CERTAIN ORIGINAL RELATIONSHIPS BETWEEN LIGHT, GRAVITY AND MASS

TEODOR OGNEAN

Sos. Alexandria

19, Bl. 30, Sc. C, Et. 3, Ap. 42

Sect. 5, 051525, Bucharest

Romania

e-mail: theodor.ognean@gmail.com

Abstract

The article presents certain relationships on the "generation of mass" from light as an effect of gravity. New notions are introduced, namely the "gravitational quantum", the "mass quantum", the "mass condensation" and the "mass expansion". Calculus shows that the mass condensation is directly related to Avogadro's Number, and the mass expansion is directly related to the speed of light and numbers π and $1 + 0.2\pi$.

1. Introduction

The article presents completely original relationships between light, gravity and mass. The relationships are based on certain characteristic lengths and dimensionless values of the fundamental constants regarding natural phenomena such as: light, gravity, quantum state, electricity,

magnetism, temperature, pressure and others. The characteristic lengths and dimensionless values were calculated based on dimensional analysis. The calculation methods, its principle and practical use were introduced by the author in the previous publications [1-10].

2. Method

For this study, the dimensionless values of the following fundamental constants were considered: speed of light c; Planck constant h and $\hbar = h/2\pi$; gravitational constant G; electron charge e; constant product $pV_m = RT$; gas constant R; absolute temperature $T = 273.15°C$; Avogadro number N_A.

Numerical values of the fundamental constants are the recommended values by CODATA[1].

The dimensionless values of the fundamental constants taken into consideration in this study are presented in Table 1. Details on their calculation were introduced by refs. [6, 7].

Table 1. Dimensionless values of the fundamental constants

1	$X_c = 1.0$	
2_1	$X_h = 0.83041837783$	$\hbar = h/2\pi$
2_2	$X_\hbar = 0.93702679751$	
3_1	$X_{Ge} = 0.93719012$	experimental G value
3_2	$X_G = 0.9371900118$	calculated G value
3_3	$X_{G0} = 0.937168147$	ideal G value
4_1	$X_{pV_m} = 0.94291358846$	$pV_m = RT$
4_2	$X_R = 0.912832879643$	
4_3	$X_T = 0.03008070882$	$X_T = X_{pV_m} - X_R$
5_1	$X_{NA0} = 1.003734276393$	$N_{A0} = 2^{79}$
5_2	$X_{NA} = 0.9962796166$	N_A - Avogadro number
6	$X_e = 0.92866651887$	

X_c - for speed of light c; X_h, $X_\hbar$ - for Plank constant h, $\hbar$; X_{Ge}, X_G - for gravitational constant G; X_e - for electron charge e; X_{pV_m} - for constant product $pV_m = RT$; X_R - for gas constant R; X_T - for absolute temperature $T = 273.15°C$; X_{NA0} - for ideal Avogadro number $N_{A0} = 2^{79}$; X_{NA} - for Avogadro number $N_A = 6.02214076 \times 10^{23} \, \text{mol}^{-1}$.

For the Avogadro number $N_A = 6.02214076 \times 10^{23} \, \text{mol}^{-1}$, two dimensionless values are defined, respectively, $X_{NA0} = N_{A0}/N_A = 1.003734276393$ and $X_{NA} = N_A/N_{A0} = 0.9962796166$. (see Table 1, rows 5_1 and 5_2). The exact value $2^{79} = 6.044629098 \times 10^{23}$ very close to N_A is considered an ideal Avogadro number $N_{A0} = 2^{79}$. Additional details on this subject can be found in refs. [3, 4].

Having in view the two dimensionless values X_{NA0} and X_{NA}, we can consider two cases:

1. There is an increase number of mass entities from $N_A = 6.02214076 \times 10^{23}$ to an ideal number of mass entities $N_{A0} = 2^{79}$. The increase could be considered a "mass expansion" [10] equal to:

$$(X_{NA0} - 1) = 1.003734276393 - 1 = 0.003734276393. \qquad (1)$$

2. There is a decreased number of mass entities from the ideal number $N_{A0} = 2^{79}$ to number N_A. The decrease could be considered a "mass condensation" [10] equal to:

$$(1 - X_{NA}) = 1 - 0.9962796166 = 0.003720383453. \qquad (2)$$

Regarding the gravitational constant G (see Table 1, rows 3_{1-3}) is underlined the following: Since the experimental value $X_{Ge} = 0.93719012$ (see row 3_1, in Table 1) is still determined with a low accuracy because of a very large relative standard uncertainty (10^{-5}) for

$G = 6.67430 \times 10^{-11}\,\mathrm{m^3 kg^{-1} s^{-2}}$ (see CODATA, footnote 1), in this article, the value $X_G = 0.9371900118$ (see table 1, row 3_2) was used for G. This value was determined with greater accuracy starting from other fundamental constants (see Eq. 8 in ref. [9]).

