The Discovery of the Main Law of Cosmomicrophysical Evolution

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Abstract

The main path of the evolution of Physics is the complex path of overcoming infinities and various kinds of uncertainties. That is why it is impossible to create **a unified or generalized physical theory** free of uncertainties by means of universal constants with G, c, ħ -dimensionality and simple, one-dimensional variables - m, r, t. In order to build such a theory, a dimensionless universal constant is also necessary: Ս= $\mathbf{2,7\cdot 10^{63}} = \boldsymbol{const.}$, as well as a dimensionless variable: $\mathbb{N}_{Ս} \in (\mathbf{1}, Ս)$. We call that maximum value of the armonic variable $\mathbb{N}_{Ս}$ - **the Armonic Constant** and denote it with the capital letter "Ս" of the Armenian alphabet. In the article, we are trying to find the experimental confirmation of the constant numerical value of the Ս-constant, to discover **the main law of cosmomicrophysical evolution** and identify the role and significance of the Ս-constant in that law. **The future General Physical Theory (GPT) should be a theory composed of four constants (G, c, ħ, Ս) and four variables** $(\mathbf{m}, \mathbf{r}, \mathbf{t}, \mathbb{N}_{Ս})$.

Keywords: $\mathbb{N}_{Ս} \in (\mathbf{1}, Ս)$- armonic dimensionless variable, Ս= $\mathbf{2,7\cdot 10^{63}} = \boldsymbol{const.}$ –armonic dimensionless constant, **z**- cosmological redshift, the main law of cosmomicrophysical evolution.

Introduction

This article is about dimensionless universal constant number, Armonic Constant Ս=$2,7\cdot 10^{63} = const.$ and the armonic dimensionless variable $\mathbb{N}_{Ս} \in (1, Ս)$. There are many dimensionless constants in Physics, we are particularly interested in: $\frac{m_{pl}^2}{m_e^2}$ =$5,72\cdot 10^{44}$, $\frac{m_{pl}^2}{m_p^2}$ =$1,69\cdot 10^{38}$ numbers, but all those dimensionless numbers are not **universal** constants, they refer to a relatively narrow, limited sphere... **Only the Ս-armonic constant is a dimensionless universal constant.** $\mathbb{N}_{Ս}$ – **armonic variable is a series of natural numbers that has a beginning and an end. It starts with one and ends with the armonic constant:** Ս=$\mathbf{2,7\cdot 10^{63}} = \boldsymbol{const.}$

G,c, ħ – conceptual unity of universal constants

The entirety of knowledge gained during the historical development of Physics can be expressed by three symbols: G, c, ħ - constants. In other words, the discovery of those three universal constants is the outcome of the entire journey of Physics. And it is no coincidence that these constants are associated with the names of Newton, Einstein and Planck and respectively symbolize Newton's theory of gravitation, relativism and quantum theory.

For almost a century, physicists-scientists have been trying to accomplish Einstein's great dream - to create a universal physical theory, a unified theory, which, according to general opinion, will be based on the "three points" - G, c, ħ constants. It turns out that the number of these points is four. One dimensionless universal constant is added to the three dimensional universal constants - the Ư-armonic constant...

The main path of the evolution of Physics is the complex way of overcoming infinities and various types of uncertainties. That is why, without the Ư-armonic universal constant, using only the G, c, ħ constants, it is impossible to create a unified or generalized physical theory free from uncertainties, because in addition to universal constants endowed with dimensionality, **a dimensionless universal constant** is also necessary to build such a theory. Just as in addition to simple, one-dimensional variables m, r, t, a dimensionless variable is needed, the $\mathbb{N}_{Ư}$-armonic variable. **General Physical Theory (GPT) should be a theory composed of four constants $(\mathbf{G}, \mathbf{c}, \hbar, Ư)$ and four variables $(\mathbf{m}, \mathbf{r}, \mathbf{t}, \mathbb{N}_{Ư})$, as the great Poincaré once dreamt.**

And so, how to find the conceptual unity of those universal constants? As a matter of fact, the numerical values of G, c, ħ -dimensional universal constants are taken from experiment. It should be noted that we always use **the Planck-Dirac constant**. / ħ/.

$$G = 6{,}67 \cdot 10^{-8} \left(\frac{\mathrm{sm}^3}{\mathrm{gr} \cdot \mathrm{s}^2}\right)$$
$$c = 3 \cdot 10^{10} \left(\frac{\mathrm{sm}}{\mathrm{s}}\right)$$
$$\hbar = 1{,}054 \cdot 10^{-27} \left(\frac{\mathrm{gr} \cdot \mathrm{sm}^2}{\mathrm{s}}\right)$$

And it is not clear what they are determined by. **There is no theory that would explain and substantiate the reason for the immutability and universality of these physical quantities, indicating why they have such numerical values.**

M. Bronstein came close to solving that issue: “Having explained why the question of the values of world constants that have dimensionality is devoid of physical meaning,” Bronstein writes: “If the theory explains constants that are devoid of dimensionality, then its task will in principle be fulfilled, since only the values of these constants determine why the external world around us looks this way and not differently.” [1]

[1] G. E. Gorelik, V. Ya. Frenkel - "Matvei Petrovich Bronstein 1906-1938", MOSCOW "NAUKA" (Science) 1990, p. 146, in Russian

He considered that if the General Physical Theory **can explain dimensionless constants, then the problem of universal dimensional constant quantities will be solved in principle, because the numerical values of these dimensionless constants (their meaning) determine why the world around us, our universe, is like this and not another way...**

"After the relativistic quantum theory is built, the task will be to build the next part of our scheme, i.e. the fusion of quantum theory (with its constant ħ), theory of special relativity (with its constant c) and gravitational theory (with its G) into one single whole. As an example, Bronstein presents the task for cGħ-theory - to explain the dimensionless number $\frac{\hbar c}{G m_{pl}^2} = 6{\cdot}10^{44}$ and thereby explain the mass of the electron m_e through the constants c, G and ħ. But Bronstein sees the main task for cGħ-theory in Cosmology." [2]

And indeed, if the GP Theory **reveals the physical meaning of these dimensionless constants, their important role, functions,** then the question of numerical values of dimensional universal constants will be clear. Three universal dimensional constants, as well as the Armonic Constant, are first taken ready-made from the experiment, and based on them the General Physical Theory is built, which ultimately becomes the theoretical substantiation and explanation of the universality of these constants and the immutability of numerical values.

Let us follow Bronstein's advice. **The mass of the electron is taken from experiment and the constant of its numerical value also needs no explanation, just like the c,G,ħ-constants.** What is important for us **is the explanation of the physical meaning of** $\frac{\hbar c}{G \cdot m_e^2} = 5{,}72 \cdot 10^{44}$ **dimensionless quantity**, as well as what physical role and significance it and similar dimensionless numbers have /for example: $\frac{\hbar c}{G \cdot m_p^2} = 1{,}69 \cdot 10^{38}$/. In fact, he already guessed **the theoretical significance of the constant dimensionless numbers** $\left(\frac{m_{pl}}{m_e}\right)^2$ and $\left(\frac{m_{pl}}{m_p}\right)^2$, but neither Bronstein nor his successors understood their physical meaning. They could not explain the role of those dimensionless constant quantities in establishing the conceptual unity, connection and interdependence between c,G, ħ - universal constants...

Thus, **the first step towards the unification of the G, c, ħ -constants is the discovery of the Armonic Constant, as well as** the constants with a fixed numerical value of $\mathbb{N}_{\text{U}}$- armonic variable, which are determined by the fixed masses of stable elementary particles: $\mathbb{N}_{\text{U}} = \frac{m_{pl}^2}{m_k^2} = const.$. **With those dimensionless constant numbers, not only the connection and interdependence between elementary particles are revealed, but also the connections and interdependence between the universe, its subsystem Metagalaxy, and their components...**

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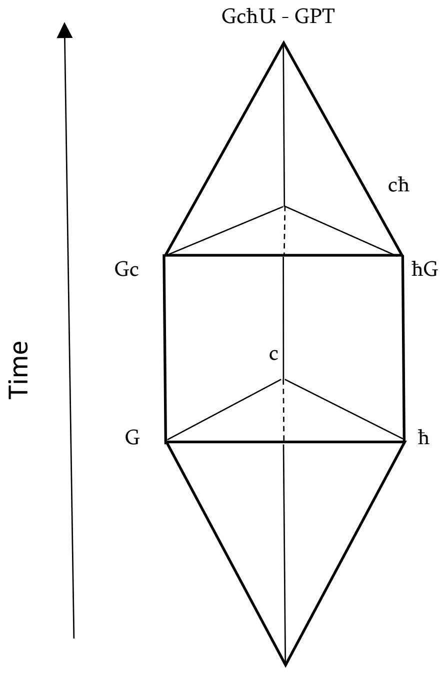
[2] G. E. Gorelik, V. Ya. Frenkel - "Matvei Petrovich Bronstein 1906-1938", MOSCOW "NAUKA" (Science) 1990, p. 147, in Russian

Let me say in advance that **when we say the conceptual unity of G, c, ħ, Ա-constants, it is necessary to understand their mutual connection, interdependence, to find out that they depend on each other, and are individually incomplete. Only with their unity it becomes possible to describe the whole physical reality, our universe with its subsystem MG, as well as their micro and macro components.** The key and the secret to that unity lie in the following: if this unity has not been achieved in the description of all types of physical systems and phenomena known to modern Physics, then the origin of such unity is connected solely with **the discovery of some fundamentally new type of physical systems.** In other words, the constants G, c, ħ, Ա must play a significant role in the description of that completely new type of physical systems. I make this intriguing statement with the purpose of stirring up interest in the second article following this article, "General Physical Theory and the **GcħԱ**-Cosmological Model". Some of the ideas claimed in the first article, as well as why our dimensionless constant and variable are called "Armonic", will also be explained in the second article.

