THE ARMON STRUCTURE OF METAUNIVERSE

Samvel Pogosyan

Author's Foreword

God created the world eternal and absolutely perfect; he who doubts this, he doubts the omnipotence of the Creator. The man's destiny is to cognize the God's creation and to admire its creature and harmony. And the fate has a true human happiness in store for the one who can, at least in the rough, cognize the mechanism of the eternal existence of the World and the laws of Eternity.

Samvel POGOSYAN

Editor's Foreword

Samvel Pogosyan's book on "**ARMON STRUCTURE OF THE METAUNIVERSE**" is a special and fundamental phenomenon in the scientific Literature, devoted to cosmology and to the fundamental problems of Astroparticle Physics in general. The **Pogosyan's** phenomenon is that he, virtually being a physicist and a philosopher rather than a physicist and mathematician in the conventional sense, nevertheless, touched very deep and perpetual themes that put him in a row with the best philosophers of our civilization. In his book on "**DREAMS OF A FINAL THEORY**" **Steven Weinberg** writes: *"In our hunt for the final theory, physicists are more like hounds than hawks; we have become good at sniffing around on the ground for traces of the beauty we expect in the laws of nature, but we do not seem to be able to see the path to the truth from the heights of philosophy"*.

Samvel Pogosyan, from the heights of his philosophic knowledge, tried to grope after, and it seems that has found the very path to the truth that is necessary at present. The first two Chapters of the book and on the whole the general dialectical approach to the solution of many problems of Cosmology and Physics authenticate in favor of this.

Once **Einstein** expressed an interesting idea about **Faraday**: "It is fascinating to muse: Would **Faraday** have discovered the law of electromagnetic induction if he had received a regular college education? Unencumbered by the traditional way of thinking, he felt

that the introduction of the 'field' as an independent element of reality helped him to coordinate the experimental facts".

The same could be stated about **Samvel Pogosyan**. If he had received a regular physical-mathematical academic education, hardly could he discover the way to the eternal truths from the height of Philosophy. Now about the book. It consists of four Chapters:

- In Chapter 1 the author sets forth his philosophical concept of matter, where he justifies the existence of two opposite forms (sides) of matter: positive and negative pra-matters.
- Chapter 2 recounts the physical theory of matter: the physical essence and nature of matter, as well as the types of fundamental components of non-free physical systems is explained.
- In Chapter 3 Samvel Pogosyan represents his approaches to the solution of **Einstein's** Great Dream. He uncovers the physical nature of inertia, ideally flat space, its structure and regularities of its formation, as well as physical consequences. The basics of GchU - physical theory are developed. It is a general physical theory that describes free and non-free local (finite) physical systems and their types. A new cosmic model is created, within the framework of which the physical nature and micro-structure of Dark energy, as well as the direct physical reason of accelerated expansion of the Universe is brought to light. It is to be mentioned that many observable phenomena, which do not go into the frames of ΛCDM – cosmic model, receive natural explanation within the GchU-cosmic model.
- Chapter 4 is devoted to Armons – fundamental components of the Metauniverse, to these peculiar "pumps", thanks to which the eternal circulation of matter takes place, providing the eternal existence of the Metauniverse. Here the author continues the development of Cosmology, setting forth his views on the structure of our Universe, evolution of Primary black holes, the Universe, D bodies, etc.

By the way, this Chapter was written long ago and since then the author's certain views seem to be changed. However, in terms of the importance of many issues considered there, he could not but include this Chapter in his book.

Viktor Musakhanyan,
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One day the doors will
surely, open and we will see the
sparkling mechanism of our World
in all its simplicity and perfection.

J. Wheeler

Introduction

There is the regularity well known in the History of Science: when there is a deep crisis in the given field of Science it is overcome at the very end by revealing of new objects of research. To my opinion, such a situation is in the Cosmology, and, in a broad meaning, in the Physics. In the field of investigation of both the microcosm and the mega-world discovery of physical systems of a new class is expected.

One admires the circumstance that the most deeply thinking physicist (like academician M. **Markov** and others) thought that these physical objects of a new type belong to both the microcosm and the mega-world simultaneously. This remarkable idea of antique philosopher **Anaxagoras** and **Leibnitz** revives with the corresponding additions of the modern Science.

The search for the "pra-matter", lasting about five thousand years probably has now reached its culmination, and the humankind, who has entered the third Millennium, most likely, cannot continue its development, its progress, not having found the answer to this question. In addition, the answer to this question follows not only from the internal regularities of the modern theory of gravitation and the development of microphysics but also from the general logic of historical development of scientific ideas about the World. It is a question of the regularities noticed long time ago in the course of

historical development of cosmological ideas, and of the consequences resulting from them.

The history of the science endows four basic stages:

I. The geocentric **Ptolemaic** system of the universe.

II. The **Copernican** heliocentric system.

The latter has shown the limitation of the former one and, denying the uniqueness of the Earth, has proved its belonging to a whole class of similar bodies, to the class of planets. **Copernicus** "moved" the Earth from the system center to the number of planets, on the periphery, and "placed" the Sun in the center of the system.

III. The **Newton-Herschel's** model of the stellar world.

This "stellar world" also has its center, which is a star-rich cluster, and when one moves to the edge, to the periphery, the average density of matter decreases. In fact, it was the pra-model of the Galaxy, which has revealed the limitation of **Copernican** heliocentric model, and the belonging of Sun to the class of stars.

IV. Based on the **Einstein's** General Theory of Relativity, the Cosmology of the 20th century has denied, generally speaking, the concept of the center, and revealed the cosmological expansion by detection of galaxies and accumulation of galaxies.

So, "the world system", coming into existence at each stage and claiming itself on very completeness, proves the limitation of the previous one (definitely including the improved variant of the previous one in itself) and opens a new class of physical bodies, more exactly, of cosmological ones. The point is that every "world system", accepting some heavenly body as the center, considers it as especial and individual. While at the following historical stage the whole set of such bodies becomes known and, denying its exclusiveness, the selected arrangement in the system center, it "loses the category" and "is transferred" to the system edge. It was the case at all stages.

Only Cosmology of the 20th century has shown the originality in this question, denying the concept of the center in general. There is one circumstance, though it has played a certain positive role, nevertheless,

in my strong judgment, has become the basic cause of cosmological crisis.

To overcome the present crisis it is necessary also to consider the above-mentioned historical regularities and to accept the below concepts following from them as a basis:

1. The modern cosmological ideas which, in general, are also applicable to the description of infinite, the Eternal Universe, basically refer to our Metagalaxy, to the system which has relatively limited cosmological scale, which expands (in the infinite and Eternal Universe only one tendency of movement cannot dominate, the change and expansion, the cosmological evolution), and many billions years ago it was compressed excessively …

2. Our Metagalaxy is the representative of the whole class of identical bodies (physical systems). My compatriot, **Viktor Hambardzumyan,** defended the idea of a large number of the Universes or Metagalaxies.

3. Since cosmological expansion is related to the Metagalaxy, hence, it is necessary to restore the idea of the center of the Metagalaxy; how can the local system exist, let even on the cosmic scales, but nevertheless limited, and not to have its backbone center. Only the infinite and Eternal Universe cannot have its center.

Thus, during the historical development of the given field of Science there is a well-known negation of negation of **Hegel's** dialectics … Denying the idea of absence of the Einstein's center (**A. Friedman, Lemaître** and others), I re-establish the **Newton's** traditional idea about the center. The average density of mass decreases, when one is moving away, from the center to the edges.

4. If the Metagalaxy is the local physical system, there should be an external medium for it, an external pulse, and the possibility of physical interaction with this medium. Origination, change and the end of Metagalaxy should be determined mainly by this environment.

5. An absolutely new approach exists to large-scale structure origination of the Metagalaxy which synthesizes in itself the classical and Bjurakan approach, according to which the not glowing D bodies (preliminary superclusters) periodically separate themselves from the

Metagalaxy center and, moving away, "freeze" and "ignite". They are the local sources of relict beams, which are involved in the cosmological expansion and in the course of evolution turn in the usual superclusters. So, in parallel to the cosmological expansion the idea of origination of positive mass (energy) and the idea of continuousness and duration of evolution (to the present day), strictly connected to it, is put forward and stated.

6. The model of the Metagalaxy with the center results in one more impressive conclusion: something similar to the **Copernicus** reform takes place. It became necessary to comment and perceive the visible picture of the large-scale structure of the Metagalaxy in a different way. In my opinion the observable quasars and young galaxies in this picture, which are at the distances of 10-14 billion of light years, actually are not at edges of an expanding Metagalaxy but close to the center, and we, our galaxy, our star-clusters are on the edge.

The theory of Armons has been created, based on such relatively "mad" ideas.

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The History of discoveries has cognized us too much. One of the lessons of this history shows that it is impossible to present a discovery (theories, the law) to the scientific community untimely, until its requirement has grown up; it will be crushed or forgotten. The force of inertia and scientific authorities is ruthless.

Still in 1997, after discussion of my small brochure, Academician **David Sedrakyan** said, - *"Well, you have created a new theory, it is necessary to popularize it"*. Then I thought that it was not time yet.

Really, the known successes of astronomical observation during the last decade supposedly testify upon the definitive victory of the Standard cosmological model on one hand and they made old and new problems more "bright and expressive" on the other hand; thus, therewith deepening the present crisis even more.

Today, when in the authoritative scientific circles phrases like *"The crisis in cosmology", "The Standard model is not correct", "It is necessary to reconsider the bases of Cosmology"* etc. are heard more

and more often, I think that it is time for me now to speak out. The scientific community is ready to discuss and pay attention to the new cosmological theory, which I named “The Theory of Armons” or “The Armon structure of Metagalaxy”.

I wish to underline in advance that my cosmological model:

1. does not deny the cosmological expansion, but along with it accepts the **A. Einstein’s** ingenious supposition on the counterbalanced or static state;
2. does not deny that in the big scales “the cosmological principle” approximately justifies itself, but accepts the traditional approach about the center existence as prevailing.
3. “*but it does move*”. In global scales, perhaps, we do not notice yet but the Metagalaxy is moving.

I. The Crisis of Cosmology

1. “Conceptual difficulties” of standard cosmological model; their underlying causes

Academician **Jakov Zel’dovich** called the basic problems of SCM *“conceptual difficulties”*, that is, their conceptual origin connected with The basics of SCM was directly specified. **The Cosmological principle,** underlain of SCM, according to which our Universe is homogeneous and isotropic, during many decades, was a subject of candid discussions, which finally have ended with the victory of supporters of this principle.

Today both this principle and the SCM, constructed on its basis, are considered as the **gospel** truth, verified by experiments and observations. However, some part of the basic problems of SCM "is solved" by means of change of the SCM, within the ranges of the so-called “the Inflationary theory”. The overwhelming majority of cosmologists, similar to **Zel’dovich**, have been convinced that “*the change of model to eliminate these defects should not change already*

tested standard cosmological model, which in this meaning will never disappear"[1]. At the same time, they realize perfectly that *"the **Friedman's** model is the idealized lovely sight of the Universe ..."* that the cosmological principle and the Hubble's law "are valid" approximately.

In a word, as it has been noticed long time ago, the true reason of basic problems of SCM is hidden in the cosmological basis that the Universe is homogeneous and isotropic. However, the gnosiological roots of these problems proceed from **Einstein's** wrong ideas. He tried to reconcile two opposite points of view, which became the subject of century long discussions:

1. The world is infinite in Space (and Time).
2. The world is finite in Space (and Time).

Certainly, as a basis and as an initial idea, **Einstein** accepts the validity of point 1. The infinite World is homogeneous and has no center in Space and in Time (which contradicts and is incompatible with the **Newton's** theory). But the **Mach's** principle is incompatible with it: *"The idea suggested by **Mach** that the inertia is defined by the interaction of bodies is in the equations of the theory of a relativity in a first approximation ... But the ideas of **Mach** are in agreement only with the assumption of the finite Universe limited in space and disagree with the concept of quasi-**Euclidian** infinite Universe. From the gnosiological point of view, the idea that the mechanical properties of space are defined by matter completely is much more justified, and this can be only in the case of the spatially-limited Universe"*[2].

To satisfy the "and the wolves were fed and the sheeps are safe" principle, **Einstein** finds that it is necessary to accept the infinity of space-time with uniformity and, simultaneously, to accept that such a space should be closed, to avoid **Newton's** model of Universe with the center. He named the Heading of Paragraph 31 of his basic work in such

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[1] **A. D. Dolgov, Ya. B. Zel'dovich, and M. V. Sazhin**, **COSMOLOGY OF EARLY UNIVERSE** (Moscow State. Univ., Moscow, 1988. p.23. (in Russian)

[2] **A. Einstein**, **COLLECTED WORKS**. V2. p. 81(in Russian)

a way – **"THE POSSIBILITY OF THE FINITE AND STILL NOT LIMITED WORLD"**. **Einstein** finds the geometrical model of such space, - *"It follows from the previous that the closed spaces which do not have borders are conceivable. Among them spherical (and the elliptic, respectively) spaces single out by their simplicity"*. Within the frameworks of GTR just in this order, **Einstein** formulated the bases of modern cosmology, however, without the conceptual application of the basic constant of GTR: the speeds c; the **Einstein's model**, in general, was the constant (the static) one. According to his concepts, all the material World, the Universe, has the finite (and invariable) radius r, the finite (and invariable) average density ρ, hence, the final (and invariable) mass m. To conciliate, to connect this finite and closed model with the infinity or limitlessness **A. Einstein** had attributed to the final (closed) Universe the quality of the infinite and Eternal Universe that is, the uniformity and the absence of center. As a result, he obtains the **eclectic** unity of ideas on the infinite and Eternal Universe and the finite and temporary Universe, which mathematically can be even justified (in geometry) but it is not acceptable both from the point of view of Philosophy and Physics. The Philosophy considers the entire material world, the Universe as one infinite and unlimited integrity in Space and in Time, which is homogeneous and without the center, unlike other material formations and systems of all types which are finite and limited in Space and in Time. These are local and non-uniform physical systems with center and a backbone axis. Cosmology should divide these two diametrically opposite concepts accurately. At least after **Hubble's** discovery, **Einstein** and his supporters had to have to accept that our expanding space, though having the cosmic scale, nevertheless is local system, since the eternal and infinite Universe cannot develop in one direction, as far as all matter does the eternal recycling inside the infinite and Eternal Universe; the evolution and degradation and the progress and regress are transformed into each other and compensate each other. For just the same reason the antique thinkers claimed that despite its infinite motion the Universe remains invariable. And the local physical system developing in one direction, in

this case the Metagalaxy or the Universe, is in time vector that is, it should have a certain beginning and the end and, consequently, the backbone center. **Einstein** and his successor cosmologists could not get rid completely the illusion that the cosmological model developed by them reflects and describes the entire material world, the Eternal Universe. In this meaning, they have repeated the errors of **Ptolemaist**, **Copernicus**, and **Hershel**. It seemed to them too that "The World system" created by them contains not content, however, it was clarified later that it describes and coincides only with one local system of the Eternal Universe.

And so, here is the main question (touchstone): is the expanding space (call it as you like, the Universe or the Metagalaxy) a local physical system, or not? Any cosmological model, which assumes, asserts that outside of the Hubble's expansion there is no matter and that this "model" does not interact with any physical bodies and fields, which are outside, is sentenced in advance. And if any cosmological model takes into account that the expanding cosmic medium is a local physical system, it necessarily should accept the concept of the center.

Here is my conclusion – as a philosopher.

Beside the problem of uniformity, there are also other essential unsolved problems in SCM like the problem of horizon, singularity, cosmological constant etc. Numerous attempts to change have been made, but no one has solved all these problems. The inflationary theory is considered as the most successful change, which, however, could not overcome the problems of singularity and the cosmological constant. For example: the problem of horizon of SCM is solved not only by the inflation Theory, but also in the **Miln** model where the constant c is accepted as the velocity of cosmological expansions. Unfortunately**, Miln** too relied on the cosmological principle and did not perceive deeply the conceptual value of the use of the constant c. His model did not have successors. However, **Miln's** point of view seems to me more "natural" - our cosmic media expands with the speed c relatively than with the exponential one.

As related to singularity, it is the most important problem of SCM, which is an Achilles heel of GTR. Whatever the cosmological model should be, the homogeneous and isotropic or inhomogeneous and anisotropic, is all the same within the frameworks of GTR (only with use of constants G and c) the problem of singularity is not solved, therewith the singularity of infinitely small, infinite compressibility will not be overcome without the use of possibilities of the quantum theory (the constant t). It seems that the founders of the inflationary theory (**Gut**, **Linde**, **Steinhard**, **Starobinsky**) have tried to apply the quantum theory to the description of "the quantum birth of the Universe from the vacuum", but they have not understood the conceptual value of the constant t, the importance of unity of parameters (G, c, t) of ingenious physicist and philosopher **Max Planck** and conclusions following from this unity because they continued to remain in the "captivity" of cosmological principle. They have not understood the essence of coincidence of big numbers in Cosmic Microphysics, the conclusions, originating from it, the importance of limitation of infinite small, infinite compressibility and infinitely large, infinite expansion, and the Armon number arisen from comparison of all these ideas, thanks to which the conceptual combination of constants G, c and t takes place.

2. The cause of viability of SCM, its historical value

There is a question that logically arises from the stated above: if SCM is so vulnerable, why it has not been refused for a long time and how to explain its length of life? Today it remains the most widespread and prevailing concept despite ever increasing new problems. The point is that there are certain facts, which are described sufficiently by the standard cosmological model (SCM), moreover, these facts are considered as the experimental validation of SCM.

First, this is the recession of galaxies according to the law $V = \mathrm{H} \cdot \mathrm{r}$, discovered by **Hubble** in 1929. Secondly, it is the observable uniformity of the Metagalaxy in the big scales. Thirdly, the relict (background) radiation, which argues that in the past (in the compressed condition), the Metagalaxy was very hot and that fact

argues also to the uniformity of expanding space, etc. Impressing facts; and, in general, though SCM is “ugly and complicated" but it has played its historical role, significantly stimulating the development of Cosmology, as well as of Physics. So we are grateful to all founders of this theory and let us do a step forward to the genuine revolution, which will give us not only the deeper and accurate ideas about our Metagalaxy, but also will open the most fundamental type of matter – the Armons, which provide the eternal turnover of matter in the infinite and Eternal Universe …

I hasten to say that the theory of Armons, on my deep belief, will explain and describe not only those facts, which SCM successfully describe, but also numerous new facts, which SCM is incapable to describe. The theory of Armons overcomes basic problems of SCM, predicts new phenomena, which can be proved by true experiments and observation. My theory answers many questions in a "natural way" - what was before the Big Bang, what will be after the end of expansion, why the world constants as they are, etc …

3. The necessity of radical revision of cosmological bases and creation of a new theory

Yes, those scientists, who characterize the present condition as the **big crisis of Cosmology** are absolutely right. It means that, **firstly**, the modern cosmological theory is not terminated yet, as we have seen in the previous two paragraphs, there are serious problems in its frameworks, which cannot be solved with the possibilities of this theory. **Secondly**, facts, serious enough have accumulated, which "cannot be placed" within the modern cosmological ideas, which argues that these ideas have become outdated, moreover, they interfere in some way with the further development of the given area of the Science. And **thirdly**, the Big Crisis of Cosmology argues to general crisis of **Weltanschauung** of Mankind. Here, I have to agree with the blaming of philosophers by **Hocking**. The Philosophy of XX Century, which has reached considerable successes in the areas of gnosiology and logic, in the problems of ontology, has made the recycling, and in this meaning the Philosophy could not fulfill its mission as a beacon for stimulation

of development of Natural Sciences, especially, for Physics and Cosmology. “What disintegration of philosophical traditions from **Aristotle's** time to the Kant, - writes **Hocking**, - Nevertheless, if we really discover an entire theory, in a due time it should become understandable to everyone and not just for small number of scientists. At the same time, all of us, the philosophers, scientists, and even the ordinary people will be capable to participate in the discussion of the question: why we and the Universe exist?” Surely, this is the confession of an honest scientist: after numerous unsuccessful attempts of the desperate scientist to overcome the deep crisis of cosmic microphysics, it is understandable both the reproach, and the recognition of powerlessness … Dear **Hocking**, I, **Samvel Srapion Pogosyan** accept the "challenge" and I will try to show a correct way for an exit from this crisis …

The present crisis, surely, does not mean that our civilization has put futile efforts in this area during the last 80 years, God forbid! The crisis means that the humanity is on the threshold of a new, higher degree of development. In particular, in the area of cosmic microphysics a big revolutionhas started, which opens big prospects of development before our civilization.

That is why the new theory is necessary. Its necessity, certainly, has also its internal logic. The internal logic of the further development of cosmic microphysics pushes one to unify the relativistic and quantum theories. During many decades, two or three generations of physicists have been working in different directions to solve the big problem of unification. Yet, for the present time, the ideological nucleus, the beacon, which would light up the researches in this area and give them chance to consolidate efforts in a correct direction to obtain the expected result has not been formulated accurately and clearly.

The inflation theory could not play the role of such a beacon; the theory of strings is in the course of formation and requires new ideas by itself; I am very interested in development of this theory and I hope that the Theory of Armons will suggest to the “stringers” what to do.

II. My philosophical concept of matter

1. Matter, its forms and attributes

1.1 Standard ideas of modern philosophy about matter and their shortcomings.

You can open any philosophical Encyclopedia, and get acquainted with the standard notions about matter. The materialistic ontology considers matter as an objective reality, ascribing it the general properties (attributes):

- Mass and energy[1]
- Space and time
- Rest and motion

Continuity and discontinuity (infinity and finiteness)

Lack of structure and structural properties

etc.

The non-createdness and indestructibility of matter and its attributes is especially underlined. As the general laws of existence of matter the following ones are taken into consideration:

- The law of the conservation of matter and motion,
- The causality law,
- The law of unity and struggle (interaction) of opposites,
- The law of transition from quantity to quality,
- The law of spiral development (negation of negation).

[1] Not in an absolute form but in the relative one.

Then, with the aim of development and deepening of concepts and characteristics of matter the general philosophical concepts (categories) and their interaction are listed.

In a word, the philosophical doctrine about matter after **Engels** had no essential development. In addition, the philosophical ontology could not give proof, learn and explain why the philosophical postulate recognized as an axiom: "matter is eternal and not-distractible" is considered true. Why and how matter exists eternally? If the philosophy had the logical and consistent answer to this question, physicists would create the physical theory of matter that would be that final, General Physical Theory, which would answer all basic questions, and, at last would describe the physical image of eternal existence and eternal circulation of matter and the Eternal Universe. I aspired to it, too …

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From the very beginning, I want to present a logic structure, so to speak, the "skeleton" of my philosophical contemplation of matter, and, later, to explain and give philosophical evidence of the basic questions (concepts and laws) in details.

- Matter is eternal and indestructible … **Why**? How?
- Matter is the struggle and unity of opposites. **Why**?
- Two continuously opposite forms of matter are positive and negative pra- matters. **Why**?
- If one of the opposites were not eternal then, after some time, matter would cease to exist. Thus, positive and negative pra-matter, as universal opposites of matter, should be eternal and infinite …
- If the conflict of opposites of matter (difference, opposition) or **unity** (equivalence, identity, unification, transition) were not infinite and eternal, too, then in the course of time matter would cease to exist. Therefore, struggle of positive and negative matter is eternal.

It follows from this that positive and negative pra-matters in the content of matter:

a) are equipotent eternally to each other and never will one surpass the other, one will not conquer the other and will not occupy its place.

b) struggle, confrontation (which is eternal) of positive and negative pra-matter never means that they are absolutely divided from each other, have no relation and interaction. Their opposition, antagonism does not mean at all that in one-half of matter there is positive matter, and in the other half is the negative. Not at all, it would be the end of motion and existence. They are not only differing from each other, but also similar, identical. The positive and negative matters not only differ from each other essentially by their describes, but also have general essential properties - both are the universal (general) forms of matter, and out of these two forms there are no other forms of matter. Both are endowed with one essential property - the general property of mass interaction, each of them - by its own way. This mass interaction[1] is the main, basic, universal (mean, mode) property of communication, interaction, motion (variation) of matter; exactly because of this, the **universal** means of interaction positive and negative pra-matter are connected and interrelated. This main and universal way of interaction predominates and is inherent to interactions of all particular, individual formations of matter. In this meaning, the **mass interaction** (by means of two forms - attraction and repulsing) for matter (rest and motion), is the way and means of eternal turnover, the way **Kant**, **Hegel** and **Engels** thought …

[1] The mass interaction - interaction by means of mass (energy) of physical quanta and systems.

c) The positive and negative pra-matters are interdependent; one is eternally both **the cause** (beginning) and **the consequence** (end) for the other.

d) They exist in an interpenetrative way, one has the other in itself (and does not have), each of them is endowed with the double property and turns into the opposite one, and does not turn, and can turn and cannot turn. Each of them consists of two forms of components - from quanta of limiting elements and from the limiting systems. These two components have exclusive describes: the first ones are indivisible and structureless, the second ones, on the contrary, have structure, can be formed, but do not enter into the systems distinct from themselves, do not play the role of composite …

That is why due to unstructured and indivisible quanta neither positive, nor negative matter can transformed into each other, in limiting systems of positive pra-matter there are formations, portions, components of negative pra-matter, and v.v.

e) and both, eternally, transformed into each other proportionally, providing the **eternal turnover of matter, eternal preservation**.

And here, having reached to the conclusion under item e), we have made one big turn in the course of recognition, the cognition of matter, from general, abstract concepts passing to the stage of differentiation, and have come to two opposite sides of matter – to positive and negative pra-matters, to revealing of their generalities and describes, to the opening of their structural units, components. Then we have come to the unity, identity, to the transition of these two opposite forms, which is the basis of eternal turnover, eternity of matter. Thus, our philosophical **concept** of matter was created and generated…

The philosophical contemplation of matter is one conditionally separated side of this ontology, one part, the main, the basic subject of whose main, basic subject of investigation is matter. For notion "matter"

this concept is a philosophical explanation and a substantiation, logic development and expansion of its content, it is the system of holistic ideas about it[1].

In the philosophical Literature, the concept of "matter" and the Universe, or "the whole material world" are identified very often. Though these concepts of the universality coincide in volume, their identification is the cause for certain disorder. "Matter" is the philosophical category, which expresses the matter, the "structure with use of which the Eternal Universe - majestic system is constructed. (The Universe consists of matter; however, matter does not consist of the Universe…).

Matter and the Universe differ by structure: matter "is composed", or, more exactly, is expressed by its general and especial forms, as well as in the form of particular or unit structures. However, the Universe has the system structure.

In Literature usually the attributes of matter are discussed, the investigation of its forms is mainly related to unique formations; it is evident that the general things are discussed since these unique formations belong to this special form. And there is almost no information about the general forms of matter. In due time, the antique thinkers had more various and interesting (original) approach to this question, than modern philosophers.

Strictly speaking, Hegel and even Engels have come closer but not reached to the idea about the general forms of matter. Discussing the forms of motion Engels has reached a very important, primary thought that the forms of motion have their carrier, corresponding to a certain form of matter: "Since we have cognized the forms of motion of matter, we have cognized matter itself, and by this the cognition is settled[2]".

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[1] More precisely, one is the whole system which contains concepts, reasoning and conclusions (or principles and laws), expressing forms, properties and the interactions of matter.

[2] **F. Engels**, "**THE DIALECTICS OF NATURE**", p. 199

And, as the motion has individual, specific and general forms, the matter alike should have not only individual and special forms, but also general forms.

1.2 Eternal existence of matter.

I should find out, why and how does the matter exist? What is in the basis of its being, thanks to what it exists? And only after that to find out, why it exists eternally?

So, the true studying of matter begins with the definition of its borders, that is, when certain properties are attributed to it and, since "matter" is a universal concept, its properties have general character, too. As matter, as a form of being (the objective one), matter at first should be endowed with the property of its existence (or not existence), by the property of its being-non-being.

Matter affirms and is negated, one is denied as existence, being and as a non-being, the non-existence (both all and nothing). If the dialectics does not come to correctness of this argument then such a dialectics is incomplete, it has shortcomings.

However, matter is one form of being, one form - the objective being and as such it should have and has the attributes inherent only to it, which prove objectively and describe its existence:

mass and energy,

space and time,

Just these attributes of matter I call the substantive attributes:

non-existence and existence,

mass and energy,

space and time.

These attributes are the main attributes inherent to matter. Here, it is necessary to dwell on the concepts of mass and energy, since the Philosophy of the XX century in most cases does not consider them as the attributes of matter, especially as the main ones, as the substantive attributes.

When matter is considered from the points of view of "does not exist" or non-existence, then all the attributes of matter (both positive and negative) are negate; however, when we discuss matter from the

point of view of its (objective) existence than, if we accept that matter cannot exist without space and time, we should accept that without mass and energy matter cannot exist (objectively) as well. That is, the mass and energy are the general properties of matter indeed and there is no definite form of matter which would not have these properties.

It is interesting that unlike the mass (energy), the gravitation (as the general form of motion) is considered sometimes as the attribute of matter. In particular, philosopher **S. Melyukhin** has this opinion. He, by the way, supported the common opinion that *"In general, for all true attributes of matter there are no equivalent antipodes, i.e. there are no opposite and just as general properties, which would neutralize and destroy the first ones. Otherwise, those would not be the universal attributes, but would be relative and temporary properties"*[1]. Then, he adds in the reference: *"Some of the general properties of matter are reflected in pair categories, such as space and time, quantity and quality, etc., whereby an impression can be made that they express equivalent opposites, while as matter of fact, the different attributes or general laws of matter are reflected here"*. By such a non-dialectic approach, he tried to prove the generality of gravitation and to deny the existence of general repulsion: *"For gravitation there is no opposite equivalent force of repulsion (anti-gravitation), all antiparticles possess positive values of mass and energy"*[2]. Such a one-sided approach is inherent to Philosophy and, in particular, to standard XX century philosophical representation about matter. An impression is created as if Kant, Hegel and Engels did not exist. As a result of such non serious relation to the philosophical testament of these great thinkers is that during the last century the Philosophy lost its possibility and its missions to play the role of a beacon for Natural Sciences and, especially, for Physics and Cosmology (which dissatisfies **Hocking** and others).

Other attributes of matter are secondary and tertiary.

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[1] **THE PHILOSOPHICAL PROBLEMS OF NATURAL SCIENCE**, M. 1985 p. 194 (in Russian).
[2] Ibid.

So, rest and motion
Lack of structure and structural properties,
Indivisibility and divisibility,
Discontinuity and continuity etc.

These are substantive attributes. If to pay attention to concepts in right and left columns of the paradigm of attributes then we will notice with ease the generality of their conservation:

1. A non-existence, mass, space, rest, lack of structure (indivisibility), discontinuity … this series describes an invariance, firmness, conservation, integrity of matter.

2. And the other series - existence, energy, time, motion, structural properties (divisibility), and continuity …, describes the change of matter but integrity.

And here, very frequently both in Philosophy and in Physics the proceeding from these generalities of content, requests, inappropriate one-sidedness, identify different concepts – finding oneself in one, or in the other extremes. Let us give the striking example of **Kobsarev** and his supporters: it is known that without time it is impossible to describe three-dimensional motion, that is, without certain duration of time space cannot change, and in a definite space there is no displacement or motion. This "activity of time or the instant of the active party" motion **Kobsarev** exaggerated and absolutized, having assigned to time the property of matter. Likewise, **Einstein**, **Wheeler** and their followers fall into another extreme - having absolutized and exaggerating the space, considering it as an independent matter.

This is related to attributes, I necessarily should consider ones in details, the concepts of non-destroyable and non-creatable. The materialists do not understand the dialectics deeply, assert one-sidedly that matter is non-creatable and non-destroyable, is infinite and so on.

Matter is infinite and finite, and one is non-destroyable and is destroyable and one is non-creatable and is created. Even more, all this is eternal, absolute.

Matter, as universal, is already destroyed at the moment of separation into particular, individual formations and the general, special forms, and at the moment of joining, transition, association of these

forms of differentiations, matter originates, is entirely created, as a generality. But isn't the differentiation of matter and unification, isn't the integrity not absolute eternal? Therefore, by composition of divisibility and indivisibility, discontinuity and continuity, finiteness and infinity matter represents itself as destroyed and not destroyed, created and not created, infinite and final, and one is absolute, eternal.

