.0207	2.7973	2.8552
Earth	5.3718	0.053718	0.052542	0.001176	1.0224	2.9406	3.0065
Neptune	20.761	0.20761	0.188313	0.019297	1.1025	0.8734	0.9629
Uranus	21.384	0.21384	0.193377	0.020463	1.1058	0.6775	0.7492
Saturn	49.175	0.49175	0.389488	0.102262	1.2626	0.3648	0.4606
Jupiter	58.947	0.58947	0.44708	0.14239	1.3185	0.7073	0.9326
Sun	587.13	5.8713	0.99726	0.997260	6.8686	0.7496	5.1487
Bodies	Diameters (D)	EEA	SEA	HEA	β = (EEA:SEA)	(M_o/V)	B x (M_o/V)
1	2	4	5	6	7	8	9
Pluto	1	0.001	0.001	0	1	1	1
Mercury	2.0569	0.002057	0.002056	0.000001	1.0005	2.8954	2.8968
Mars	2.8579	0.002858	0.002855	0.000003	1.0011	2.0982	2.1005
Venus	5.1020	0.005102	0.005091	0.000011	1.0022	2.7973	2.8035
Earth	5.3718	0.005372	0.005360	0.000012	1.0022	2.9406	2.9471
Neptune	20.761	0.020761	0.020557	0.000204	1.0099	0.8734	0.8820
Uranus	21.384	0.021384	0.021167	0.000217	1.0103	0.6775	0.6845
Saturn	49.175	0.049175	0.047843	0.001332	1.0278	0.3648	0.3749
Jupiter	58.947	0.058947	0.057272	0.001675	1.0292	0.7073	0.7280
Sun	587.13	0.58713	0.44427	0.14286	1.3216	0.7496	0.9907

Information of the columns 9 witness an unexpectedly comparatively high density of the Sun, which contradict the modern scientific views on Sun as mainly composed with hydrogen and helium. The great planets look much denser, but the ratios between their densities and those of little planets are not so impressive as they could be according to the official data.

Graviton-acceptive and graviton-emissive properties of matter

Everything that was discussed here above in such or other way concerned the graviton-acceptive properties of matter. There was disclosed that the transfer of gravitational efforts exerts itself through an interaction between the attracted body's nuclei and gravitons or graviton waves generated by the attracting body, and the here described shadow effects concerned the interaction mechanism between gravitons and nuclei of the attracted bodies. Nevertheless as it ensues from the 4-th Law of Newton, as well as the article [1], in every pair of gravitationally interacting objects each of them is simultaneously subject and object of the interaction.

In the article [2] there was explained that the gravitational waves or gravitons are created as a result of electrons orbital revolving in atoms and molecules. That is why the gravitational effect exerted by a body, is made as a sum of effects exerted by its atoms and molecules. Quite logically would be to draw here from a conclusion that the graviton-emissive properties of bodies are affected by shadow effects in a quite similar way as their graviton-acceptive properties.

Here, nevertheless exists a particularity consisting in that, the gravitational waves resulting from orbital revolving of electrons, the graviton generation could take place only in atomic or molecular matter. Nucleons unorganized in atoms can accept a gravitational action, but they themselves cannot attract other bodies. The same concerns electrons and other particles unorganized in atoms and molecules.

Epilogue

The modern concept of mass has its double or even triple faces, because on one side we have the Newton proposed concepts of inertial and gravitational masses, which equivalence though theoretically is not proved. On the other side we have the concept of mass as measure of matter's quantity that is also not undoubtedly connected with the concepts of inertial and gravitational masses. As to the nature of the above Newtonian masses, that question still remains unresolved as well as still remains open for all kind of speculations the question of what to consider as matter's quantity.

In spite of the above theoretical shortcomings the modern science keeps on its conviction in identity of all the three hypostases of mass.

In this article mass is considered as quantity of matter, whose measure is volume. Inertial and gravitational masses accepted by modern science and named in the article as official, are by their nature areas of those matter surfaces that are facing interacting factors such as gravitons or particles of gaseous ether (if one deals with inertial resistance). The said areas are by their mathematical nature the areas of matter's projection onto a plane perpendicular to the direction of the interacting factors action.

Although the article does not contemplate it directly, it is really impossible to imagine the world without ether and it is fully regards such notion as mass.

Conclusions:

1) The so called "gravitational masses" or masses tout court that figure themselves in the 4-th Law of Newton, also known as the Universal gravitation law, are by their nature effective areas of gravitating objects, which effective areas are integrated surface areas of the atomic nuclei of interacting objects opposing other ones and unscreened by other nuclei.
2) The so called masses that would be better to call "official" masses cannot measure the body's amount of matter.
3) As we understand, the "entire" mass of an object or mass tout court is integrated volume of all atomic nuclei of the object.
4) The entire mass is composed with effective or visible mass, the projection of which onto a diametric section surface makes up the effective area, which by its nature coincides with the official mass, and the hidden mass, the projection of which laps over the effective area.
5) In bodies of relatively small dimensions, such with which we are accommodated, the official masses have to be proportional to the entire masses, which explain the usual view on mass as measure of the amount of matter.
6) In bodies of relatively great dimensions especially in stars including the Sun, the part of the hidden mass in the entire mass of the body is quite important, which would claim revising the established views on their masses and structures.

Bibliography:

1) Yuri Dunaev, MASS, GRAVITATION, AND DARK MATTER http://gsjournal.net/Science-Journals/Research%20Papers-Astrophysics/Download/1699
2) Yuri Dunaev, MECHANISM OF GRAVITATION AND HOW DOES THE DARK MATTER WORK? http://gsjournal.net/Science-Journals/Research%20Papers/View/4214
3) https://en.wikipedia.org/wiki/List_of_Solar_System_objects_by_size