A brief overview of the historical and logical stages of the formation and generalization of the formalism of the General Physical Theory, the evolution of Physics, can be schematically presented as follows:



Pre-physics (Newtonian Mechanics)

- Pre-physics - Newtonian Mechanics without universal constants.
- First stage: theories of laws of Physics composed of one universal constant. Newton's Theory of Gravitation /G/, Einstein's Theory of Special Relativity /c/ and Quantum Mechanics/ ħ/.
- Second stage: theories of laws composed of two universal constants. Einstein's Theory of General Relativity /Gc/ and Relativistic Quantum Mechanics/ ħc/.
- Third, final stage: a theory of laws composed of three universal constants and one dimensionless universal constant. General Physical Theory /ԱGcħ-Physics/.

It is clear from the scheme that the source of all theories is Pre-physics, Newton's Mechanics, which lacks any universal constant quantity. It is a physical theory of flat space, which does not even pose the question of the origin or structure of that space. An essential, great uncertainty, the solution of which was left to future general theory.

Historically, from the beginning, **in the first stage**, physical theories with one-dimensional universal constant were created: Newton's Theory of Gravitation/G/, Einstein's Theory of Special Relativity /c/ and Quantum Mechanics n/ ħ/. It is the first stage in the evolution of Physics itself.

Then, the relativistic theories of gravitation and quanta, created **in the second stage**, revealed the paradigms of the fundamental laws of Gc-Physics and ħc-Physics. These are two **special**, independent and even opposite theories of Physics, which reveal the possible physical connections and interdependences between variable m,r,t-dimensional quantities with two universal constants, G,c and ħ,c... Of course, there is also the possibility of another, non-relativistic special theory: G ħ - Physics, which, however, is an ineffective theory and is left out of the evolution of Physics... **Since the evolution of Physics proceeds in the direction of freeing the content of concepts and laws from uncertainties,** and Għ -Physics assumes the existence of infinitely high speeds, that is why the evolution of Physics continues with the main pathway of relativistic theories - Gc-Physics and ħc-Physics, as well as generalization and synthesis, constantly overcoming the uncertainties and infinities.

As a result of that synthesis, the theory of **the third, final stage** is born: General Physical Theory, which describes physical reality with universal constants **G, c, ħ, U**.

Compare this schematic picture of the evolution of Physics with A.L. Zelmanov's **cube** of physical theories. [3]

The completed logical structure of a physical theory with the main stages of its theoretical formation or logical development coincides or corresponds to the main stages of the historical evolution of Physics (just as the stages of ontogenesis in Biology are roughly similar to the stages of phylogenesis). The complete or full theoretical structure of Physics is formed through the logical development and generalization of **particular** theories, making a transition to **specific** theories of Physics and from there a logical transition to a **general or generalized** theory.

All of them together form a single theoretical structure.

1. $\mathbb{N}_{U}$-the Discovery of the Armonic Variable

The creation of a fundamentally new type of Cosmology is stimulated by the following dimensionless numbers known to physicists for a long time: $g^{-1} = \frac{\hbar c}{G m_e^2} = 5{,}72 \cdot 10^{44}$, $g^{-1} = \frac{\hbar c}{G m_p^2}$ $=1{,}69 \cdot 10^{38}$. Physicists believe they are important for a future unified theory, but **the physical meaning of these numbers has not been revealed to date.**

[3] A.L. Zelmanov, V.G. Agakov, Elements of the Theory of Relativity, M, 1989, p. 12, in Russian

Similar to those dimensionless constant numbers, other constant numbers can be obtained for particles with a fixed mass: $m_{W^{\pm}} -$ for W boson of electroweak unification: $g^{-1} = \frac{\hbar c}{G m_W^2} \approx 10^{34}$. For $m_{x,y} -$ X,Ybosons of grand unification: $g^{-1} = \frac{\hbar c}{G m_{X,Y}^2} \approx 10^{10}$. A similar number can also be found for today's microwave background photons: $g^{-1} = \frac{\hbar c}{G m_{\gamma}^2} = \frac{m_{pl}^2 c^4}{E_{\gamma}^2}$=2,7· 10^{63}. And if we take into account the fact that for the Planck mass, that number is equal to: $g = \frac{\hbar c}{G m_{Pl}^2}$ =1, then it becomes obvious that these numbers form a certain **unified sequence**. Moreover, **these dimensionless numbers increase as the particle mass decreases.**

$$\frac{\hbar c}{G m_{\gamma}^2} = \frac{m_{pl}^2 c^4}{E_{\gamma}^2} = 2{,}7 \cdot 10^{63}$$

$$\frac{\hbar c}{G m_e^2} = 5{,}72 \cdot 10^{44}$$

$$\frac{\hbar c}{G m_p^2} = 1{,}69 \cdot 10^{38}$$

$$\frac{\hbar c}{G m_W^2} = 2{,}35 \cdot 10^{34},$$

$$\frac{\hbar c}{G m_{x,y}^2} = 3{,}725 \cdot 10^{10}$$

$$\frac{\hbar c}{G m_{pl}^2} = 1$$

All bosons and fermions with a fixed mass known to the standard theory fit into this sequence of natural numbers. Moreover, it is likely that other elementary stable particles will be discovered, whose index (g^{-1}) will also fit into $1 \longrightarrow 10^{63}$ sequence scale of natural numbers.

Now we have come closer to revealing the secret of those numbers, or their physical meaning more precisely.

Each of these constant numbers relates the mass of a given type of elementary particle to its mass in the phase of expansion of our universe corresponding to that specific number:

In g^{-1}=2,7· 10^{63} case: $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1} = \mathbf{5,875 \cdot 10^{58}_{gr}}$,

g^{-1}=5,72 · 10^{44} $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1} = \mathbf{1,24 \cdot 10^{40}_{gr}}$,

g^{-1}=1,69 · 10^{38} $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1} = \mathbf{3,68 \cdot 10^{33}_{gr}}$,

$g^{-1} = 2{,}35 \cdot 10^{34}$ $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1} = 5{,}1 \cdot \mathbf{10^{29}_{gr}}$,

$g^{-1} = 3{,}725 \cdot 10^{10}$ $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1} = 8{,}1 \cdot \mathbf{10^{5}_{gr}}$,

g =1 $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot \mathbf{g} = \mathbf{2,176 \cdot 10^{-5}_{gr}}$:

Each of those dimensionless constant g^{-1} numbers represents a specific phase of the expansion of our universe, in which case $\mathbf{M_{UV}} = \mathbf{m_{pl}} \cdot g^{-1}$. But since the expansion of the universe is not limited to those few constant numbers, the addition of the $\boldsymbol{M_{UV}}$ mass of the universe relative to the Planck mass is a series of ever-increasing natural numbers and not transitional jumps between constant dimensionless numbers; instead of $g^{-1} -$ s it is preferable to use $\mathbb{N}_{U} -$ armonic dimensionless variable number, which has a more specific content. Although it is a series of natural numbers, it is limited on both sides: it has a beginning and an end. The beginning of $\mathbb{N}_{Ц}$ – number is manifested by two equations.

$$\mathbb{N}_{Ц} = \frac{M_{UV(min.)}}{m_{pl}}=1 \quad \mathbb{N}_{Ц} = \frac{m_{pl}^2}{m_{k(max.)}^2}=1 \;:$$

And the upper limit of the numerical value of the $\mathbb{N}_{Ц}$ is determined by the Ц- Armonic Constant.

Thus, it turns out that $\frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}} = \mathbb{N}_{Ц} = \frac{\mathbf{m_{pl}^2}}{\mathbf{m_k^2}}$, where m_k is the mass of a **characteristic particle** of the corresponding phase of the expansion of the universe. From this equation $\mathbf{M_{UV}} = \frac{\mathbf{m_{pl}^3}}{\mathbf{m_k^2}}$ or $\mathbf{E_{UV}} = \frac{\mathbf{E_{pl}^3}}{\mathbf{E_{\gamma}^2}}$ law follows. Let us present the table of M_UV and m_k numerical values corresponding to the given numerical value of $\mathbb{N}_{Ц}$:

$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_{\gamma}^2} = \frac{m_{pl}^2c^4}{E_{\gamma}^2} = 2{,}7 \cdot 10^{63}$	m_{γ}=4,18 $\cdot$ 10_{gr}^{-37}	$M_{UV} = 5{,}875 \cdot 10_{gr}^{58}$
$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_e^2} = 5{,}72 \cdot 10^{44}$	m_e=9,1 $\cdot$ 10_{gr}^{-28}	$M_{UV} = 1{,}245 \cdot 10_{gr}^{40}$
$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_p^2} = 1{,}69 \cdot 10^{38}$	m_p=1,67 $\cdot$ 10_{gr}^{-24}	$M_{UV} = 3{,}68 \cdot 10_{gr}^{33}$
$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_W^2} = 2{,}35 \cdot 10^{34}$,	$m_W = 1{,}418 \cdot 10_{gr}^{-22}$	$M_{UV} = 5{,}1 \cdot 10_{gr}^{29}$
$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_{x,y}^2} = 3{,}725 \cdot 10^{10}$	$m_{x,y}$=1,124 $\cdot$ 10_{gr}^{-10}	$M_{UV} = 8{,}1 \cdot 10_{gr}^{5}$
$\mathbb{N}_{Ц} = \frac{\hbar c}{Gm_{pl}^2} = 1$	m_{pl}=2,176 $\cdot$ 10_{gr}^{-5}	$M_{UV} = 2{,}176 \cdot 10_{gr}^{-5}$

With those $\mathbb{N}_{Ц}$ numbers determined by the fixed masses of elementary particles, the other characteristic parameters of our universe can also be obtained at the given evolutionary stage.

$$\frac{\mathbf{r_k^2}}{\mathbf{r_{pl}^2}} = \frac{\mathbf{r_k^2c^3}}{\hbar \mathbf{G}} = \mathbb{N}_{Ц} = \frac{\mathbf{R_{UV}}}{\mathbf{r_{pl}}}\text{, from where } \boldsymbol{R_{UV}} = \frac{\mathbf{r_k^2}}{\boldsymbol{r_{pl}}} \quad \boldsymbol{or} \quad \boldsymbol{R_{UV}} = \mathbb{N}_{Ц} \cdot \boldsymbol{r_{pl}}\,.$$

For example, in the case of $\mathbb{N}_{Ц} = 5{,}72 \cdot 10^{44}$, $\boldsymbol{R_{UV}} = 5{,}72 \cdot 10^{44} \cdot r_{pl} = \mathbf{9{,}24 \cdot 10_{CM}^{11}}$, and in the case of $\mathbb{N}_{Ц} = 1{,}69 \cdot 10^{38}$, $\boldsymbol{R_{UV}} = 1{,}69 \cdot 10^{38} \cdot r_{pl} = R_{UV} = \mathbf{2{,}73 \cdot 10_{CM}^{5}}$. The characteristic time of the universe is also determined in the same way: $\mathbf{t_{UV}} = \mathbf{t_{pl}} \cdot \mathbb{N}_{Ц}$ **or** $\boldsymbol{t_{UV}} = \frac{\mathbf{t_k^2}}{\boldsymbol{t_{pl}}}$. We denote the characteristic time of our universe with the lowercase letter t_{UV}, as opposed to the capital letter T, denoting temperature.