Here I should add a very important thought of the antique thinker: if one single atom from the world vanishes, then the world will collapse. This thought is after my heart. Why? As matter is given, exists, is real in its variety, that is, if it is given in its general, special and individual forms, expressions, in their transformations, it is impossible that something from it would be destroyed absolutely, would cease to exist.

As generality, as unity, matter is invariable entirely but changeable in the particulars, therefore ancient philosophies stated - matter, changing eternally remains eternally invariable.

The forms of matter, its individual formations can and are forced to rise and be destroyed, change and pass each other, but at level of all matter in infinity they eternally conserved, too.

As to the inexhaustibility, matter, by its absolute discontinuity and absolute finiteness, already is nothing, is already final, but it is natural that we do not deny that matter by its absolute continuity and infinity is absolutely inexhaustible. It is often asserted that it is impossible to exhaust matter by cognition and that the human being cannot comprehend matter completely and entirely. But all this is necessary to understand relatively, too. I give this part of from the depth, as a note and since this question is of importance not only for Philosophy, but also for Physics, I think it is necessary to dwell on it in details. In due time **Engels** wrote: *« ... since we have cognized the forms of motion ... than we have cognized matter, and it settles the cognition»*. Neither philosophers nor physicists have understood aptly these words of Engels to date. Therefore, philosophers assert one-sidedly that to settle matter by cognition is impossible, and physicists argue to date on possibility or impossibility of the final, definitive physical theory, about infinity and finiteness of number of laws and theories expressing, describing matter.

1. Matter as general whole is uniform, unique. It is possible to express it by one concept, one theory: when we say "matter ", we embrace all by it - all forms of matter, all individual formations. Naturally, it is regulated by one and general concept (theory). Based on it, one and General Physical Theory of matter should be created.

2. The general and special forms of matter are greater than one, naturally, but not infinite number. Special forms have very limited and finite quantity. The quantity of special forms of matter is limited to infinity of single formations. On the basis of certain general properties the individual formations of matter unite in special forms of matter. In these meaning, even the individual material formations entering into one special form can have infinite number.

3. In a word, individual formations exist in infinite quantity. Further, when Engels said that cognizing the forms of motion, we cognize it, the matter. It means that as motion is an attribute of matter, the forms of motion are alike the main attributes inherent to matter; hence, having discovered and cognized the main, basic or special forms of motion - we thus discover, we cognize the main, basic or special forms of matter, and thus we settle the cognition of matter.Thus:

a) it is possible to capture (to express, describe) to settle by cognition the matter as general, as integrity of final number of the special forms,

b) but it is impossible to capture to settle it by cognition as the infinity of individual, separate, particular formations.

2. Matter as struggle (interaction) and unity of opposites

The world is a colorful carpet

The God created the entire world as a huge multi-colored carpet. From colorless threads, he weaved a basis, after that he put multicolored paint pictures. People see only these pictures and do not notice the colorless basis at

all. Only the skillful weaver can notice and evaluate incomprehensible greatness of divine creation.

From the stories of my greatmother **Srbuhi**.

Einstein has said in due time: *"The existence itself should possess absolutely harmonious structure"*. Moreover, this expression applies both to the matter –as an absolute matter, and to the Eternal Universe – as an absolute perfect System. The dialectics considers harmony, symmetry, as the unity of opposites, of opposite sides. In this meaning, the Einstein's statement means that the cause of existence is in itself, in its perfect and harmonious structure, or, in the language of dialectics, the cause of existence in the unity of the opposites.

As matter, matter is eternal[1]. This means that it is necessary to concretize: matter is the eternal struggle and unity of opposites, and the opposite sides of matter should be absolute, eternal. Precisely in the way, I already spoke in the "hull".

[1] Our investigation proceeds from abstract, general one to the centre, to especial, particular; it is the method of our statement, which, perhaps, has an axiomatic essence.

It is just necessary to explain here the essences, which are substantive opposite sides of matter. In the Literature, the substantive opposite sides of matter are often confused with the opposite attributes of matter. Opposite attributes also make oneness but their oneness expresses the opposites of matter as well, and one is not identified with matter. This concerns all the attributes, including main, substantive attributes: space and time unity is also the attribute of matter, as well as the mass and energy unity is the general property of matter, but not matter itself.

So, the expressions in the Literature that matter is the unity of space and time, or unity of motion and rest, or unity of infinite and final are insufficient and have necessarily to be corrected.

As stated above, it is easily understood that the substantive sides of matter can be if and only if in the forms of matter[1], struggle and unity of which provides the eternal existence of matter.

Let us see now what forms of matter can be the absolute opposites.

In standard Philosophy, again , disorder predominates; in one case, matter is considered as circle of special forms, in another case, paying the tribute to the Physics, as the unity of matter and field. In the third case, matter is considered as a unity of its individual formations, namely, those criteria, with which it is necessary to define the substantive sides of matter, are not specified. I have already cited one criterion - the opposite sides of matter should be **absolute**: that means they should be over-abstract, to be at higher level of abstraction, which should correspond to the **generality** of matter. Here is one more criterion to you: they should be **general.** Namely, matter should be divided historically between these two general forms, out of which no any special form of matter should exist.

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[1] I call them the "substantive opposites", since any of these opposite sides is the matter endowed also by all the attributes of matter. Just by this cause, the unity of opposite attributes cannot be the unity of opposites of matter.

For example: if one considers live and lifeless matter and to consider them as their absolute opposites of matter, these two forms do not settle all the forms of matter, do not include transitive forms of matter which are between live and lifeless matter. Hence, they are not the two general forms of matter.

Moreover, if consider the variants previously mentioned, the first one mismatches because the general forms of matter should be two. The second one mismatches because, as we have already told, attributes of matter cannot be the substantive opposites of matter (the field and matter, in this case, represent the unity and interaction of continuity and discontinuity, of discreteness).

Now, let us dwell on the third case: "matter and material systems is the unity of opposites. They mutually exclude and mutually interpenetrate each other. The mutual exclusion becomes apparent in the fact that material systems appear and disappear move in space but matter conserves in all transformations. Indestructibility and non-creativity of matter was formulated as law still in Ancient Greek philosophy. Interpenetration of the opposites mentioned above is revealed, on the one hand that final material systems contain the necessity of their negation in them, an exit out the borders; on the other hand that matter itself can be considered, to some extent, as a system since it is unified and all inside it interacts"[1]. Here is a vivid example of disorder. Certainly, it is possible and necessary to consider the matter and individual material formations, discuss from the point of view of interaction dialectics of discontinuity and singularity. But it does not mean that we have the right to consider the general (moreover, the universal) and the individual as concept of one level of generalization,

[1] I them call the «substantive opposites» because any of these opposite sides, is also the matter and presented by all attributes of the matter, too. For the same reason the connection of opposite attributes cannot be the connection of opposites of the matter.

and to unite them. It turns out that matter itself is one of the parts of its opposite, and the other part is the final material systems.

Not deviating from the main subject, I will present the general properties of substantive, absolutely opposite sides of matter. First of all, as they are the general forms of matter, they should be endowed with all the attributes of matter, and first of all by substantive attributes, by mass-energy and space-time. they should be extremely different and opposite By these properties, so that on the basis of this difference opposites would create unity (integrity).

These general forms of matter should be endowed with general forms of relation, interaction, motion, moreover, by these general properties of motion, interaction they should be extremely opposite to each other, as well as different.

Now it becomes clearer, why such specific forms of matter as - organic and inorganic, or live and lifeless cannot be considered as substantive, opposite sides of matter, or as two limiting forms of matter. Since they, by the substantive attributes - the space-time and mass-energy, are not extremely different and opposite to each other.

In a word, it is already clear that the substantive opposite sides of matter, are those general, limiting forms of matter, which are endowed with general, limiting forms of relation, interactions, motion, or are carriers of these limiting forms opposite to each other - interaction, motion.

again , we will return to Engels's thought that, having cognized the motion forms, we cognize matter. Engels clearly reendowed that we cognize the special forms of matter, by means of cognizing the special forms of motion, which are inherent in these forms of matter. Simultaneously, following Kant and especially Hegel, he has grasps that repulsion as well as the attraction is the necessary property of matter: “Usually it is accepted that the mass is the most general definition of materiality, i.e. that the attraction, instead of repulsion is the necessary property of matter. However, the attraction and repulsion are as inseparable from each other, as positive and negative and, consequently, already on the basis of the dialectics itself it is possible to prognosticate that the true theory of matter should assign the same important place to

repulsion, as well as to the attraction, and that the theory of matter, which is based only on attraction, is false, insufficient, halved"[1].

Moreover, **Engels** clearly realized that both attraction and repulsion are the forms of motion with opposite orientation: "*Thus, we have again the interaction between attraction, on the one hand and the form of motion acting in a direction opposite to it, i.e., the repulsive form of motion on the other side. However, within the limits of the pure terrestrial mechanics this repulsive form of motion is not found in the Nature (operating with the masses with the given and aggregate state invariable for it and cohesion state) "*[2]. Besides, like Hegel, he also accepted that the essence of matter is attraction and repulsion: *"All theory of gravitation is based upon the statement that the attraction is the essence of matter. Surely, it is not true. Where there is attraction, it should be supplemented with repulsion. Therefore, still Hegel has noticed quite correctly that the essence of matter is in attraction and repulsion"*[3].

Thus, **Engels** as philosopher, developing these thoughts, leads up them to the culmination - from which only one step remained to reach the most important conclusion for Philosophy and Natural Sciences, I would say having a historical role, however, in due time the narrow opinions of Natural Sciences (of Physics) did not allow to step forward.

For the same reason **Einstein** failed to make it, though he has approached to the solution of the problem more closely; actually he has shown that these general, limiting forms of matter should be different and opposite not only by the mass-energy, but also by space-time (the curvature of space-time). However, he also has not reached the solution of the problem, having left some preliminary outline.

The solution of this problem can be found with use of the following arguments:

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[1] F. Engels, The Dialectics of Nature, p. 210.
[2] Ibid., p. 55.
[3] Ibid, p. 211

1. The attraction and repulsion are not the attributes of matter but are the forms of motion (and rest) of the attributes of matter. And even the general forms of motion, as opposed to special and particular, individual forms. That is why, strictly speaking, the attraction and repulsion are not the essence of matter, that is, the attraction, and repulsion are not the substantive properties of matter though specify their essence.

2. And, as far as, according to Engels, we, having cognized the forms of motion, settle the cognition of matter up to the end, that is, the motion forms describe and characterize the forms of matter.

3. From here ,we come to that main (epoch-making) conclusion that the general forms of motion, the attraction and repulsion characterize, describe two general forms of its carrier, of matter, the opposition of which is essence of matter, the basis of its eternal existence and the internal source of general activity.

Finally, being the absolutely opposite sides of matter , one of which is endowed with attraction and the other by repulsion and thank to these properties form one absolute, eternal unity.

And why «pra-matter»? And then, why "positive and negative" variants? From the very beginning I want to say that I called them so not only to give tribute to the traditions of five thousand-year old searches but also due to the distinction throwing light on researches, descriptions and content of these two forms of matter. The term pra-matter is justified for several causes:

1. First, for all the variety of matter these general and limiting forms of matter really and truly are the pra-matter, the special and particular, individual forms of matter, which indeed result from these two forms of pra-matter, with their aid.

2. Secondly, in some meaning positive and negative matter is the pra-matter for universal matter since matter also consists of these two essences, is their unity. However, it does not mean that positive and negative pra-matters at first exist separately and later join each other to form the matter.

On no account; positive and negative pra-matters, like matter, exist eternally, always. The opposite form is the cause and (aim) a consequence of existence of each of them. Moreover, the eternal is as their opposition (struggle, interaction) and their unity (transition). Hence, they cannot precede or follow the matter in the course of time (in the arrow of time).

3. Thirdly, positive and negative forms of pra-matter are the **limiting**, polarized forms of matter and per se (as absolute symmetry - two limiting opposite wings of unity of opposites) reveal themselves as imperfect wings, as nonintegral of two limits of perfect matter -positive and negative pra-matter. It means that they are insufficient separately, nonintegral, unilateral forms with which the insufficiency and limitedness of these formations of pra-matter is connected and from which it follows.. Both positive and negative pra-matter has two types of formations, which have limiting essence:

1) the limiting part, component, an element (quantum);

2) the limiting whole, compound and systems.

The first type of formations are not divided into parts, do not have components and are not composed of elements distinct from themselves. However, the second type of formations, though they are whole and compound, are the systems composed of parts and originated from elements and their interrelations, but these integers do not enter into the compound of others integers distinct from themselves and, as systems also are of limiting type and do not enter in the compound of systems distinct from themselves.

That is why in ideas about the pra-matter related to the problems of divisibility of matter, the disorder predominates to date. There are two mutually exclusive opinions: 1) on the one hand, one asserts that there should be final, indivisible atoms, elements (quanta) of matter. That is, the divisibility of matter has limit; the chain of the infinitesimal has its end, the border, the limit, reaching the indivisible elements, which compose pra-matter.

2) On the other hand, according to the opposing opinion, the individual formations of matter are **infinitely** divisible, that is, ones clame the divisibility of matter infinitesimally and in this chain there is no end or border, and the concept of pra-matter is **denied**. This point of view serves as a basis for some philosophers and physicists to come to erroneous opinion that there is an infinite quantity of forms of matter which exist and the Physics is doomed to open new and new forms of matter infinitely.

In a word, it is not clear, what point of view is correct, when all of them have shortcomings but have also the core of good meaning. To my mind, the truth is in the unity of these two different types. To reach this unity it is necessary to expand and deepen definitely the meaning of these two opinions separately.

So, if in the first case it is accepted that divisibility of matter has certain border, the end, then it is necessary to accept that this certain border has the end, there is an end on two ends of a chain of divisibility - on the infinitely small and infinitely big ends. That is, it is impossible both to divide on infinitesimally small, and it is impossible to divide on infinitely big – is the certain border for the objective reality of small and big, parts and whole, an element and a system, beyond which smaller or bigger cannot exist … In this case not only proves to be true existence of a limiting kind of matter - pra-matter, but also this concept obtains a new content - pra-matter formations too have limiting essence[1]. As stated above, the formations of pra-matter thus happen in two forms - as the limiting element (quantum) and the limiting system. Besides, the pra-matter having such formations cannot have a direct relation and interaction with the special forms of individual formations of matter. Not to be isolated from the variety of matter it should have two opposite forms, positive and negative limiting forms, the relation and interaction

[1] Introducing the pra-matter, you should not consider it only one-sidedly, as indivisible into the parts elements, finite, quanta without components and limiting systems.

between them is not only possible but is taking place and thanks to these the general forms join, finding their unity in the matter.

And in the third case when the infinite divisibility of matter is accepted, too, it is necessary to accept, as one of the side of the one and the same truth and to develop the content of this opinion.

From the very beginning, it should be underlined that the distinction and separation of formations of pra-matter into limiting parts and elements (quanta), and into limiting integers and systems is relative. From the outside, they are similar up to identity and are identical by their influence. But internally they are different; the limiting parts of the system have structure. In this meaning, our pra-matter differs from the "classical" pra-matter. Our pra-matter is not only the preliminary form of matter, from which the all variety of matter originates, but as academician **Markov** would say, as if “the final matter” since one includes in itself the all variety.

The limiting part, element (quantum) and limiting integer, the system are anyway the individual, final formations in the meaning that in due course they arise and are destroyed, they have the beginning and the end, that is, they are variable. Hence, the lack of structure of limiting elements (quanta) should not be seen in absolute terms. That is, nevertheless, they have certain structure and components? As these elements have limiting essence, they have ambiguous properties, too; on the one hand, they cannot be composed of small components distinct from themselves, below their organizational level, since they are extremely small formations of matter endowed with properties of attraction and repulsion; if to "divide" them into parts and components, then these properties henceforth will be disabled.

That is, such formations can be divided theoretically into infinitesimally small particles and components (the Mathematics gives such an opportunity to us), but they henceforth lose value of the objective reality; they have no physical meaning, like separation of molecule of water.

On the other hand, the limiting components, elements have to interact with each other, cannot be isolated from each other; the limiting elements endowed by attraction attract each other, join, and endowed by

repulsion - repulse each other. **Nequaquam in isto sunt omnia**[1]. These limiting elements of positive and negative pra-matter do not mix up with each other but can definitely create unity, unite. And this means that the limiting elements endowed by attraction, not only join, mix up with each other, pass, but also divide from each other, and those endowed by repulsion not only repulse away, and divide, but also join each other, mix up.

In its turn, this means that at unification, mixing and alsideation these limiting elements lose their "personality", this is the end of their "longevity of life", and at separation, at detachment this is the beginning of their “longevity of life ". Thus, they disappear and arise with the lapse of time. In this regard, it is possible to say conditionally that as they originate from those similar to them and are destroyed, turn into similar, this implies that the limiting components, elements are composed from similar, and are the part of similar.

Such unique properties endowed pra-matter and its formations. As stated above, this "strange" property, in a more pronounced form presents the limiting integers and systems. As I told you earlier, though they have structure, content, they do not enter in the integer as whole, into the structure of systems. Unlike the limiting elements, it is another opposite. In this case, also a logical question is arising. If they are not entering into the systems distinct from them, this means that these limiting systems are not composed of systems distinct from themselves. Then, what they are made from? And whether the components and elements do not play any role at all? Are they part of other systems, or not? It remains to accept that they are made from similar ones, and are the part of similar systems.

In this way the dogmatic ideas of infinite divisibility and indivisibility develop, and enriching their content we have reached the dialectic unity of these opposites, mutually exclusive ideas. The further concretization of this theme already belongs to the physical sphere.

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[1] but it is not the all

Let us now pass to clarifying the question, why it is expedient to name two limiting forms of pra-matter "positive" and "negative", and whether this has an essential value. First of all, it seems that the explanation of it is very easy, it is clear by itself and there is no need for complicated substantiation. Indeed, the most limiting and abstract opposite, as noticed by Engels, is the opposite positive and negative, which to such a degree is the abstract concept (like the ‘‘relative" and "absolute") that finds its application in different areas of life and Science. Then, why not to call that general form of matter the "positive pra-matter", which is endowed with attraction, especially if long time ago it was found out that the attraction is peculiar to all the bodies and formations, which surround us and the mass (energy) of which has positive sign. It is natural, since the "negative pra-matter" is endowed with repulsion that in its essence is opposite to attraction, therefore it should be endowed with negative mass (energy). Hence, both justify their names.

Even more, as we see, the names of these two general, limiting forms of matter are created and express the describes of substantive attributes, thanks to which they differ extremely from each other. So, both positive and negative pra-matters are endowed with mass and space, but differ from each other, differ from each other by the type of mass and space, that is, they do not have the identical mass and space. The elaboration of a theme again will lead us away into the field of Physics.

3. Features and generalities of positive and negative pra-matter

The material formations are endowed either by **positive** or **negative** mass; this separation of pra-matter in two forms is absolute and eternal (for example, negative pra-matter never can change its general properties like repulsion, negative mass and negative curvature of space) and positive remains positive pra-matter, and negative - remains negative; none of them loose its feature, that is, its independence.

The positive mass, capability to attraction is the inherent property of positive pra-matter, and not an acquired one. Both positive and negative pra-matter exists eternally, as well as eternally exist their describes; they do not arise and disappear in time.

It means that all formations of negative pra-matter, or more exactly, its two special forms of all formations, should be always endowed with **negative** mass-energy.

From the point of view of contraposition and distinction of positive and negative pra-matter, it is true at the moment of contraposition. And as their contraposition, the difference is eternal, and then this truth is eternal and absolute, too.

But simultaneously[1], **the unity and identity** of positive and negative pra-matter is eternal, too; hence and their equilibrium, equivalence and uniform transition is also eternal and absolute. So, it is necessary to go down from general to the special and particular, from abstract - to the concrete to see and understand, in what way concretely, how and thanks to what and by what means it is provided and the eternal opposition (distinction), and unity (identity) of positive and negative pra-matter, their eternal uniform transition and mutual transition? Why they should pass to the concrete? An explanation of it is in the differentiation of the general, special and particular (individual) matter, and with this particular in integrity, in its unity. If positive and negative pra-matter would not consist of two special types of formations then not only the unity of opposite, different pra-matters would be impossible, but also the eternal uniform transitions.

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[1] Those, who do not understand the dialectics sometimes deny that the contrapositions can simultaneously be as unity, and different and identical alike. They always understand simultaneity as one being on the discrete arrow of time, which certainly is always relative - two local systems cannot be absolutely simultaneous. But the eternal, absolutely opposite sides and forms can be unified **simultaneously** and eternally. And this simultaneity is absolute and eternal, in the duration of an arrow of time …

As it has been noted earlier, positive and negative pra-matters consist of two limiting (special) types of formations, of limiting elements and limiting systems. We have already discussed the meaning of this limitedness. Although they have their describes and differ from each other by their internal structure, but they have also the generalities, the main one of which is: any general accessory belongs either to positive pra-matter, or to negative one, that is, ones are endowed either with positive mass-energy, or with negative.

Thus, positive and negative pra-matters, thanks to their two limiting formations of a special type, provide both their eternal opposition, an absolute difference and polarization, and their eternal identity, unity and transition. Here is the cause of existence of these two limiting forms of positive and negative pra-matter: 1) both positive and negative pra-matter conserves its eternal absolute opposite, the difference, thanks to limiting elements (to quanta, parts, components). What does it mean? It means that the limiting elements of positive pra-matter, which are endowed with positive mass-energy and, therefore, by attraction, never, by no means turn into limiting elements of negative pra-matter, which are endowed with negative mass-energy, hence, by repulsion. They never change the sign of their mass-energy; do not change their unique essence. Moreover, they even do not turn into the limiting systems, which are identical with them by their essence, that is, they have the same sign of mass-energy. Just by means of such formations, due to them, positive and negative pra-matters are eternally opposite and absolutely different. But pra-matter consists not only of these types of formations but have the formations extremely opposite to this, the limiting systems, which being externally identical with the limiting elements, are endowed with internal structure, hence, can ultimately vary and turn into limiting systems with the opposite essence. That is, varying, the limiting system of positive pra-matter can turn into limiting system of negative pra-matter, and v.v.

The greatest difficulty for human mind is in the cognition and discovery of the limiting systems of positive and negative pra-matter transition. If the limiting components, the elements of positive and negative pra-matter had the need to transform into each other, then they

would be differentiated in various forms but, since the limiting positive and negative elements have no need to transform into each other, for this and the same reason they happen to be of one type. The limiting systems of pra-matter show the other circumstance. The limiting positive and negative systems should transform without fail to each other to provide the eternal transition, the eternal unity of positive and negative pra-matter. For this purpose, the limiting systems should necessarily be of two different forms.

For convenience, I call these two forms of limiting systems Armons and Pseudoarmons. What describes and generalities they have?

1. One of the great, main differences is that Pseudoarmons are the part of Armons (always exist in their structure though can leave structure of one Armon and appear as the part of another Armon …), and Armons never are the part of Pseudoarmon, do not enter in their content. Here in this meaning … after all the main property of limiting systems is that they do not enter as components into the systems distinct from them. Only limiting systems are the part of limiting ones, that is limiting systems are made of limiting ones, of one's of their owns. This is their main feature and the distinctive property. But we have discriminated between two forms of limiting systems, the Armons and the Pseudoarmons. Their difference is in: a) if Armons consist of Armons and Pseudoarmons then b) Pseudoarmons consist of Pseudoarmons, and Armons never enter in their content. Or we can reformulate the difference between them in another way: a) Armons are a part of only Armons, and Pseudoarmons are a part both of Pseudoarmons, and of Armons.

2. We know that limiting systems and limiting elements do not pass each other and do not turn, but limiting systems are not the part of limiting elements, and the latter are the part of limiting systems … Now a) the limiting elements enter into Pseudoarmons almost directly, and b) into Armons they enter not directly, but by means of Pseudoarmons, entering in their structure. It is a difference between Armons and Pseudoarmons,

too. The direct components of Armons are Armons and Pseudoarmons.

3. We already have and distinguished four forms of limiting systems with positive mass, or Armons and Pseudoarmons endowed with the properties of attraction and with negative mass, or Armons and Pseudoarmons endowed with repulsion. Although I said from the very beginning that the limiting systems of positive and negative pra-matter transform into each other of necessity, it does not mean that Armons become Pseudoarmons and v.v. This is related to the transitions of positive Armons into negative Armons, positive Pseudoarmons into negative Pseudoarmons. Thus, one more important feature has been revealed that positive and negative (pra-matters) Armons transform into each other, and positive and negative Pseudoarmons - into each other.

Now let us look what generalities have Armons and Pseudoarmons. The first generality we already know is that they belong to one special type of pra-matter, to the limiting systems. The positive Armons and Pseudoarmons externally are entirely similar to each other, they are endowed with positive space-time, by attraction. And negative Armons and Pseudoarmons outwardly are similar to each other.

The third: Armons and Pseudoarmons, as the limiting systems, belonging to one special type, have some **structural generality**. Both Armons and Pseudoarmons consist of equal portions of positive and negative pra-matter, which counterbalance each other. Here it is necessary to recall on formations of positive and negative pra-matter, on invariance, constancy, steadiness of limiting elements and limiting systems. The constancy, an invariance of limiting elements, is secured by the lack of structure that they do not have internal structure and components. And the stability, the invariance of limiting system is assured by the steadiness of internal structure. And what about the structural steadiness, is it out of the question? Naturally, I am referring to the steadiness of components in the structures endowed with the attraction and repulsion as far as we deal if and only if with these two

forms of motion, and with formations, which are their carriers. (Other forms of motion and interaction will go on stage later…).

That is, both Armons, and Pseudoarmons should be endowed with such an internal steadiness. (Skipping ahead, I will say that it is just this steadiness, which creates the flat space with all its consequences).

* * *

Now we have sufficient cognition to step down from concrete to more concrete. Let us dwell on the structure of Armons and Pseudoarmons, let us consider their components. We already know that to keep structural steadiness and internal stability, Armons should consist of equal quantity of Armons and Pseudoarmons. And Pseudoarmons should consist of equal quantity of positive and negative limiting elements. This is primary condition, but still it is necessary to find out, whether in the structure of Armons, along with positive and negative Armons, there are positive and negative Pseudoarmons, or not. To find the answer to this question it should be taken into consideration that Armon is endowed with attraction, by changing, one transforms into Armon, endowed with the repulsion and v.v. Therefore, positive and negative Armons are two different sides of the same limiting system, of Armon, but with the stable and counterbalanced states. Armons with positive mass-energy, i.e., Armons endowed with attraction, or, more exactly Armons in this state I call minimons, and with negative mass-energy, i.e., Armons, endowed with the repulsion, Armons in this state I call maximons. Thus, Armons, on one hand are similar to Pseudoarmons, since positive Armon by changing turns into negative Armon and v.v.. But unlike the Pseudoarmon, positive Armon (minimon) and negative Armon (maximon) compose two limiting conditions of one and the same system, as opposed to Pseudoarmons, which are not, that is, do not make the different states of one system. Let us call positive Pseudoarmon “pseudominimon”, and negative Pseudoarmon - “pseudomaximon”. It is caused by the structural difference of Armons and Pseudoarmons. Let us reveal these differences. Two of them are already familiar to us:

1. The Pseudoarmons consist of limiting elements almost directly, and the Armons directly consist of

Pseudoarmons, and only at intermediary of Pseudoarmons, from limiting elements.

2. The Pseudoarmons are the part of Armons, and Armons are not in the content of Pseudoarmons: in this way a very peculiar structural gradation is obtained.

Limiting elements

↓

Pseudoarmons

↓

Armons

Besides, there are also other structural differences:

3. If one of Pseudoarmons, the pseudominimon, indeed consists directly of limiting elements, the other, the pseudomaximon directly consists of pseudominimons, that is, the pseudominimon is the component of pseudomaximon, and opposite is impossible. In structural meaning, the pseudominimon is the subordinate of pseudomaximon. This is the expression of structural gradation, too.

This one-sidedness of structural subordination for Armons is absent. Both the maximons consist of minimons, and the minimons consist of maximons[1].

When we said that the Armon consists of Armons and one itself is a part of another Armon, we mean that such structural hierarchy of Armons is infinite. But we already said that this infinity cannot be opened, it is impossible that infinitely small Armons were at the one end, and infinitely big Armons - at the other end. After all, these systems belong to one class. Hence, when we say that data Armon consists of Armons, and itself enters as a component into the structure

[1] Thus, as individual formations, both the Pseudoarmons, and the Armons, despite certain features, acquire properties to be the relative element and system (the relative part and an integer, the relative component and a compound).

of another Armon, it does not mean that the Armons as part of this Armon do not differ from Armon in the structure of which they enter. Surely, they differ. Since we already have the Armons endowed with the attraction, the minimons, and endowed with the repulsion Armons, the maximons, we need to come to an idea that minimons consist of maximons, and maximons - from minimons … But why, none the less, the minimon cannot consist of maximons and minimons, or maximon - of minimons and maximons ? We already know and we were convinced that the same cannot consist from the same: the maximon cannot have maximons in its content as a component, and the minimon cannot be the component of minimon. If we would have accepted this possibility, then maximons and minimons should be divided into two different forms, but we know that the nature does not resort to overindulgence, that is, the matter does not require it, as this lack is already filled by pseudominimons and pseudomaximons.

The third circumstance: the coexistence minimons and maximons in the content of minimon or maximon is forbidden for the clear reason that minimon and maximon are two opposite states of one system, but different systems.

Hence, if it were possible, then the hierarchical structure of Armons or the structural hierarchy would be broken, meanwhile we relate the expectations with it.

The fourth substantiation and explanation is also probable, why the minimons and maximons, as well as the pseudominimons and the pseudomaximons (this is one of the forms of their generality) do not meet each other, do not collide?

We already have accepted from the very beginning one important postulate: two limiting, general forms of matter, positive and negative pra-matter do not destroy each other, not **annihilate**, but are mutually re-conciliated with each other. From this follow the describes of interactions of limiting formations of positive and negative pra-matter. These are six forms of limiting formations, which should provide not only the opposition, the absolute and eternal difference and delimitation of positive and negative pra-matters, but also their unity, **mutual transition and interconversion**. These can explain not only the

circumstance that negative limiting elements directly do not collide, do not meet, do not interact with positive limiting elements, but interact with elementary particles, with black holes, i.e., with the formations consisting of positive limiting elements. Thus, we cannot assume that interaction of positive and negative limiting elements can cause annihilation or mutual destruction since the nature forbids from the very beginning the direct collision between them.

Just like the collision and interaction between minimons and maximons, between pseudominimons and pseudomaximons is forbidden. Instead it is authorized and confirmed to be true the real direct interaction and collision, the unification and separation between Armons and Pseudoarmons.

Armons cannot unite, be grouped (and thus, create new formations) or be differentiated (decay into any new formations). The association, grouping and separation should be understood in the meaning that minimons do not absorb minimons, maximons do not absorb maximons, minimons and maximons do not absorb each other. When many maximons are available in the structure of minimon, which is endowed with the property of repulsion, naturally, they cannot absorb each other, but also cannot go away, as their repulsion is counterbalanced by the attraction of pseudominimons, and this ensures the structural stability of minimon. In the same way, inside the maximon the steadiness is ensured thanks to repulsion of pseudomaximon, otherwise the components of maximon, the minimons attracting each other would absorb themselves that is essentially inadmissible.

Unlike Armons, the Pseudoarmons can incorporate and be divided; they are absorbed and emitted, ejected from Armons, but with defined peculiarity. For example: the pseudominimons can and are unified in the structure of pseudomaximons, and can be emitted, separated, thrown up from structure of the latter. But pseudomaximons cannot unite. In the presence of corresponding conditions, the minimon absorbs pseudomaximon, and maximon unites, absorbs pseudominimon, the pseudomaximon is emitted and radiated from maximon, and in the same way the pseudominimon - from minimon.