The above-presented dimensionless values were used to explain certain unknown relationships between light, gravitation and mass.

3. Results

The results of this study are presented in a synthetic and schematic way in Figure 1.

First of all, it was considered that a mass entity could be "generated" from light under the effect of gravity and it is expressed as the difference $X_c - X_G$ (see Table 1, rows 1 and 3_2) equal to:

$$X_c - X_G = 1 - 0.9371900118 = 0.062809988$$

$$= 0.02 \times 3.1404994105 \approx 0.02\pi, \tag{3}$$

a value very close to 0.02π circumference of the circle. Having in view Eq. 3, it was taken into account the ideal case when the circumference of the circle was exactly 0.02π. In this case, the difference $(X_c - 0.02\pi)$ was considered an "ideal X_{G0} value" [10] equal to:

$$X_{G0} = X_c - 0.02\pi = 1 - 0.02\pi = 0.937168147. \tag{4}$$

The difference between the ideal value $X_{G0} = 0.937168147$ and the value $X_G = 0.9371900118$ (see Table 1, row 3_2) was considered a "gravitational quantum" [10] noted g_q equal to:

$$g_q = (X_G - X_{G0}) = 0.9371900118 - 0.937168147$$
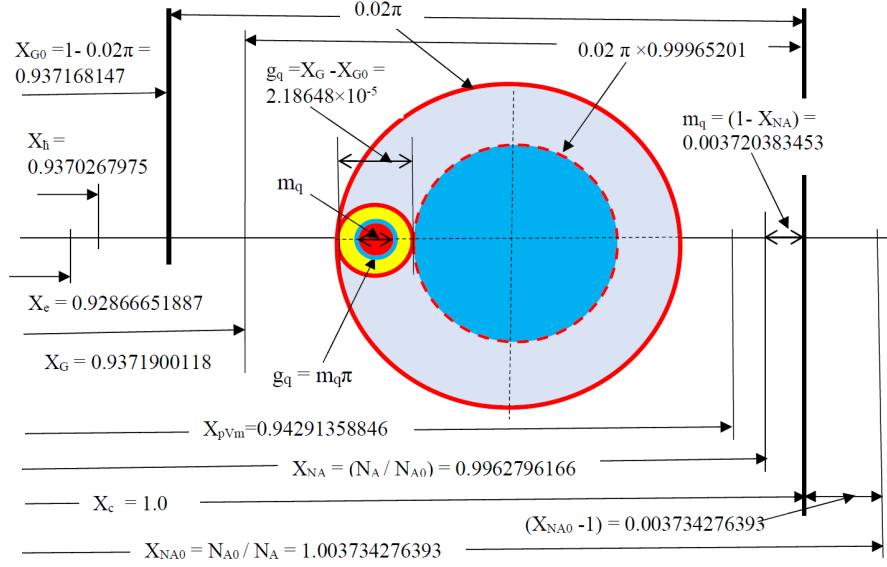
$$= 2.18648 \times 10^{-5}. \tag{5}$$

Figure 1. Relationships between dimensionless values of the fundamental constants (the values are not absolute; they are relative ones).

But the "gravitational quantum - g_q" must be in a direct relationship with the "mass condensation" process expressed by $(1 - X_{NA})$ = 0.003720383453 (see Eq. 2). In this case, similarly to the "gravitational quantum - g_q", the difference $(1 - X_{NA})$ was considered a "mass quantum - m_q" [10] equal to:

$$m_q = (1 - X_{NA}) = 0.003720383453. \tag{6}$$

If the "gravitational quantum - g_q" (see Eq. 5) is related to the "mass quantum - m_q" (see Eq. 6) and further the result is divided by 2^{167} is obtained:

$$(g_q / m_q) / 2^{167} = [(2.18648 \times 10^{-5}) / 0.003720383453] / 2^{167}$$

$$= 3.14158293 \times 10^{-53} \approx \pi \tag{7}$$

a value very close to a circle. Equation 7 shows that the "gravitational quantum - g_q " is in a direct relationship with a circle having a diameter very close to the "mass quantum - m_q " or $g_q \approx \pi m_q$.

If "gravitational quantum $- g_q = 2.18648 \times 10^{-5}$ " is multiplied by 2^{314} is obtained:

$$2.18648 \times 10^{-5} \times 2^{314} = 0.00729733 \times 10^{92} \approx \alpha$$

$$= 7.297352568 \times 10^{-3}, \qquad (8)$$

a value very close to the fine structure constant α. It means that the "gravitational quantum - g_q " and the "mass quantum - m_q " are in a direct relationship with the electromagnetic force.