Below we will touch upon the content and rationale of the laws $\frac{M_{UV}}{m_{pl}} = \mathbb{N}_{Ц} = \frac{m_{pl}^2}{m_k^2}$ and $\boldsymbol{M_{UV}} = \frac{m_{pl}^3}{m_k^2}$, in order to avoid their misinterpretation. It is worthwhile to note here that the first law means **the evolutionary relationship between $\boldsymbol{M_{UV}}$ *and* $\mathbf{m_k}$, that in the case of the given $\mathbb{N}_{Ц}$ of the expansion of the universe, these masses should have exactly the given numerical values,** strictly according to the $\boldsymbol{M_{UV}} = \frac{m_{pl}^3}{m_k^2}$ law. But that law does not mean at all that **$\boldsymbol{M_{UV}}$ is composed of particles with the given mass $\mathbf{m_k}$.**

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Why couldn't experts guess the physical meaning of the large numbers mentioned above? Because they are constrained by the ideas of the Standard Cosmological Model /ΛCDM/.

a/ The basis of the Standard Cosmological Model is Friedmann-Lemaitre's idea[4] that during the expansion of the universe, its mass and energy are preserved:

$M_{UV} = \rho_{UV} \cdot V_{UV} = const.$ or $E_{UV} = \varepsilon_{UV} \cdot V_{UV} = const.$. This **very idea is the reason for the emergence of conceptual problems of the Standard Cosmological Model.** Instead of revising and changing the idea that caused these problems, cosmologists invented the inflation scenario, further deepening the crisis of that science.

It did not even occur to them that our universe (also the MG) is expanding, because a certain amount of mass regularly penetrates from outside and the mass of our universe always increases during expansion, more precisely, the opposite: **due to the increase in mass, our universe is constantly expanding** and the $\boldsymbol{M_{UV} \sim R_{UV} \sim t_{UV}}$ parameters of the universe are directly proportional to each other, as follows from the fundamental laws of Gc-Physics.

$$\mathbf{M_{UV}} = \frac{\mathbf{R_{UV} \cdot c^2}}{\mathbf{G}}, \qquad \mathbf{M_{UV}} = \frac{\mathbf{t_{UV} \cdot c^3}}{\mathbf{G}}, \qquad \mathbf{R_{UV} = t_{UV} \cdot c}$$

As each of those three parameters increases or decreases $\mathbb{N}_{\mathrm{U}}$ times, the others also change that many times.

b/Furthermore, cosmologists were accustomed to the idea that our universe is expanding adiabatically with the pattern $R_{UV} \sim r_\gamma \sim \frac{1}{T} \sim \frac{1}{z}$, meanwhile this is not the case. Our universe and its subsystem MG are expanding with the pattern $\boldsymbol{R_{UV} \sim R_{MG} \sim r_\gamma^2 \sim \frac{1}{T^2} \sim \frac{1}{z^2}}$.

Today, if someone says that our universe is not expanding according to Hubble's law, they will be laughed at. After all, astro-observations show that the separation of galaxy clusters corresponds to Hubble's law. But that law approximately correctly describes the **extensive expansion of the already formed large-scale structure of the MG, which occurs in the range of $\mathbf{1} \geq \Delta \geq \mathbf{0}$ numerical values of Δ-extensive redshift.** Extensive expansion **with acceleration of** MG is also observed in that range.

But the **intensive expansion** of the universe and the MG occurs in the following **range** of extreme numerical values of the $\mathbf{z}$ -intense redshift: $\mathbf{5,19 \cdot 10^{31}} \geq \mathbf{z} \geq \mathbf{1}$. Moreover, **the intensive expansion of the universe and the MG is carried out at an unchanged c-speed.** We will address all this in the next article.

[4] "A Homogeneous Universe of Constant Mass and Increasing Radius, Explaining the Radial Velocity of Extragalactic Nebulae", in Russian **Abbé G. Lemaître**, *Monthly Notices of the Royal Astronomical Society*, Volume 91, Issue 5, March 1931, pp. 483–490, Published: 13 March, 1931, in Russian

"ON THE CURVATURE OF SPACE" A. A. Friedman, July 1963, Vol. LXXX, issue 3 PHYSICS-USPEKHI (Advances in Physical Sciences). The work was first published in German in Zs. Phys. 11, 377 (1922), in Russian

2. The Search for Coincidences of Large Numbers in Cosmomicrophysics: Background to the Discovery of Armonic Numbers

Starting with Eddington, Dirac and Gamow, physicists have repeatedly tried to give some explanation to the coincidences of large numbers discovered in the fields of Cosmology and Microphysics, without violating the basic laws of Modern Physics. But until the discovery of the Armonic Number, all these attempts were a failure, and the secret of coincidences of large numbers was shrouded in impenetrable mystery. Although, as Zeldovich noted in his famous book: "There is a belief among physicists that dimensionless quantities that differ significantly from the unit are subject to explanation and are the matter of (at least) a qualitative theory. This belief suggests that the proximity of large dimensionless numbers from various natural phenomena indicates the presence of internal connections between these phenomena and can serve as a beacon indicating the path of scientific development".[5] And indeed, the discovery of Armonic Numbers makes it possible not only to extract the parameters of our universe as a limited physical system, to outline the patterns of their change, and **to give their borderline, extreme values**, but also to determine the mutual connection of the universe and its subsystem MG, their main components and to describe the mutual dependence, the number of their main components corresponding to each phase of the evolution of the universe, as well as the connection and mutual dependence of the physical parameters of the universe and its main components.

In a nutshell, the almost century-long history of the study of coincidences of large numbers can be considered the background of the discovery of the U-Armonic Constant and the N_U-Armonic Variable.

It is worthwhile to mention below only the main inaccuracies that did not allow my predecessors to discover Armonic numbers.

First of all, I would like to say that Zeldovich was right when he claimed that: " in the absence of a theory with logical closure, hints or indications of the role of large numbers are ambiguous "[6]. But we managed to do the opposite, by discovering Armonic numbers based on the search for coincidences of large numbers, using them to create a complete theory with logical closure...

[5] Ya. B. Zeldovich, I. D. Novikov, "The Structure and Evolution of the Universe", Moscow, 1975, p. 668, in Russian

[6] Ya. B. Zeldovich, I. D. Novikov, "The Structure and Evolution of the Universe", Moscow, 1975, p. 669, in Russian

And so, according to Dirac and Gamow, from the G, c, ħ constants and the mass m of elementary particles, it is possible to make a non-dimensional quantity $\frac{G \cdot m_k^2}{\hbar c} = g$, for example, for a proton: $g_p = \frac{G \cdot m_p^2}{\hbar c} \approx 10^{-38}$. This is, in fact, the ratio of the square of the Planck mass to the square of the proton mass: $\frac{\hbar c}{G \cdot m_p^2} = \frac{m_{pl}^2}{m_p^2} = 1{,}69 \cdot 10^{38}$. This is one large number taken from Microphysics. Dirac takes the total number of nucleons from the large numbers that characterize the world or our universe (viewing our universe as a closed system). Based on the data of his time, Dirac gets $N = 10^{79}$ and naturally concludes that $N = g^{-2}$. In the end, both Dirac and Gamow come to a conclusion that the T_{UV} age of our universe is equal to the product of the characteristic time of protons (nucleons) $t_p = 10_s^{-24}$ and g^{-1}: $T_{UV} = t_p \cdot g^{-1}$.

It is clear that this formula does not work because T_{UV} is actually a variable quantity and the expression on the right-hand side of the equation is invariable. So either the expression on the right-hand side of the equation must be variable for the equation to work, or T_{UV} must be viewed as the final time that captures the end of the expansion of the universe and as such is an invariable quantity, giving a very small number for our universe.

Let us first discuss the second case. The formula of Dirac and Gamow has a physical meaning only if we assume that the universe has an upper limit of expansion, that is, that this formula captures the moment of the end of the expansion, that the expansion of our universe in terms of time has a beginning $T_{UV} = t_{pl}$, which is a fixed invariant quantity and naturally should also have an end $T_{UV(max.)}$, which is also a fixed quantity and in that sense is invariant. However, in this case, it is not clear how the age of the universe, T_{UV}, will grow from its minimum, t_p, to its maximum, $T_{UV} = t_p \cdot g^{-1}$:

And then it is not clear why exactly t_p should be taken as a unit of time, a quantum, and not, say, t_p, especially since nucleons appear late in the expansion process...