Thus we have found out that positive and negative pra-matters are differentiated in six types of formations: two forms of limiting elements endowed with attraction, the extreme elements endowed with positive mass-energy, according to tradition we call them g-gravitons, and the limiting elements having negative mass-energy and endowed with the repulsion we call the anti-gravitons and we will designate sign by the sign $\bar{g}$. I repeat again , you should never identify the gravitons and the anti-gravitons with the concepts accepted in the Physics "the particle and antiparticle, the matter and anti-matter".

Besides the graviton and the anti-graviton, positive and negative pra-matter are divided into the four forms of limiting systems, minimons and pseudominimons endowed with attraction, and also maximons and pseudomaximons endowed with repulsion. We will cite this in the table:

Table 1

Limiting formations	**Transform in each other**	**Interact with each other, collide**	**Form groups**
Gravitons and anti-gravitons	No	No	Gravitons - always, Anti-gravitons - never
pseudominimons and pseudomaximons	Yes	No	pseudominimons - yes, pseudomaximons - not
minimons and maximons	Yes	No	No

By the above-stated properties and the structural describes, these six types of formations compose one uniform structural hierarchy. Therefore, the gravitons and the anti-gravitons are the part of Pseudoarmons and the Pseudoarmons are the part of Armons. The structural gradation is obtained where the limiting elements and Pseudoarmons in structural meaning are the subordinates of Armons, and are in their structure.

That is why, following the antique thinker, I say that only Armons exist, and there is nothing without Armons, and all that exists, except the Armons, exists by use of Armons and in them.

Thus Armons differ from the limiting formations of positive and negative pra-matter that in itself unite, involve, embrace not only limiting elements and limiting systems of positive and negative pra-matter (one type of which they compile), but also cover all possible variety of matter, all the individual formations arising from grouping of positive pra-matter.

The Armons, belong to one class of similar ones, the individual, local, final, relative systems, which, thanks to transition of two opposite and different conditions of the hierarchical chain of minimonos and maximons, and even by means of absorption and radiation of Pseudoarmons realize the uniform, continuous transition of two limiting, general views, positive and negative pra-matter, and by this the eternal circulation and eternal existence of matter is provided.

It is worth noting to remind again that the ultimate goal of the development of philosophical and physical science (in particular of Cosmology) is the revealing, as said **Wheeler**: *"the shining mechanism"* of eternal circulation of matter, or the eternal existence of the Universe. Here, reaching this ultimate goal, the Philosophy, Physics, as sciences, obtain their final and finished form.

My philosophical contemplation of matter presented to you has reached the ultimate goal of development: as the basis it postulates the eternity of matter (the naked intuitive reasoning) in the beginning, based on which and proceeding from which the contemplation is built (the philosophical theory of matter), which is entirely the expansion and the development of content of this primary postulate. Thus an initial reasoning turns to the whole contemplation, to the theory that as the whole system of concepts and laws, which simultaneously confirms the correctness of a postulate "the matter is eternal", and confirms that it is logically integral and final.

III. From Philosophy to Physics

1. The physical theory of matter (the general characteristics)

1.1 Why we need the Dialectics

The development of scientific idea, in particular, the development of physical theory is taking place by generalization: from the particular and concrete to the general, from the general to universal (generalizations also have border). Both in the Philosophy and in the development of physical theory the important role plays not only the distinction of concepts and their opposition, but also their association, unity and identity. Very frequently, the whole duration of the History of Physics was the transition of opposite definitions of physical concepts to unity of such concepts (by way of generalization).

It was the case with the history of dialectic unification of such opposite concepts, as mass and energy, space and time, gravitation and the curvature of space and other opposite concepts. In general, the Dialectics has the heuristic role in the development of physical theory. It is such a method; it becomes possible with the use of it not only to reveal the breaking of certain symmetry, but also to restore the broken symmetry. It is a question of structural units of the theory of Physics, the development, expansion and generalization of physical concepts and laws.

The **Gödel's** Theorem argues that all the exact sciences and theories, which are based on the formal logic and mathematics, are limited, remained incomplete, not final and not perfect … Perhaps this circumstance has forced **Ilya Prigogine** to admit*:"…the unification is not sufficient. We need more dialectic view at the Nature"*. Moving ahead, when you reach the general by way of generalization, it is impossible to continue it by this generalization further; the general is impossible to generalize, for example, the theory of the Grand Unification of Physics is the culmination of the unification, the

generalization of quantum forces. It is impossible to move further inside this channel of generalizations. Especially, it is not correct to unite and generalize this general quantum force directly with the gravitation. The gravitation, as a universal force, is possible and necessary to unite, generalize if and only if with the opposite universal force corresponding to it, with the repulsion.

So, I absolutely agree with **Prigogine's** opinion. Indeed, it is necessary to apply the dialectics to create the final and perfect physical theory, for this purpose it is necessary to execute the requirement of the main law of dialectics, the requirement of law of unity of opposites, to unite the opposite ideas and concepts.

In my theory of Armons, I have tried to unite such mutually exclusive and opposite objects like:

- attraction and repulsion,
- spaces with positive and negative curvature,
- system and element (quantum),
- conservation and transformation laws,
- static and changing (evolutionary) cosmic models,
- differentiation and integration processes and others.

* * *

1.2 Matter is united by its separateness.

The ideas about infinity has had interesting development up to now. The development of science and the epoch-making experience of cognition have led to such a conclusion that the big always consists of small, the small of smaller and so, as if in the world around an infinite chain of hierarchy is taking place, at one end of which the infinitely big predominates and at the other end – the infinitesimally small.

On some level of development of Science such ideas had the definitely sufficient and effective role, however, the further development of the science cannot be satisfied with it, especially, when in the sphere of microphysics and not only there the facts and phenomena are revealed, which cannot be placed within the frameworks of this traditional approach. It is the problem of the dialectics of big and small. During the antique period the Greek philosopher Anaxagoras tried to prove in his doctrine

Homeriomers that not only the big consists of small, but also it is possible that the small consisted of the big. Such ideas were further developed by **G. Narekatsi**, and German philosopher **Leibnitz** in his "**MONADEOLOGY**". In recent times the well-known physicist **Wheeler**, **Markov**, **Stanyukovich** and others have been carried away by such ideas . The intensive investigation of their ideas allowed me to come to one very important idea that two edges of structural hierarchical infinity join in infinity. It means, first of all, that it is impossible that infinitely big and infinitesimally small, big and small have certain border and that in this infinite hierarchical chain these big and small transform into each other.

Still **Hegel** asserted that the matter is both infinitely divisible and indivisible. Engels in this case grumbled that **Hegel** explains mystically the divisibility and indivisibility of matter. Time has come to bring certain clearness to this problem.

1.3 The General-especial-individual.

It is necessary to look at divisibility and indivisibility of matter through the prism of these concepts. When we say the matter is the general concept, the one uniform set without the relations between its parts it is uniform and indivisible (in general, the universal is one, without parts). It is such standpoint, the necessary generalization, which per se does not require the divisibility.

The next is the level of extraordinary (of special). At this level the matter is divided into the especial types, the quantity of which cannot be infinite and, consequently, they are of especial types. In this case, the divisibility of matter is final.

Thr other level or the third level is level of individual. At this level, the matter is divided into the individual formations, the quantity of which is infinite. In this regard, the divisibility of matter is really infinite. That is, the matter can be infinitely divided into the individual formations.

From the point of view of the dialectics of big and small the divisibility and indivisibility of matter is also perceived in a new fashion, when we mean that the big and small have a certain limit, that is, the matter cannot be divided into infinitely big and infinitesimally

small. A matter consists of infinite quantity of big and small, but these big and small has a certain limit over which they are transformed, turn into each other: big becomes small and small becomes big. On my deep belief, just this is (the tendency of big to small and v.v.) the mechanism of eternal circulation, the eternal existence of infinite hierarchical structure of matter, the physical theory of which is the Theory of Armons.

The matter as dialectic integrity has its opposite sides, which not only struggle among themselves and are opposite and differ from each other, but also are transformed into each other, making one unity. The finished or the unified physical theory, or the physical theory of matter should explain eventually why and how the matter exists, though the theory of the matter existence accepts from the very beginning as a postulate, as an axiom, but for the construction of theory, eventually, when the theory is already finished, one should give an explanation of the primary postulate entirely, to be its explanation.

* * *

Matter cannot exist otherwise as soon as through its opposites. As the dialectics alsideed, the struggle and unity of these opposites are the main essence of matter and cause its existence. Hence, the problem of the theory of matter is to define (to cognize) these opposites and to find out, to explain and to prove, as these opposites are transformed into each other, making the unity or existence of matter as the whole, the uniform.

The first that is evident, is the mutual conditionality of opposites of matter that one of opposite sides cannot exist without the nother; one is the precondition for existence of the nother, as well as its consequence; each of the opposites, changing and developing, can turn only to the opposite since outside of these two opposites of matter, simply there exists nothing. So, for cognizing and definitions of opposites of matter we have already a certain cognitive basis:

1) The opposites of matter are diametrically opposite to each other, they are opposed to each other by the fundamental, major and essential qualities, by positive and negative mass, attraction and repulsion and positive and negative curvature of space.

2) The opposite sides cannot exist separately, they are mutually causal and their unity provides both their separate existence from each other, and the existence of the whole of matter. In this meaning, the matter reminds an absolute symmetry (it was called in the past as the pre-established harmony), the parts of which are the symmetric negative and positive matter.

3) From circumstance of mutually causal of opposite sides the transition and transformation of one into the nother is following (the one side of opposite excludes the other; each of them by its existence and struggle, as if, tries to win the opposite and to take its place, to destroy it but as the same tendency has also the other side, hence, they do not destroy each other, but counterbalance: infinitely and uniformly transforming into each other). They are not isolated from each other absolutely, one implies in itself the other, one contains the other, and thus they not only differ from each other, but also have the defined similarities and the generalities, they are identical to each other, hence, they are endowed by the possibility of transformation to each other that is carried out to support the existence of the whole of matter and each opposite side.

4) The most important is that we, defining two opposite sides of matter, have not committed the traditional error (**Hegel, Engels**), considering the attributes of matter as opposite sides of the matter. We face this chaos also in modern researches (**Melyukhin** and others). Each opposite side of the matter is also the matter. So, the matter separates in two basic types. What these types are? In this occasion, there is the hint of **Engels** (inherited from **Kant** and **Hegel**): the most abstract opposite is the concepts "positive " and "the negative" (the words of Engels: “the usual polarity”). In such a way, we have the right to define that the opposite sides of matter are positive and negative matter. Unfortunately, **Engels** has not come to this idea; he has developed the idea arguing correctly, but he has considered the attraction and repulsion, their unity as the essence of matter. Instead of declaring positive and negative matter, the basic types of matter carrying in itself these attributes as manifestations of the essence of matter, he actually has overestimated the above mentioned attributes above the carriers, too. Though **Engels**

came closer to the correct idea best of all, but, perhaps, the level of development of Physics in the 19th century did not give him the chance to come to the valid inference. The same error was repeated also by Einstein and his followers: they considered the gravitation or space as the matter.

1.4 The positive and negative pra-matters, the substantiation of their physical existence

With respect to the physical existence of positive and negative matter the existence of positive matter is obvious and out of any doubt. The basic problem is in the substantiation and the proof of the physical existence of negative matter.

Till today the Physics mainly has been cognizing and investigating the variety of physical systems with positive mass originated from the formations of limiting elements (graviton) of positive pra-matter, starting from elementary particles to the space bodies, which are the carriers of free motion, and by that they are differing from the general forms of matter, from the pra-matter. So, the modern Physics has discovered and investigated not all of the forms of physical systems endowed by positive mass. One yet has not recognized and not discovered the limiting elements and limiting systems of positive pra-matter. The modern Physics has come closer only to the cognizing of limiting elements of positive pra-matter, the gravitons. The fact that the numerous attempts to register the gravitational waves do not give positive result evidences of the absence of free forms of gravitons as the limiting elements, they do not exist separately and as the bunches, in the form of wave. Gravitons cannot be separated from or radiated by elementary particles. But they exist and exist as the components of elementary particles, which is evidenced by the well-known physical phenomenon of annihilation to which follow all the forms of elementary particles and antiparticles. Annihilation is the possible and real process of their physical transformation and transition.

As to the limiting systems of positive pra-matter, the minimons and pseudominimons, the physicists, in general, even have no idea about

their existence, that is, a general form exists, the class of physical systems endowed with positive mass that physicists even do not suppose…

Let alone that the physical science has accepted and has cognized the existence of physical formations, having negative mass. Their cognition becomes complicated due to the general property of negative pra-matter, that is, due to repulsion, the formations endowed with negative mass, owing to this essential property are not grouped into bunches at all, hence, in the media surrounding the human being it is practically impossible to discover and cognize the formation of negative mass with the experimental methods. But it does not mean that negative pra-matter does not exist.

In general, the science and cognition pass along the lines from the phenomenon to essentiality, from image to the essence, from external to internal, from sensual to the rational. Certainly, those laws and regularities, which concern the image, phenomenon and phenomenon, are cognized without any difficulties, but the cognition of internal, deep, essential laws and regularities is very difficult. The positive pra-matter, its describes and the different forms of its manifestation, are relatively more accessible to our cognition than its antipode: negative pra-matter, whose role in the daily human life, in the surrounding of its environment and even in solar system is insignificant and invisible, but as the matter of fact, it is just that type of matter, without which the structures of positive matter could not exist and originate at all. The problem of the unity of opposites of positive and negative pra-matters and the existence of negative pra-matter is so deep, essential and difficult that to its cognition the science comes right at the end. If negative matter would not have the gnosiological roots and if its manifestations were on the surface of practical activities of the human being, it would be discovered long time ago and easily, and today there would be no need of finding-out the physical existence of negative pra-matter.

Thus, once again it is necessary to underline and divide clearly that six formations of positive and negative pra-matter are deprived of the “inert mass”, or, the possibilty of free motion. It is their essential feature. By that the pra-matter differs, in general, from the usual

physical systems surrounding us, which are endowed by positive mass and possibility to move freely, that is, their gravitational mass is identical or equivalent to the " inert mass", as it is used to say. As will be clarified further the ability to inertia of physical systems surrounding us, and their origin, in general, is connected with the origin of flat space.

Therefore, the physical systems endowed with the free motion differ strictly and divide from the pra-matter, to which they owe their origin and existence - in double meanings:

a) they are directly formed from the limiting elements of positive pra-matter, from **gravitons**.

b) they cannot originate and exist out of the flat space; presence of the flat space is a precondition for their existence, while the flat space is originated and formed from positive and negative pra-matter.

That is, if there is no matter endowed by negative mass and repulsion, the material variety surrounding us directly, from elementary particles to the human being cannot exist.

There are two natural ways to prove the physical existence of negative pra-matter, the theoretical and experimental ones. Certainly, the apparent and undeniable proof is experimental one. As the experimental proof of real existence of a negative matter, I consider the fact of existence of so-called "dark energy", discovered by astronomers in 1998. In the science, this concept has received various comments, it is called the "quintessence", a "phantom matter" and so on, and nobody of the scientists wants to consider this "dark energy" as matter with negative energy-mass which is endowed by the quality of universal repulsion.

However, to me the theoretical substantiation of physical existence of negative matter is the most important; one also promotes to find out the essence of "dark energy".

There is no laboratory or theoretical proof of objective existence of particles or systems with negative mass since they are not grouped in the form of usual elementary particles and macrosystems. They do not interact by quantum way with positive masses, and do not participate in strong, weak and electromagnetic interactions and are subject only to the so-called mass interactions. Hence, the existence of formations with

negative mass follows from my theory on the “mass interaction, or the unity of attraction and repulsion”, in the frameworks of which the interrelation of positive and negative pra-matter existence is validated. It results from this that the existence of various formations in our space with positive mass testifies by itself to the existence of matter with negative mass, that is, our theory proves the idea that without negative mass there cannot be the formation with positive mass, from elementary particles to the human being. We discussed in details, but again we will remind Hegel's idea that without the repulsion all the formations with positive mass would be compressed in one vanishing point and so the matter would disappear.

One of physical substantiations of negative matter is that if it would appear in the flat space, then it would break, as physicists have noticed, the main principle like causality, as well as the second law of thermodynamics. This fact, by itself, testifies in favor of existence of negative matter and not against it. In flat space, negative mass cannot really express itself in a free form since it, as the part of flat space, is its component, the carrying agent of flat space and cannot be grouped at all. If such masses would appear in flat space, then the cause-and-effect relations would be broken, but nobody says how this causality arise, nobody wishes to accept that this causality is impossible without negative mass and that one of the physical causes of causality is negative mass. The normal cause-and-effect relations existing in the flat space are the consequences of unity, compensations, "advancing" and "retarded" causalities caused by positive and negative masses.

The use of negative mass concept is just necessary in the physical science. It is impossible to solve the problems of matter and cosmology without it.

The solution of cosmological problem needs to accept the physical existence of negative mass. The fact that physical parameters defined by observation of our Universe coincide with the laws of an absolute black hole was noticed long time ago: $R_B=10^{28}$cm, $M_B=10^{56}$g, result in $M_E/R_E = G/c^2$.

But it does not mean that our Universe is a black hole; we exist in it, after all. Moreover, if our Universe were an absolute black hole, then it would undergo the collapse, but meanwhile the observation shows that our Universe is expanding[1].

Why? What forbids and prevents its gravitational collapse?.. Here it is necessary to recollect the words of **Wheeler**: *«The closed Universe, subject to geometrodynamics of Einstein and not possessing negative* density *of mass-energy, inevitably leads to singularity»*.

In one of his books **Hocking** notices that the Einstein's Λ-term (the cosmological term) means that negative curvature of space is the consequence of negative mass … And, wonderfully, he does not go to the following logical step and does not unite positive and negative curvatures. That is, on the left-hand side of the **Einstein's** well-known equations it is necessary to add negative curvature to positive one, and, on the right hand side it is necessary to add negative energy-mass to positive one. Thus, we will receive the physical explanation of the flat space that will be by-turn the physical substantiation of negative mass, that is, the existence of flat space is an argue in favor of the existence of negative mass. In a word, all the physical properties and consequences (we will talk about it separately) of flat space originate and exist thanks to negative mass-energy, that is, the existence of the first is an argument in favor of the existence of the latter.

So, as Wheeler prompts us, negative mass-energy in our Universe should exist necessarily to counterbalance positive mass, and by it to "rescue" our Universe from an absolute collapse, from singularity.

Worth noting that in Cosmology the attempts to create the model of the Universe with zero average density have resulted in the models: **Hoyle-Bondi-Gold** of "the stationary Universe" was the first, after that the idea became common that all mass of Friedman's "closed Universe" is equal to zero. To this occasion **Zel'dovich** wrote: "… in the case of

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[1] If our Universe was the black hole, then its mass should be evaporated long ago, however, its mass is increasing under the law $|M| = c^2 R/G$.

the closed Universe in GTR the gravitational defect "eats" completely the mass of matter and the full mass is equal to zero identically. Under these circumstances, the quantity of matter in the Universe can vary arbitrarily…". What is the gravitational defect of mass, or, in general, the mass defect? It is the mass-energy removed outside and taken from the physical system. It is not the part of physical system. By its nature, the gravitational energy is not negative energy, it is simply the energy spent for linking two bodies by attraction, which is positive energy, but radiated and taken away from the system. That is why the gravitational energy of the "closed Universe" cannot neutralize positive mass since it is not entered into the composition of this system. Most likely, **Zel'dovich** kept this in his mind when he wrote: "The concept of mass of the closed world is mystical to some extent because there is no external space in relation to this world, there is no external observer who could define the gravitational field created outside by the closed world"[1]. The concept of the "closed Universe" has appeared in the frameworks of the GTR and follows from the cosmological equations of Einstein, which have not unequivocal solutions. The model of "closed Universe" is only one variant, which has the singularity too and in the end means that this model nonetheless is an absolute black holes: if it would have the zero mass then its space should be flat but it has positive curvature. It is impossible also to accept **Markov's** point of view that positive curvature of space during the expansion of the Universe smoothes out. But problem is that in the beginning of expansion positive curvature of space is too large under conditions of which hardly there would be the freely moving physical systems, and after that the Universe, too, by its own forces could not step out; only by forces of gravitation it is impossible to overcome this curvature and to expand. That is why negative mass-energy is necessary.

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[1] **J.B. Zel'dovich,** "**THE THEORY OF THE EXPANDING UNIVERSE CREATED BY A.A. FRIEDMAN**". **Physics Uspekhy** 1963, July, p. 381(in Russian).

And secondly, Zel'dovich notes one more variant, continuously adding the mass into the physical system (surely, under certain specific conditions) after a while, the gravitational defect starts to grow faster than positive mass of system and as a result of this, the general mass of system, possibly, equals to zero. In this case, the "evaporation" of black holes, invented by **Hocking**, does not take into consideration that the more the mass of black holes increases, the more the volume of "evaporation" of black holes decreases, thus the less the mass-energy is radiated. Here is the law, $M_{BH} = m_{pl} / m_k$. This means that the more the mass of the "closed Universe" increases, the more the gravitational defect of its mass decreases.

Most probably, this defect of mass should be radiated, but with the mass increase the radiation decreases, reaching small and negligible value.

Thus, this manipulation, mismatches, too … However, the cosmological model with the zero average density is really necessary. It is necessary, both for the liberation from the absolute collapse, from singularity and for the physical explanation of flat space and its properties. Perhaps, **A. Friedman** guessed this when affirmed:"…only **Einstein's** cosmological equations, without additional assumptions, are not sufficient to conclude the finiteness of our world". Friedman showed that the model yet does not mean the "closed world" that our Universe is finite: "The data which we have, are absolutely insufficient for any numerical calculations and for solution of the problem on what world is our Universe; perhaps, the problem of causality and the problem of centrifugal force will throw light on the problems considered here" [1]:

1.5 Addition. Why the modern Physics does not accept and denies the existence of negative mass?

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[1] **A.A. Friedman** «**On the Curvature of Space**», **Physics Uspekhy** 1963, July, p. 446.

Till today, in the Physics and Cosmology everything has been done to negate and deny the objective physical existence of negative mass. This point of view became the real postulate and the absolute true.

However, as often is the case in the long-term development of Science what is considered as the absolute true, turns to be the relative one. The opinion, point of view and idea of the negation, which reaches its culmination (the peak), suddenly obtains serious substantiation and corroboration.

In the Physics and Cosmology the recognition, corroboration and substantiation of negative gravitational mass is one of the peculiarities of epoch-making revolution.

There are two forms of local physical systems in the Nature: 1) non-free and 2) free, or lacking and endowed with inert mass. The inert mass of the latter is equivalent to the gravitational mass (positive gravitational charge), and for the first one is not present.

This distinction allows one to explain why the gravitational mass (charge) can be positive and negative, and the inert mass cannot be negative.

If the physical system were endowed by negative inert mass then it could not **resist** external (some kind of) mechanical influence… Such system would not have the properties of inertia, since the "structures "of such physical systems with negative inert mass are permeable. Any force and influence would pass it without any resistance, since the components of this "structure" repulse each other and do not cause stable structural links, invariable, definitely stable and stationary structural elements, which would provide the non-penetrability of such system …"hardness", **resistance.**

The inert mass of physical system is formed of masses of the components of this system. If the inert mass of system is positive, therefore, the masses of components of the system are positive; if the inert mass of physical system is negative, the elements of this system are endowed by negative mass. But, it means that between the elements of this system the repulsion predominates, there are no stable links between these elements, hence, the **physical system cannot have**

negative inert mass , that is, the formations with negative inert mass are not physical systems …

Hence, the particle or the system with negative inert mass cannot exist physically; since they are deprived the physical resistibility, whereas the inert mass (with positive sign) is the measure of resistibility of system.

In such a way, the modern Physics has all bases when denies and does not accept the existence of physical systems with negative mass. It is necessary only to specify: the free physical systems (the inert mass of which is equivalent to gravitational mass) with negative inert mass do not exist and are unacceptable physically. But we have already found out that except the free physical systems there are also **non-free** physical ones, all the formations of pra-matter which are deprived of the inert mass or their inert mass is equal to zero, but the gravitational mass is not equal to zero, $|m_g| \neq 0$ or $m_g > 0$ and $m_g < 0$. It is exactly how the non-free physical systems differ from the free physical ones by their gravitational mass, which is not equivalent or not proportional to the inert mass, one **differs from the inert mass**. Or, speaking more roughly, the non-free physical systems have only gravitational charge (mass). It is the main distinctive feature of all pra-matter formations or non-free physical systems. The physical essence, the nature of non-free physical systems is characterized by this. If the free physical systems, being in the flat space-time can obtain and have various forms of physical interactions: along with positive gravitation, also strong, weak, electromagnetic, etc., the non-free physical systems are endowed only by the mass or gravitational interaction, that is, they enter into interaction by their physical essence, by means of mass, or, that is almost the same, by their gravitational charge. This kind of interaction would be unilateral and more scant, and would not promote to the matter existence if the interaction originatered only between positive masses or by means of positive gravitational charges. As we already mentioned, it would lead to an absolute collapse and, eventually, to the matter disphenomenon.

That is why the physical science needs to accept not only the existence of negative mass, but **the existence of one more type of non-free physical systems**, which possess negative gravitational charge, negative gravitational mass. Naturally, one should not forget that these systems, having negative gravitational charge do not have the inert masses, too …

1.6 Physical generalities and description of positive and negative pra-matters

Any of them possesses all the basic attributes of matter, that is, both positive pra-matter and negative one are endowed by the space-time, structure, energy-mass and so on, but there is essential difference between them, for example:

1. if positive pra-matter is endowed by positive energy-mass, hence, by the universal attraction, negative pra-matter is endowed by negative energy-mass, hence, by the universal repulsion.

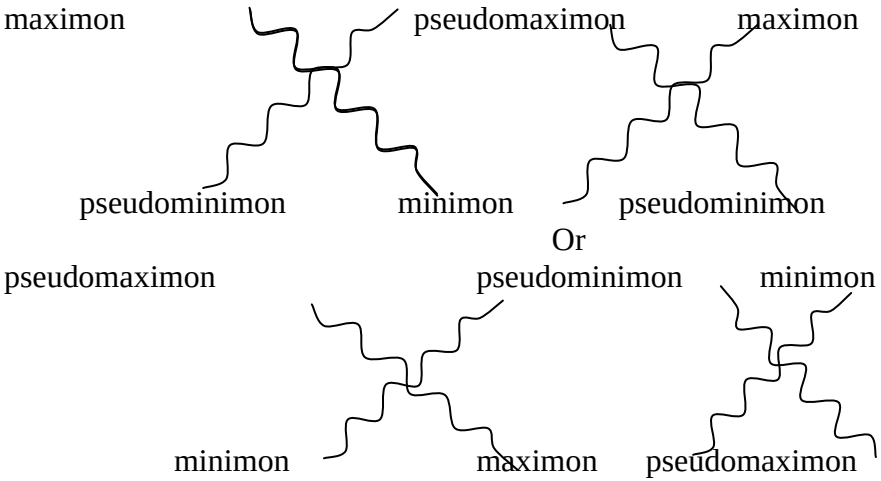
2. if positive pra-matter can be grouped, has different visualizations and from it all the variety originates, negative pra-matter, on the contrary, cannot be grouped, has no different structural visualizations, it is, actually, homogeneous.

3. Different structural visualizations of positive pra-matter except the universal form of interaction - gravitation, have also other dependent specific forms of interaction, and the components of negative pra-matter are endowed only by one universal type of interaction: by repulsion.

4. Separate formations of positive and negative pra-matter for sure interact with each other by repulsion and attraction. That is, the compound quanta of negative matter do not absorb or radiate, as the elementary particles of positive matter.

Here, it is necessary to concretize our thoughts. The formations of positive and negative pra-matter interact with each other by their physical essence, by two forms of mass interactions, by attraction or repulsion. There are no other specific forms of physical interactions, for them. This is the cause that annihilation does not take place during physical interactions . Moreover, there is no such physical phenomenon in their interactions as the defect of mass between them.

We already know that the six types of formations of positive and negative pra-matter are endowed by one single mass $|m| = 10^{-67}g$. We know that the gravitons and anti-gravitons are not transformed into each other, and they are not in direct interaction. Hence, we can speak only about the interactions and transitions of Armons and Pseudoarmons:



Just during these interactions and transitions, when the unity of maximon and pseudominimons, or minimona and pseudomaximon is taking place, during these transitions the changes of internal plan - the internal (quantitative) balance is broken that results in qualitative changes of an internal structure and in the change of "sign" in an external plan, and as a consequence of this unity, the Armons and Pseudoarmons of opposite sign arise …

Though this unity and separation are similar to the process of absorption and radiation of elementary particles, but essentially differ from them … Various formations of our environment, from elementary particles to astrophysical bodies, are endowed by positive mass (energy) and by their unity positive mass of linked system increases and, simultaneously, the energy of linking spent for the unity remains out of linked system, representing the defect of mass.

It concerns not only the quantum unities, but also the usual gravitational ones.

Such physical phenomenon (the defect of mass) has no place in the physical interactions of Armons and Pseudoarmons, at their unity. During these unities again the Armons and Pseudoarmons originate or are divided, masses of which are equal to each other by absolute value, that is, the mass does not increase, there is no defect of mass. During combination or separation, no physical systems with different complexity or with different structural level originate.

One of the main physical describes of these six formations of pra-matter is that though they consist of formations of the "previous" organizational level, Armons from Pseudoarmons, and Pseudoarmons from limiting elements, but at the "personal" existence do not arise from them, do not decay, and are not transformed into them. On the contrary, a) gravitons "originate" from gravitons and decay, turn into gravitons, as well as the anti-gravitons.

b) Pseudoarmons originate from Pseudoarmons and turn into Pseudoarmons.

c) Armons originate from Armons and turn into Armons.

By this important feature, the pra-matter differs first from the processes of an origination and destruction of simple physical systems, which originate under conditions of the flat space, and then, the hierarchical structural infinity of matter is described by these.

In an external plan, the maximon, pseudomaximon and anti-graviton are completely similar to each other by their phenomenon; they are endowed by the same negative mass and the same repulsion force. Likewise, the minimons, pseudominimons and gravitons are absolutely similar to each other by their phenomenon and are endowed by the same force of attraction. Nevertheless, we have seen above that from the point of view of internal structures, the six formations have certain gradation: the gravitons and anti-gravitons form Pseudoarmons, which are the part of Armons. And Armons consist not only of Pseudoarmons, but also of Armons. And above all, the Armons and Pseudoarmons have a certain structural generality: their structure is quantitative balance of positive

and negative components, positive and negative masses, and attraction and repulsion forces.

It is necessary to emphasize again that these six types of pra-matter formations always exist: there was no time when one of these forms did not exist, and has then originated. If I assert that there is a structural dependence and gradation between the limiting elements, between Pseudoarmons and Armons, it does not mean that the dependence exists during time (in arrow of time), or moreover, it does not mean the temporal genealogical dependence… The matter is given, one exists eternally in the six types of its formations and through them.

It means that we cannot observe in a certain time how Pseudoarmons are formed and originated from gravitons and anti-gravitonos, or how Armons are formed and originated from Pseudoarmons during a certain time. These six types of pra-matter formations exist eternally and absolutely simultaneously.

But how, in this case, the change of these formations, their transition takes place? These six forms of individual formations of infinite quantity, any of which has its “longevity of life” and definite borders of its separated and unitary existence, its beginning and its end in which frameworks it originates and disappears. That is, on the other hand, we should accept that every graviton or anti-graviton, Armon or Pseudoarmon, as an individual formation, should have definite borders of its existence, the beginning and the end, one should originate and be destroyed. How it can be real, when even any individual formation exists eternally in the eternity of the Universe… Simply, any separate and individual formation, being destroyed in a local site, arises in the other local site of infinity, where the corresponding conditions for its origination are met. Moreover, in our opinion, in the different local sites of infinity the variants of "past" and "future" of this individual formation can and should be. Otherwise, what kind of infinity it is if it does not include in itself all the variety.

* * *

One of the main describes of pra-matter is that it is endowed by the internal and external plan. In general, all the local physical systems are endowed by the internal and external plan, that is, the physical

system interact with the medium as the whole, but expresses itself as a component and in the external plan, in an internal structure the physical system is definitely differentiated, one has its components. So, investigating any local physical system we should take into account the existence of both the internal and external plan.