Besides the aspects related to the "generation of mass" from light and the "mass condensation" as an effect of gravity, also the "mass expansion" was taken into account. Thus the "mass expansion" was expressed by the difference between X_{NA0} for the ideal Avogadro number N_{A0} and $X_c = 1$ for speed of light c and it is equal to $X_{NA0} - X_c = 0.003734276393$ (see Eq. 1). Furthermore, the following dimensionless values (see Table 1) were considered: X_G for gravitational constant G; X_{pV_m} - for constant product pV_m; X_T - for absolute temperature T; X_e - for electron charge e; $X_\hbar$ - for the Planck constant $\hbar$.

From the calculus, we get the following results:

$$X_G - X_\hbar = (0.9371900118 - 0.93702679751)/(1 + 0.2\pi)/2^{28}$$

$$= 3.734039744909 \times 10^{-13}, \qquad (9)$$

$$X_G - (1 - 2X_T)$$

$$= \{[0.9371900118 - (1 - 2 \times 0.03008070882)]/(1 + 0.2\pi)\}/2^{135}$$

$$= 3.734416622 \times 10^{-44}, \tag{10}$$

$$(X_{pV_m} - X_G)\pi = \pi\, 0.005723577 \,/\, 2^{236}$$

$$= 1.628314914 \times 10^{-73} \approx (1 + 0.2\pi), \tag{11}$$

$$(X_{pV_m} - X_e)\pi = \pi\, 0.01424706959 \,/\, 2^{38}$$

$$= 1.62830435 \times 10^{-13} \approx (1 + 0.2\pi), \tag{12}$$

$$(1.628314914 - 1.62830435) \,/\, (1 + 0.2\pi) \,/\, 2^{227}$$

$$= 0.3008015 \times 10^{-74} \approx X_T. \tag{13}$$

From the equations (9)-(13), we can notice that the "mass expansion" $X_{NA0} - X_c = 0.003734276393$ is in a close relationship with numbers π and $(1 + 0.2\pi)$. It seems that in the Universe the "mass expansion" is in direct relation with a circle to which a unit is added. The diameter of the circle is in a direct relationship with the dimensionless value $X_c = 1$ for speed of light c. These results confirm the previous results published by the author [9, 10].

It is underlined that all the equations of this article refer only to the dimensionless values. These values are not absolute quantities, but relative ones. Thus, they can be compared to each other but only in a relative way. A key element of this comparison is π, which is always associated with the circumference of a circle. In this context, the powers of 10 were neglected since it does not matter if a circle is large or small, it remains a circle regardless of its diameter.

4. Conclusions

1. The mass is "generated" from light in a "condensation" process

under the gravity effect. "Mass condensation" is directly related to the Avogadro's number N_A. There is also a "mass expansion" that is in direct relation with light and numbers π and $(1 + 0.2\pi)$. This conclusion confirms certain previous results published by the author.

2. The "mass condensation" and the "mass expansion" can be expressed by two fundamental notions, respectively, "gravitational quantum - g_q" and "mass quantum - m_q". From calculus appears that the "gravitational quantum - g_q" would be a circular entity having its diameter equal to the "mass quantum - m_q" or $g_q \approx \pi m_q$. The "gravitational quantum - g_q" and the "mass quantum - m_q" are in a direct relationship with the fine structure constant α.

3. Although the relationships presented in the article are simple, intuitive and empirical, they offer very interesting and exciting conclusions on subatomic matter structure. With greater accuracy of the fundamental constants in the future, certain more subtle aspects of this structure could be highlighted.

5. A remark

Many researchers are circumspect about these results considering that they belong to the numerology. It is a totally false opinion. These results are obtained from dimensional analysis that is a really very serious method well-known by engineers. It is right, dimensional analysis is based on numbers, - similarity criteria -, but these numbers have nothing in common with numerology.

References

[1]   T. Ognean, 14th National Conference on Physics, Bucharest, September 2005.

[2]   T. Ognean, Revista de Chimie (Rev. Chim.) 65(11) (2014), 1378.

[3]   T. Ognean, https://vixra.org/abs/1809.0446. (2018).

[4]   T. Ognean, Physics Essays 32(3) (2019), 292. http://dx.doi.org/10.4006/0836-1398-32.3.292.

[5]   T. Ognean, Fundamental J. Modern Physics 12 (1) (2019), 35.

[6]   T. Ognean, Space-Time Relationship and Golden Number, Lambert, Berlin, 2020.

[7]   T. Ognean, Ch. 2. in New Insights into Physical Science, Book Publisher Intern., London, Vol. 2, 2020, pp. 21-33, DOI: 10.9734/bpi/nips/v6.

[8]   T. Ognean, Physics Essays 34(1) (2021), 12. http://dx.doi.org/10.4006/0836-1398-34.1.12.

[9]   T. Ognean, Physics Essays 35(2) (2022), 191. http://dx.doi.org/10.4006/0836-1398-35.2.191.

[10]   T Ognean, Physics Essays 36(4) (2023), 459. http://dx.doi.org/10.4006/0836-1398-36.4.459.