So, let us move on to the first possibility of **overcoming** the inaccuracy of the Dirac-Gamow formula, which is even more interesting from the perspective of revealing the interconnection between the phenomena of the microworld and the megaworld, and physical systems.

As we already mentioned, the first way to overcome the inaccuracy of the formula $T_{UV} = t_p \cdot g^{-1}$ lies in the fact that the expression on the right-hand side of the equation $(t_p \cdot g^{-1})$ should be changed into a variable like T_{UV}.

In the past, Dirac (and others) tried many times to rectify the situation in this way, but resorted to another extreme, because $(t_p \cdot g^{-1}) = \frac{\hbar}{c^2 \cdot m_p} \cdot \frac{\hbar c}{G \cdot m_p^2}$, then, according to Dirac, one of the G, h, c, m_p constants must be variable. And here they began to revise the physical universal constants; especially the gravitational constant G was mercilessly attacked. Unfortunately, such attempts are still being made today, but in vain.

Meanwhile, the only right way to solve the problem, to change the expression on the right-hand side of the formula, is connected with new ideas, new approaches. At first glance, it might seem like we are going back to Dirac's viewpoint on one of the four constants being variable, but that is not entirely the case. In my opinion the route of **generalizations** should be taken. It is not about the universal constants G, c, ħ, but about the quantities mp and g.

What is g? It is a non-dimensional quantity, a number that expresses, say, the ratio of the square of the proton mass m_p to the square of the Planck mass: $g_p = \frac{m_p^2}{m_{pl}^2} \approx 10^{-38}$. However, it turns out that g has a more **general** meaning in addition to that particular case. In the first stage of generalization, it turns out that g^{-1} also expresses the ratio of the characteristic time of a proton (nucleon): $t_p = \frac{\hbar}{m_p \cdot c^2}$, and the Compton wavelength: $r_p = \frac{\hbar}{m_p \cdot c}$, to Planck time and radius.

$$g^{-1} = \frac{m_{pl}^2}{m_p^2} = \frac{t_p^2}{t_{pl}^2} = \frac{r_p^2}{r_{pl}^2} \approx 10^{38}.$$

Thus: $T_{UV} = t_p \cdot g^{-1} = t_p \cdot \frac{t_p^2}{t_{pl}^2} = \frac{t_p^3}{t_{pl}^2}$, and it becomes clear that at this **generalization** level: $T_{UV} = t_p \cdot g^{-1} = \frac{t_p^3}{t_{pl}^2}$, the expression on the right-hand side of which, even in its updated form, remains unchanged. This leads to the next, even deeper, even more essential step of **generalizations**. It is known that g expresses the relation of not only the mass of the proton (m_p), but also the mass of the electron (m_e), and why not, also all other stable elementary particles, including electroweak particles, characteristic particles of grand unification, and even the mass of the relic photon to m_{pl}. We have already written about it in the previous chapter, but for the sake of clarity, let us present again the numerical values of g-s expressing these relations.

$$g_\gamma = \frac{Gm_\gamma^2}{hc} = \frac{m_\gamma^2}{m_{pl}^2} \approx 10^{-63}$$

$$g_e = \frac{Gm_e^2}{hc} = \frac{m_e^2}{m_{pl}^2} \approx 10^{-45}$$

$$g_p = \frac{Gm_p^2}{hc} = \frac{m_p^2}{m_{pl}^2} \approx 10^{-38}$$

$$g_w = \frac{Gm_w^2}{hc} = \frac{m_w^2}{m_{pl}^2} \approx 10^{-34}$$

$$g_{x,y} = \frac{Gm_{x,y}^2}{hc} = \frac{m_{x,y}^2}{m_{pl}^2} \approx 10^{-10}$$

$$g_{pl} = \frac{Gm_{pl}^2}{hc} = \frac{m_{pl}^2}{m_{pl}^2} = 1$$

Thus, in the given paradigm, all elementary particles have an important common feature: their masses are smaller than m_{pl}, by which their quantum nature is conditioned, consequently their **masses and corresponding g-s can be generalized** by presenting with one general formula: $\mathbf{g_k} = \frac{\mathbf{m_k^2}}{\mathbf{m_{pl}^2}}$, where k- index means quantum particle. At first glance, this may seem like a formal generalization, but as we will see below, it will allow us to discover patterns with rich content.

The merit of that formula is that m_k is variable, it can take any value smaller than the mass m_{pl}, accordingly, g_k has also become variable and in that sense g_k is already similar to $\mathbb{N}_{U}$- armonic variable. From the aforementioned paradigm, it can be seen that g_k^{-1} can have numerical values greater than 1, just like the variable $\mathbb{N}_{U}$. So all that remains is to equalize them:

$$g_k^{-1} = \mathbb{N}_U = \frac{\boldsymbol{m_{pl}^2}}{\boldsymbol{m_k^2}} = \frac{\boldsymbol{r_k^2}}{\boldsymbol{r_{pl}^2}} = \frac{\boldsymbol{t_k^2}}{\boldsymbol{t_{pl}^2}}.$$

From now on, we can get rid of g_k and deal only with the armonic variable $\mathbb{N}_U$, especially since this variable is more general than g_k^{-1}. The variable $\mathbb{N}_U$ is also the growth factor of its parameters m, r, t during the expansion of our universe: $M_{UV} = \mathbb{N}_U \cdot m_{pl}$, $R_{UV} = \mathbb{N}_U \cdot r_{pl}$, $t_{UV} = \mathbb{N}_U \cdot t_{pl}$.

Thus, inserting the value $\mathbb{N}_U = \frac{t_k^2}{t_{pl}^2}$ in the formula $t_{UV} = \mathbb{N}_U \cdot t_{pl}$, we will get the formula $\mathbf{t_{UV}} = \frac{\mathbf{t_k^2}}{\mathbf{t_{pl}}}$, which expresses the interdependence of that global physical system and elementary particle parameters during the expansion of the universe. And it applies to all the physical parameters (m, r, t,): For example $\boldsymbol{M_{UV}} = \frac{\boldsymbol{m_{pl}^3}}{\boldsymbol{m_k^2}}$, $\boldsymbol{R_{UV}} = \frac{\boldsymbol{r_k^2}}{\boldsymbol{r_{pl}}}$, $\boldsymbol{t_{UV}} = \frac{\boldsymbol{t_k^2}}{\boldsymbol{t_{pl}}}$, from which it also follows: $M_{UV} = \mathbb{N}_U \cdot m_{pl} = \frac{m_{pl}^3}{m_k^2}$, $m_k = \frac{m_{pl}}{\sqrt{\mathbb{N}_U}}$, *as well as* $r_k = r_{pl} \cdot \sqrt{\mathbb{N}_U}$, $t_k = t_{pl} \cdot \sqrt{\mathbb{N}_U}$.

It is interesting to compare our laws $t_k = t_{pl} \cdot \sqrt{\mathbb{N}_U}$ and $t_{UV} = \frac{t_k^2}{t_{pl}}$ with their formula $T_{UV} = t_p \cdot g^{-1}$ from the perspective of revealing the Dirac-Gamow inaccuracy. If we insert the value $g^{-1} = \frac{t_p^2}{t_{pl}^2}$ in the latter, we will get $T_{UV} = \frac{t_p^3}{t_{pl}^2}$, while ours will be as follows: $t_{UV} = \frac{t_k^2}{t_{pl}}$. From the comparison, it can be observed that the Dirac-Gamow formula is formal and does not express the change of the universe age, while ours has a deep content; it is a law of nature. First, our law $t_{UV} = \frac{t_k^2}{t_{pl}}$ describes the change of the universe age related to the evolution of elementary particles; or more precisely, the evolution of elementary particles is related to the expansion of the universe, its age, and then when that expansion ends, in case $\mathbb{N}_U = \text{Ш}$, the characteristic time or age of the universe is equal to: $\boldsymbol{t_{UV(max.)}} = \text{Ш} \cdot \boldsymbol{t_{pl}} = \boldsymbol{const.}$ or $\boldsymbol{t_{UV(max.)}} = \frac{\boldsymbol{t_{\gamma(min.)}^2}}{\boldsymbol{t_{pl}}}$ **=const.** , because $\boldsymbol{t_{\gamma(min.)}} = \boldsymbol{t_{pl}} \cdot \sqrt{\text{Ш}} = \boldsymbol{const.}$... In other words, the **Ʉ- constant limits the maximum numerical values of M_{UV}, R_{UV}, t_{UV} - parameters of the universe and the minimum numerical values of m_k, r_k, t_k- parameters of elementary particles...**

$t_{UV(max.)}$ =Ʉ $\cdot t_{pl} = 1{,}455 \cdot 10^{20}$s- **this marks the end of the expansion of our universe, the characteristic maximum time of the universe, which is associated with its maximum mass:** $t_{Ʉ} = \frac{G \cdot M_{UV(max.)}}{c^3} = 1{,}455 \cdot 10^{20}\mathrm{s} = const.$.

The characteristic time of the universe is not to be confused with the lifetime of the universe. They are different things.

The same can be said about Dirac's formula $N \sim \frac{c^3}{HGm_p} \approx g^{-2}$, where the expression $\left(\frac{c^3}{HGm_p}\right)$ is equivalent to $\left(\frac{M_{UV}}{m_p}\right)$, so $\frac{M_{UV}}{m_p} = \frac{m_{pl}^4}{m_p^4} \approx g^{-2}$. For Dirac, it actually means: $M_{UV} = \frac{m_{pl}^4}{m_p^3}$, which is significantly different from our law: $M_{UV} = \frac{m_{pl}^3}{m_k^2}$.