As to formations of pra-matter, they differ from the usual physical systems possessing the free motion by being endowed with certain balance in the internal plan, and in the external plan this internal balance is broken. Speaking in terms of Physics, the total symmetry predominates in internal plan and in the external plan this symmetry is broken. Unlike the usual local physical systems, the internal symmetry of formations of pra-matter is defined by the balance of positive and negative mass, and in the external plan - by breaking of this balance. Each of the six types of pra-matter formations should be always asymmetric in the external plan - or should be endowed by attraction or repulsion. This structural condition forbids, does not allow that some forms of pra-matter formations become in an external plan neutral or in the counterbalanced state, as a consequence of combination or separations; and in the internal plan, as noted earlier, the balance is not only possible, but also is real. For example: the absence of internal structure for each of gravitons and anti-gravitons needs also to be considered as an phenomenon of balance of their internal plan or one type of this balance, which never breaks. Unlike the limiting elements, the internal balance of Armons and Pseudoarmons can be both broken and restored. Thanks to it, the interaction of Armons and Pseudoarmons, their combination and separation becomes possible.

* * *

a) the graviton and the anti-graviton are not transformed into each other, do not interact and do not meet each other directly.

b) Pseudoarmons are composed of big portions of gravitons and anti-gravitonов … Pseudoarmons are the limiting systems with compound structure, inside is the balance of components and outside, they have either one graviton, or one anti-graviton as the mass charge ($\sqrt{G}\cdot \mathrm{m}$ is the gravitational charge). That is why the Pseudoarmons

cannot unite, as their mass charges repulse each other; Pseudoarmon is capable to repulsion due to its gravitational charge, due to anti-graviton. And the Pseudoarmons can unite owing to positive mass charge, to the graviton. This explains that pseudomaximon consists from pseudominimons: pseudomaximon not only consists from pseudominimonов, but also decays into pseudominimons…

Besides, pseudominimons and pseudomaximons cannot interact with each other, do not unite, as their gravitational charges, gravitons and anti-gravitons, are incompatible…

b) Armons consist of the counterbalanced condition of Armons and Pseudoarmons and the role of positive and negative gravitational charges of Armons is played by the Pseudoarmons. minimon consists of the balance of maximons and pseudominimons, and the role of negative gravitational charge is played by yet another pseudomaximon.

Armons cannot have gravitons or anti-gravitons as the gravitational charge, since Armons do no consist of them, but of Pseudoarmons and Armons.

Hence, to turn the maximon into the minimon (or v.v.) one should also change its gravitational charge, the Pseudoarmon, and the type of internal balance, the balance of minimons and pseudomaximons.

At the first glance, it seems that absorbing and uniting with the pseudominimon, the maximon should change its charge, some balance of pseudomaximon and pseudominimona. However, that is not the case, since, as we already know, the pseudomaximons and pseudominimons are **incompatible**, do not unite, as their charges, the graviton and anti-graviton, are incompatible…

Just because of it, absorbing the pseudominimon the maximon immediately **emits pseudomaximon as a charge** … and since the change, the restructuring are also taking place inside, the minimon turns into the maximon, emitting pseudominimons; then one superfluous pseudominimon becomes positive mass charge of the new born **minimon**…

As we see, the Pseudoarmons for Armons are not only the components, providing balance of structure of Armons (in an internal plan), but ones also play the role of positive and negative gravitational

charges. In general, Pseudoarmons are some kind of vagrant bodies, but not free vagrants. Pseudoarmons exist to carry out actually the eternal circulation of matter, when Armons absorb and emit them; Pseudoarmons pass from one Armon to another and cannot exist beyond Armons, just as the Armons, which are composed of Armons and are in the structure of Armons. That is Armons form the infinite hierarchical chain of Armons, beyond which their existence is impossible.

Armons and Pseudoarmons can unite and be combined, causing the internal counterbalanced structure of Armons, since in the external plan positive or negative gravitational charge promotes this. The internal balance is impossible without the disbalance, the single-sided external plan and an external charge. This is the unique symmetry, the unity of opposites, of balance and disbalance, of internal and external plan, the unity of internal and external symmetry.

This is the crucial issue. Why the physical system, having the internal counterbalanced structure, should have either repulsion or attraction in the external plan? For example, we assert that the minimon consists of equal quantity of maximons and pseudominimons due to which the minimon obtains the internal balance. In this case the question arises - why the minimon, endowed with such internal balance should possess attraction, instead of repulsion, in the external plan? The answer is hidden within the hierarchical structure of Armons. This structure demands for maximon to be formed of minimons, and minimon of maximons. Why? This supports the transformation of minimon into maximon, and v.v.

1.7 The general forms of physical interaction.

The general form of physical interaction is the mass interaction. All the material formations from infinity, continuousness of matter are divided, interrupted, separated by the mass (energy) and the masses following from locality corresponding to these space-time borders. As matter consists of positive and negative pra-matter, the main disjunctive property of which is the separation of mass to positive and negative, and it appears from this recognition of two general types of mass interaction, the existence of attraction and repulsion. Thus, we have separated out

two general and basic types of physical interaction: the formations endowed by positive mass attract each other, and those endowed by negative mass repulse.

This is not all there is to the content of mass interactions. After all, the interactions between formations endowed by positive and negative masses are not ruled out. The first who studied these interactions was Prof. **Terletsky**. It is his pioneer investigation, which certainly is not based on the ideas of limiting elements and systems of positive and negative pra-matter. His representations about negative mass were based on the analogies with the usual elementary particles and their systems. For example: according to **Terletsky**, the antielectron (positron) endowed with negative mass, which has been discovered theoretically by **P. Dirac** is the example of particles with negative mass. With such logic, it turns out that all antiparticles are endowed by negative mass and, therefore, interacting with particles corresponding to them, can be annihilated and are subject to annihilation. Meanwhile, **Terletsky** considers that the physical systems composed of equal quantities of particles having positive and negative mass are possible. Such physical system can be our Universe, too. But inexplicable remains how these equal quantities of particles having positive and negative mass, can jointly exist and not undergo annihilation? This is just that crucial issue, the solution of which **Terletsky** could not find, not having the representation about formations of pra-matter, not distinguishing these formations from the usual physical systems endowed with inertia.

Though, Prof. **Terletsky** has come closer to the concept of positive and negative mass; he considered the possible existence of only gravitational interaction between "plus - particles" and "minus - particles", that is, these particles are deprived of electromagnetic and other quantum properties: *"Quasibalance of systems consisting of plus - and minus - particles ... can be provided if to admit that the minus - particles interact with plus - particles only gravitationally and that*

other forms of interaction (strong, weak and electromagnetic) between them are absent completely ...".[1]

In his opinion, positive masses in such case can be considered as isolated from the minus - particles and be in the thermodynamic equilibrium. So, **Terletsky** came close to the concept of general mass interaction of positive and negative pra-matter formations that has led him to his representation of model of the Universe with zero average density . We consider necessary to cite comprehensively his book: *"Really, the gravitational forces pull together plus-particle. But minus-particles as a result of gravitational interaction will repulse each other. Thus, in the space filled with the plus-particles, clots of matter should be formed and it will be distributed with a relatively non-uniform* density *, as is the case in real Universe filled by positive masses. If the space is filled by minus-particles, repulsive forces will lead to the distribution with uniform* density .

Assuming the existence of minuses-particles, it is possible to consider the model of Universe having on average the zero self-mass. In the real Universe the average density of the mass of plus-particles is extremely small, approximately equal to $10\text{-}30 g/cm^3$, i.e., approximately one proton per cubic meter. The intergalactic space is filled with a little bit smaller density ; the greater values, reaching $10^5 g/cm^3$ even $10^9 g/cm^3$ the matter density has only inside the stars, which occupy relatively negligible space volume. If suppose that there are minus-particles besides the plus-particles and that their average density approximately coincides with the average density of plus-particles, than, taking into account the mutual repulsion of minus-particles, we should suppose also that the real density of minus-particles in any point of the Universe has almost the same order. However, this density is very small, and it can explain the way we do not find out the minus-particle under terrestrial conditions and do not observe their influences in the

[1] **Ya. Terletsky**, "**Paradoxes** in the **theory of relativity**., 1968,Plenum Press edition, NY, p. 101

media consisting of plus-particles. However, in the Galaxy scales the presence of the background of minus-particles can lead to noticeable effects. So, for example, at the distance of order $R = \left(3M/4\pi\rho\right)^{\frac{1}{3}}$ the distribution of minus-particles with approximately constant density ρ should almost completely compensate the gravitational field of the separate Galaxy with mass M since the mass of minus-particles enclosed in the sphere of radius R is equal by its absolute value to the mass of the Galaxy, which is in the center of this sphere.

This gravitational shielding can be taken into account in more details if consider that minus-particles that are in the equilibrium at negative temperature $T<0$ and that they are obeying to the **Boltzmann** distribution in the field of the big plus-mass, describing by the formula

$$n^- = n_0{}^- \cdot e^{-m\cdot\frac{\varphi}{kT}},$$

where n^- is the concentration of minus-particles, $n_0{}^-$ is the average concentration of minus-particles in the Metagalaxy, m^- is the mass of minus-particles, φ is the potential of gravitational field described in the Newtonian approximation by the equation

$$\nabla^2\varphi = 4\cdot\pi\cdot(m^+\cdot n^+ + m^-\cdot n^-).$$

Obviously, for the Universe with the zero average mass,

$$m^+\cdot n_0{}^+ + m^-\cdot n_0{}^- = 0.$$

It is useful to note also that in the relativistic Cosmology the model of the Universe with the zero average density of mass is of particular interest"[1].

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[1] I was surprised always, why one "heretic", Prof. **Stanyukovich**, has not given due attention to the zero model of another "heretic" Prof. **Terletsky**? And it is in the case, when **Terletsky's** book "**THE PARADOXES OF THE THEORY OF RELATIVITY**" actually was edited by **Stanyukovich**. In general, **Stanyukovich** was the supporter of the evolutionary theory and if it would be accepted, the **Terletsky's** concept

Thus, according to **Terletsky**, the plus-particles attract each other and the minus-particles repulse each other, and in the case of equal quantity and mass the plus- and minus-particles balance each other. This balanced state as **Terletsky** writes *"is the gravitational shielding"*; "*the full neutralization"* of attraction and repulsion is just the balanced type of mass interactions.

He discussed unbalanced forms of these interactions heretofore. To get acquainted with them it is recommended to read necessarily **Terletsky's** book , and especially to attend §25 where the general properties of systems of particles with positive, negative and imaginary masses are discusses. **Terletsky** notes that *"it is enough to admit the existence of at least two particles of the second class with negative self-mass and then ... we will bind to consider all three classes of self-masses as existing. Hence, introducing negative masses, we are introducing thereby also the imaginary self-masses."*

Previously, he gave eight Theorems on self-mass, and the Seventh Theorem asserts that: *"The collection of two particles with positive and negative masses (*m_+ *and* m_-*) can form a system with the total mass or* $M>0$ *or* $M^2<0$ *(i.e., of the first and third classes), if* $m_+ + m_- > 0$*; with the total mass* $M<0$ *or* $M^2<0$ *(i.e., of the second and third classes), if* $m_+ + m_- < 0$*, and with the total mass* $M=0$ *or* $M^2<0$*, if* $m_+ + m_- = 0$ *".*

Terletsky considers these positive and negative particles and their systems in flat space, or in the **Minkowski** space-time. Due to it, naturally, both the principle of causality and the principle of impossibility of superluminal motion are broken. **Terletsky** tried to

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of the zero model, which actually means the static and equilibrium state of the Universe and would studied this equilibrium state in cosmological evolutions then, in any way, it would remain unclear, where from and how the positive and negative masses, plus- and minus-particles originate.

prove by all means that in the flat space there can be particles of the system with negative mass and in the state of free motion. Meanwhile, his efforts to prove the existence of systems or particles with negative mass in the frameworks of STR were a waste of time. This is impossible essentially and on principle. As he notices, it is possible only in that case when you decline the fundamental principle of Physics – the causality. In such an expensive way, **Terletsky** wished to validate the hypothesis of existence of negative masses, including the causality principle, as secondary, considering it as not the absolute law of Physics, and as consequence, of the second law of thermodynamics. This is really inadmissible from the point of view of Physics.

But, I am repeating that the attempts of **Dirac, Bondi and Terletsky** have played a very important role in the evolution of Physics and in the development of the basic concepts of Physics. **Terletsky's** attempt has revealed the principal failings of the Special Theory of Relativity and of the Gravitational Theory based on it; both of them do not have physical explanation of flat space, do not show the physical cause of origination and physical properties and consequences of this space.

That is, provided that the physical theory cannot explain and prove the physical essence, the physical cause of existence of flat space, the causality, the inertia, the constant c and the physical cause of their existence, than such theory is insufficient, imperfect. all the physical theories existing till now, including the theory of strings suffer such fundamental shortcomings,. **Terletsky** underlines: *"the causality principle ... does not follow from the relativistic kinematics and dynamics"*.

This fundamental problem of the Special and General Theory of Relativity was also understood by **Einstein**. He said that in his theory the flat space was taken **off-the-shelf**, without revealing its physical essence. Meanwhile, the causality needs to be considered as the physical properties of flat space - separately taken formations of positive and negative pra-matter are the carriers of attraction and repulsion, of positive and negative curvature of space, *"retarded and advanced causality"*. Their unity results in the flat space with the properties of

inertia and normal causality. Only in this case it becomes clear, why the free moving particles and systems with negative masses are forbidden in the flat space.

The flat space has complex structure (to our opinion, it is composed of and formed by positive and negative masses), but for freely moving bodies it is free and "empty space". However, the homogeneous and isotropic medium is impossible to represent as the flat space, as one type of matter and field, like the continuous gravitational field. The balance of formations with positive and negative pra-matter defines uniformity and isotropy of flat space. That is why the pra-matter formations cannot freely move in the flat space, as they are the components of this space by themselves. Einstein had almost the same ideas about the world ether: *«According to GTR the space is impossible without ether; really, in such a space not only the light propagation would be impossible, but there could not be scales and clocks, and there would be no space-time distances in the physical meaning of word. However, it is inconceivable that this ether is composed of parts traced in time; such property owns only the ponderous matter; in the same way it is impossible to apply the concept of motion to it»* [1].

Einstein cannot be get out of the concept of ether, as the flat space also should have the carrier - matter, in which light would propagate. Nevertheless, as the ingenious physicist has noted correctly, it is impossible to present the carrier, the matter of this flat space made of such components or parts, which would possess the free motion. Certainly, formations of positive and negative pra-matter, making flat space, really, cannot be allotted by the free motion. **Einstein** adds: «*such property the ponderous matter possesses only*». And, since **Einstein** considered the gravitational and inertial masses as equivalent, it has made the next error, identifying space with the gravitational ether: *" ...there are two realities absolutely different in a content though also causally related to, namely the gravitational ether and the*

[1] **A. Einstein**, **COLLECTED WORKS**. V2. p. 524(in Russian)

electromagnetic field: it is possible to call them as space and matter ". For this purpose, he also tried to integrate these two realities. And, to his opinion, this integrated, or the unified theory, has reached the idea, that *"the contrast between an ether and matter would smooth out, and all physics would become the closed theory … "*. Thus, the inconsistent essence of flat space become clear; on the one hand, it cannot be presented as one of the forms of matter, parts or particles of which possess the free motion. On the other hand, in an obligatory form, this form of space should have the material carrier, and it should not induce acceleration to freely moving to freely moving particles. It does not mean that the flat space does not influence the freely moving particles; simply, these forces are opposite to each other and cancelled. Moreover, it means that the carrier - matter of flat space consists of two diametrically opposite and different forms, which separate formations do not appear in the free form. As Einstein said – if they do not move in time, they are not observed.

Therefore, the relativity theory describes the free motion of physical particles with inertial mass under condition of flat space. Within the limits of this theory, not only the particles with negative[1] mass but also the general existence or free motion of these particles, which do not have an inertial mass, are really forbidden. STR, as the theory of flat space, does not recognize and not accept the free motion of physical systems with positive mass (gravitational mass), which inertial mass is equal to zero or is not equivalent to gravitational mass in flat space, or in its background. Generalizing, it is possible to say that the modern physics **does not suppose at all the existence of such physical systems, which gravitational mass is not equivalent to inertial mass.** The physics has not given the physical explanation to this surprising fact …

The necessity of generalization due to sidedness and insufficiency of GTR is seen from here.

[1] **A. Einstein**, **COLLECTED WORKS**. V1. p. 688 (in Russian)

Existence of flat space and its physical properties, as inertia and relation to cause and effect, set a problem to physical science to study and to suppose not only the existence of separate formations with negative masses, but also the existence of six types of pra-matter formations, in general.

That is, except physical systems, which possess usual inertia and the free motion (from elementary particles to galaxies and their clasters), it is necessary to suppose and study the existence of formations of pra-matter not having the inertia and not possessing the free motion. Their inertial mass is always equal to zero and the gravitational charge (gravitational mass) is not equal to inertial mass - or it is positive or negative:

$$m_i = 0 = \text{const.},\ m_i \neq m_g;\ m_g > 0; m_{\bar{g}} < 0$$

Considering the absolute value of these masses, one can see that the gravitational mass of formations of pra-matter slightly differs from the zeroth inertial mass $\left(|m| = 10^{-67}\,e\right)$. In this meaning, they are apparently equivalent; but just this insignificant difference also plays the role of positive and negative gravitational charge, that is, transmits essential physical properties to pra-matter formations.

The zeroth inertial mass of pra-matter formations always remains invariable, it does not decrease or decrease, and only the sign, not an absolute value of its gravitational charge, changes during interactions,.

The local physical system possesses inertia if and only if it is in a flat space (instead of the composition of the flat space component) and **has the inertial mass $m_i > 0$.**

Physical systems have an inertial mass or do not have it in general. It means that the inertial mass cannot be negative, as negative masses play the role of negative gravitational charges for pra-matter formations and they are not grouped. Only the gravitons with positive gravitational mass since they do not have the inside structure can be grouped. The local physical systems, arising due to the group of

gravitons, obtain positive inertial mass, which is simultaneously equivalent to positive gravitational mass.

That is why the bodies or systems with negative inertial mass, possessing the free motion, cannot exist in flat space; it is forbidden also by the general Principle of causality, and the second law of Thermodynamics. Terletsky tried to overcome this circumstance artificially. Certainly, it does not mean, that formations with negative mass do not exist in general. Moreover, the matter would not exist at all without them. They simply do not exist in the free form, in flat space; but they are present without fail in structure and as the part of flat space. They are carriers of space with negative curvature which, being integrated with carriers of space with positive curvature, form the flat space. To skip ahead, we note that the flat space dominates not only in Pseudoarmons but also in Armons; meanwhile, the space with positive curvature predominates in the inertial mass.

Let now return to general forms of mass interactions. Except repulsion and attraction the third general form of mass interaction is possible and quite real - the unity of repulsion and attraction, which represents the quantitative equilibrium of formations with negative and positive masses. This general form of physical interaction dominates in the inside plan of Armons and Pseudoarmons, in their structure.

2. Einstein's great dream, a single and true way of its realization.

2.1 What dreamt Einstein?

If to state short, **Einstein** dreamt to create one unified physical theory, or the general physical theory. But what problems this theory should solve, according to Einstein? In addition, what it should be?

About **Einstein's** dream, it was already much spoken and written. **Einstein's** complete representation about the uniform physical theory was not subject to the scientific analysis and study until now. This is my deep belief; otherwise, having studied **Einstein's** investigations and his thirty last years of life attempts, one could draw the correct scientific deductions, and we already would have the unified physical theory of which he dreamt for a long time.

To the future theory, **Einstein** showed two types of requirements, of physical and methodological character.

On the one hand, **Einstein** perfectly understood the boundedness of the gravitational theory and on the other, the historical regularities and "the correspondence principle" of developments of physical theories. Proceeding from it, he dreamt to create **the new theory** which, according to Einstein, should be based, in all cases, on GTR, to become its generalization and **logic extension** and **development**; one simultaneously should incorporate the other forms of physical interactions of matter distinct from the gravitation.

During his life, **Einstein** has made two attempts of GTR generalization. Certainly, he has spent the most part of his time for development of the unified theory of gravitation and electromagnetism. These efforts of decades have terminated in failure, having caused a pain to the great thinker.

But, as we have already noted, **Einstein** has made the attempt of generalization of gravitational theory in 1917. It was the first and most significant attempt to extend GTR, which also was finished in failure for **Einstein** though the ways and directions have been chosen correctly for this generalization.

From these two unsuccessful attempts of **Einstein's**, the first one, nevertheless, is singled out by its effectiveness. The best illustration of it is in the history of development of cosmology, history of cosmological constant and, especially, the discovery of cosmological anti-gravitation, by means of astronomical observations.

There is only one (and single) way of generalization for the gravitational theory **of Einstein,** and this way demands for integration of universal attraction and universal repulsion. The gravitation is possible and necessary to integrate with its direct physical antipode, with the repulsion.

For what purpose this integration of attraction and repulsion is necessary? Unfortunately, in the theory, neither **Einstein**, nor other physicists could correctly represent the **Einstein's** ingenious thought that the attraction is counterbalanced by repulsion, and could not consider the repulsion as the part of physical reality.

Generally, the **Einstein's** first attempt to extend gravitation until now has not been appreciated, and ones have not made the correct deductions from this attempt. Otherwise, physicists would develop the theory, which would explain the physical cause of origination of flat space-time. To our deep belief, such theory is just the unified theory of gravitation and repulsion. That is why, first, it is necessary to integrate gravitation with the repulsion, as with the universal form of real physical interaction and only this integration can be unified further on with the quantum interactions, and even then, with the unified quantum interaction.

again we return to the **Einstein's** dream. He pointed out two forms of requirements of the physical and methodological nature to the future general physical theory.

According to **Einstein**, the future theory should:

1. To reflect and describe completely and adequately the objective reality, the matter, that is, it should be the physical theory of the Matter,
2. It should describe the Mega - and microstructure of matter, that is, the generalized physical theory should include in itself the description both cosmological and astrophysical objects, and quantum interactions and the theory of fundamental particles, too.
3. The future theory should explain, why the masses with positive sign, exist and why there is no masses with negative one.
4. The future theory should exclude the physical singularity,
5. This theory should have some boundary conditions.

Einstein has made the following methodological demands to the future theory:

- the theory should be logically simple,
- it should be described by the set of field equations,
- such field theory will enable us to understand the atomic and quantum structure of the reality,
- the reality cannot be represented in the form of the continuous field …

2.2 Problem of the gravitational theory generalization. What for, how and with what to generalize?

If **Einstein** would be satisfied with the gravitational theory (GTR) created by him, he would not raise the questions and problems, which have been presented in the previous paragraph. He, as the philosopher-physicist, has been interested in such final physical theory, which could describe the reality as much as possible, all the world as the whole. At the same time, his gravitational theory was marked out by the boundedness from the very beginning. **Einstein's** desire to advance, extend and improve the theory, GTR, also has been related to this fact. Physics, as the science, has been formed and developed by generalization, with the motion from particular to general (abstract) and from general to the universal one. During this process the general (universal) laws of physics have been arisen.

So, developing the representations about the gravitation, having finished them to the generality culmination, it becomes suddenly clear that the gravitation, being the universal property of the mutter, nevertheless, is restricted (the matter description is not exhausted by the gravitation). There is obvious that the gravitation it only one side of a medal (and that is the visible and obvious side). It is only one side of more general idea (symmetry) that is available, it is also distinct from the gravitation and even the side **opposite** to it, some other universal property of matter, difference and the inconsistency with which should overcome the new and essential (conceptual) generalization of the theory of gravitation.

That is, this should be a new, more general theory which is beyond the frames of gravitation, and describes not only the gravitation, but also another and opposite to it the universal property of the matter.

Here, as we see, there is the serious theoretical problem - with what to extend and integrate the gravitation?

We start from afar. What does the generalization mean? This is the scientific and in say ectual operation. I would say, this is the creativity, when two different objects, subjects or concepts are compared, and the essential general properties of this comparison are revealed, on the basis of which these extended and integrated properties

are generalized and united in one concept, in one class (one form) or in one theory of different subjects, objects or concepts (including the scientific concepts, laws and, etc.,)[1].

Therefore, the gravitation is the physical phenomenon or that principal physical concept, which can be integrated, if and only if, with the one, corresponding to it (on the abstractness and the generalization level), but is essential, distinct from it and opposite by content and by other physical phenomenon or concept.

By the way, this circumstance has been realized in due time by Kant, but even more by **Hegel** and **Engels**.

Therefore, **Einstein's** thought on the universal repulsion absolutely "is not taken from the air", and has quite real historical and epistemological grounding.

Thus, thousand-year experience of scientific thinking suggests us that the idea about the universal attraction is necessary to compare to the idea about the universal repulsion and in this comparison to discover that general and essential property which is peculiar to these two opposite concepts, and to those physical phenomenon, which reflection they are. On the basis of this generality it is necessary to integrate these opposite concepts of uniform essence or concept, or in the uniform theory. That is, to create one unified theory this describes both the attraction, and repulsion, both their unity and transformations.

After such general reasoning, let us go to the particular one, to the scientific and logical (axiomatic) substantiation. First, it is necessary to justify and prove that **the universal repulsion,** besides the universal attraction, also exists in the Nature.

The Philosophy and Natural sciences (Physics, Chemistry, etc.) are integrated by one universal assertion, one postulate: **the Matter (the World) is eternal**. The Science and Philosophy begin and finished by it. That is, this postulate is the main principle of Philosophy and Science, on which the corresponding theories, in particular, Physics is under

[1] It turns out good for **Einstein;** this is evidenced by the equivalence of space and time, the mass and energy and the attraction and the curvature of the space

constructed, and, simultaneously, one is an ultimate goal. These theories eventually should verify, explain and reveal completely, why the Matter (the World) is eternal.

This principal postulate in philosophy obtained the separate and particular definition: the matter is inexhaustible and indestructible, one is eternal in space and in time. In addition, in natural Sciences this postulate is formulated as the "Law of conservation of matter". This natural philosophy Law became the basement of development of natural Sciences and, in particular, Physics and Chemistry. Because of this Law, there were Laws of conservation of mass, energy, motion, and others, during historical development of physical sciences. These particular conservation laws, which appear in the course of differentiating, concrete definition of the abstract postulate on the matter conservation, at the further development of scientific thinking, under the inside requirement of logic of things, have appeared before the new process of generalization. Today, the demands of this logic has compelled us to come to very important deduction about existence of a **universal conservation law** in a physical science, i.e., to the discovery of the conservation law of physical system. Not declining from the essence of matter, it is necessary to underline that the physical theory of matter also is based on the law of conservation of eternity and matter. Therefore, we will begin with this principal postulate, which puts some restrictions and exclusions for our physical representations about matter. So, with discovery of the " Newtonian law of gravitation", the status of the universal property of matter has been given to attraction[1] and it is underlined that there is no such material formation, or body, which would not possess the property of attraction. against such one-sided approach disputed **Kant** and **Hegel**. The last has realised accurately, that if the matter possess only attraction, it would contract, tighten in one point, and disappear. That is, being based only on idea (concept) of the universal attraction, it is impossible to construct the theory of eternal

[1] to such an extent, that even in Philosophy textbooks is written that the attraction is the universal property and principal attribute of the matter.

matter. To exist eternally, it is necessary to possess one more universal property, which would react against attraction and would balance it, providing the matter existence overall.

Kant and **Hegel**, and, after them, **Engels**, considered, that corresponding opposition to universal attraction is the universal repulsion. Moreover, in their opinion, the matter consists of these two, and is the unity of these two and as such, exists eternally.

In some meaning, they were right. For example, if the matter possesses only repulsion it, eventually, would dissipate and completely disappear. Only by unity and consistency of these two properties the matter can dissipate and be grouped, and, thus, exist in the form of various formations and be conserved eternally.

Proceeding from these arguments, it becomes clear, which exclusions and limitations implies the postulate on eternity of matter:

1. The impossibility and forbid of absolute collapse. The singularity and absolute collapse is forbidden and is considered as impossible and unreal physically;
2. Also the absolute anti-collapse is impossible and unreal; the principle of impossibility and the exclusion of absolute anti-collapse.

It means that in the Physics or in the physical theory of matter the infinite contraction and infinitely contracted state, on the one hand, and, the infinite expansion and infinitely expanded state, on the other, are essentially forbidden, with all physical consequences. Are these principles unimportant for matter or for the Eternal Universe? Is it possible to underrate them in the up-to-date cosmological investigations?[1]

From the previously mentioned, it becomes clear that in the nature the existence both the universal attraction and the universal repulsion follows from this postulate of eternity of matter. Moreover, the only true way of generalization of the **Einstein's** gravitational theory is the

[1] It is evident that, under these principles, there would be no such erroneous concept like eternal expansion of the Universe.

creation of general theories of "attractions and repulsions" by generalization of principles put forward by **Einstein**.

What these principles are? In addition, basing on what generality it is possible to unite the attraction and repulsion?

Great achievement of Einstein is the discovery[1] of the principle of equivalence of gravitation and the curvature of space.

"Our former reasoning grounded on the field equations (96), started with the supposition that the space is the space of ***Euclid - Galilee*** *and that this character of space is violated only by the presence of masses"*[2]. According to **Einstein,** the mass (energy), which appeared in the flat space, creates the positive curvature round itself, which is equivalent to attraction.

Criticizing the model of the empty Universe **of de Sitter**, **Einstein** wrote in year 1918 *"... The physical properties of space are completely defined only by matter. Thus, no* $g_{\mu\upsilon}$ *-field, i.e. no space-time continuum can exist without the matter generating it".*

Last reasoning is absolute truth. Any space-time continuum exists only thanks to matter, which creates it. It is related both to the space-time continuum with positive and negative curvature and to the flat space.

It is necessary to show a logical sequence to develop **Einstein's** incomplete and half-hearted ideas. For example, if the matter with positive energy-mass is the physical cause of positive curvature of space-time, i.e., of gravitation, why do not suppose that the physical cause of negative curvature of space-time, that is, of repulsions, is the matter with the negative mass-energy?

Einstein's error is that he, following historical traditions, negates the physical existence of matter with negative gravitational mass. Otherwise, in the left, geometrical part of the cosmological equation, he would introduce variable $\left(-1/r^2\right)$,which reflects the

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[1] Some physicists (including **Einstein** himself) overestimated this circumstance and identified the space curvature and attraction and some others (**Logunov** et al) underestimated it.

[2] **A. Einstein**, **COLLECTED WORKS**, V2, p.74 (in Russian)

negative space-time curvature and corresponds to the repulsion, instead of the cosmological constant Λ. Moreover, in the right hand side he should introduce the tensor of energy of negative gravitational mass, which is the physical cause of repulsion.

1. Physical properties of space are completely defined only by matter,

2. There are three physical properties of space in the physical theory, or, more precisely, there are the spaces with three physical properties:

a) flat space,

b) space with positive curvature,

c) space with negative curvature.

3. A physical cause of positive curvature of space is the matter with positive mass.

From comparison of this reasoning **of Einstein** follows logically:

1. the flat space will be considered below;

2. A physical cause of space with negative curvature is the matter with negative gravitational mass;

3. There are two universal forms of matter, the matter with positive and negative mass; so, the physical cause of these three types of space is the matter with its two opposite forms.

Thus, we have found apparently that generality, that general property, on which base it is possible to integrate the attraction and repulsion. We have already seen that the attraction and repulsion are equivalent to the **space curvature**. Despite the first one is equivalent to the positive curvature, and the second - to negative; however, **both** play the same role, they **curve the flat space**.

Here it is worth remembering **Hegel** who, considering **Kant's** vew on attraction and repulsion, wrote: *"In this representation they **[attraction and repulsion - S. P]** are considered as self-conserved, so they correspond to each other not by the nature, i.e., each of them is not only the moment transferring into the opposite but is strongly conserved, opposing another".*

Miracle. Till today nobody has understood this thought of **Hegel**. The gravitation, considered **by Einstein** as the **independent** essence, and the positive curvature of space are not compared with repulsion by its nature. **An attraction** and repulsion should **correspond** with each other **by the nature**. And what is their essence, nature? Just this curvature of space. The attraction is positive and the repulsion is negative curvatures of space. So, if to consider the nature of their relationship we obtain the unity of the positive and negative curvature of space. This unity manifest itself in the form of a **flat space**. In this unity is manifested interdependence and the mutual attraction and repulsion. That is, **in the unity of opposites this manifests the essence of each, both the gravitation, and universal repulsion.**

"... In the presence of only repulsion, without attraction, there could be, as matter of fact, no matter"[1].

Hegel adds to these words **of Kant** that only with the repulsion the matter could not be spatial. In addition, in other place he affirms: *"If the matter has reached what she searches in gravity, it would merge in one point"*[2].

Therefore, **Hegel** justifies the correlation of attraction and repulsion, that one without another cannot exist, and that their real existence is manifested only in their unity.

Einstein has introduced into the theory the universal repulsion in the form of constant Λ, and has not reached the unity of attraction and repulsion and their true equilibrium. Why? Because such unification has not led to the flat space, that is, the zero on the left side of equation is not achieved. In the right side of the equation the positive energy/mass was not counterpoised by the negative.

Though, in one of his books we meet the vague representation of similar idea: *"But if the world is fined spatially, there is a second discrepancy with Newton's theory which in language of last can be*

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[1] **Immanule Kant**.**CRITIQUE OF PURE REASON**. Vol 6, M., 1966, p. 105 (in Russian)

[2] **G.V.F. Hegel, ENCYCLOPEDIA OF PHILOSOPHY. V. 2. PHILOSOPHY OF NATURE**, M.: 1975, p. 67, § 262 (in Russian).

expressed so: the gravitational field possesses such properties as though except the weight masses it has formed also by the uniformly distributed in space mass, having the negative sign. Since this spurious mass density *is infinitesimally small, it can be noted only in the case of very big gravitating systems"*[1].

Hegel once rightly observed that the matter is the unity of attraction and repulsion (positive and negative matter) and is the **outcome** of this unity. However, it does not mean that the attraction and repulsion more primary than the matter, and that matter is their consequence. Not at all; it is the matter, which is the precondition for them and the precondition of their existence and development. It is very important that there was no such impression, as if there was attraction and repulsion in the beginning, separately, and then, owing to their unity, the matter come into being.

2.3. Physical representations about space and time.

2.3.1 Problem of unification of two opposite concepts of space-time.

For centuries two different concepts of the space-time, which caused hot debate between **Newton** and **Leibnitz,** and their supporters.

1. Newton and his supporters considered space (and time) as an independent, on one's own existing **substance**. Such **absolute space and time** are considered as **eternal** and **invariable.** As **Einstein** has underlined, the exaggerated idea of independence and autonomy of space and time leads to independence of existence of space-time on matter: *«the idea of independent existence of space and time can be expressed as follows: if the matter has disappeared, there would be only the space and time (some kind of a scene on which physical phenomena are played)*[2]»

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[1] **A. Einstein, COLLECTED WORKS**, V 2, p.89 (in Russian)

[2] **A. Einstein, COLLECTED WORKS**, V 2, p.750 (in Russian)

2. On the contrary, Relationalists (**Leibnitz** and others), negated substantional essence of space and time, their independent and self-conserved existence from matter. In their opinion, the space and time are shapes of existence of the material formations, and developments of relationships between these formations.

The space and time in these two different concepts are featured by two rows of opposite properties:

Table 2.

The substanitional concept	**The relational concept**
Infinite	It is final
Continuous	Descrete
Static (invariable)	Dynamic (variable)
Uniform and isotropic	Non-uniofrm, non-isotropic
Formeless	Structural
Flat (empty)	Curved (not empty)

The dialectic unity of these two traditionally opposed concepts is one common idea that the space of any local physical system is flat:

- Is the "receptacle" for the components and elements of this system, and simultaneously,
- This space is made and composed of "self" spaces of elements of this system.

Our approach is based on the generalized concept of physical theory, or on principal and main concept, which is a physical system. The physics has one and the single object of investigations; it is the physical system. Other concepts, studied by physicists, are different properties and ratios of physical system.

Therefore, all other and important categories of physics are the subordinates derivatives both auxiliary and concepts who used to deepen, broaden and develop theoretically the conceptual content of "physical system".

Thus, we wish to underline that in the universal theory of physics the concept of "physical system" has primary and substantional content,

unlike other physical concepts (space and time, motion and rest, mass and energy etc.).

If to put aside the Eternal Universe, this absolute physical system, in that case the physicists study mainly the relative physical systems (which are local, final, and temporal) and their forms, properties and interactions.

For this reason the physical systems, proceeding from their essence, localization and finiteness, should be explored from two points of view – from inside and outside.

1. The local physical system has its internal space-time, which is organized from physical systems composing it, and from the elements and space-time relations, arising between them. For inside components - elements of our trial physical system, the space-time can be considered as both the field and medium, as well as background. But this is the inside (proper) space-time for our trial physical system.

2. At the same time, our trial physical system itself is, as the part of another, as an element, or is in the space-time relations (interactions) with other physical systems. That is, our trial physical system is in the external space-time medium, which, in turn, is inside space-time of some other, conditionally speaking, "greater" physical system. In spite of the fact that for trial system, it is the continuum, "receptacle" and medium, but at all, it is not the absolute space-time, but the space-time of certain "big system", which also is local, final and relative.

Thus, the physics always deals with the local physical system, which physical properties - space-time, rest and motion, mass etc., also are final and relative.

Here, once again it is necessary to underline the principal difference (in the space-time meaning) between local physical system and the absolute physical system, namely, between **the Eternal Universe**. The Eternal Universe, as the absolute physical system, has no external scales, does not interact with any physical system, which distinct from and is out of it. In this meaning, the absolute physical system, as integrity, is not the direct object of investigation and

description for the experimental and theoretical physics. Because the Science generally and Physics in particular, is characteristic property and work of in say igent beings, and in say igent beings cannot be outside of the Eternal Universe. Hence, the Eternal Universe, as absolute system, is incognizable from the outside for the human being. The space and time of absolute system are infinite and finite, continuous and discrete, invariable and variable and so on, and all this is absolute. However, the space and time of local physical system are discontinuous and continuous, infinite and final, invariable and variable relatively.

As declared **Minkovsky** in due time - there is no separated space and time, and there is only their unity. The universal physical theory also asserts that there is no the separate space-time, the separate field (continuum) and the separate particle (the physical body, the point), and there is only the universal concept of "physical system" and its different forms. And remaining physical concepts simply reflect the properties and interactions of physical systems of different types. Therefore, we definitively reject such properties of local physical systems, like space-time (and others) which are absolutely hyperbolized representations. In particular, it is necessary to underline, that one of **Einstein's errors** was that he considered a gravitational field as an absolute substance and that if one removes all the matter from the world, there will be only the gravitational field i.e., the curved space-time. Moreover, if one removes the gravitational field from the world, nothing remains in the world. **Einstein** has separated space-time from matter (matter, physical systems) and considered them as self-conserved essence. However, unlike **Newton**, **Einstein** considered this space-time continuum as moving and varying physical reality, which according to **Einstein**, however, had absolutely self-conserved and substantional essence, on a par with matter. In the Science, this erroneous point of view is not overcome till now. **Lie Smolin** considered space and matter as two independent, self-conserved and equivalent concepts. It comes to such extremes and before to such a misunderstanding, that cosmology-physicists with scientific gravity consider "the empty Universe", i.e., the model of the Universe without matter: *"The space is so dynamical, as well as the matter, it moves and deformed. As a result, the empty*

Universe can be expanded or compressed, and time can even begin (in Big Bang) and to be finished (in a hole)".

2.3.2 Physical cause and properties of the origin of flat space-time

In historical development of physical representations about space-time it is possible to select two epoch-making achievements:

1. Physical representation of flat space of Newton's mechanics - the problem of inertia,

2. Physical representation of curved space by the Einstein's gravitational theory.

Einstein has created a crucial leap forward in the historical development of physical representations about space and time, having related physical properties of space (the space curvature) with matter and mass presence. In this problem, his road illuminated the **Mach's principle,** as the beacon. However, in application of this principle **Einstein** was not consecutive. In an effort to explain the mystery of gravitation, he restricted himself only to the explanation of one form (or one type) of space curvatures - the discovery of the "cause" of positive curvature of space. Nevertheless, he could not expand his ingeniously formulated general principle[1] to negative curvature of space. In this problem the **Einstein's** rebellious thinking remains in a prison of traditions, not recognizing the physical reality of negative gravitational mass. This fact explains his theoretically unreasonable application of "cosmological constant" Λ , which is unfounded and without any proofs, and symbolizes the repulsion: "*the Requirement of Mach can satisfy in a general relativity theory if to consider the world spatially final and closed. Thanks to this hypothesis, it appears also possible to consider a averaged* density *of matter in the world final, while in spatially infinite (quasi-Euclidian) the world should be converted in zero. However, it is impossible to hold back that for such fulfillment of Mach's postulate of it is necessary to introduce the term, which is not grounded on any*

[1] cause and source of the curvature of space - matter and masses

skilled data into a field equation and it is not caused at all by logically remaining terms of these equations. For this reason the "cosmological problem "while cannot be considered the indicated solution quite satisfactory"[1].

Thus, **Einstein**, **De Sitter**, **Friedman** and their followers though accepted the possibility of physical existence of negative curvature of space, but not fond particular physical cause of its existence or origin[2].

Even after discovery of the accelerated expansion of the Metagalaxy by astronomers in 1998, physicists cannot explain till now the physical causes of "***insuperable curvature***" according to **Chernin**,

Today it is very easy to say that the reason for negative curvature of space is the matter with negative mass. All complexity of the problem consists in philosophical and physical substantiation of existence of matter with negative mass.

To prove the real existence of such matter theoretically and experimentally and to discover such really invisible and imperceptible matter, which today is called as the "dark energy", it is the complexity which could not overcome not only **Einstein**, but also many outstanding modern physicists. Even respected by me **Terletsky,** which has made so much in this direction and whom (together with the Japanese scientists) is necessary to consider as "godfathers" of negative mass.

Certainly, honor and glory to those astronomers who have unclosed the accelerated expansion (the repulsion of far galaxies from each other).

This remarkable experimental fact till now try to explain by various fabrications, such as quintessence, phantom matter, dark energy and so on. In addition, nobody wishes to listen to **Einstein's** or **Terletsky's**

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[1] **A. Einstein, COLLECTED WORKS**, V 2, p.127 (in Russian)

[2] **Friedman** has closely approached to the solution of this problem. In the known article he asserted that the negative curvature is possible in two cases, when $\rho = 0$ or if the averaged density has the negative sign. However, in the calculations he also used **Einstein's** equations with constant Λ. For this reason, he also obtained the equivocal solution.

wise helps. *«But if the world spatially is terminating, there is a second discrepancy with Newton's theory, which in language of last can be expressed so: the gravitational field possesses such properties as though except weight masses it formed also by uniformly distributed in space mass having negative sign. As this fictitious* density *of mass id extremely small, it can be noted only in the case of very big gravitating systems»*[1].

And **Terletsky** wrote - *"Supposing the existence of minus-particles, it is possible to consider the model of the Universe having on the average the zero characteristic mass …"*

Unfortunately, nor **Einstein** or **Terletsky** could not develop this idea, have not substantiated the thought that the cause of negative curvature of space is the negative mass; the idea, which is so important for the future development of physics. If they managed to explain and justify it clearly, there would be only one pitch further before **the third epoch-making achievement** in evolution of physical representations about space and time.

2.4 Physical cause of really existing flat space or inertia.

This is already new representation about space, at higher level, at the level of the general physical theory. It returns us to the **Newton's** mechanics, to his concept of flat space, but, actually, it is not the absolute returning, but the relative, this reconsideration of **Newton's** representations of flat space at the up-to-date level of physical perception of the world. As **Einstein** has underlined, the concept about the flat space both in the **Newton'**s Physics and in the STR is applied in a "ready form " as the postulate and absolute truth, and in the general physical theory comes to light the reason of flat space, the "mechanism" of its origination, its structure and its physical properties and consequences.

Here it is necessary to note that physical representations about space and time are developing, as old man **Hegel** would say , under the dialectic Law of negation of negation. The above-stated three epoch-

[1] **A. Einstein, COLLECTED WORKS**, V 2, p.88 (in Russian)

making achievements make a uniform, one major coil in the general spiral development of these representations. In the beginning of this coil, **Newton's** representation about flat space, in the middle - **Einstein's** representations about curved space (the positive and negative curvatures of space), and in the end of a coil – the representations of the general theory of physics, flat space as the unity of positive and negative curvature. Thus, we see that the evolution, development and its regularities, as **Hegel** teaches us, dominate and in the field of knowledge and, in particular, in the sphere of development of physical theories, concepts and laws. This development, as has already been told, spiral course, fluxion - in exact correspondence with the Law of negation of negation. Therefore, **Einstein**, negating **Newton** relatively, has advanced and enriched the Newtonian representations about space and time. Then the time of the general physical theory has come, negating relatively the **Einstein's** representation (about the space curvature), as though negated negation of representations of **Newton's by Einstein**, as though confirming, in this way, the idea of flat space. However, it is not the absolute return to Newton, I repeat, this is the development of representations about flat space at new and higher level. It integrates and synthesizes former two representations in itself. **Hegel** would present this process so:

Newton - the thesis - space is flat,

Einstein - the antithesis - space is curved ,

Pogosyan - synthesis - flat space, this is the unity of positive and negative curvatures.

2.5 Physical reason of origin of flat space

Concepts of rest and motion are the principal ones, both for Philosophy, and for Physics. They are tightly related to the concepts of space and time and express together the essential properties of physical system.

From the very beginning, I wish to underline, that unlike **Newton's** representations, bodies or local physical systems can be **relatively free** (solitary). That is, they cannot be isolated absolutely from the external actions. **It is impossible that the medium did not**

influence the physical systems, which are in this medium. If, surely, this medium has physical value, instead of pseudoscientific, like "empty space", "ether" and other similar fictitious matters. Local physical systems possess properties of the relative rest and motion (change).

In this paragraph we will try to discover answers to two problems - **what is the secret of inertia? And what is the physical cause of existence of plane space?** Neither **Newton**, nor **Einstein** and the up-to-date physical theories have discovered until now the answers to these problems. These two problems are interconnected; therefore, it is possible to begin with inertia. We will recollect the words of **Feynman** - *"... the free motion has no visible reason. Why subjects are capable to fly eternally as the crow flies, we do not know. The origin of a law of inertia remains till now a riddle"*. With reasoning **of Feynman** comparably definition **of d'Alembert**: *"the rest is related to the equality and the opposite direction of acting forces"*. It is necessary to add that the rest and motion reflect two states of physical system, which mean that the **rest and the free motion cannot exist without the physical cause**. Thus, synthesizing the reasoning **of Feynman** and **d'Alembert**, we come to the following deduction - the cause of inertia can be "invisible", but without fail it should exist physically.

Here, I should recollect the words of great Armenian scientist and-philosopher of V-VI centuries **David Anhaht**: *"the invisible is learnt by the means of visible"*. In this case the following facts are "explicitly visible":

1. In the nature really exist the rest and the free motion (a rectilinear uniform motion),
2. Only in flat space these physical states really exist,
3. The validity of the third **Newton's** law is a doubtless and indisputable fact.

It means that following the logic of **d'Alembert** it is possible to argue so - if on body or on physical system act equal, but oppositely directed forces then these forces cancel each other and they will be neutralized and for this reason they as though, "are invisible". Nevertheless, it does not mean that these forces objectively do not exist, because the rest of this body is obvious. On the contrary, such forces are

physically real and they are the cause not only for rest, but also for the free motion; in a word, they are the real physical cause of inertia. Certainly, absolutely other problem is, what are these forces? What is their nature? And why did they cancel each other out?

At this stage, we have approached to the principle **of Mach,** which has played the important heuristic role in the history of development of Physics.

As is known, **Mach** considered that **the cause of inertia is the interaction of body or physical system with the all mass of the Universe**. Accurately understanding and supporting the desire of **Mach** for discovery of physical cause of inertia, **Einstein** wrote: *"While for gravitational properties of the mass point the observable material particles are considered responsible, for inertial properties of the mass point any material cuse, and spurious (the absolute space, or an inertial ether) is not underlined. It though is not logically intolerable, but leaves feeling of dissatisfaction. For **E. Mach's** this reason demanded the recasting of the law of inertia in the meaning that inertia should be understood as the resistance of particles to acceleration under the relation to each other, instead of relation to "space"*[1].

Mach has not reconciled to the thought that inertia has no "visible" causes, therefore it has related it to the influence of all mass of the Universe. The Physics of XX century could not discover the physical causes[2] of flat space and inertia until now and remains deprived of the "physical content". From the previously mentioned it follows, that it is considered fiction, absolute space, either an inertial ether, or empty space etc.

And as the physics of the XX-th century essentially negated physical existence of matter with negative mass and physicists perceived "matter" as one with positive mass (energy) only, for this reason **Einstein** and its followers have tried to create such cosmological model of the final Universe. In this theory the law of inertia would be fulfilled

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[1] [1] **A. Einstein, COLLECTED WORKS**, V 2, p.127 (in Russian)

[2] Ibid., p.128

only for the uniform distribution of matter with positive mass. With that end in view he artificially and unreasonably introduced cosmological constant Λ into the equations to ensure the static state of model and the constancy of ρ, but it was not possible. **Фридман** and **Lemaître** have proved that static character and steadiness of his model are illusory and non-constant.

So, **Einstein's** historical attempt to explain the inertia problem only by means of the uniform distribution of positive mass has not been justified. However, during this work **Einstein** managed to formulate two ingenious ideas:

1. **Physical properties of space are related to the presence of matter.** This opinion, to my mind, is necessary to consider as universal true since it concerns as to matter with the positive mass and to positive curvature of space, and to matter with negative mass and negative curvature created by it. However, speaking about matter, **Einstein** understood it only as matter with positive mass (energy).

2. **To counterpoise the universal attraction, he has introduced the concept of "universal repulsion"**, however, without the substantiation of its existence and considering Λ as constant. But we will overcome this shortage within the limits of the General physical theory.

* * *

As it has already been shown, the space has three types by physical properties: flat, with positive curvature and with negative curvature.

A. **Einstein's** Great merit was that he, at first, has related physical properties of space to the presence of matter, and, secondly, positive curvature of space he related to the presence of matter with positive mass;
B. Then, having introduced into the cosmological equations the constant Λ symbolizing repulsion, **Einstein** has willy-nilly introduced the concept of negative curvature.

To it, first of all, promoted **De Sitter** with the model of exponentially expanded "empty" Universe, and then **Friedman** in the paper *"***ON THE POSSIBLE EXISTENCE OF SPACE WITH NEGATIVE CURVATURE"**. However, **Friedman** used the **Einstein's** equations with constant Λ, he noted especially that the cause of negative space can be both $\rho = 0$, and $\rho < 0$.

That is, mathematician **Friedman** has indicated an irregularity of the equations of **Einstein** with constant Λ. He also noted that these equations do not give the unequivocal solutions and the cause of space with negative curvature can be both positive and negative mass. This irregularity of the equations **of Einstein** has served as the basis for making further erroneous and hyperbolized cosmological representations and theories – De Sitter model, the inflationary theory, the up-to-date models of accelerated expansion of the Universe and others.

Meanwhile, the logic of historical development of Physics and, in particular, the Cosmology, demand that the negative curvature of space unequivocally caused by negative masses.

C. the physical property of space is also in its plane (non-curvature); by the way, this is very important physical property, which leads to serious physical consequences.

This physical property of space results from unification of the previous properties of space - positive and negative curvatures. Hence, a physical cause of flat space is the unity of positive and negative masses.

Here, it is necessary to do the explanation of general character. We consider the curvature or plane of space as physical properties only in that case when they call physical consequences.

The positive curvature, negative curvature and flat spaces are considered as physical properties if they create attraction, repulsion and inertia, accordingly. So not any positive or negative curvature of space can be considered as physical properties of space, capable to attraction and repulsion.

In addition, more precisely it can be formulated:

- matter with positive mass results in attraction, which is equivalent to positive curvature of space,
- matter with negative mass results in repulsion which is equivalent to negative curvature of space,
- equilibrium of matters with positive and negative mass results in inertia which is equivalent to the flat space.

In these new representations, the **Mach's** principle obtains a new content; really, inertia is caused by the mass of all Universe. Primly, all mass of the Universe consists of equal portions of positive and negative mass which cancel each other $\mathbf{m_{tot} = m_{пол} + m_{отр} = 0}$ **.** The Universe with such full mass is not empty; it is seen that positive curvature produced by positive mass $\mathbf{m}_{пол}$, and negative curvature produced by negative массой $\mathbf{m}_{отр}$ create together the flat space which is equivalent to inertia[1].

Einstein always underlined that it is impossible to negate the Physics of **Newton**, it is the basement of "building" of Physics. Therefore, the structure of general "building" of Physics needs to begin with the basement, starting from concepts and physics of **Newton's** Laws. Then, by generalization method to mount and reach the **Einstein's** concepts and then to mount together above and to reach the laws and categories of general physical system. Thus, structural level or structural segments (special physical theories) general theory of physics logically should imply one of another. More clearly, to present all this course and process, I apply one methodological principle, which is known for a long time, and is termed 'dimensional theory'. This principle is just for such lazy and not experienced in higher mathematics people like me, to put aside the lengthy mathematical calculations, and, by means of final formulas or equations to create the simple (even simplified) representation about physical properties and their

[1] Here, general and partial forms of inertia should be distinguished

interactions, about physical laws, and with ease to apprehend and understand their essence, a general principal side.

I. The First stage.

Thus, we will begin with the bases: the Physics of Newton is the Physics of the flat space, and it describes the inertia (the flat space) without any explanation.

1. The first Newton's law

The first Newton's law sometimes referred as the law of inertia:

An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force.

It means that the acceleration $\mathbf{a}$ of the physical system which is in such state (in the state of inertia) is equal to zero, $a = 0$. It means, that $a = V/t = 0$ has two versions, or is true in two cases:

a) $a = V/t = 0$ $a = V/t = 0$, when $V = 0$, that is when the physical system is in the rest and does not move;

b) $a = V/t = r/t^2 = 0$, when $r = V \cdot t$ where V is a constant. In the case when $a = \text{const}/t, a = 0,$ because $V = \text{const}$, also does not vary eventually.

So, when $a = 0$, takes place, two versions exist $V = 0 = \text{const.}$ or $V > 0 = \text{const.}$.

2. The second Newton's law

The following law - the second **Newton's** law, $F = m \cdot a$ or $a = F/m = 0$, $a = \sum F/m$. Now, in what case $a = F/m = 0$? Only in that case, when external force acting on the mass, or the total of acting external forces F, is equal to zero, $F = 0$ or $\Sigma F = 0, a = 0$.

3. The third Newton's law.

$$F_{12} = F_{21}, \text{ where } F_{12} - F_{21} = 0.$$

The third Newton's law has for me directing value. Actually, **Newton** suggests us, the total of forces can be equal in what case to zero,

$\Sigma F = 0$. It in due time it has been clearly understood and formulated by **d'Alembert**, but only for the rest state: ***"the rest is related to equality and the opposite direction of acting forces"***. In this case $a = (F_{12} - F_{21})/m = 0$**,** but it can concern not only to the rest, but also to the uniform rectilinear motion.

At last, we came closer to the 'fourth' and most interesting Newton's law with new constant, $F = G \cdot m_1 \cdot m_2 / r_{12}^2$ whence $a = G \cdot m / r^2$; the new law of acceleration has primary importance for the Physics and, in particular, for the Cosmology. From the very beginning it is clear, that equation $a = G \cdot m / r^2$ has three possible forms:

$$a = \frac{Gm}{r^2} < 0, a = \frac{Gm}{r^2} > 0, a = \frac{Gm}{r^2} = 0.$$

II. The Second Stage.

We already have approached to the Physics of **Einstein**. It is the second stage of development of Physics, related to the **Einstein's** name. It was marked by the declaration of principle of equivalence of gravitation and curved space, more that by making the special theory of relativity, which, to my deep belief, has played the revolutionary role in the ideological development of Physics.

Setting aside the unique mathematical formulation of his concept, a tensor analysis, within the frameworks of Newton's Physics this idea can be represented as:

$$a_{grav} = G \cdot m / r^2 < 0$$

This version shows, that acceleration has negative sign, that is there is a deceleration that is the expression of attraction; and this, in its turn, means that mass m has positive sign and the attraction field creates round itself, that is, it has the positive curvature. If the curvature of space to designate as $K = 1/r^2$ $a_{тяг} = -(G \cdot m \cdot K)$ which can be conversed into $K = F/(G \cdot m^2)$ and it became visible that the space curvature is equivalent to attraction.

Here, it is necessary to underline that the quantity **K**, this new physical concept to what the **Einstein's** stage in development of Physics is related.

It is interesting that the post-**Newtonian** physics had two directions of development:

The quantum physics has formulated the new concepts:

1) the square root from the combination of classical variables m, r, t **Ньютона**: for example the electrical charge e or the generalized quantum charge q.

$e \approx q \approx \sqrt{mr^3}/t^2 \quad \Phi = \sqrt{mr}$

Or $a = \sqrt{mr^3/t^4} \quad H = \sqrt{m/rt^2}$

2) Unlike quantum physics, Einstein's gravitational theory has created a new physical concept the curvature of space **K** which consists of the variable of classical physics r, but in the minus two power. Curvature of space **K** has the right to be the separate physical concept, as it has two types of expression, with posit curvature of space and is equivalent to attraction, another to the negative curvature of space and is equivalent to repulsion. The right to be the separate physical quantity **K** is ensured by its second version $\mathrm{K} = -1/r^2$; negative curvature has its physical meaning if we will try to compare it to the concept of negative curvature of space radius and to find thst we obtain the imaginary quantity.

Thus, it follows from the **Einstein's** representations that not only positive curvature of space is equivalent to attraction, but also negative curvature is equivalent to repulsion. In addition, the main thing is that these concepts is implied from the Newton's laws, from their development.

For $a = G \cdot m/r^2 \neq 0$ the cause of the acceleration, which are distinct from the zero, can be the attraction, either the repulsion, or equivalent to them the positive and negative curvature of space,

$a_{тяг} = G \cdot m/r^2 < 0$ And $a_{отт} = G \cdot m/r^2 > 0$

$a_{тяг} = G \cdot m \cdot K < 0$, $a_{отт} = G \cdot m \cdot K > 0$.

If the attraction acceleration has the minus sign, it is lesser than zero, such attraction reduces the velocity of motion of physical system and it is all thanks to positive curvature of space, and the physical cause of positive curvature are masses with the positive sign.

When $a_{тяг} = -G \cdot m \cdot K$, the repulsion acceleration has positive sign, it is greater than zero and as the repulsion picks up the speed of physical system, thanks to the negative curvature of the space, which physical cause are the masses with negative sign $a_{отт} = G \cdot (-m) \cdot (-K) > 0$.

Thus, logic it become clear from simple logic that the physical meaning and physical existence have the masses both with positive, and with negative sign, which results in attraction and repulsion, accordingly, or equivalent to them the positive and negative curvatures.

III. The Third stage.

In addition, at last, we have reached the present stage of development of Physics. The universal theory of physics cannot be created if it does not find the answers to problems, which are not solved till now. Those problems, answers on which did know neither **Newton**, nor **Einstein,** are the following:

1) What is the physical cause of inertia? Or, what is almost the same, what is the physical cause of flat space?

2) Why there cannot be the formation of matter with negative inertial mass? Or, why there are the matter formations only with the positive mass? And, also, the other problems related to it.

We already said about the physical causes of inertia, or about the flat space. It would be impossible to explain physically that flat space and inertia without developing the representations about the positive and negative masses and positive and negative curvatures (attraction and repulsion) generated by them.

It became already clear that there are two components of matter in our cosmic medium, with positive and negative masses which give rise to the universal attractive f $a_{прит} = Gm/r^2 < 0$ and repulsion

forces $a_{отт} = Gm/r^2 > 0$ which are equivalent and always counterpoise each other, resulting in the universal inertia $a_{инерц} = a_{прит} + a_{отт} = 0$ или $a_{инерц} = -(GmK) + G(-m)(-K) = 0$.

It means, at the same time that the attraction, caused by positive mass of the Universe, or, in other words, the positive curvature of space, and the universal repulsion caused by negative mass; or, which is the same, the universal negative curvature of space, cancel each other, creating inside the universal flat space of the Metagalaxywhich both are uniform and isotropic …

This global, flat universal space already has the physical explanation, unlike the Newton's and Einstein's flat spaces:

$$K_{пол} + K_{отр} = \frac{\varepsilon_{пол}}{F_{pl}} + \frac{\varepsilon_{отр}}{F_{pl}} \left(F_{пл} = \frac{c^4}{G} \right) \text{ or } \frac{1}{r^2} + \left(-\frac{1}{r^2} \right) = \frac{G\varepsilon}{c^4} + \left(-\frac{G\varepsilon}{c^4} \right).$$

It has a certain structure though this space is not empty absolutely, is allotted by vacuum properties, but, it is allotted also by positive and negative components which counterpoise each other (but do not destroy). Surely, the time of flat space is local and finite but it is allotted by the physical properties to influence and act, by inertia, and also leads to certain physical consequences …

2.6 The formation of flat space

The flat space is organized, or made, of comparison of equal portions of continuously arising positive and negative masses. These portions are equal to the Planck's to mass by absolute values and arise always together, in unison. It is the vagabonding matter, moving from Armon to Armon, $m_{pos} = m_{neg} = m_{pl} = 10^{-5} g$ the number of these portions equal to Armon variable $1 \le n \le ² = 10^{62}$

It follows from this expression that during formation of flat space (or, as it is used to say, during cosmological expansion) the full mass of the Metagalaxy is equal to zero: $\mathbf{m_{tot} = m_{пол} + m_{отр} = 0}$, $\mathbf{m_{отр}}$ has no structure and does not create the structure and system; it is the

group of anti-gravitons $(\bar{g})$, repulsing each other, which are always increased by the portions 10^{-5} gram and dissipate. Just this repulsion "constrains" the positive mass, which, however, organizes the structure, and by means of this structure constrains the negative mass. This "restraint" means actually the saturation process. This process of making and formation of flat space (which is called the cosmological expansion) discrete and continuous (continuousness is interrupted on every chronon by time of 10^{-43} seconds, but it is definitively terminated on 10^{19} second). Formation of flat space takes place for 10^{62} stages. Each stage[1] is the immovability and rest moment caused by compensations and balance of physical processes of scattering of **the negative component** and compression of positive component. Whence, the flat space is not expanded; one is under construction, formed, and develops from 10^{-5} grams of small bricks with negative and positive masses. Consequently, when bricks terminate, after 10^{62} pieces, the addition of flat space terminates. According to the law $n \cdot r_{pl} = ct_{pl}$ from this 10^{62} instances is constructed $\mathbf{R}_{\text{з}} = {}^{2} \cdot \mathrm{r}_{\mathrm{pl}} = 10^{29}\mathbf{T}_{\text{з}} = {}^{2} \cdot \mathrm{t}_{\mathrm{pl}} = 10^{19}$ Thus, the formation of flat space takes place with the constant velocity $\mathbf{c}$. $\mathrm{R}_{\mathrm{n}} = \mathrm{n} \cdot \mathrm{r}_{\mathrm{pl}} = 10^{-43}\,\mathrm{sec}$ is the chronon, a discontinuous quantum of time. Time interval between the following one after another quanta, $10^{-43}\,\mathrm{sec}$, has no physical meaning, as well as, on the space scale $10^{-33}cm$, between such two durations $l<10^{-33}cm$, also has no physical meaning. Just these continuous origin and addition of quanta $(10^{-9}g)$ of positive and negative components compose the homogeneity and isotropy of flat space. This homogeneity consists of two components – from fine-grained negative homogeneity and coarse-grained positive homogeneity.