3. *z*-Cosmological Redshift is a Quantity Describing the *Intense* Expansion of Our Universe and Its Subsystem Metagalaxy/MG/

Another dimensionless variable quantity describing the cosmomicrophysical evolution is known to science, **the z-cosmological redshift**. It is the redshift of cosmic microwave background /**CMB**/ photons/ $\mathbf{z_{CMB}}$/ or the redshift of free photons in the early period of the universe, in the super-dense and high-temperature plasma for a short time between absorption and radiation / $\mathbf{z_{\gamma}}$/. **In fact, only this is directly related to the expansion of the universe and the MG and directly describes the entire process of that expansion, from beginning to end. The redshift of** distant objects - **galaxies and quasars - cannot play such a role.**

cz = HR - Hubble's law particularly correctly describes the extensive expansion of the already formed large-scale structure of the MG - the movement of galaxies and their clusters away from each other or from the observer. **That law works in the following range of redshift values: $0 \geq \Delta \geq 1$. Therefore Hubble's law is correct in the** cΔ = HR form. **That Δ can be called the metagalactic extensive redshift. In the 60s of the previous century, a certain difference was made between Δ − and z- redshift.**

"The advantage of using Δ is related to the finite range of variation - from Δ= 0 near the observation point to Δ= 1 at the horizon; Δ→ 1 corresponds to the fact that the frequency of the observed light tends to zero; Δ= 1 is the limit of the possibility of observation. The variable z varies from 0 to ∞ , which makes it difficult to construct graphs…"[7]

In the current extensive expanding volume of the large-scale structure of the MG, the cosmic background microwave radiation /**CMB**/ is approximately homogeneous and isotropically distributed, its temperature is T = 2,726 K everywhere, regardless of where the observer is located, therefore the redshift of the background microwave radiation is equal everywhere: $\mathbf{z_{CMB}}$=1. In other words, the formation of the large-scale structure of the MG is **mostly** completed in the final

[7] Ya. B. Zeldovich, I. D. Novikov, "The Structure and Evolution of the Universe", Moscow, 1975, p. 67, in Russian

stage of the expansion or evolution of the MG, when $\mathbf{z_{CMB}}$ =1 and the temperature of the CMB radiation is T = 2,726 K everywhere.

In the literature, it is widely written that the redshift of background microwave radiation is equal to 1000 or 1100. In order to avoid misunderstanding, it should be clarified. The CMB redshift of 1000 or 1100 was during the recombination phase of the hydrogen atom, when the photon temperature was 3000K. And today it is considered as follows: $\boldsymbol{T_{CMB}}$**=2,726 K**. Taking into account that the CMB temperature and the z-redshift are always directly proportional to each other, therefore, if the temperature has decreased 1000 or 1100 times, then the z_{CMB} redshift has also decreased that much, i.e. today, $z_{CMB} = 1$.

$0 \geq \triangle \geq 1$ - this is really the redshift of objects at some distance from the observer. Unlike Δ, which depends on the observer, their location, $\mathbf{z_{CMB}}$ or $\mathbf{z_\gamma}$ **is an objective physical phenomenon and does not depend on the observer. It physically depends on the kinetic energy and temperature of photons, the change of which is also caused by an objective process - the expansion of our universe. And the expansion of the universe has a beginning and an end. That is why the intense redshift should also have limited numerical values:**

$$\mathbf{5,19 \cdot 10^{31} \geq z_\gamma \geq 1} \quad \text{or} \quad \mathbf{z_\gamma} \in (1, \sqrt{\text{Ա}}).$$

The proof of this is the discovery of the main law of cosmomicrophysical evolution presented below .

4. Discovery of the Main Law of Cosmomicrophysical Evolution, Experimental Confirmation of the Numerical Value of the Ա-Armonic Constant

As already mentioned, the ($\mathbb{N}_{Ա} \geq 1$)-armonic variable cannot have numerical values smaller than 1, and this is determined by Planck's parameters. It is the limit of the compression of our universe and the beginning of its expansion. However, the expansion of the universe must also have an upper limit and, naturally, this means that the variable $\mathbb{N}_{Ա}$ cannot have an infinitely large numerical value, it must have a maximum value, beyond which it cannot be greater. That maximum value of that very $\mathbb{N}_{Ա}$ variable is called the **Armonic Constant** and is denoted by the capital letter "Ա" of the Armenian alphabet. Now let us try to find the experimental confirmation of the numerical value of the Ա= $2,7 \cdot 10^{63}$- constant, as well as to discover the main law of cosmomicrophysical evolution and the role and significance of the Ա-constant in that law.

In general, we discovered Ա= $2,7 \cdot 10^{63}$-armonic constant and its numerical value by a complicated, sinuous path of guesses. The main guideline was the idea that every beginning has an end, that our universe is a temporary system, so its expansion must have a limit, an end, and so on. Certainly, the adjustment of the numerical value of the Ա-constant is the most difficult part. At first I thought that Ա= 10^{62}, but eventually I was convinced that Ա is equal to $2,7 \cdot 10^{63}$. Moreover, the great Archimedes believed that our universe is made up of exactly 10^{63} grains. We obtained that numerical value from the ratio of the square of Planck temperature to the square of the current residual radiation temperature: Ʉ=$\left(\frac{T_{pl}}{T_\gamma}\right)^2$=$\left(\frac{14\cdot10^{31}K}{2,726K}\right)^2$=2,7· 10^{63}.

Specialists dealing with large numbers have long noticed the following proportion in the Standard Cosmological Model /ΛCDM/.

$\frac{M_{UV}}{m_{pl}}=\frac{R_{UV}}{r_{pl}}=\frac{t_{UV}}{t_{pl}}\approx \mathbf{10^{61}}$. M_{UV}, R_{UV} , t_{UV}- the numerical values of these parameters are determined by the **Hubble Constant:** $\boldsymbol{H}_\circ$ =2,3 $\cdot_{s^{-1}}^{-18}$, confirmed by the current capabilities of astro-observations, and the Standard Cosmological Model is built on this basis. As we can see, **Ʉ=**$\left(\frac{T_{pl}}{T_\gamma}\right)^2$=$\left(\frac{14\cdot10^{31}K}{2,725K}\right)^2$**=2,7·** $\mathbf{10^{63}}$ – the armonic constant exceeds the $\mathbf{10^{61}}$ *number by two degrees.* That very discrepancy is a consequence of the model error of ΛCDM.

In other words, if we are talking about the current state of our universe, then only the current parameters of CMB photons should be used to describe the parameters of our universe and not the **unreliable** Hubble constant...

Of course, this still does not mean that the obtained number **Ʉ=2,7·** $\mathbf{10^{63}}$ is a constant quantity, because as a result of the further expansion of the universe, the index $T_\gamma = 2{,}726$ K may change and decrease. And we do not seem to have any evidence yet that it will not happen.

In our opinion, the most valuable achievement of a century of studies in the field of Cosmology and Physics is the discovery of **thermal equilibrium phases** of plasma and photons during the cosmomicrophysical evolution and the determination of **z-cosmological redshifts** corresponding to these phases.

For example, the **Hadron Epoch** is when, under conditions of high temperatures, $T > 10^{13}$K, that is, when kT> m_pc^2, nucleon-antinucleon pairs in cosmomicrophysical plasma are in thermal equilibrium with photons. This thermal equilibrium phase lasts up to T=$\frac{m_pc^2}{k}$=1,09 · 10^{13}K index, after which nucleon-antinucleon pairs are annihilated. The $z_\gamma = z_p$=$\frac{\mathrm{T=1{,}09\cdot10^{13}K}}{T_o=2{,}726\ K}$=4· 10^{12} cosmological redshift corresponds to T_γ=T_p = 1,09 · 10^{13}K temperature.

The next phase is called the **Lepton Epoch,** when electron-positron pairs in the plasma are in thermal equilibrium with photons at high temperatures, $T > 10^9$K. This phase, for obvious reasons, lasts up to T=$\frac{m_ec^2}{k}$=5,93 · 10^9K , after which electron-positron pairs are annihilated. The z_γ = z_e=$\frac{\mathrm{T=5{,}93\cdot10^{9}K}}{T_o=2{,}726\ K}$=2, 175 · 10^9 cosmological redshift corresponds to T_γ=T_e =5,93 · 10^9K temperature.

By the analogy of proton and electron, we can determine the corresponding T_k and z_k parameters of elementary particles mentioned in the paradigm of the $\mathbb{N}_{Ʉ}$-variable.

$\mathbb{N}_{Ʉ}=\frac{\hbar c}{Gm_\gamma^2}=\frac{m_{pl}^2c^4}{E_\gamma^2}=2{,}7\cdot\mathbf{10^{63}}$	T_γ=$\frac{m_\gamma c^2}{k}$=2,726 K	z_γ=$\frac{\mathrm{T=2{,}726K}}{T_o=2{,}726\ K}$=1
$\mathbb{N}_{Ʉ}=\frac{\hbar c}{Gm_e^2}=5{,}72\cdot10^{44}$	T_e=$\frac{m_ec^2}{k}$=5,932 · 10^9K	z_e=$\frac{\mathrm{T=5{,}932\cdot10^{9}K}}{T_o=2{,}726\ K}$=2, 176 · 10^9

$\mathbb{N}_{U} = \frac{\hbar c}{Gm_p^2} = 1{,}69 \cdot 10^{38}$	$T_p=\frac{m_p c^2}{k}=1{,}09 \cdot 10^{13}\text{K}$	$z_p=\frac{T=1{,}09\cdot 10^{13}\text{K}}{T_o=2{,}726\ K}=4\cdot 10^{12}$
$\mathbb{N}_{U} = \frac{\hbar c}{Gm_W^2} = 2{,}35 \cdot 10^{34},$	$T_W=\frac{m_W c^2}{k}=9{,}24 \cdot 10^{14}\text{K}$	$z_W=\frac{T=9{,}24\cdot 10^{14}\text{K}}{T_o=2{,}726\ K}=3{,}39\cdot 10^{14}$
$\mathbb{N}_{U} = \frac{\hbar c}{Gm_{x,y}^2} = 3{,}725 \cdot 10^{10}$	$T_{x,y}=\frac{m_{x,y} c^2}{k}=7{,}35 \cdot 10^{26}\text{K}$	$z_{x,y}=\frac{T=7{,}35\cdot 10^{26}\text{K}}{T_o=2{,}726\ K}=2{,}696 \cdot 10^{26}$
$\mathbb{N}_{U} = \frac{\hbar c}{Gm_{pl}^2} = 1$	$T_{pl}=\frac{m_{pl} c^2}{k}=14{,}14 \cdot 10^{31}\text{K}$	$z_{pl}=\frac{T=14{,}14\cdot 10^{31}\text{K}}{T_o=2{,}726\ K}=5{,}19\cdot 10^{31}$