The positive mass forms the structure $\left(m_n = m_{\text{ЧД}}^2 / m_{pl}\right)$

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[1] by10^{-5} grams increasing of positive and negative masses

When we say that two components are cancel each other, counterpoised and discontinue the course, scattering or compression, it does not mean that the positive and negative components (portions by $10^{-5} g$) develop, move to each other on one line, creating one straight line with cross-section $10^{-66} cm^2$ and length $10^{29} cm$, and on all length has uniform density $\rho_{отр} = \rho_{пол} = 10^{93} г / см^2 = const$. From this anything good is impossible, and such space could not ensure the free motion …

It is necessary to add that positive and negative masses arisen in volume $10^{-99} см^3$ by portions $10^{-5} g$ developing with each other, all the same increse the volume in n^3 time. That is, the scattering of negative and compression of positive do not neutralize absolutely each other (do not discontinue the expansion, volume and space build-up), and is relatively relative… Why? Let, apparently, are strung on one line and spatially will neutralise each other …

Thus, without the positive mass, the negative mass would eternally be subject to anti-collapse and dissipate irreversibly; and, the positive mass without negative would eternally be contracted and subjected to collapse, and, finally, will disappear. Meanwhile, counterpoising each other, these two components form flat space, which is organized as follows: the positive components restrict the possibility of scattering of negative mass but discontinue their tendency to dissipate not completely. To constrain and counterpoise scattering of negative mass the positive mass should be grouped and distributed definitely and uniformly, that is, the positive mass fulfills two types of problems:

1. On the one hand, to create and organize together with the uniformly distributed negative mass the fabric of flat space, it should be distributed in a certain way and uniformly all over the space volume.

2. On the other hand, to create a unique net, a frame and the lattice , which, as a whole, could counterpoise and constrain repulsion of negative mass, being attracted to each other,

the primary black holes having fairly strong attraction should be arranged in knots of this uniform distribution.

That is why the formation of primary black holes with positive mass is very important their evolution and making of net. It is very important to know masses of positive black holes, their amount and proportions of distances between them, because on it depends, whether this lattice can counterpoise the universal repulsion of **the negative component** or not. These positive component fulfill two problems, physically being based on negative component. The **the negative component** makes to the positive component are distributed uniformly[1].

Thus, at uniform distribution the positive mass cannot constrain the repulsion of negative mass because the attraction between quanta or particles of positive mass will be very feeble, and the repulsion of negative mass will very easily scatter the positive mass. For this reason, to organize the flat space it is necessary that the positive mass be not distributed fine-grained in relation to the negative mass. Being grouped, it should be distributed, creating the lattice , the frame of primary black hole so that primary black hole in knots were on such identical distance from each other that could attract each other with sufficient force in such a way that average the distribution and average density of positive mass would be equal to negative one, $\rho_{\text{n}(пол)} = \rho_{\text{n}(отр)}$.

Thus, as a part of flat space, the positive mass is relatively uniformly distributed and grouped. More precisely, as a part of flat space, the positive mass is grouped restrictedly and distributed relatively uniformly. At the same time, the negative component is scattered restrictedly within the limits of flat space in an extremely uniform fine-grained distribution.

* * *

Since the flat space is three-dimensional, hence, the construction of flat space, its addition or its structure (the volume of structure) is increased

[1] **Hegel** was right that the repulsion is more efficient factor than attraction**.**

(cosmologists call it the expansion) by three measures $V_n = n^3 \cdot r^3_{pl}$, reaching full volume $V_{вс} = вс^3 \cdot r^3_{pl}$. What does it mean? It means that the volume of mass $m_{отр} = 10^{-5} г$, which made $V = 10^{-99} см^3$ being increased (that is quanta with negative mass $m_g = 10^{-67} г$, all $N_g = 10^{62}$ and $m_{отр} = 10^{-5} г = вс \cdot m_{\bar{g}}$) repulsing each other dissipate, dilating a volume), reaches size $V = 10^{25} см^3$ providing an indicator of the general uniform density $|\rho| = 10^{-31} г/см^3 = 10^{-5} г/10^{25} см^3$.

Question may arise, why the positive mass does not constrain and "does not forbid" this expansion of the volume of negative mass? As it is noted above, the positive mass discontinues the motion not absolutely. For example, if in the total volume $V_{вс} = вс^3 \cdot r^3_{pl} = 10^{87} см^3$ would not be the positive mass then it is obvious that the negative mass $m_{вс} = 10^{57} г$ "would not be constrained", and would scatter in infinity . The same with repulsion; it cannot restrict absolutely to positive masses to be grouped and compressed into primary black hole. If the repulsion of negative mass exceeds the attraction of positive, then the groupings with positive mass would not have time to be organized and positive mass, being differentiated, would dissipate in infinity . However, since these two components are equal always, in the course of formation of flat space, at each moment and at any stage then repulsion definitely restricts attraction, thanks to what the gravitational collapse never happens, but positive mass has time to be grouped, creating the physical systems (primary black hole) with complex structures.

The consequences of equality of these two components are:

This equality **restricts** ability of each of components to move and vary, dissipate or be contracted, thanks to what their integrity appears as the local physical system. If components of this physical formation had the infinite physical properties, such formation could not be the local physical system.

This equality does not mean, that in **relation** to each other such components are fixed and do not interact. Not at all, do not forget that though they make the integrity but this integrity is formed because of their opposition, "confrontation and struggle". Therefore, the moment of these two components unity cannot be overestimated. These opposite components are in constant interaction.

Because of this interaction, each of components is subject to a certain change, and this change expresses certain regularities, that is, the components vary accordingly to certain laws:

$$m_{tot} = m_{n(omp)} + m_n = \left(m_{pl(omp)} \cdot n\right) + \left(m_{pl} \cdot n\right) = 0$$ where

$m_n = m_{pl} \cdot \mathbf{n}$, $^2 \cdot m_n = m_{pl} \cdot n$

Always $m_{n(omp)} = m_{pl(omp)} \cdot n$, the negative mass is always increased by portions amd in the case of $n = ^2$, $m_{_2\ (omp)} = 10^{-5} g \cdot 10^{62} = 10^{57} g$.

In this process, the negative mass always remains fine-grained and uniform. That is, $m_{n(omp)}$ always consist of anti-gravitons with negative mass, which are equal to the negative mass $m_{\bar{g}} = 10^{-67} g = \text{const}$. They are never grouped and do not create the complex structures. The positive mass m_n is really increased n times, $m_n = m_{pl} \cdot n$ but as positive masses are grouped in primary black hole $m_n = m_{чд} \cdot \sqrt{n}$ represents the amount of primary black hole, at the same time $\sqrt{n} = m_{ЧД} / m_{pl}$, that is $m_{чд}$ are grouped from $\sqrt{n}$ by number of m_{pl}. The total mass $M_{tot,}$ at n = U. is possible to write as

$$M_{tot} = \left(-10^{-5} г \cdot 10^{62}\right) + \left(10^{26} г \cdot 10^{31}\right) = -10^{57} г + 10^{57} г = 0$$

In the end of expansion, or the build-up of flat space when in volume $V_n = V_{_2} = r_{pl}^3 \cdot ^2 {}^3 = 10^{87} см^3$ the negative mass is distributed by a fine-grained homogeneity with the density $\rho_{_2\ (omp)} = 10^{-31} г / см^3$, and

the positive mass 10^{57} г is completely distributed in primary black hole $m_{чд} = 10^{26}$ г, density of which $\rho_{чд} = 10^{31}$ г/см^3 and ² time more than averaged density of negative mass $m_{чд} = 10^{26}$ г. Number of primary black hole is $N_{чд} = 10^{31}$ and they are distributed uniformly, that is, are on equal distances from each other, they form a unique frame, which counterpoises negative mass.

The most important thing, to elucidate the regularities of uniform distribution of positive mass, that is, the coarse-grained uniform distribution of positive mass, or the frame of primary black hole, as will be discussed below, is a precondition for non-homoge, the varieties of positive mass, or the moving positive mass. The attraction of frame of positive mass counterpoises the repulsion of negative mass, and they organize together and develop the build-up of flat space. It is organized from ² $= 10^{62}$ pieces of bricks (wonderfully, **Archimedes** also considered, that our world is constructed from the same number of atoms). They are " born" from the “field of minimons” and are added sequentially. Each of them consists from $m_{pl} = 10^{-5}$ г positive and negative masses which counterpoise each other in the volume V_{pl}. That is why, when origin of these bricks ceases (having reached ² $= 10^{62}$ pieces) then the build-up and formation of flat space is also finished. In spite of the fact that the volume of flat space Vu is formed from an amount of bricks, any of which has volume V_{pl}, but it does not mean at all that V is equal to V_{pl}: $V_A \neq V_{pl} \cdot$ ². As $|m_n| = r_n \cdot c^2 / G$, that is $m_n = m_{pl} \cdot n$ and $r_n = r_{pl} \cdot n$, we obtain that $V_n = r^3_{pl} \cdot n^3$ (since $V_n = r_n{}^3$). Then $n =$ ² $\cdot V_{\text{ш}} = r_{pl}{}^3 \cdot$ ² ³.

In the case, when $n =$ ², $V_{\text{ш}} \neq V_{pl} \cdot$ ², though total of bricks arising in the volume V_{pl} равно ². It means, that though the positive and

negative components of masses are always equal to $m_{отр} = m_{пол}$, and rising uniformly, however, the distribution of these components and volumetric changes of their portions occur by different laws. So, the volume $V_{порц}$ each of the portion $|m_{pl}|$ negative mass in fluxion $n = 1 \to ²$, or during cosmological time $V_{порц} = V_{pl} \cdot n \cdot ²$, when $V_g = r^2_{pl} \cdot r_{₂} = 10^{-99} см^3 \cdot 10^{124} = 10^{25} см^3$. It means, that each portion of the negative component, which consists from ² pieces of anti-gravitons: $m_g = -10^{67} г$, each of them during cosmic evolution, being repelled each other, expands the volume $V_g = r^2_{pl} r_{₂} = 10^{-37} см^3$. If in the case of $n = 1$, $V_{порц} = V_{pl}$ and in this volume it is located ² amount of anti-gravitons $\bar{g}$, then in the case of $n = ² \cdot V_{порц} = 10^{25} см^3 = ² \cdot V_g = 10^{-37} см^3 \cdot 10^{62}$

Thus $V_n = V_{порц} \cdot n$, in the case of $n = ²$ $V_{₂} = ² \cdot V_{порц}$. But in this volume V_n the positive component is distributed as well. We saw, that positive mass m_n is not only equal to $(m_{pl} \cdot n)$, and $m_n = m_{чд} \cdot \sqrt{n}$, that is m_{pl} to a portion of positive component, being increased, are grouped in the form of primary black hole, making the frame of coarse-grained uniform positive mass. And volume $V_{чд}$ of primary black hole obeys the law of change: $V_{чд} = V_n (\sqrt{n})^3$ and then $V_n = V_{чд} (\sqrt{n})^3 = V_{÷д*} n\sqrt{n}$, and in the case of $n = ² \cdot V_{₂} = V_{чд} \cdot ² \cdot \sqrt{²}$, as in this case $V_{чд} = 10^{93} \cdot 10^{-99} см^3 = 10^{-6} см^3$, then $V_{₂} = 10^{-6} см^3 \cdot 10^{93} = 10^{87} см^3$

Means

1) $V_n = V_{порц} \cdot n, (V_{₂} = V_{порц} \cdot ²)$ the law of change of a volume of portions of negative mass, and

2) $V_n = V_{чд} \cdot n \cdot V_2 = V_{чд} \cdot 2$ the law of change (expansion) of volumes primary black hole.

Thus, though changes of volumes of positive and negative components are obeyed by different laws and they have certain independent essence. But, apparently, it follows from these equations that these two components make unity in the same volume, and their equilibrium is the physical cause of origin and formation of volume V_n (or V_2) of flat space.

It is necessary to consider the uniform distribution of primary black hole in details. In the course of cosmic evolution the primary black holes increase the mass according to the well-known law $m_{чд} = r_{чд} \cdot c^2 / G$, with the same proportion the volume V_2 is increasing. It is increasing according to expression $V_{чд} = \left(\sqrt{n}\right)^3 \cdot V_p$). Since $V_n = V_{порц} \cdot n$ then we can obtain the relation $V_{порц} = V_{порц} = V_{чд} \cdot \sqrt{n}$

However, we are interested also in regularities of distance change ℓ between primary black hole during the cosmic evolution. As primary black hole are distributed uniformly, they are almost on equal distances from each other. As far as $m_n = m_{чд}\sqrt{n}$ or $m_n = m_{чд} \cdot N_{чд}$, where $N_{чд} = \sqrt{n}$, in volume V_n, the number of primary black hole $N_{чд}$ should be distributed uniformly to ensure the coarse-grained homogeneity, that is $\frac{V_n}{N_{чд}} = V_{чд}$. For example, in the case of $n=2$ each of primary black hole having mass $m_{чд} = 10^{96} г$ has the volume $V'_{чд} = V_2 / \sqrt{2}$, $= 10^{87} см^3 / 10^{31} = 10^{57} см^3$ or they are apart by $\ell_{чд} = 10^{19} см$ from each other.

Perhaps, $\ell_{чд} = 10^{19} см$ is the radius of "horizon" of primary black hole.

However, it is important that in this volume $V'_{чд} = \ell^3_{чд}$ the density of primary black hole is $\rho'_{чд} = 10^{-31}\ г/см^3$, which is equal to expression As many physicists, even today, doubt that the quantities $G, c, \hbar$ are the universal constants, let we now conduct the experimental check-up. Let us take the relation $m^2_{pl} = \hbar \cdot c/G$ and, separately, the constants $G, c, \hbar$.

1) In physics $G \cdot c$, quantity $\hbar$ is not considered as a constant. Since it has the dimensionality of pulse I (torque) the **Planck's** equation can be expressed in the form of $m^2_{pl} = I \cdot c/G$, and in the case of $\mathrm{m_{pl}} = 10^{-5}\ г$ we obtain, that $I = \hbar$. However, if to increase $\mathrm{m_{pl}}$ n time, then $I = n^2 \cdot \hbar$, and if to decrease n time, we will obtain $I = \hbar/n^2$.

2) In physics $\hbar \cdot c$ we will accept that $m^2_{pl} = \hbar \cdot c/G_o$, where $\mathrm{G_o}$ is variable and at value $\mathrm{m_{pl}} = 10^{-5}\ г$ $G = G_0$. In this case, increasing $\mathrm{m_{pl}}$ n time we will obtain $G_o = G/n^2$, and decreasing n time - $G_o = n^2 \cdot G$. Certainly, $\mathrm{m_{pl}}$ can vary not only n time but also $\sqrt{n}$ time, and in this case $G_o = G/n$ or $G_o = n \cdot G$. That is why, starting with Dirac, many believed that the constant G is actually the variable. **Landau,** quite rightly, demanded not to neglect the effects of gravitation in the quantum interactions in elementary particle physics., it is one of the most important Laws of Nature, it is the "Driving Force" of cosmic evolution.

This law is equal to $\rho_{вс} = (\rho_{вс}) = \rho'_{чд}$, in this form it is valid throughout the cosmic evolution.

Now we will consider the regularity of change of volume $V'_{чд} = \cdot \ell^3_{чд}$. We already had one preliminary law $V_n = V'_{чд} \cdot \sqrt{n}$, where $V'_{чд} = \ell^3_{чд} = V_n / \sqrt{n}$ and as $V_n = \mathrm{V_{pl}} \cdot \mathrm{n}^3$, we can obtain $V'_{чд} = \ell^3_{чд} = \mathrm{V_{pl}} \cdot \mathrm{n}^2 \cdot \sqrt{n}$. From here it is possible also to find the expression $\mathrm{V}_{чд} = \mathrm{r}^3_{g(чд)}$ and $V'_{чд}$

$$\begin{cases} \mathrm{V}_{чд} = \mathrm{V_{pl}} \cdot n \cdot \sqrt{n} \Rightarrow \mathrm{V_{pl}} = \dfrac{V_{чд}}{n \cdot \sqrt{n}} \\ \mathrm{V_{pl}} = \dfrac{\mathrm{V}'_{чд}}{n^2 \cdot \sqrt{n}} \end{cases}$$

Equated, we will obtain : $V_{чд} = \dfrac{V'_{чд}}{n\sqrt{n}}$

From this equation it may be seen that $l_{чд} = \sqrt[3]{n} \cdot r_{g(чд)}$

We have already deduced the law expressed by relation $V_{порц}$ and $V_{чд}$, now it is necessary to find the relation between $V_{порц}$ and $V'_{чд}$. It is absolutely not difficult: knowing, that $V_n = V'_{чд} \cdot \sqrt{n}$ and $V_n = V_{порц} \cdot n$, having equated them, we will obtain : $V'_{чд} = V_{чд} \cdot n$, $V_{порц} = V_{чд} \cdot \sqrt{n}$.

Thus $V_{порц} = V_{чд} \cdot \sqrt{n} = \dfrac{\mathrm{V}'_{чд}}{\sqrt{n}}$ or in the case of $n = ^2 \cdot V_{порц} = V_{pl} \cdot ^2 = \mathrm{V}_{чд}\sqrt{^2} = \mathrm{V}'_{чд} / \sqrt{^2} = 10^{25} см^3$.

The equation $V^2_{порц} = V_{чд} \cdot V'_{чд}$ is also true. So, we have obtained two important laws:

1. The positive mass of the Universe (pseudomaximon) during cosmic evolution in general is compressed and concentrated in the primary

black hole uniformly. Though $m_n = m_{чд} \cdot N_{чд} (N_{чд} = \sqrt{n})$, but relation of their averaged density result in $\rho_{чд} / \rho_n = n$.

2. Spatial distribution of primary black hole is due to the major law of the Nature

$$|\rho_n| = \rho_{\rho n} = \rho_{чд}$$

So, all the talk about the changes and fluctuations (perturbations) of the averaged mass density during the cosmic evolution can only refer to positive component and do not belong to the negative component. Can be grouped only positive masses, and, grouping in primary black hole, form a kind of three-dimensional framework the averaged density is:

$$\rho_n = \frac{\sqrt{n} \cdot m_{чд}}{V_n} = |-\rho_n| .$$

However, the homogeneity of positive component, the distribution of primary black hole with an identical mass, differs from the homogeneity of negative component. Right at the beginning of cosmic evolution, both of them fine-grained and uniform, but then the positive component obtains the **coarse-grained** homogeneity, and the negative remains **fine-grained** forever.

Throughout the cosmic evolution $\left(t_{чд} = 10^{19} сек\right)$, though the portions of positive and negative components $\left(|m_{pl}| = \pm 10^{-5} г\right)$ are increased in equal amount of pieces $^2 = 10^{62}$, however, the amount of the fine-grained uniform negative component – the number of structural units of the coarse-grained homogeneity decreases ($\sqrt{n}$ time) as they organize the same three-dimensional volume, or develop in three-dimensional flat space.

The **negative component is** always fine-grained, one is homogeneous, since its quantum (component) is $|-m_{\bar{g}}| = 10 - 67 г = const.$, but the number $N_{\bar{g}}$, the volume V_g and the averaged density $\rho_{\bar{g}}$ are variable,

as well as the parameters of the primary black hole $m_{чд}, V_{чд}, V'_{чд}, N_{чд}, \rho_{чд}, \rho_{чд}$.

Summing,, it is possible to draw the conclusion that though for freely moving physical systems the flat space seems, in the mail, almost formeless and unobstructed, however, as we already saw, the flat space, is not a vacuum and is not empty. On the contrary, it is constructed of an identical amount of positive and negative masses, and has a relatively complicated structure. It is invisible, dark", and if it was visible, the components and elements of a flat space for a long time could be detected. Both components of flat space due to invisibility have obtained in Science the titles of “dark energy” and “dark matter”. The first is the negative mass, the second is positive one. The first is already actually confirmed by experience and astronomical observations, and second, I hope, will definitively be confirmed by universal observations of the phenomenon of gravitational superweak microlensing. Unlike many, we simply find that positive component and the dark matter (on the mass), is equal to negative component (dark energy).

Moreover, the most important, the positive component $\sqrt{2}$ $m_{чд} = 10^{26} g$ is concentrated today manly in the black holes, the composition and structure of them we will consider below in details. Here we must recall the approach of Markov to this issue. He, perhaps, was the first who considered that the basic components of the dark matter are the primary black hole having the Planck parameters.

2.7 Physical properties and consequences of flat space

As mentioned above, plane or curved space we believe the physical properties only if they cause physical effects. The physical property of flat space is inertia, the free motion. That is, we have found that the flat space influences the physical systems "immersed" in it, but influences in a way to ensures the free motion and rest of these physical systems.

1) the flat space-time (continuum) as it is extremely uniform and isotropic ensures the existence of conservation laws,

2) the flat space-time (continuum) ensures the general irreversibility of physical processes (that is, the physical systems and their changes) - time promoting (arrow of time),

3) Simultaneously with arrow of time , flat space-time provides a causal physical relationship and causality,

4) Ensures the general thermodynamic disbalance for free physical systems,

5) Physical consequence of flat space-time is the impossibility of an absolute collapse (singularity) and an anti-collapse (absolute or eternal expansion)[1],

6) Existence constant (and invariable) velocite c.

8.7 Stationary and invariable velocity c.

Let us start with the last point (6). The constant velocity c is an invariable rate of **generation and formation** of flat space-time; in this sense, the velocity c is both the physical property and the consequence of flat space. Here it is necessary to underline gain that the flat space-time we speak about it not some abstract or independently existing physical substance, but is the internal space-time of Armon and Pseudoarmons. The plane space of our Universe or the internal space of our pseudomaximon, which cosmologists of the XX centuries considered as expanding[2], and we consider this space-time as being under construction, organizing and forming. Therefore, we are talking about the velocity of cosmological constant speed c of formation or "expansion" of this space of our Universe; about invariable quantity of physical process, which course cannot be decelerated or accelerated. There is no such force in the Nature, which could suspend the "expansion" of pseudomaximona. That is, there is no force in the Nature greater than the Armon force $\mathrm{F}_{\mathrm{pl}} = c^4/G$, which could suspend this

[1] It said more **Logunov** but did not provide the evidence.

[2] the consequence of the Big Bang

expansion. This is cause that Armon force consists only of constants G and c [1].

So, the flat space is organized with the invariable velocity c; it means, that at this flat space-time $r_n = c \cdot t_n$, as is the **Minkovsky** case. If change r_n n time, t_n also will vary in n time: *"Uniformity of a course of hours means, that quantities of intervals by which we measure by means of hours, should agree with the linear structure of space".*[2]

For the Cosmology prof. **Stanjukovich** demanded the same. *"It is impossible to construct the uniform dynamic models of the Universe so that the solution of field equations (19,1)* [the equations of a gravitational field of **Einstein** - С.П.] *obey the reasonable boundary conditions* $a \sim t$, *at* $v = c$".

Underlining this common fault of physical cosmic models, **Stanyukovich** raised the problem of making such cosmic models in which the distances would vary proportionally or uniformly to the Universal time, under the law $r = c \cdot t$. Moreover, this is possible only in the presence of the flat space-time. M. Bronstein means that**,** when he suggested refusing the geometry of **Riemann** (from the space-time of **Riemann)** for making $G \cdot h \cdot c$-physics**.**

The law of flat space formation $R = c \cdot t$, is the property of this space-time. Our Universe – the maximon, starts to "expand" by its inside scales from the compessed state, when its parameters are equal to $R = c \cdot t$, $|m_n| = 10^{-5}$ г |, $r_n = 10^{-33}$ см, $t_n = 10^{-43}$ см etc., $t_n = 10^{-43}$ см, $|t_n| = 10^{93}$ г / см^3, $|T_n| = 10^{31}$ K. That is, in the beginning of "expansion"

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[1] The formation of flat space from V_{pl} to $V_{г} = г^2 \cdot V_{pl} = 10^{87} cm^2 = const.$ is expanding with the speed $c = const.$: if m_{pos}, m_{neg} increasing in г time, the forces of attracition and repulsion are equal to each other by absolute value $F_g = F = F_{pl} = c^4 / G \cdot$

[2] **WILLIAM L. BURKE**, **SPACE TIME, GEOMETRY, COSMOLOGY**, University of California, Santa Cruz University Science Books, Mill Valley, California, 1980.

the parameters of maximon[1] are identical to **Planck's** parameters by absolute value. Hence, they obey to regularities $G \cdot c$ - $|m_n| = |m_{pl}| \cdot n$, $t_n = t_{pl} \cdot n$, It means, that $r_{pl}/t_{pl} = c = r_n/t_n = const$, that is the Universe space (maximona) is organized with constant velocity c, and formation of this flat space is finished, when the process of retraction and magnification of positive and negative matter is finished, that is, the space "expansion" begins from n=1 and is finished at $n = ^2 = \text{const.}$, when $r_n = r_{pl} \cdot ^2$ and $t_n = t_{pl} \cdot ^2$.
That is, the space radius of the Universe has the maximal value $R_{\text{вс}} = ^2 \cdot r_{pl} = \text{const.}$ reaching of which it becomes the stationary, static and the balance state. And this it happens just at $T_{\text{вс}} = ^2 \cdot t_{pl} = \text{const}$.

* * *

One of the physical consequences of flat space-time is that in this space-time the velocity of freely moving physical systems cannot exceed the constant скорость c, for that simple reason, first of all, that if the free physical system will possess velocity $v > c$ then, after some time, it can exceed the generation rate of flat space-time c, and nothing can prevent to it to go outside the limits of our Universe. This very important circumstance, which the cosmologists do not always consider.
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The ratio of positive mass of our Universe is closely related to the mass of our Metagalaxy $m_n/m_{мет} = 10^5$. So, the integrity of all galaxies and their superclusters, the Metagalaxy, is the integrity of all free physical systems, one is expanded in the flat space of our Universe organized with the speed c, always exceeding the velocity of an expansion of the volume of the Metagalaxy.

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[1] of our Universe

And when the formation of structure of the Universe or flat space is finished, in the case of $R_г = 2 \cdot r_{pl}$ then still some time expansion of the Metagalaxy is prolonged until the Metagalaxy will obtain a form of a stationary rotation.

More shortly, one of the physical consequences of flat space-time is the exclusion the velocities greater than c, the moving systems can have only the velocities $v \leq c$.

2.8 The arrow of time. On the irreversibility and reversibility of time.

For local physical systems, the reversibility and irreversibility of time are relative, as for the Universe are absolute.

As for the Universe, there is no external plan; the reversibility and irreversibility of time lose their meaning. For the Universe, time does not exist in the external plan. Therefore, it is impossible to consider that one possess the reversibility and irreversibility in the Universe, however, the structural infinity, which is absolutely unclosed and closed dominates in an internal plan

1) The absolute openness of structural infinity of the Universe means that links of this structural infinite chain, of local physical systems, v, continuously varying turn into the local systems distinct from; this process never stops, which means the **eternal motion of time** and the absolute irreversibility of time.

2) The absolute closeness of structural infinity of the Universe means that the links of structural infinity , the varying local physical systems, all the same prolong to remain the local physical systems. In addition, it already means that links of structural infinity of the Universe are identical; hence, the passage of one local physical system to another means the recurring of structural

links[1]. That is, the time as though, does the rotation. Within the limits of one link, this rotation of time is relative, but within the limits of all Universe, one it absolute.

Besides, absolute closeness of structural infinity of the Universe is caused by the continuous passages of formations of positive and negative pra-matter in it, as ensures the eternity of the Universe. In addition, the eternity means an absolute reversibility and the rotation time, when the absolute beginning and end are identical to each other. Absolute cause and effect are identical absolutely, unlike the absolute temporariness of the Universe or from absolute irreversibility of its time that supposes the absolute motion of time, absolute contrast and distinction of cause and effect and the beginning and end .

The openness and closeness, the finiteness and infinity of time and space of local physical systems are relative. It means that local physical systems are separated or parted from each other and from the medium relatively that their space and temporary separation, isolation and separation is relative and approximate. Consequently, describing their characteristic time is also reversible and irreversible as internally, and externally.

In an external plan the relative reversibility of time of local physical system means **the relative** coincidence, the similarity between the beginning and end of the "longevity" of this single physical system. System, as integrity in relation to the medium, has the beginning and end , the moment of an origin and the moment of destruction, which coincide approximately, not absolute, but relatively. The end of the "individual longevity" of physical system or, as physicists usually say, of the «life time», this in an interruption of characteristic time of this system, end of the arrow of time and rest. End of time of this single system comes to the beginning as though this "individual" time did the relative rotation. But the relative closeness of time means also

[1] We must always bear in mind that the direct structural elements of the Metauniverse are Armons. Надо

the relative openness, that is, the end of the "life time" of this system do not coincides absolutely with the beginning of this time. The individual arrow of time does not make the absolute rotation. The time of local system is nonreversible absolutely, but relatively. It means this time moves by spiral, and, apparently, the coil end is joined to the beginning, but actually, it comes closer, but does not coincide with the beginning. That is, the local physical system is destroyed not absolutely, but relatively. It breaks up as the whole and is destroyed, but any component of it continue to exist, carrying away some information on breaking up of system.

It means that in the external plan the characteristic time of system also is irreversible relatively and that from the general river of time of this single system some flows separate and prolong the self-conserved motion, this time, perhaps, as the part of other channel. System time breaks relativelyr (rotation!), but not entirely. The other arrows of time separate from it. Time is branched out relatively, being joined with the other general course of time. And in an internal plan time also has the difficult structure. It makes unification general and particular. In the given system there is the general course of time; that is, the system, as whole, dictates and forces the components their characteristic times were and held in this general arrow of time of system.

For these flows, the general river (arrow) of system time is considered, in general, **relatively nonreversible**. Here, it is necessary to specify: the river of system time is organized of the flows of immediate components, the last - from flows of their components. the system in its composition has such transient components on which existence the action of system is too low. Here, for the characteristic time of these overly-mediated components, the river of time of this system seems non-reversible; they do not feel the close end of existence of system and its time.

The relative reversibility and the end of system time is "felt" by intermediate components of system, the flows of their characteristic time, they also can stall and make no progress in promoting.

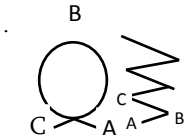
And overly-mediated components and flows of their characteristic time can go out of relative rotation, from the frameworks of rest of time of breaking up, "dying" system and independently prolong the relative course May be, as a part of other general system and in the general river of its time.

So, as a part of each local physical system and during its "longevity" new components arise and destroyed. That is, the "longevity" river, first of all is not uniform, each is from the streams; and second, consists of direct flows - in the general channel of this river new flows originate, and, having made the rotation, disappear relatively, giving rise to new streamlets.

Generally, when the contributor starts to study and, especially, focus attention on one of the major properties of subject under investigation and to go deeply in it, always there is a danger to him to exaggerate this property. Sometimes, he goes into extremes to such degree that property is considered by him as the carrier and the subject, or the property is considered as a substance separately and independently existing from the subject. It was the case with concepts of space and time. For example, **Kozyrev** assigned to the time the property of physical activity and some powerful property of transformation, meanwhile as time itself is one of principal properties and is physical characteristic of physical system. Moreover, never it is necessary to confuse and identify physical system with any of its physical properties … **Wheeler** and others considered space as a physical substance. It is time to put everything in its place. There is only one substance and one subject of study for Physics – the physical system with all its physical properties and interactions. In addition, absolutely there is no need to confuse the physical properties of system with the same physical system.

Well then, the time of local physical systems is relative, which certainly means that it has the beginning and end. This relative time, as the property of physical system, is arising and born together with the system. The local physical system has the relative beginning and end. Between the beginning and end there is "longevity" of system, which

also is final and always positive quantity ($t_2 - t_1 > 0$ or $t_2 - t_1 < 0$). Time or space with negative signs does not exist. Nevertheless, as irreversibility of time (arrow of time) is relative, as well as its reversibility, The "longevity" of local physical systems has a spiral course. And the coil on the one hand is similar to a circle, but is not the circle[1], and on the other hand, arrow of time moves with an increase and forward, but, simultaneously, it is not rectilinear, and represents a curvilinear arrow. Moreover, the most important thing, the spiral course of time has one culmination point, which is the time of "maturity" of physical system or existence of time describing the physical system:



In the figure the point B is the culmination of the development, to which the system evolves (the constructive processes and tendencies predominate in system), and after the point B the arrow of time as though changes the direction and starts to be returned back During this time the destructive processes and tendencies start to predominate in system. It means that after the culmination the system starts to "grow old"[2].

Certainly, it does not mean that the time expressing the "longevity" of system stops or decelerates; simply this arrow of time reverses its direction and, having made one coil, the "longevity" of this system is finished; its time is finished relatively. Why relatively? Why is the arrow of time moves in a spiral? Because having made one coil, this system breaks up and destroyed, but destroyed not absolutely. The

[1] two edges of a coil, the beginning and end, do not coincide with each other

[2] The amazing thing is that when one ask the old Armenian: how are you? They answer in a mysterious way – oh, out time revolves back.

super-mediated components, which "longevity" is greater, are separated and parted from it. **Prigogine** and others are assured that the atoms of our body are immortal: *" Atoms in our body are immortal, ageing is the property of populations, instead of individuals, it is true also to the inanimate world "*. I cannot agree with this widespread thought. Certainly, in comparison with the time duration of our body the atoms, which are excessively mediated components of our body, have greater longevity. So big that in comparison with human lives they are practically eternal. But, after all, we already know from the theory that even the proton has the '**final** longevity' (to my opinion $t_p > 10^{43} s$, that is equivalent to infinity for us). Therefore, based only on this fact, we can already say that atoms are not immortal. They also are temporary, have the beginning and end, besides, as single formations and as individuals. Certainly, the fact that they have the end does not mean at all that atoms and elementary particles directly, before our eyes can grow old and "die". Longevity of stable microsystems is very great. Nevertheless, it is natural and clear that they will decay and destructe at the end of the longevity. It is necessary to add that the duration of "ageing" of physical systems, which structure is relatively more difficult, is more long-term than the systems with more simple structure. So, we can say, both proton and atom 'grow old', but this ageing, as compared with their life time, is short. This is the moment of decay of a physical system. During this moment there is the relative reversibility of their arrow of time and its time of an individual life is finished, though at decay some components, which several flows (several arrows of time) prolong the motion separately. It means that the breakings up systems are destroyed not absolutely.

It is worth staying on **Prigogine's** ideas about time. He is paying a great place to time irreversibility of non-equilibrium processes, argued that: *"In the nature are reversible and irreversible processes. Irreversible processes are a rule, and reversible - elimination"*. He, actually, remains at **primary** and **distinctive** level of reversibility and irreversibility of time, does not mount on the steps of negation of negation of these concepts. For the same reason it remains not clear and

inexplicable for him, how it can be the moments of reversibility or v.v. in irreversibility? Therefore, he urges to convert to dialectics and to dialectic perception of the nature. Meanwhile, the problem consists in transferring from level of primary and distinctive levels to the level of identity of reversibility and irreversibility. Then it becomes clear that any process, both reversible and nonreversible, after which it is necessary again to distinguish, already at the higher level, that absolutely nonreversible and reversible processes or physical systems and relatively non-reversible and reversible processes or physical systems exist. Here, at this higher level of distinction, at arguing of reversibility and irreversibility of time, will be already revealed that the time of the Eternal and infinite Universe is irreversible and is reversible. That is, its time (as well as space) is unclosed and is closed. Time, or its arrow moves forward **infinitely**. But in this infinity it does rotation as the beginning and the infinity end are absolutely identical, and in infinity any point is both the beginning, and the end[1].

Contrary to this, the time of components of the Eternal Universe, of local physical systems, is nonreversible and is reversible relatively. That is, their time, as well as space, is unclosed and closed relatively, not isolated and isolated, parted and not parted relatively.

In the course of time of these local physical systems is similar to a coil, as it, on the one hand, is similar to a circle, one expresses and symbolizes the reversibility of time, but, on the other hand, the beginning and end of a coil, its edges, are not joined with each other. It does not a circle, and this expresses the relative irreversibility of time. From here, it becomes clear, why existence of processes of the relative reversibility and irreversibility, in the process of relative irreversibility, and v.v. is possible? Since the time or "longevity" of any local system reversible relatively and nonreversible, and consists of the direct and mediated components which also an essence forms of local physical systems and are presented by the relative reversibility and irreversibility

[1] It is appropriate to say also that any point at infinity can be regarded as a center and as an end.

only in this case we can say , that in the relative reversibility there are moments of the relative irreversibility and reversibility, and on the contrary. Here it is necessary to underline, that is absolutely optional, that components had shorter "longevity", than system …

Prigogine identifies the reversibility of time with symmetry, and irreversibility - with the violation of this symmetry: "*Why there is a general future? Why arrow of time always indicates in the same direction? It can mean only that our Universe represents a unit. It has a general origin, which already involves symmetry violation in time. Here we face cosmological problems*". On the one hand, it is necessary to consider as positive **Prigogine's** attempt - in a similar way to confirm the idea that our Universe is temporary and local physical system. On the other hand, boundedness of its representations about time is opened, in the meaning that it does not distinguish the absolute symmetry from the relative. Time of the Eternal Universe is absolutely symmetric

a) Not only in the meaning that its time reversible, but also in the meaning
b) Reversibility and irreversibility make unique symmetry, and even absolute symmetry. That is time of the Eternal Universe makes unity (identity) and contrasts to reversibility and irreversibility. And time of local physical systems makes the relative unity of reversibility and irreversibility.

That is why **Prigogine** approaches one-sidedly to the problem of reversibility and irreversibility of time. He considers time eternal, underlining and realizing that arrow of time is eternal: "time *is eternal, some age has the Universe, but time has no beginning nor end …"*[1]."*Arrow of time - is eternal"*[2]. There is such an impression that the arrow of eternal time, ostensibly, is one river flowing in one general side … It is, of course, not so. The infinite time has arrows of time of the infinite number, which are joined and integrated by places, and are parted and branched out. Then, when say that time has no beginning and

[1] **Ilya Prigogine , «THE END OF CERTAINTY»**, The Free Press, NY, 1997. p.145
[2] **ibid**. p. 158.

end , by this understand that the arrow of eternal time has no beginning and end, sometimes forget that the eternal time, which does not have the beginning and end, simultaneously is the absolutely reversible time, that is, time of the Eternal Universe absolutely reversible and nonreversible. Our Universe, unlike the Eternal Universe is the local physical system, hence, its time is relatively reversible and nonreversible, i.e., it has the form of coil. It is impossible to consider our Universe only nonreversible, only as non-uniform and non-equilibrium. Certainly, when all scientists almost unanimously say that our Universe is uniform and isotropic, **Prigogine's** this point of view has made a fresh impetus in the development of cosmological views. Thus, he tried to explain the evolution of our Universe and arrow of time by non-equilibrium and non-uniformity: *"The Universe from the very beginning is strongly nonequilibrium thermodynamic system with instabilities and bifurcations*[1] *"*. So, from one extreme, **Prigogine** moves to another; in this case underestimating or lost sight of the moments of homogeneity and equilibrium, which, according to Prigogine's logic, are identical to the reversibility of time. Since the reversibility and irreversibility of time in dialectic unity are not considered, this is the unilateral approach. In this case, the time of our Universe simultaneously is nonreversible and reversible relatively. It means, that time of our Universe is relatively continuous and discontinuous. On the other hand, from the point of view of philosophy the unilaterality of **Prigogine's** approach leads him to extremes and frank misunderstandings. In his opinion, the space-time is transformed into matter; however, the matter is not transformed into the space-time. According to **Prigogine,** it is the physical explanation of irreversibility of the arrow of time of our Universe. Certainly, the irreversibility should have the physical substantiation. At the heart of evolution and irreversibility of development of our Universe there are certain physical processes, which should **forbid and hinder** the reversibilities of time and, on the contrary, help promote of the arrow of time. On my deep belief, the arrow of time is nonreversible during

[1] **ibid** p. 159.

evolution of our Universe until the flat space is organized inside the structure of the Universe. Physical process of flat space formation and its arrow of time cannot be turned back, since it is caused by nonreversible physical processes, by clusters of pseudominimons. Everyone added pseudominimon advances the arrow of time forward on $t_{pl} = 10^{-43} s$, at last, having finished it to $T_n = ^2 \cdot t_{pl} = 10^{19}$ sec. It is the end of evolution or formation of flat space of our Universe, as the number of direct, primary components, of pseudominimons is restricted by the number U. =const and adding of the last pseudominimon, formation of flat space is finished. It means time promoting also is finished for our Universe. During this moment, the Universe obtains the present balanced state and stability. Unfortunately, **Prigogine** considers our Universe as strongly unbalanced thermodynamic system and he wants to prove the irreversibility of time. That is, he also continues to remain within that general opinion, that our Universe consists only of positive mass and does not perceive at all the physical existence of negative gravitational mass and negative energy and heat corresponding to it.

In my opinion, our Universe is the local physical system with positive and negative mass, and positive and negative heat, corresponding to them, which are counterpoised thermodynamically. This equilibrium is broken and immediately restored after every $10^{-43} сек$ when inside our Universe adds one pseudominimon: It is appropriate to recall the words of the great **Poincaré**: *" ... In gaps between these races, the Universe remains motionless; various instants, during which this invariable state of the Universe is conserved, obviously, cannot be distinguished from each other. Thus, we come to discontinuous time fluxion, to atom of time "*. Admires an insight of ingenious Frenchman into the problem of the course of time and the arrow of time, the flow, as the uniform physical process of unity of discontinuity and continuity. Naturally, this atom of time is called chronon, $t_{pl} = 10^{-43} c$. Between two chronons is so small duration of

time $\left(t_o \approx 10^{-43} s\right)$ that the intermittence of the general arrow of time of our Universe does not appreciable; it does not hinder and influence the physical interactions, the processes, taking place inside our Universe. For them, the general arrow of time is the continuous spreading duration, and each interval of time on this arrow greater than previous and lesser than the subsequent. That is, time always has a positive sign $\left(t_2 - t_1 > 0\right)$, which reflects the physical consequence of a flat space, the normal chain of causation. In fact, the physical properties of the formation of the internal structure of the Universe, the flat space, is both the causality and arrow of time.

We are interested in answer to the question: why is the lifetime of an individual arrow time of physical systems allotted with the free motion coincides with the general direction of the arrow of time evolution of the Universe? Why the change and development of freely moving physical systems with an inertial mass, is mostly irreversible?

These are very important problems. The positive components of an inside structure of our Universe, of the flat space, are primary black hole, although they have inertial mass, but in general, they do not have the possibility to move freely[1]. Gravitational stable connections between them do not permit to negative mass of the Universe repulse away from each other and disperse. On the other hand, this repulsion does not allow to primary black hole come close to each other by means of attraction. In this way, the stable lattice of primary black hole, in which the hard points, the primary black hole, almost in a motionless state is organized. That is, this lattice "is expanded", during what the primary black hole increases its mass and distances between them also increase. Moreover, this lattice only at the end of expansion obtains the static state and primary black hole do not increase its mass any more. Before that, during all evolution, the primary black hole forced to merge and increase their mass. However, the unification of different levels of

[1] They are in free motion, when combined, increasing their mass

primary black hole is impossible to consider as the free motion, since it is compulsory. So the primary black hole, though have an inertial mass, but in the lattice under conditions of equilibrium of general forces of repulsion and attraction, they seemed neutralized and transparent.
That is why the primary black hole do not move freely. But unlike them, the D particles or other local systems, capable to move freely under conditions of flat space, can move in different directions, except in the direction opposite to the arrow time of flat space.
This is an important circumstance. The ability to move in flat space in different directions gives the possibility to these physical systems to create junctions, unifications and local physical systems of new various forms. In addition, the arrow of time of the Universe forces these freely moving systems to be grouped and continuously create the physical systems of new degrees of complexities, that is, the evolution of matter. Origin of the difficult forms from simple, up to the person, is the outcome only of free motion of local physical systems. Without the free motion there cannot be more difficult material formations … And this evolution and the development of matter is guided and boosted by the flat space-time, by the general arrow of time of formation of structure of the Universe, which forbids to freely moving systems to move in direction opposite to the arrow of time of expansion of the Universe. With an inertial mass, the flat space as if jolts these systems forward; as Prigogine says - the arrow of time of the Universe always indicates the same direction. Why? Again, the problem arising. Because in relation to thermodynamic equilibrium of positive and negative medium, flat space or our Universe, these physical systems with positive mass only, play the role of thermodynamically non-equilibrium and unstable systems. It is evident, that at absolute zero temperature of medium, if $T_{tot} = 0$, such systems should reach an equilibrium state. This is one explanation. Also, another exists.
Scientists were tormented always by the problem, why in the complex physical systems various forms of matter arise in stratums more close to the surface, or on edges of physical system, instead of center? For example; a life. The person has appeared on the surface of the planet

Earth, instead of its depths. The planet Earth is on the brink of Solar system, instead of center, not in the Sun and not in the center of Sun. The Sun is on the brink of our galaxy, instead of its center. In turn, our galaxy is on the brink, instead of at center of cluster of our galaxies. And clusters are on the brink of the Metagalaxy, instead of it center. Why? Really, does not this direction indicates the general direction of development of matter? Especially if we know, that move from the structural center to edges of the Metagalaxy, during expansion, the averaged density of matter continuously decreases.

2.9 Addition. The spiral fluxion of the arrow of time.

The arrow of time is the characteristic of physical processes. The space and time of local physical systems, as well as their carrier, the system, also can be **invariable and varying**, or characterize the constant, stable and variable (evolution and degradation) system states.

Hence, the physical processes of stable or variable state of physical system cause the change and the invariance of space and time.

1. The equilibrium and stable or static state of system means that the system, its space and time, do not vary considerably, remain relatively constant and invariable. Or vary and fluctuate (oscillate, etc.) in such small limits that equilibrium is not violated at all, not influence the stability and firmness of physical system. For example, in this case the space can be subject to an **insignificant** strain, be flattened and even to pulse, but insignificantly. Moreover, time together with space can revolve too (to rotate)…

2. And in the case of a change, vary both space, and system time, and it also characterises a physical change of system, of course, together with a mass-energy change.

The fact that **Kozyrev** calls *as "physical activity of time"*, and Prigogine considers the constructive physical changes as arrow of time, they concern the changes of local physical system, feature this change and the most important thing, the system change means the **interconnected** change of its physical parameters and properties. That is, the change of space and system time (or its invariance), it not separate self-conserved process; it depends and is crossly caused by change of the mass-energy

of system (or an invariance). Not only a mass-energy, but also a change of all other physical properties and quantities.

It means when we speak about the arrow of time, it is necessary to search for the relative nonreversible physical processes underlying the arrow of time. It has been noted above that in any local physical system the arrow of time is one coil of a spiral, which has the culmination point, which also shows the certain duration of time after which the arrow of time of system changes its direction. That is, arrow of time (last $\Rightarrow$ present $\Rightarrow$ the future) cannot be imagined as an ascending straight line of development. It does a coil, and time of physical system, actually this lifetime, is parted on three parts (three parts, which are on the arrow of time).

the First part: the time between origin of system and its culmination,

the Second part – the time of culmination,

the Third – the time from the culmination to system destruction.

The first stage of time is the stage of constructive changes in system; it is a stage of formation and life development; second is the stage of maturity, firmness, stability and stationarity. During this stage constructive and destructive processes in the structure of physical system are balanced, after ththat the culmination arrow of time transits the third stage – the period of degradation of physical system when the destructive physical processes already predominate.

For local physical systems, the duration of these three stages of the arrow of time can be different. Culmination or stability time can be infinitely greater than the time of origin (the first stage) or destruction (the third stage). For example, the time of origin of proton. Its decay, perhaps, demands as much time, but its stability, its "life expectancy" (lifetime) is immensely great $t_{в.ж} = 10^{43} s$.

Or, a simplest atom. Its time of origination $t_{н} = 10^{-8} см / 3 \cdot 10^{10} (см / с) = 10^{-19} с$, perhaps, will last as much and its decay. But stability time lasts $t_{в.ж(н)} = 10^{19} с$.

Let now return to the "activity" of time, and also space, or as we already noted, to the change of space and system time (gradation and degradation). We are interested in cosmological problem: the change of space and time of our Universe is related stringently to the change of Universe, as the local system, and with the change of its inside structure. Formation the structure of our Universe is related to the of its two components, of positive and negative mass, or with the periodic increase 10^{62} pseudominimons. This is the complex physical process. During this process, though the general (full) mass of our Universe m_{tot} is not increasing, does not vary, but positive and negative masses, taken separately, are increasing proportionally, and as the consequence of interactions and interdependence of these two components arises, the structure of our Universe (the present large-scale structure) - the lattice or frame primary black hole is organized.

Let's note again, that this frame of primary black hole, which we consider as structure of our Universe, is defined not only by positive mass of primary black hole. The origin and existence of this frame is impossible without a negative component.

The structure organized by these two components of our Universe is characterized also by the flat space and time. During the origin and formation of structure of the Universe, its space-time remains flat, that is, in the inside plan of our Universe the space-time of its structure always remains relatively uniform and isotropic. But the Universe structure, its flat space-time (continuum) vary, organized and during this change, the homogeneity of flat space varies also, the relative isotropy, for example the homogeneity of structure is violated, the frame of primary black hole varies in one certain side, from a fine-grained homogeneity to the coarse-grained $m_{чд} = m_{pl} \rightarrow m_{чд} = \sqrt{m_{pl}}$. Only in the end of a change of this frame (in the end of cosmological evolution or expansion), the frame of our Universe finds a stable state when the coarse-grained homogeneity does not vary any more. The directional evolution and change of structure of the Universe, its flat space-time which is accompanied by constructive physical processes inside our

Universe - formation of structure of the Universe, its coarse-grained homogeneity - evolution primary black hole, characterizes and stipulates the direction of the arrow of time of our Universe, the general flow of time in which channel arise and destroy the physical systems with an inertial mas. Again we will note that the homogeneity and isotropy of flat space of our Universe should not be absolutized. The structure of our Universe is relatively uniform and isotropic, especially during formation of this structure when during everyone chronon, at every $t_{pl} = 10^{-43} c$, the homogeneity and isotropy of this structure, its flat space-time are violated and recovered though insignificantly. Only in this way are organized the flat space, structure of the Universe and a **direction** of the **arrow of time** corresponding to it. The course of evolution of our Universe and irreversibility of time in our Universe are caused by flowing of pseudominimons, which direct the process of structure formation of the Universe and the flat space-time, too. Here is the physical base and explanation of mysterious **activity** of the arrow of time. In this meaning, during evolution of our Universe (in the course of expansion), all directions of space are similar and identical to freely moving systems, except the inverse direction, which is forbidden to the arrow of time or to direction conducting from a coarse-grained homogeneity to fine-grained, which physically and consequently is impossible. Certainly, physical systems capable to move freely, can move against arrow of time (or formations of structure of the Universe), too, but such motion for these systems becomes decay and destruction process; it becomes the third stage of life time of these systems.

When our Universe reaches the end of the evolution , that is, the culminations, only in this case the Universe structure, and also the flat space-time obtain stable, steady or stationary state. Just at this time, without elimination all directions of flat space-time of the Universe are identical. This second stable, static or stationary state of our Universe, a state of extremely expanded maximon. In this state, as the local physical system, our Universe is not subjected to change, does not vary also its general scheme and its space-time. If vary, they vary insignificantly. Therefore, in this point of the culmination (in this case of stabilities) the

arrow of time as though stops. This is the stage of "maturity" of our Universe (both its structures and the structure of flat space-time) when constructive and destructive processes inside are counterpoised. It means that the physical processes going on inside the Universe (some physical systems arise, and others are destroyed) are so mediated and insignificant as compared with the Universe general scheme that they do not influence and do not change this structure at all. That is why, the arrow of time of our Universe in the inside plan as though "freezes" and stops. The given stage of existence of our Universe is very similar to the **Newton's** absolute and invariable space and time. Really, at this stage the flat space-time of our Universe as though is "absolute inertial system" for physical systems capable to the free motion. It is an "absolute receptacle" in which physical systems with an inertial mass are in the free state. During expansion of Universe these physical systems going on to move inertially, vary and develop, arising and obtaining an inertial mass, that is, obtaining the defined импульс $\vec{p} = m \cdot \vec{V}$.

As we already noted, at the culmination stage some of them are destroyed, others arise, that is, the evolution of usual matter is continued, but it completely does not act physically on the structure of our Universe, on the stability, equilibrium and stationary state of the organized flat space-time and does not change it. In papers of **Chernin** certain observations are made about it.

However, **Chernin** does not explained again, how and why this equilibrium state and integrity of galaxies and their superclusters, all the same, does not influence the equilibrium and this stability and does not change them.

We give a physical explanation to this phenomenon. The integrity of all galaxies and their superclusters in our theory from the moment of the origin, formation and during all evolution of our Universe does not influence, and cannot influence, change structure of our Universe, process and the course of formation of flat space-time, as the Metagalaxy with the mass-energy makes approximately $1/10^5$ part of the Universe, that is, the integrity of physical systems capable to the

free motion really makes an insignificant part of positive mass of our Universe, and for this reason they cannot influence and change structure of our Universe.

Thus, we convinced that the general arrow of time of our Universe is related to the formation of its structure of flat space and when formation of this structure is finished, at the moment of culmination $T_{\text{в}} = 2 \cdot t_{pl}$ then the promoting (irreversibility) of the arrow of time is finished, too. Certainly, all physical processes do not stop and continue, but all it does not favor the promoting of the general arrow of time, and takes place during period $T_{\text{в}} = 10^{19}$ sec . Time of our Universe as if is in the rest and it characterizes physically the stationary and stable state of the Universe - a state of maximon. From this state of stability and rest the Universe can be developed only in the case, when some impulse is obtained from the outside, boosting an exit from the rest and stability and changing its structure the degradation.

In our Universe, there is a passage from the coarse-grained homogeneity to fine-grained one, as the arrow of time of the Universe from the culmination point means, that is, after the relative rest continues the motion, but in opposite side, towards the decay and system destruction. It means that from our Universe periodically, every $10^{-49} сек$, separate 10^{62} pseudominimons and, eventually, our Universe as the local single physical system ceases to exist, its lifetime $t_{lt} = t_{\text{в}} \cdot 2 = 10^{81} сек$ is finished. It is the total duration of the coil of the arrow of time. However, if to consider the backward direction of the arrow of time, after the coil culmination $t_{вж} = t_{\text{в}} / 2 = 10^{19} c / 2 = 10^{-43} сек$, it is just necessary to consider that it does not mean the returning to the beginning of lifetime of our Universe, and that end of life time of our Universe coincides with the beginning of life time of other Universe.

2.10 Local and final essence of flat space, its relative openness and closeness.

The flat space has final radius. However, Einstein also said that the radius of curvature of flat space is infinite or equal to zero. In

addition, there is an opinion that the flat space is the infinite space, but this is erroneous, purely geometrical (mathematical) representation about the flat space. Since "flat" is perceived as an analogy to flat surface or straight line, whose ends are spread infinitely and do not interrupted at continuation, unlike the curve, or curved surface, whose extremities at continuation are crossed and intersected, as in the case of line and surface. The flat and curved space is perceived in the same way. However, this is the abstract mathematical representation about the flat space. Such flat space has no physical origin and does not possess any physical properties and not lead to physical consequences.

In addition, we are particularly interested in the "physical space" or, more precisely, in the space of local physical system in their inside and outside plan. Since the properties of physical systems have the physical essence, the space under investigation should also be the physical essence and have physical properties and as essence it should have its physical origin and cause of this origin.

Investigating our Universe as the local physical system and exploring its internal space, we actually side with **Leibnitz**. Really, this inside space is almost identical to the structure of the system organized of components. Hence, this inside structure of system characterizes its space (the inside plan). It means, if space is flat then it is based on the structure of the system. This structure is the **physical cause** of flat space. From here, the questions arising - of what consists this structure? Which leads to this flat space? How consists and how is organized? Moreover, this structure results to the flat space both in the beginning of formation and during all lifetime of our Universe. We have already found out that our Universe is formed of positive and negative components, which counterpoise each other. The **negative component** of this structure possesses the negative curvature of space, and the positive possesses the positive curvature, correspondingly. And, in the beginning of evolution of our Universe and in the beginning of formation of structure and flat space, the absolute value of any of these components is extremely great and remains equal to each other in the all duration of evolution - $|K| = 1/\left(r_{pl}^2 \cdot n^2\right)$. Now pay attention to the fact,

why we do not agree with the standard idea that the flat space infinite and cannot be final?

All this for the simple reason that our flat space has its physical origin, consists of two physical components, which are represented by two opposite forces. These forces, which act in accordance with the Newton's third law, but as by nature are mass forces of (gravitational) interactions they make unity. These two components make the uniform structure of our Universe, which has the final space volume primarily due to the finite number of ^{2} bricks of pseudominimons. Besides, the flat space of our Universe has the final volume or final radius for that remarkable physical reason that positive and negative components suppress each other and counterpoise. It does not mean that the positive curvature of space of its components will absolutely neutralize and destroy the physical properties and consequences of negative curvature of negative component. It means simply that positive curvature restricts the physical properties of negative curvature of space. As well as, the negative curvature restricts properties of positive curvature. Thus, it is obtained that the structure of our Universe is organized, which space though also flat, but final. None of the components is greater by force than other, and for this reason, flat space is not subject to neither an absolute collapse, nor the absolute anti-collapse. The positive component of our Universe, the positive curvature of space by its physical action (attraction) does not allow to that structure of the Universe and its space to be **absolutely unclosed**. In addition, **the negative component,** the negative curvature of space, by its physical action (repulsion) does not allow to the structure of Universe to be **absolutely closed**. That is, the equilibrium of these two forces ensures the relative openness and closeness of flat space of our Universe. The Radii of positive and negative curvature always remain equal to each other both suppress each other and restrict. That is why I am convinced that our Universe has final radius inside the flat space.

Our Universe exhibits the surprising regularities of evolution . During this evolution, the positive and negative curvatures of flat space always are equal to each other though the volume of space is increasing. And the most important thing, the masses of positive and negative

components of our Universe are increasing $|m_n| = n \cdot m_{pl}$, but the repulsive and attraction forces of these two components always remain identical by absolute value $F = c^4/G = const$. Once again, here is necessary to remind that the structure of our Universe doth in the beginning of evolution and during it always is in the balanced state. Naturally, there is a problem: how to combine eternal equilibrium with evolution in this case, with the change or with expansion? Our cosmic model ensures the dialectic unification of equilibrium and non-equilibrium, the rest and change ahd the static and developmental moments. This unity is ensured by the fact that positive and negative components vary separately from each other, but this change proportionally and uniformly so that it is never violated, and their equilibrium is always conserved.

$$\frac{1}{n^2} \cdot \left(\frac{1}{r_{pl}^2} + \left(-\frac{1}{r_{pl}^2} \right) \right) = \frac{G \cdot \varepsilon_n}{c^4} + \left(-\frac{G \cdot \varepsilon_n}{c^4} \right)$$

This equation expresses the equilibrium of structure of our Universe and the corresponding flat space. Both sides of this equation are always vanishing, equal to zero. That is, the left-hand side of the equation, which describes the space curvature, is always equal to zero and shows that the space consists of two components: of positive and negative curvatures, which always are equal to each other by absolute value. At any value n the flat space remains always flat though its real radius can vary in n times. The right side of the equation expresses the density of energy (mass) of our Universe and shows, that the all mass-energy of our Universe consists of two components - from positive and negative mass-energy, which always counterpoise each other, at any value n and $\varepsilon_{tot} = \varepsilon_n + (-\varepsilon_n) = 0$. That is, our cosmological equation is extremely symmetric.

It is necessary to add here, that $1 \le n \le ²$, that is, the Armon variable n has the beginning and end, it cannot be lesser than unity and greater than $²$, that is. $n = ²$ or $n = 1$ it is extreme and critical values

of n, $\left|\varepsilon_{pl}\right| = \left|c^4 / G r_{pl}^2\right|$ or $|\varepsilon_{\text{n}}| = \left|c^4 \cdot K_n / G\right| \rightarrow |\text{K}_{\text{n}}| = \left|1/r_{pl}^2\right| \cdot 1/n^2$, when n=1 $\left|1/r_{pl}^2\right| = \left|G \cdot \varepsilon_{pl} / c^4\right|$,

$$\frac{1}{r_{pl}^2} + \left(-\frac{1}{r_{pl}^2}\right) = \frac{G \cdot \varepsilon_{pl}}{c^4} + \left(-\frac{G \cdot \varepsilon_{pl}}{c^4}\right) = 0$$

Thus, $\left|\text{q}_{\text{pl}}\right| = 10^{114}\, эрг / см^3$ in our Universe, but $\varepsilon_{\text{tot}} = \varepsilon_{\text{n}} + (-\varepsilon_{\text{n}}) = 0$, $\text{m}_{\text{tot}} = \text{m}_{\text{pl}} + \left(-\text{m}_{\text{pl}}\right) = 0$, but spaces $\text{V}_{\text{n}} = \text{v}_{\text{pl}} = 10^{-99} см^3$ as the radius of space r_{n} is approximately equal to r_{pl}: $\text{r}_{\text{n}} = \text{r}_{\text{pl}} + \text{r}_{\text{i}} \approx \text{r}_{\text{pl}}$, where r_{i} is an imaginary quantity and expresses also the radius of negative curvature and it is equal modulo r_{pl} its total also will be equal to r_{pl}.

When $\text{n} = 2$, then

$$\frac{1}{r_2^2} + \left(-\frac{1}{r_2^2}\right) = \frac{G\varepsilon_2}{c^4} + \left(-\frac{G\varepsilon_2}{c^4}\right) = 0.$$

The full mass of our Universe $\text{m}_{\text{tot}} = 10^{57} g - 10^{57} g = 0$, but the volume is equal to $\text{V}_2 = \left(\text{r} \cdot 2\right)^3 = 10^{87} см^3$, which is the real radius of Universe $\text{R}_2 = \text{R}_2 + \text{R}_2\,\text{i} \approx 2 \cdot \text{R}_{\text{pl}} = 10^{29} см$.

As we see, the flat space of our Universe, the curvature of which is equal to zero, has final real radius and volume and at each stage of cosmological development

$\text{r}_{\text{n}} = \text{r}_{\text{pl}}\text{n} \rightarrow \text{r}_2 = \text{r}_{\text{pl}} \cdot 2$, $\text{V}_{\text{n}} = \text{r}^3{}_{\text{pl}}\text{n}^3 \rightarrow \text{V}_2 = \text{r}^3{}_{\text{pl}} \cdot 2^3$

2.11 Addition. The problems of theory of relativity and the ways of their solution

We first discuss the problem of special theory of relativity (STR), it is “the theory of flat space the theory of flat space and time”. It does not consider, why space time plainly and quasi-**Euclidean**. It assumes this fact as a basis and describes the motion of particles in this

continuum. Moreover, as the space and time of Minkovsky have no gravitational fields in this theory, for light propagation it can be considered as empty. It is natural that in this empty space light moves freely, rectilinearly and with the constant velocity, not being subjected to any physical action, force or hindrance. The greatest problem of the STR is the constancy of light speed c. In the STR the constant speed of light, $c = const.$, chosen as postulate. The same postulate is the **Minkovsky's** space-time. And it is not clear, why it is necessary to accept these two postulates without the explanation and physical verification.

The theory, based on certain postulates (axioms) and experimental facts, should manage, eventually, and give some scientific explanation to these foundation, postulates and constants after theory build-up. However, in the STR such explanations is not present and cannot be. It would be logical to expect, that in a general or generalized relativity theory the explanation to these problems will be given.