From the data in the given table, some patterns can be seen with the naked eye: if z decreases during the cosmomicrophysical evolution, then $\mathbb{N}_{U}$ increases; that is, they are inversely proportional to each other. It is also noticeable that if z decreases n-times, then $\mathbb{N}_{U}$ increases n^2 *times*, that is, $\frac{\boldsymbol{const.}}{\boldsymbol{z^2}}$ $=\mathbb{N}_{U}$. It is not difficult to guess that the const. coefficient is the Ụ-armonic dimensionless constant:

$$\text{Ụ}=\mathbb{N}_{U} \cdot \boldsymbol{z^2} = \frac{\boldsymbol{m_{pl}^2}}{\boldsymbol{m_k^2}} \cdot \boldsymbol{z^2} = \boldsymbol{2,7 \cdot 10^{63}} = \boldsymbol{const.}.$$

Let us check the accuracy of this obtained law. Let us take the phase of the expansion of the universe, when electron-positron pairs are in thermal equilibrium with photons. That phase is determined by the number $\mathbb{N}_{U}=\frac{m_{pl}^2}{m_e^2}=5{,}72\cdot 10^{44}$, and the redshift of that phase is $\boldsymbol{z_\gamma}=\boldsymbol{z_e}$ $=2{,}175\cdot 10^{9}$. Therefore:

$$\text{Ụ}=5{,}72\cdot \boldsymbol{10^{44}} \times \left(\boldsymbol{2,175 \cdot 10^{9}}\right)^2=2{,}7\cdot \boldsymbol{10^{63}}=\text{const.}.$$

Let us check the same with proton data: $\boldsymbol{z_\gamma}=\boldsymbol{z_p}$ $=4\cdot 10^{12}$, while $\mathbb{N}_{U}=\frac{m_{pl}^2}{m_p^2}=1{,}69\cdot 10^{38}$, we will obtain

$$\text{Ụ}=1{,}69\cdot \boldsymbol{10^{38}} \times \left(\boldsymbol{4 \cdot 10^{12}}\right)^2=2{,}7\cdot \boldsymbol{10^{63}}=\text{const.}.$$

Thus, the law **Ụ**$=\mathbb{N}_{U} \cdot \boldsymbol{z_\gamma^2}$ corresponds to reality and correctly describes the patterns of changes in m_k and M_{UV} during the cosmic expansion. If instead of the equation $\mathbb{N}_{U} = \frac{m_{pl}^2}{m_k^2}$ we insert the equation $\mathbb{N}_{U} = \frac{\mathbf{M_{UV}}}{m_{pl}}$ in our law, then we will get the same Ụ-armonic constant:

$$\text{Ụ}=\mathbb{N}_{U} \cdot \boldsymbol{z_\gamma^2}=\frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}} \cdot \boldsymbol{z_\gamma^2}=2{,}7\cdot \boldsymbol{10^{63}}=\text{const.}.$$

This once again proves the truth of the law $\frac{\mathbf{M_{UV}}}{m_{pl}} = \mathbb{N}_{U} = \frac{m_{pl}^2}{m_k^2}$, where m_k is the mass of a characteristic particle of the corresponding phase of the expansion of the universe. From that equation follows the $\mathbf{M_{UV}} = \frac{\mathbf{m_{pl}^3}}{\mathbf{m_k^2}}$ law, which does not mean at all that our universe is composed of m_k- mass particles. That law does not describe a structural relationship between $\mathbf{M_{UV}}$ **and** m_k, but **an evolutionary, genealogical relationship.**

Thus, we take the numerical value of the Ụ-armonic constant from the experimental data of Cosmomicrophysics. Ụ$=\mathbb{N}_{U} \cdot \boldsymbol{z^2} = \frac{\boldsymbol{m_{pl}^2}}{\boldsymbol{m_k^2}} \cdot \boldsymbol{z^2} = \boldsymbol{2,7 \cdot 10^{63}} = \boldsymbol{const}$. law is **one of our most important**

discoveries. It is a great **law of nature,** which plays the role of an important tool in the construction of the future General Physical Theory /GcħA-Physics/ and GcħA-cosmological model.

By discovering this law of nature, we actually put an end to the misconceptions that our universe is endless and unlimited in space and time, and that it is expanding endlessly. **Our universe is a limited physical system, which has a beginning and an end.** Its emergence corresponds to indexes $\mathbb{N}_{Ա}$**=1** and $\boldsymbol{z_{\gamma(max.)}} = \sqrt{Ա}$, and vice versa, the expansion ends when $\mathbb{N}_{Ա}$**=Ա** and $\boldsymbol{z_{\gamma(min.)}} = \mathbf{1}$**:**

***

There is another way to empirically establish the Ա-constant. It is an experimental test of the upper limit of proton and electron stability. Today, experimental data contradict **theoretical** predictions. Experiments show that protons "live" longer than the versions of the Grand Unified Theory define - $\boldsymbol{\tau_p} = 10^{29-31}$ years.

The proton was born when t_{UV}=$t_{pl}\cdot\left(\frac{m_{pl}}{m_p}\right)^2$=9,125· 10_s^{-6} and $\boldsymbol{z_\gamma}$=$\boldsymbol{z_p}$=4· 10^{12}. Therefore, according to the GPT, being born at $\mathbf{t_{gen.(p)}} = t_{UV}$=9,125· 10_s^{-6}, the proton survives until the end of the expansion of the universe: another $\frac{Ա}{\mathbb{N}_{Ա(p)}} = \frac{2{,}7\cdot10^{63}}{1{,}69\cdot10^{38}}$=$\mathbf{1,6\cdot10^{25}}$ ***degrees***, which corresponds to $z_p^2 = 1{,}6\cdot10^{25}$; that is how many times it survives during the compression of the universe , until the density and temperature of the plasma increase and reach the threshold, after which the protons disintegrate into components. Therefore:

$$\boldsymbol{\tau_p}=\mathbf{t_{gen.(p)}}\cdot\left(\frac{Ա}{\mathbb{N}_{Ա(p)}}\right)^{\mathbf{2}}=\mathbf{t_{gen.(p)}}\cdot\boldsymbol{z_p^4}\ ,\quad \boldsymbol{\tau_p}=(\,9{,}125\cdot10_s^{-6})\cdot(1{,}6\cdot10^{25})^2=23{,}36\cdot\,10_s^{44}.$$

Thus, the lifetime of a proton is equal to 7.5· 10^{37} years.

We found out that the threshold of proton stability is $\boldsymbol{\tau_p}$ =23,36· 10_s^{44}, and although it is quite problematic to reach it experimentally, if it is possible at all in the next few decades, from the point of view of our problem, this indicator gives an opportunity to determine the numerical value of the Ա constant.

$$Ա^{\mathbf{2}} = \frac{\boldsymbol{\tau_p}\cdot\mathbf{t_{gen.(p)}}}{\boldsymbol{t_{pl}^2}}\ ,\quad Ա=\frac{\sqrt{23{,}36\cdot10_s^{44}\cdot\,9{,}125\cdot10_s^{-7}}}{t_{pl}}=2{,}7\cdot\,10^{63}$$

With the index $\boldsymbol{\tau_p}$ =23,36· 10_s^{44} , we can also get the numerical value of $t_{UV(max.)}$ by the following formula: $\mathbf{t^2_{UV(max.)}} = \frac{\boldsymbol{\tau_p}\cdot\mathbf{t_p^2}}{\mathbf{t_{pl}}}$, from which we will get: $\mathbf{t_{UV(\boldsymbol{max.})}} = \mathbf{1,45\cdot10_{\boldsymbol{s}}^{20}}$. Afterwards: $\frac{\mathbf{t_{UV(\boldsymbol{max.})}}}{\mathbf{t_{pl}}}$ =Ա=const..

Thus, the experimental verification of the upper limit of proton stability would simultaneously represent another difficultly attainable experimental confirmation of the existence of the upper limit of the cosmological expansion and the determination of the Ա-constant.

From the point of view of the experimental verification of the Ụ-constant, it is more promising to check the upper limit of the electron lifetime. Today, the lower limit of the electron lifetime has been confirmed by experiment, which is equal to $\tau_{e(min.)}$=6,6· 10^{28} years, that is, $\tau_{e(min.)}$=2 · 10^{36}_{s}.[8]

In fact, according to the GPT, the electron lifetime is 346.5 times more than that index. It should not seem surprising if we say that the electron lifetime is less than the proton lifetime $\left(\frac{m_p}{m_e} = 1836\right)^2$ times:

$$\mathbf{\tau_e}=\mathbf{\tau_p} \cdot \left(\frac{m_e}{m_p}\right)^2 = 6{,}91 \cdot 10^{38}_{s}.$$

The GPT finds out the time of the generation of the electron: $t_{UV}=t_{pl} \cdot \left(\frac{m_{pl}}{m_e}\right)^2$=3,08· 10^{1}_{s} and

$\boldsymbol{z_\gamma}$=$\boldsymbol{z_e}$=2,177· 10^9. **It is the freezing phase of that particle.** Therefore, the electron, born at $\mathbf{t}_{\mathbf{gen}.(\mathbf{e})} = t_{UV} = 30{,}8$ seconds, survives until the end of the expansion of the universe: another $\frac{Ụ}{\mathbb{N}_{Ụ(\boldsymbol{p})}} = \frac{2{,}7 \cdot 10^{63}}{5{,}71 \cdot 10^{44}}$=4,74 · 10^{18} degrees, which corresponds to $z_e^2 = 4{,}74 \cdot 10^{18}$; that is how many times it survives during the compression of the universe, when the density and temperature of the plasma increase and reach the threshold after which the electrons disintegrate into components.

$$\mathbf{\tau_e} = \mathbf{t}_{\mathbf{gen}.(\mathrm{e})} \cdot \left(\frac{Ụ}{\mathbb{N}_{Ụ(e)}}\right)^{\mathbf{2}} = \mathbf{t}_{\mathbf{gen}.(\mathrm{e})} \cdot \boldsymbol{z_e^4}, \quad \mathbf{\tau_e} = (30{,}8\ \mathrm{s}) \cdot (4{,}74 \cdot 10^{18})^2 = 6{,}91 \cdot 10^{38}_{s} = 2{,}2 \cdot 10^{31}\ \text{years}.$$

So, if it were not Ụ=2,7· $10^{63} = const.$, but one degree more or less, it would affect the lifetime of a proton or an electron. So, first, an experimental verification of the lifetime of a proton or an electron would be another experimental confirmation of the Ụ-constant. And then, it would be with the expansion and compression, as a proof of interdependence of the increase and decrease /inflow and outflow/ of the universe mass.

* * *

After the discovery of the main law of evolution, it is worth revisiting the **reinterpretation** of the z_γ- intense cosmological redshift and a certain **substantiation** of the law $\frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}} = \mathbb{N}_{Ụ} = \frac{\boldsymbol{m_{pl}^2}}{\boldsymbol{m_k^2}}$.

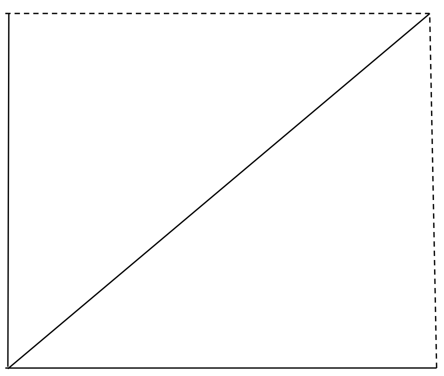
First, let us touch upon the z_γ- intense cosmological redshift.

[8] Test of Electric Charge Conservation with Borexino M. Agostini et al. (Borexino Collaboration) Phys. Rev. Lett. 115, 231802 — Published 3 December 2015.

It is impossible to determine the z_γ of the early phases of our universe by astro-observations, it is determined by the law $z_\gamma = \frac{T_{исп.}}{T_{наб.}}$ -1. It is right in the case of $1 \geq \Delta \geq 0$ of the Δ-extensive redshift, and is wrong in the case of z_γ >1. In the latter cases, we determine the intense redshift by the law $\boldsymbol{z_\gamma = \frac{T_k}{T_\gamma}}$. In general, in cases of thermal equilibrium, when the threshold temperature of relativistic particles is equal to its rest energy: $\boldsymbol{m_k c^2 = kT_k}$; in such cases the redshift is determined according to the law: $z_\gamma = \frac{T_k}{T_\gamma} = \frac{E_k}{E_\gamma} = \frac{m_k}{m_\gamma}$, where T_γ, E_γ, m_γ-are the **current** parameters of background microwave radiation photons. However, after the discovery of the main law of evolution, it becomes clear that $\mathbf{T_\gamma = \frac{T_{pl}}{\sqrt{Ц}} = 2,726\ K = const.}$, $\mathbf{E_\gamma = \frac{E_{pl}}{\sqrt{Ц}} = 3,778 \cdot 10^{-16}_{erg} = const.}$, $\mathbf{m_\gamma = \frac{m_{pl}}{\sqrt{Ц}} = 4,2 \cdot 10^{-37}_{gr} = const.}$. **These quantities are not only constant, but also have a minimal numerical value for the variable parameters of photons. They actually act as energy, mass, and temperature quanta for elementary particles and cannot decrease further than these constant indexes. That is why it would be correct to present the aforementioned redshift law in the following form:**

$$\boldsymbol{z_\gamma = \frac{T_k}{T_{\gamma(min.)}} = \frac{E_k}{E_{\gamma(min.)}} = \frac{m_k}{m_{\gamma(min.)}}} \ .$$

The Graph of the Change of z_γ and T_γ with the Pattern $z_\gamma \sim T_\gamma$:



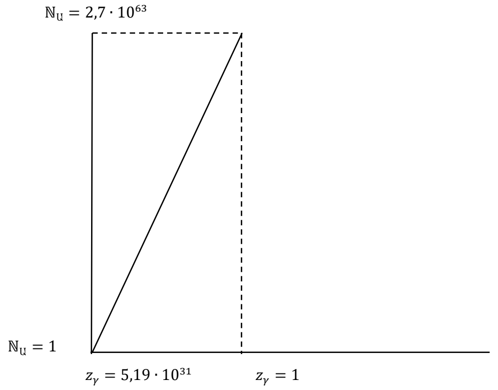
$$T_{\gamma(min.)} = \frac{T_\gamma = 1,4 \cdot 10^{32}\ K}{z_\gamma = 5,19 \cdot^{31}} = \frac{T_\gamma = 2,726\ K}{z_\gamma = 1} = 2,726K$$

$$z_{\gamma(max)} = \frac{T_{Pl}}{T_{\gamma(min.)}} = 5,19 \cdot 10^{31}$$

$$z_{\gamma(min)} = \frac{T_{CMB(o)}}{T_{\gamma(min.)}} = 1 , \quad T_{\gamma(max.)} = T_{Pl} = 14 \cdot 10^{31} K , \ T_{\gamma(min.)} = T_{CMB(o)} = 2,726\ K$$

$$T_{\gamma(min.)} = \frac{T_{CMB(o)}}{z_{(min)}} = 2,726\ K \ , \ T_{\gamma(min.)} = \frac{T_{Pl}}{z_{(max.)}} = \frac{T_{Pl}}{\sqrt{Ц}} = 2,726\ K$$

The Graph of the Change of z_γ and $\mathbb{N}_{\text{Ա}}$ according to the Law $\frac{\text{Ա}}{z^2}=\mathbb{N}_{\text{Ա}}$:



We also propose the determination of $\boldsymbol{z_\gamma}$ with other equations: $\boldsymbol{z_\gamma}=\sqrt{\frac{\text{Ա}}{\mathbb{N}_{\text{Ա}}}}=\frac{\boldsymbol{m_k}}{\mathbf{m_{pl}}}\cdot\sqrt{\text{Ա}}$ or $\boldsymbol{z_\gamma}=\frac{\boldsymbol{z_{pl}}}{\sqrt{\mathbb{N}_{\text{Ա}}}}=\boldsymbol{z_{pl}}\cdot\frac{\boldsymbol{m_k}}{\mathbf{m_{pl}}}$.

These last laws follow from the main law of cosmomicrophysical evolution.

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The law $\frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}}=\mathbb{N}_{\text{Ա}}=\frac{\boldsymbol{m_{pl}^2}}{\boldsymbol{m_k^2}}$ **also needs some substantiation.**

There are two paradigms of the fundamental laws of Gc-Physics and ħc-Physics, which describe the connection and interdependence of m, r, t-variables from opposite positions: $m_{Gc}=\frac{r_{Gc}\cdot c^3}{G}$, $m_{Gc}=\frac{t_{Gc}\cdot c^3}{G}$ և $m_{\hbar c}=\frac{\hbar}{c\cdot r_{\hbar c}}$, $m_{\hbar c}=\frac{\hbar}{c^2\cdot t_{\hbar c}}$. If m_{Gc} is directly proportional to r_{Gc} and t_{Gc}, then $m_{\hbar c}$ is inversely proportional to $r_{\hbar c}$ and $t_{\hbar c}$. Inserting Planck's quantities in these opposite laws, it turns out that m_{Gc} can be greater than Planck mass, but not less. And vice versa, $m_{\hbar c}$ can be less than $\mathbf{m_{pl}}$, but not greater.

Thanks to those two special theories, two evolutionary branches start from the Planck mass.

$\leftarrow 10^{58}_{gr} \leftarrow 10^{53}_{gr} \leftarrow 10^{40}_{gr} \leftarrow 10^{33}_{gr} \leftarrow 10^{28}_{gr} \leftarrow 10^{5}_{gr} \leftarrow \boldsymbol{m_{pl}} \rightarrow 10^{-10}_{gr} \rightarrow 10^{-21}_{gr} \rightarrow 10^{-24}_{gr} \rightarrow 10^{-29}_{gr} \rightarrow 10^{-34}_{gr} \rightarrow 10^{-37}_{gr} \rightarrow$

At first glance, it seems that we are dealing with two different evolutionary branches stretching in opposite directions, which have nothing to do with each other, but when we take into account the parameters r and t corresponding to the masses of both sides, it becomes obvious that these two branches describe a single evolutionary process: one on a macro scale, the other on a micro scale. But what do they have in common? It is known from the general theory of evolutionism that the spatial and temporal scales of bodies or systems involved in the process of evolution increase: during the evolution with the laws $m_{Gc}=\frac{r_{Gc}\cdot c}{G}$, $m_{Gc}=\frac{t_{Gc}\cdot c^2}{G}$ and $m_{\hbar c}=\frac{\hbar}{c\cdot r_{\hbar c}}$, $m_{\hbar c}=\frac{\hbar}{c^2\cdot t_{\hbar c}}$ the numerical values of both r_{Gc} and t_{Gc}, and the numerical values of $r_{\hbar c}$ and $t_{\hbar c}$ increase. This means that these two different branches develop **in a single evolutionary direction** or are on a **common** arrow of time. This is evidenced by the following **common aspect: during evolution, the average densities of $\mathbf{m_{Gc}}$ and $\mathbf{m_{\hbar c}}$ decrease,** although the mass of one increases and that of the other decreases. The picture becomes clear: all this is directly related to and conditioned by the **expansion** of our universe.

Now it is necessary to find out how $\mathbf{m_{Gc}}$ increases and how $\mathbf{m_{\hbar c}}$ decreases, that is, to find out their interconnection during the expansion of the universe. This means to find the connection between the fundamental laws of two opposite gravitational and quantum theories: $m_{Gc}=\frac{r_{Gc}\cdot c}{G}$, $m_{Gc}=\frac{t_{Gc}\cdot c^2}{G}$ and $m_{\hbar c}=\frac{\hbar}{c\cdot r_{\hbar c}}$, $m_{\hbar c}=\frac{\hbar}{c^2\cdot t_{\hbar c}}$. Scientists have been searching for that connection for a century, but they have not succeeded. We managed to find that connection and interdependence through the Armonic Variable and Constant, as well as thanks to Planck's quantities.

$$\frac{G\cdot M_{UV}^2}{\hbar c} = (\mathbb{N}_{U})^2 = \frac{\hbar^2 c^2}{G^2\cdot m_k^4} \quad \text{or} \quad \frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}} = \mathbb{N}_{U} = \frac{m_{pl}^2}{m_k^2}, \text{ while in case } \mathbb{N}_{U} = U,$$

$$\frac{G\cdot M_{UV}^2}{\hbar c} = (U)^2 = \frac{\hbar^2 c^2}{G^2\cdot m_k^4} \quad \text{or} \quad \frac{\mathbf{M_{UV(max.)}}}{\mathbf{m_{pl}}} = U = \frac{m_{pl}^2}{m_{k(min.)}^2}.$$

Now it remains **to substantiate** our idea that the following laws always apply during the cosmic expansion: $\mathbf{M}_{UV} = \frac{m_{pl}^3}{m_k^2}$, $\boldsymbol{R}_{UV}=\frac{r_k^2}{r_{pl}}$, $\boldsymbol{t}_{UV}=\frac{t_k^2}{t_{pl}}$, **from which particularly the following pattern of cosmic expansion derives:** $\boldsymbol{R_{UV}\sim t_{UV}\sim r_\gamma^2\sim t_\gamma^2\sim \frac{1}{T_\gamma^2}\sim\frac{1}{z_\gamma^2}}$.

First, let us take into account the fact that cosmomicrophysicists discovered a long time ago that **in each phase of the thermal equilibrium of the expansion of the universe, the average mass density /$\boldsymbol{\rho_{UV}}$ / or energy density /$\boldsymbol{\varepsilon_{UV}}$ / of the universe is equal to the mass density or energy density of the characteristic particle or photon of the given phase:** $\boldsymbol{\rho_{Gc}}=\frac{c^6}{m_{Gc}^2\cdot G^3}$, **and** $\boldsymbol{\rho_{\hbar c}}=\frac{c^3\cdot m_{\hbar c}^4}{\hbar^3}$: from the alignment of these expressions / $\boldsymbol{\rho_{Gc}} = \boldsymbol{\rho_{\hbar c}}$ / the following law derives: $\mathbf{m}_{Gc} = \frac{m_{pl}^3}{m_{\hbar c}^2}$ or $\frac{\mathbf{M_{UV}}}{\mathbf{m_{pl}}} = \mathbb{N}_{U} = \frac{m_{pl}^2}{m_k^2}$, which means that during expansion, $\mathbf{M_{UV}}$**-increases** $\mathbb{N}_U$ times in relation to $\mathbf{m_{pl}}$, and m_k decreases $\sqrt{\mathbb{N}_U}$ – times. That is, $\mathbf{M_{UV}}=\mathbb{N}_U\cdot\mathbf{m_{pl}}$, **while** $m_k=\frac{\mathbf{m_{pl}}}{\sqrt{\mathbb{N}_U}}$.

Let us go back to our $\boldsymbol{R_{UV}\sim t_{UV}\sim r_\gamma^2\sim t_\gamma^2\sim \frac{1}{T_\gamma^2}\sim\frac{1}{z_\gamma^2}}$ pattern. It differs from the $\boldsymbol{R_{UV}\sim t_{UV}\sim r_\gamma\sim \frac{1}{T}\sim\frac{1}{z}}$ pattern of the Standard Cosmological Model, which describes adiabatic expansion. Essentially, if the latter referred to the expansion of the universe, then it should have been composed of **the laws of nature**, laws that connect the $\boldsymbol{R_{UV}}$ ***and*** $\boldsymbol{t_{UV}}$ ***parameters*** of the universe with r_γ-ħ, T_γ-ħ, z_γ. However, there are no such finite laws, which are expressed with universal constants. Instead, there are laws that describe the dependences of the pattern $\boldsymbol{R_{UV}\sim t_{UV}\sim r_\gamma^2\sim t_\gamma^2\sim \frac{1}{T_\gamma^2}\sim\frac{1}{z_\gamma^2}}$.

One of them is known from the 60s of the previous century. $(kT)^4=\frac{1}{\chi}\cdot\frac{45}{32\cdot\pi^3}\cdot\frac{\hbar^3 c^5}{Gt^2}$ / Ya. Zeldovich, I. Novikov, The Structure and Evolution of the Universe, page 163/. The coefficients adapted to the cosmological model are omitted. A law described by universal constants is obtained, which expresses the relation $\boldsymbol{t_{UV}}\sim\frac{\mathbf{1}}{\boldsymbol{T_\gamma^2}}$ between t_{UV} and T_γ: $(\boldsymbol{kT_\gamma})^{\mathbf{4}}=\frac{\hbar^3\boldsymbol{c}^5}{\boldsymbol{Gt_{UV}^2}}$. If we insert the index T_γ=2,726K into that law, we will get the real age of our universe today: $\boldsymbol{t_{UV(max.)}}$ =**1,45· 10_c^{20} = 4,83· 10^{12} years.**

We will get the second law if we replace t_{UV} with the corresponding expression $\left(\frac{\boldsymbol{R_{UV}}}{c}\right)$. We will obtain: $R_{UV}^2=\frac{\hbar^3c^7}{G(\boldsymbol{kT})^4}$. Inserting the residual radiation temperature into this law, we will get the current radius of our universe: $\boldsymbol{R_{UV(max.)}}$=**4,32· 10_{sm}^{30}.**

These laws confirm the dependence $\boldsymbol{R_{UV}}\sim t_{UV}\sim\frac{1}{\boldsymbol{T_\gamma^2}}$.

The next two laws describe the relations $\boldsymbol{R_{UV}}\sim\boldsymbol{r_\gamma^2}$ and $\boldsymbol{t_{UV}}\sim\boldsymbol{t_\gamma^2}$:

$$\mathbf{R_{UV}^2}=\frac{\mathbf{c^3r_\gamma^4}}{\mathbf{G\hbar}} \rightarrow \boldsymbol{R_{UV}}=\frac{r_\gamma^2}{r_{pl}} \quad \text{and} \quad \mathbf{t_{UV}^2}=\frac{\mathbf{c^5t_\gamma^4}}{\mathbf{G\hbar}} \rightarrow \boldsymbol{t_{UV}}=\frac{t_\gamma^2}{t_{pl}} .$$

It remains to derive the last laws describing the dependence $\boldsymbol{R_{UV}}\sim\boldsymbol{t_{UV}}\sim\frac{\mathbf{1}}{z^2}$. They are easily derived from our equation **Ư**=$\mathbb{N}_{Ư}\cdot\boldsymbol{z_\gamma^2}$. It is already known that $\boldsymbol{R_{UV}}=\mathbb{N}_{Ư}\cdot\boldsymbol{r_{pl}}$ and $\boldsymbol{t_{UV}}=\mathbb{N}_{Ư}\cdot\boldsymbol{t_{pl}}$; by inserting the expressions $\mathbb{N}_{Ư}=\frac{\boldsymbol{R_{UV}}}{\boldsymbol{r_{pl}}}$ and $\mathbb{N}_{Ư}=\frac{\boldsymbol{t_{UV}}}{\boldsymbol{t_{pl}}}$ into the law **Ư**=$\mathbb{N}_{Ư}\cdot\boldsymbol{z_\gamma^2}$, we will get: $\boldsymbol{R_{UV}}=\frac{Ư\cdot\boldsymbol{r_{pl}}}{\boldsymbol{z_\gamma^2}}$ or $\boldsymbol{R_{UV}}=\frac{\boldsymbol{R_{UV(max.)}}}{\boldsymbol{z_\gamma^2}}$ and

$\boldsymbol{t_{UV}}=\frac{Ư\cdot\boldsymbol{t_{pl}}}{\boldsymbol{z_\gamma^2}}$ **or** $\boldsymbol{t_{UV}}=\frac{\boldsymbol{t_{UV(max.)}}}{\boldsymbol{z_\gamma^2}}$. **Thus, our universe expands** according to the law $\boldsymbol{R_{UV}}\sim\boldsymbol{t_{UV}}\sim\frac{\mathbf{1}}{\boldsymbol{z_\gamma^2}}\sim\frac{\mathbf{1}}{\boldsymbol{T_\gamma^2}}$ and since T_γ *and* z_γ change evenly and linearly during the expansion/see graphs/, then it becomes clear that no acceleration or deceleration took place during the intensive expansion/also compression/of our universe and MG. The cosmic expansion proceeded at a c-constant speed.

Indeed, we profoundly understand that building a GcħU-cosmological model with the above-mentioned laws and patters is almost impossible, because such a model will be in open contradiction with the cosmological principle and conservation laws. Bearing all that in mind, we will try to present the GcħU-cosmological model in the next article, which will be built on the basis of the perfect cosmological principle and conservation laws.