Einstein itself admits, that the GTR, or the gravitation theory, being based on the STR, also takes as a finished form the flat space and explains origin of gravitation by presence of mass in this space. The best achievement of the **Einstein's** theory of gravitation is the integration of two, at first sight incompatible, physical concepts - the energy-mass and space-time. That is, on the one hand, he developed the **Newton's** concepts, supposing that the cause and attraction carrier is the mass-energy. He had discovered equivalence of mass and energy and had shown that the energy and mass are two various developments of the same essence or the same attribute of matter and, hence, they can be integrated into one essence or into one concept. On the other hand, developing the non-**Euclidean** geometry representations about space and, especially, relating properties of space with the physical causes, **Einstein** has come to conclusion that the space-time curvature is caused by the presence of certain mass. That is, the certain mass, which has appeared in **Minkovsky's** space-time, in flat space generates round itself the curvature of this space. It is **Einstein's** most remarkable idea: gravitation is curvature of space, which is caused by certain energy and

mass of matter. We will write his well-known formula for gravitational field:

$$R_{m\nu} - \frac{1}{2} \cdot G_{m\nu} \cdot R = \frac{8 \cdot \pi \cdot G \cdot T_{m\nu}}{c^4} .$$

The left-hand side of this equation describes the curvature of space, and the right – the energy-mass of space which has been generated by this curvature. This formula is incomplete, and it was discovered soon. Einstein itself was very dissatisfied with it and has devoted his last 35 years of the life to overcome the shortage of the theory of gravitation. The fact that this formula is inadequate, does not mean that it is totally wrong, not at all. It simply means that it requires addition, generalization and expansion. Repeated efforts of scientists in this field have almost century-long history. As noted at the time **Stanyukovich**, in fact, all these attempts were formal. That is, these attempts did not go beyond mathematics, while this problem is physical. For example, the first attempt to generalize **Einstein** himself did.. It is the problem of static cosmological model, which he has created. This **Einstein's** attempt, perhaps, is the single attempt of conceptual generalization, and remained in history. Let us follow the logic of the genial physicist. Writing down his well-known formula of gravitation, he was preoccupied with the task of creating the physical model of the world or Universe, of course, taking his formula of the gravitational field as a basis. But after that became clear that this formula cannot be applied to the description of Universe. Why? Because according to his philosophical representations, the Universe as integrity is unchangeable. In addition, returning a tribute of this tradition, **Einstein** decided to create such cosmological model of the Universe, which should reflect this invariability. This invariability, first of all, means the invariance of volume or Universe radius, just as the invariance of energy-mass, and, hence, the invariance of an averaged density . But how to reach such a model? After all, the aforementioned equation does not satisfy to this requirement. Thanks to gravitation, this equation expresses only varying model. Here **Einstein** has made improbably courageous step in the history physics. It has developed the idea of existence of the universal

repulsion, along with the universal attraction. He has introduced into his formula the well-known cosmological constant Λ which, in his opinion, characterizes the universal repulsion equal by force and capable to counterpoise the universal attraction. This attempt remained in history as the first and single attempt of conceptual generalization of the gravitational theory, which, despite the essential shortage, indicated a single correct trajectory of generalization of GTR[1]. And below we will dwell on the historically first cosmic model of **Einstein**.

1. The importance of this model is that it was an attempt to describe the static and invariable state of cosmological model. However, further, thanks to theoretical works of **Fridman-Lemaître** and observations of **Hubbles**, the static model of the Universe generally has been rejected; for me it is rejected from the point of view of Armon's theory. That cosmological model, which describes only the one-sided, either static, or varying state is insufficient. On my deep belief, only cosmological model of full value, which is capable to characterize and unite these two opposite approaches, that is, it describes the static and varying state. Hence, we have no right to refuse completely the **Einstein's** idea about the static cosmic models[2]. Nevertheless, we also have no right to negate or refuse the achievements of expanded cosmic models. Hence, our problem consists in uniting these two approaches and concepts in one uniform cosmic model - in Armon's cosmic models. In any case, the dialectic suggests us that. However, this unification should not be formal and mechanistic, but essential and dialectic. The static state cosmic models should comprise the possibility of change, evolution , expansion or compression. On the contrary, the varying state cosmic models should have the moment of static character and tendency to reach the static state during this change.

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[1] Our considerations devoted to the "Odyssey" of cosmological constant Λ, we will present in the separate Section.

[2] In these sense the efforts of Hoyle, Bondi et.al. should be considered as positive, despite they fall in other ectremity, traying to reject the expanding cosmic model

Hence, it is not necessary to negate the static cosmic model of **Einstein**, and finding its shortages, to overcome and clean them, reaching the perfect static model. The scientists **Friedman**, **Eddington**, etc. in due time have revealed, that the static character and invariance of cosmological equations of **Einstein** is illusory. Why? Because according to **Einstein**, the cosmological term Λ is constant, but the terms, which are in two different sides of the equation, do not counterpoise each other, absolutely. Minor alteration of radius R violates the equilibrium between the universal attraction and repulsion, that in due course, can increase even more; hence, the steadiness and static character of system is illusory and not perfect. If we will analyze the **Einstein's** cosmological formula in details, the aforementioned shortage can be overcome only if to accept $\Lambda = 1/R^2$ where R the radius of the Universe and

$$a_{tot} = -\frac{Gm}{R^2} + \frac{\Lambda c^2}{3} R \quad , \quad a_{tot} = 0 \rightarrow \frac{Gm}{R^2} = \frac{\Lambda c^2}{3} R \quad .$$

In this last equation the expression in the right side is comparable to expression in a left-hand side, if to accept, that $\Lambda = 1/R^2$ is variable, and $m = Rc^2/G$. Having substituted these values into this equation, we will obtain identity $c^2/R = c^2/R$. It means and a_{tot} is possible to present in the same way, $a_{tot} = c^2/R - c^2/R = 0$. In this case, it the absolutely stable and static cosmic model is obtained. Here, nevertheless, there is one big omission. It remains not clear, what physical nature and explanation has this term Λ expressing the universal repulsion, which we have accepted varying and what physical cause of this universal repulsion is. To elucidate this problem it is necessary to return to the **Einstein's** basic equation of gravitation. Inferiority of this equation Einstein itself considered as the basic shortage of the theory, of the General theory of relativity (GTR). His theory a priori, accepted as base the flat space, and on this background the theory describing the curvature of space - the gravitation, arising because of the mass of

matter is constructed. But this theory has not been able to explain the physical reasons for the emergence and existence of flat space. It means that the **Einstein's** well-known formula need to be extended in this direction.

Adding a cosmological constant in the formula, he has tried to oppose to the universal gravitation force the equivalent of it - the universal repulsion. That is, its basic idea and supposition was correct, but fulfillment was wrong. Why?

a) The attraction which **Einstein** represents as the curvature of space arising due to any positive energy-mass and which is changed, depends on quantity of this energy-mass and the distance from gravitating mass.

b) And why not to present the repulsion, as the curvature of the space, which have arisen from the negative energy-mass. The repulsion, which, unlike the positive attraction, has the physical carrier, the type of matter possessing the negative energy-mass.

From the above it becomes clear that **Einstein** has not achieved his object, having added the cosmological term in the formula, because term Λ in the cosmological equation, representing the repulsion, has been presented without its carrier, without tensor of negative energy-mass. After all Λ has dimensionality $-1/R^2$, that is, represents the curvature of space. According to **Einstein**, the curvature of space has some physical cause, the energy/mass. Hence, it is logical to draw a deduction that positive energy/mass generates positive curvature of space, and negative energy/mass generates the negative. It means, that in the left-hand side of the equation **of Einstein** (in geometrical) side the expression of curvature of space, and in the right side - the cause, the carrier of this curvature is presented: the tensor of energy-mass. It means, the same need to be made with the tensor of negative curvature characterizing the repulsion, and with the tensor of negative energy-mass. That is, these last need to be added in the equation of gravitation **of Einstein**. In this case, we will obtain one equation, in which the terms from the left side and from right side counterpoise each other both separately, and in unison. Each term of the equation, varying n time,

changes others by same appropriate quantity. The total sum of all terms in this equation is always equal to zero. What does it mean? It means that **Einstein's** basic equation, which represents the violation of higher symmetry, it only one side and one part of this symmetry. Moreover, we have simply restored this symmetry, adding the equation in other side as well. Moreover, the new obtained equation satisfies to the **Newton's** basic law - in our equation the acting and counteracting forces are equivalent, and consequently they counterpoise repulsion and attraction of each other. And it means that these two physical forces - two basic types of matter possessing positive and negative energy-mass, which generate opposite forces both positive and negative curvature of space, are equivalent and counterpoise each other, forming the flat space-time. That is, counterpoising each other, they do not destroy each other, and is simple, one restricts and suppresses another. The matter with the positive energy-mass and the attraction does not allow that the matter of negative energy-mass due to repulsion would dissipate in infinity, disappear and, thus, would evaporate. In turn, the matter with the negative energy-mass does not allow that positive matter, thanks to the attraction, was subject to the absolute collapse, turn to infinitesimally small point and disappear. It means that these two phenomena do not destroy each other, and counterpoising, generate a new quality and the physical reality of matter, which obtains the property to be presented in the form of local physical systems. Therefore, we will already deal with the local physical system, which possesses the final physical parameters. So, we come close to the quantum description, getting rid along the way from unnecessary perpetuities and absolute zero.

Though, it seems from the first sight that the flat space-time cannot be local and restricted as it was considered till now, but it is not so. As we will see later, both the number of parts of positive and negative matter, and the linear space sizes of ours cosmic models are final and defined by the Armon constant.

Here it is necessary to make some additional clarification:

1) since the coefficient G/c^4 appeared from the very beginning in **Einstein's** equation it is necessary, first of all, to consider its

physical meaning. This coefficient, on our deep belief, has the important physical meaning and an inside content. It is surprising, how **Einstein** has not noticed it and not paid much attention to the fact that $c^4/G = F_{Pl}$, that is, this parameter has the dimension of force, which means, one is related to the paradigm of **Planck** parameters. It is one of **Planck's** parameters, though it contains the **Newton's** gravitation constant and the relativistic constant c, but this is one of the basic concepts of field of $G \cdot c \cdot h$-physics and expresses itself as the Armon force. The fashion it has appeared both in **Einstein's** gravitational equation and in our equation of gravitation and repulsion unity, suggests us, that this coefficient has certain functional value. Which one? This coefficient, first of all, indicates, that

1) terms in the right and left sides should be (initially) the **Planck's** quantities and to have values of quantities **of Planck**, to vary according to these values, that is, to have the minimal and maximal numerical values which are defined Armon by variable $n \left(1 \le n \le ^{2} = 10^{62}\right)$.

2) Coefficient G/c^4 also means that both positive and negative masses of the given system (of cosmic Armon model) are increased by portions equal to the **Planck** mass: $m_n = m_{pl} \cdot n \left(m_{2} = m_{pl} \cdot ^{2} = 10^{-5} g \cdot 10^{62} = 10^{57} g\right)$, that is, in system of Armon both positive and negative masses have the minimal and maximal values: $^{\Gamma}$ and $10^{57} g$. The same is related to numerical values of radiuses of negative and positive curvatures of internal space of system. They also have minimal and maximal values: $10^{-33} см$ and $10^{29} см$.

That is, the linear structure of inside space cosmic models also has the quantum nature and from the minimal numerical value, being increased proportionally, reaches the maximum value: $r_n = c \cdot t_{pl} \cdot n$.

3) Our equation reflecting the unity of gravitation and repulsion, is perfect and symmetric. It expresses the internal state of local physical system, of Universe (pseudomaximon) and gives the possibility to integrate concepts of static nature and change in the spirit of physics. That is, our equation reflects and describes both the rest and the state of the uniform change; but as equation expressing an inside physical state of local physical system -, it varies only at external influences.

* * *

"It is possible to prove convincingly that the reality cannot be presented by continuous field at all. From quantum phenomena, apparently, follows that the final system with final energy can be described by final set of numbers (quantum numbers) completely. It, apparently, cannot be combined with the theory of continuum and demands for description of reality of purely algebraic theory. However now nobody knows how to discover the base for such theory"[1].

Encouraged the fact that this prediction of brilliant thinker becomes a reality in the new times and new conditions of scientific development. As though to realize **Einstein's** major dream, the Lord and the Nature have met me, the philosopher with knowledge of mathematics, restricted by algebra.

Einstein's idea, that final and local systems should have final properties and can be described by restricted amount of quantum numbers, and that for this purpose it is required to describe the reality by purely algebraic theory, starts with his conceptual position and from its general relation to quantum theory, and also with its feeling of dissatisfaction in relation to his own theory. In a word, **Einstein** dreamt to be saved of indeterminacies and infinity available in cosmic microphysics. This desire peculiar to human reason - break by knowledge the complex objects and phenomena into properties and parts, to clear connection and the relationships existing between them and to sum up, to obtain an overall picture of the given object or phenomenon. That is, in the development of science always there was

[1] A. Einstein**, COLLECTED WORKS** T.2, стр. 873

the desire - to learn and describe the complex physical systems, as certain integrity of final number of components having final properties. That is where there are large numbers of coincidence occurring in Astroparticle Physics, or, more precisely, the value and functions of Armon number.

Therefore, the **Einstein's** above-stated reasoning needs to be extended. At last, the problem on local and final physical system is raised, let it be in micro or mega scales. It the last years of life, **Einstein** has understood, anyway, all testifies to this.

It is appropriate to note that it is possible also to consider the Eternal Universe as final, local physical system, but unlike all its components, the finiteness of the Metauniverse is absolute, as there is nothing out of it, to what the Metauniverse would correspond as an integrity; therefore it is absolutely final as the system, absolutely isolated, absolutely closed and absolutely local.

As the integrity and physical system the Metauniverse is possible to explore and describe only by inside scales, in relationships of the components, and in an external scale it cannot be the object of examination of science.

In a word, as physicists say, the physics is always local, but this true is realized not by all. The Physics always deals with local, final, restricted, temporary and relative physical systems, which possess final, temporary and relative physical properties. It means that final physical properties of local physical systems can be and should be described by final physical quantities of finite number. That is, the physical properties of any local physical system can and should have the definite and precise both minimal and maximal values.

Einstein has been convinced that the reality can be described by purely algebraic theory, but as he admitted, he did not know how to discover the base for such theory or what could be necessary in the base of such theory. And reallly, what can be at the heart of such theory?

On what principle? With help of what limiting conditions, it is possible to construct such theory? The main principle, more precisely, the main principal law, on which base it is possible to construct the

theory, is the conservation law of physical system. And the law requires that:

1) any local physical system, its performances and physical properties was final, as ensures transition, rotation and conservation of local physical systems of all types;

2) types of local physical systems should be finite, also their physical properties should have the minimal and maximal values.

For this reason the local physical systems of all types can be described by four basic constant and four variables $(G, h, c, ^{2})_{и}$ (m, r, t, n). Here Armon number represented by Armon constant and variable is designed to provide the algebraicity of theory. Thanks to it, it is probable to describe the theory by means of simple algebra. One of the important requirements for the general theory is principle of dimensionality; it is necessary to represent formulas of all laws in finite form.

3. Basics of the General Physical Theory

3.1 Foreword

The universal physical theory is formed and organized by the generalization of all previous physical theories and as that is considered the complete and closed theory, universal and generalized, extremely volumetric and one comprehends everything.

Generally, the scientific knowledge has two directions:

1) from particular to abstract, or from single to general and

2) from abstract to particular, or from general to the single.

This is uniform screw motion, and science (physics, in the given particular case) during its historical development and on the way of formation of theory does many such coils, yet does not reach the vertex of the generalization (abstraction) related to the subject of the examination – comprehensive generalization and it is impossible to extend more, not being beyond an object of research. Thus, the theory becomes complete and perfect after that it is necessary to apply this theory to particular cases to study the concrete physical phenomena.

And now we will try to define Physics, as a Science. Physics, as usually say, is the Science about Nature and natural phenomena. This is rather natural philosophy definition than paradigm. It is our belief, the **the subject of study of Physics is physical systems: their basic types, origin and destruction, and interactions** etc. It seems that our definition is extremely abstracted and is too far from Nature and natural phenomena. However, it is not so. The Physics is studying really the physical systems that reflect, describe the structure of the Eternal and Infinite Universe, its structural components, as well as the micro- and mega phenomena of Nature.

So, the Physics is studying also the Eternal Universe, but the Eternal Universe, as physical system, is absolute (non-local), hence, this study not of full value since it cannot be considered as a whole from the "outside".. For this reason, **the Physics is studying, in general, the relative, local, final and temporary physical systems,** which are differing from absolute system and being in its contents. Really, the Physics is always local.

However, it all does not mean that the Universal Physical theory not capable to study and feature the Eternal Universe. The absolute system can be studied also as the structural **hierarchical chain is closed in infinity** . That is, its eternal existence is caused by the eternal rotation of matter, which means – in general, there is only one absolute perpetuum mobile and it is the Eternal Universe or Metauniverse. The final problem of the Universal Physical theory is to study and describe the mechanism of this perpetuum mobile (as has told **Wheeler**), that is, to show the mechanism of eternal rotation of matter in Metauniverse.

Since the structural hierarchical chain of Metauniverse it is closed in infinity, it means also that in this infinite chain the structural hierarchical rings are iterated; they are identical, hence, studying and describing one of the rings of this chain, we can imagine, hoq the rotation of matter is taking place in this infinite chain. So, it comes out that we have cognized and studied the Eternal and Infinite, though, as would say **Narekatsi**, not wholly, nor in full form.

As the principal and ultimate goal of theory the study and the explanation of "mechanism" of eternal rotation of matter and the eternal

existence of the Universe; hence, this idea is put in the basement of theory from the very beginning. In addition, based on initial hypothesis, the "building" of all theory is constructed, which, eventually, becomes the proof and verification of correctness of this hypothesis in the integrity.

Thus, the theory begins with this principal and initial idea, which shows its requirements and limitations:

1. The Metauniverse as an absolute system, one and single, the second such system cannot exist essentially; that is, out of the Metauniverse there are no physical systems at all. And
2. if there are the physical systems differing from the Metauniverse, they exist only in its composition, as components. It means that the physical systems of all types, which are in the composition of the Eternal Universe, are not eternal, but local, relative and temporary ones.

3. If the Metauniverse is perfect absolutely, the local physical systems are perfect relatively; they are insufficient and incomplete. That is why the Eternal Universe or the Metauniverse, varying, nevertheless cannot turn into the other physical system, which is distinct from it. The Eternal Universe, varying, nevertheless turns in itself always, and the local physical systems as incomplete, always "seek" to vary (seek to perfection). In addition, during this change they "seek" to turn to other physical systems differing from them. However, any local physical system, to whatever changes it is subjected and to whatever physical systems it has turned, all the same, it always remains the local physical system. From this comes the main and universal law of General Physical theory - the law of conservation of the physical system.

3.2 Main types of physical systems

In general, it is possible to distinguish between two forms of physical systems - the absolute and relative. The absolute physical system is one and unique the Metauniverse. The relative physical systems are local and finite physical systems.

So, mainly, we deal with the local physical systems, which forms are

a) Not free **systems -** formations of pra-matter, as local physical systems. It is one of forms of local physical systems, it characterized by lack of inertial mass, and, hence, the free motion. Such are **Армоны and Pseudoarmons** (with some stipulations - also gravitons and anti-gravitons).

b) **free systems,** to this second form of local systems belong all those physical systems, which possess an inertial mass and property of the free motion. The physical systems, which have the inertial mass can be divided into two sub-species -the **local gravitational** and **local quantum systems**.

1. Local gravitational systems. For them $m_{pl} \geq m_{к}$ and $m_{pl} \leq m_{g}$, they are gravitational impaction with positive mass, the limiting form of them is the relative black holes. That is, all physical particles with mass greater than **Planck's** mass (cluster, galaxy, star, planet, meteorite, the macrosystems, from atomic aggregates to the human etc.), all of them are gravitational impactions, which for some reasons were not contracted for the present and did not become the relative black holes or they come out of $r_{g.}$

2. Local quantum systems with $m_{pl} \geq m_{k}$, they are physical systems with positive energy-mass are elementary particles (and the atoms and molecules made of them). They obey to quantum regularities and, naturally enough, are studied in quantum theories.

3.3 Conservation law of physical system

For the second year, when I studied intensively the Philosophy, I was especially interested in an idea[1] that the Eternal Universe construction is so harmonic, that *if we remove from it even one speck of dust, then the structure of the Universe will collapse*. This idea is expressed differently in Philosophy, in the Literature and in mythology

[1] the idea put forward by the ancient philosophers

of the most ancient people. Still then, I have already been convinced that any physical system and any structure is conserved in infinity of the Universe. I argued so: the telephone does not grow on trees; it was invented by the person living on the planet Earth but if phone and its inventor did not exist always in the infinite Universe, they could not appear in this Universe and in our local world. Which is possible in the local part of the Universe, takes place in the infinity of the Metagalaxy. These reflexions have become stronger, especially after acquaintance with the historical analysis of **Engels,** which studied the process of deriving of conservation law of motion. **Engels** shows beautifully, how develops a scientific idea in the process of historical development of physical theory: by generalizations, from unitary to the especial forms of a motion. In addition, in the end, by studying the transformations of special forms of motion, the science comes to extended ones, and in this meaning, to final and perfect representation about motion - to the conservation law of motion. According to the logic of the same historical development, the other conservation laws were organized also: law of conservation of mass and energies, momentums, etc., which are considered till now in the physics separately and without their unity. Even the study of relations between different conservation laws is not considered as one of the ways for revealing the one general conservation law, as the manifestation of unity of existing conservation laws.

Not going deep into the history of attempts to discover such general conservation law, just want to note the following. First and foremost, it is inadmissible to assume that by the level of generalization the law of conservation and transformation of energy is higher than other conservation laws. In the same way, one should not consider the energy, as physical quantity or as physical property (attribute) of physical system, like more general attribute, than mass, motion, entropy etc.

Therefore, the physical quantities expressing the attributes of physical system, as though we generalize them, all the same, all of them remain the physical quantities expressing the basic properties of physical system. In addition, it is impossible for one or other of them, more generalized physical quantity, to include other quantities so that all

other physical quantities would be particular demonstrations of this general physical quantity.

Another matter, when between all conservation laws and between all conserved physical quantities new relations and transitions (equivalence) become known. Hence, any physical quantity can be expressed by other physical quantities; it concerns as well the conservation laws. We obtain some peculiar rotation of physical quantities reflecting the basic qualities of physical system and their conservation laws. Thus, it become clear for myself the following: there is no actually more generalized physical quantity, which would include all other physical quantities as its limiting cases. But it does not mean and does not follow from here that there cannot be more generalized conservation law than the law of conservation of energy. Such generalized conservation law is possible and real. Nevertheless, this law will be not the conservation law of any more general physical quantity, but the conservation law relating to the "physical" concept, which by its the level of generalization will be higher than the concept "physical quantity". In the physical theory we have such concept, one is the concept of "physical system", being the subject of study by General Physics theory.

It is especially necessary to distinguish that, though the physical system also is conserved and transformed, but it is distinct from the conserved physical quantities, which show the basic physical qualities and attributes of physical system. "The physical system" is the major and most general category of the theory, in relation to which the physical quantities are additional and second category concepts.

Therefore, the logic of historical formation of different conservation laws shows that it is necessary to extend and come to detection **of a single**, important and generalized conservation law to reach the unity and completeness of the theory. For this purpose, there are two bases, two causes and two boosting circumstances:

1. The set of existing conservation laws and the logical inside requirement of their unification that will follow from detection of the relations, existing between these conservation laws.

2. The existence of set of types of local physical systems, that also makes the logical demand to unificate and generalizate on the basis of general properties.

* * *

The contraposition of local physical systems of the Metagalaxy has essential and conceptual value. From it follows that all types of local physical systems, as though they varied, whatever forms they obtain and whatever actions accept, at any interactions and transformations they continue to remain invariable and as the local physical systems. After all, the Eternal Universe also not only varies but also is conserved, as invariable. Therefore, summing all, we can say that the **law of conservation and transformation** of physical system is the major, fundamental and universal law of general physical theory. For me becomes clear that the principal concept and category of the Universal physical theory is the “physical system”, and the principal law as, was noted above, is the law of conservation and transition of physical system. The Universal physical theory is the theoretical generalization and deployment of content of these concept and law.

* * *

The principal conservation and transformation law, as matter of fact, has complex structure. All particular conservation laws are separate segments of this structure. In the same way, as any separately taken physical property cannot substitute and reveal the essence of physical system and physical system as integrity, both all its rich content, and each particular conservation law cannot substitute the conservation law of physical system and reflect all the variety of content of this law.

The law of conservation and transitions of physical system is integrity of all possible conservation laws. In this integrity, based on equivalence, the particular conservation laws reveal the possibilities of transformation to each other, which, thanks to universal relations and transitions of these particular laws, ensures the "rotation "of particular laws.

3.4 About a possible mathematical statement of the principal law.

Within thirty years, I repitedly tried to discover the definition and statement of the principal law. Today, I have come to the major deduction that any mathematical formulation of this law, the main role in it should play the Armon number.

* * *

3.5 The role, value and functions of the conservation law of physical system

From the point of view of knowledge and logic (briefly, from the point of view of dialectics) the principal conservation law is simultaneously also the Universal physical theory taken as a whole. Moreover, it is main principle, the logic "algorithm" and principal postulate, used for construction of this theory, the proof and substantiation or logic expansion and development of which is just represents by itself this theory.

The Principal conservation law has a heuristic value. Since all physical quantities express the properties and attributes of physical system, in other words, they are the essence of performance of physical system; hence, the conservation law of any of them is the particular development of the principal conservation law. From here we do the important deduction - if exists the laws of conservation of mass, energies, momentums and conservation laws of other physical quantities, there should be also the conservation laws of other quantities of physical system which are the space and time, the information and entropy and so on are.

As matter of fact, all formulas and the equations known in the modern physics and presented in final mathematical form based on the principle of dimensionality is possible to consider as conservation laws and transformations of the given physical quantity; for example, $E_0 = m_0 \cdot c^2$ or $E_0 = r \cdot c^2 / G$.

This formula show the regularities of transformation of energy; in the first case the energy is equivalent to the rest mass and in direct proportion to the mass, which increases or decreases linearly with the

mass change. As well, the second equation, where the energy is direct proportion to the space scale. Moreover, when we will present these equations in a form

$E_0 - m_0 \cdot c^2 = 0$ and $E - r \cdot c^2 / G = 0$,

than we will obtain ethe nergy conservation equations. And, since these last equations can be equated each other

$$E_0 - m_0 \cdot c^2 = E_0 - r \cdot c^2 / G \Rightarrow m_0 \cdot c^2 - r \cdot c^2 / G = 0.$$

Whence follows, that $m_0 \cdot c^2 = r \cdot c^2 / G$, and we obtain the new equation which express by itself *the conservation and mass transformations law*. Here, in this way is possible to reveal and reflect all physical quantities, one by means of another. And so, it is constant, all turn to all. Any physical quantity can be expressed through any other physical quantity. Just because of this peculiar rotation of physical concepts and laws ensures the theoretical structure of principal conservation law.

As matter of fact, the principal conservation law plays the " **Okkam's** razor" role[1].

That is, the principal conservation law constrains. Moreover, it starts with the character of the principal law and from its internal logic structure. In this structure, as it has been noted above, rotation and cross passages of concepts and laws are taking place. First, it is obvious that the number of basic physical quantities cannot be infinite in like manner these quantities cannot accept the infinite numerical values, in other case the transmission between them would become impossible. Follows now that:

1) the number of the physical quantities characterizing the physical system should be finite and they should have the finite numerical values. Experiment shows that the physical quantities characterizing physical systems can have the minimal and maximal values, in which frameworks a change (oscillations, fluctuations,

[1] «Non sunt entia multiplicanda praeter necessitatem»

evolution and degradation) conserve the physical system within the in boundaries of this type.

2) one of the principal law limitations requires that number of types of physical systems also be the restricted and finite; that is, the number of types of physical systems cannot be infinite. We are not destined to unclose the infinite number of times the all new and new classes of physical systems. In addition, the number of types, generally, always is restricted, as opposed to the number of their single developments, the number of "individuals" can be infinite. If the number of types of local physical systems was infinite it would be impossible them to rotation and interact.

3) nest limitation, which follows from this principal law, is the definition of minimal number of physical quantities necessary for description of physical systems, and is also the number of characteristic physical quantities. There are three universal constants G, c ,h, and, on the assumption of the dimensionality principle, There are three basic variables: m,r,t. Any quantity, known to the physicist, is possible to express by variables m,r,t. These three constants and variables have dimension. To ensure the transformation and rotation of physical quantities in the theory, it is necessary to include in it also the Armon number, which is dimensionless, and consists of Armon constant ^{2} and Armon variable n. So, for the theory construction the four constants $G,c,h,^{2}$ and four variables m,r,t,n, are enough, not taking into account the zero and mathematical combinations of the above-stated constants.

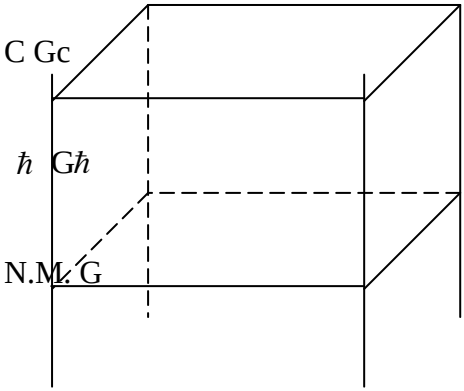
3.6. The theories describing the main types of physical systems.

3.7 Structure of the general physical theory, the Zel'manov's Cube.

As it was noted above, the finite and local physical systems are divided into two general groups

a) Free, possessing the positive inertial mass - energy, and
b) Not free, not having the inertial mass and not possessing it.

The physicists have studied till now, mainly, the free physical systems and their types; the corresponding particular physical theories were created the description and sequence of origin of them is very well demonstrated in the book **«THE ELEMENTS OF GENERAL THEORY OF RELATIVITY »** from which we have taken the well-known **the Zel'manov's cube** which shows the origin and relation of these theories. ħc GħcU)



As you can see, the basement of this

1) the Newton's mechanics, on which there have been formed
2) the Gravitational theory **of Newton**,
3) the Relativistic mechanics (the Special relativity theory, STR),
4) the Quantum mechanics,
5) $\hbar \cdot c$ physics with the varieties (the Quantum electrodynamics),
6) $G \cdot c$ - Physics with its varieties.

Within the limits of these theories, the "real" Physics is studied. As to different exploration programs guided to unification of $\hbar \cdot c$ - and $G \cdot c$ - physics, they are still far from the final theory. As we will show later, the titanic efforts for creation the General physical theory have no success for two principal and basic reasons:

1) the study of "quantum gravitation" was restricted only to fiels of energy dominating physical systems, or physical systems with an inertial mass. That is, beyonds these investigations were the **not free** physical systems, which have both positive gravitational charge, and

negative (gravitational masses). That is, there are two types of non-free systems, one of them has the attraction, and another-the repulsion. However, all not free physical systems have no inertial mass. Even the fact of existence of "dark energy", discovered in astronomical observations, has not urged physicists on comprehension and acceptance of existence of matter with the negative gravitational mass (charge). They continued the unsuccessful attempts of explanation of physical essence of "dark energy" by old theoretical means.

2) the second reason also is essential. Physicists have not understood, though many supposed, the deep meaning of theoretical coincidence of the great numbers in Astroparticle Physics. A comprehensive study of this issue led to the discovery of Armon ^{2} and Armon number ^{n} $\left(1 \le n \le {}^{2} = 10^{62}\right)$, which play a key role in the general physical theory

At first glance it may seem strange, as this dimensionless quantity (from variable ^{n} and to constants ^{2}) can play such essential role in the definitive and unified theory of physics. But as will be shown below, this is indeed the case.

So, we will return again to **the Zel'manov's cube**. **Zel'manov** itself considered the possible existence $G \cdot \hbar$ - physics: *"As gravitational quanta – the gravitons - should move like quanta with the fundamental speed, the full quantum theory of gravitation, as well as of the electromagnetic field quantum theory, inevitably should be relativistic. Therefore, apparently, the nonrelativistic quantum gravitational theory should be split into non-quantum (Newton's) gravitational theory and quantum mechanics and, thus, cannot exist as independent theory. However, it can be imagined the possibility of such quantum-gravitational phenomena in which the description of finiteness of velocity of distribution of interaction does not plays a role. In this case, the nonrelativistic quantum gravitational theory is possible as the independent theory and the number of possible basic physical theories*

will be increased to eight"[1]. But before, under the point number seven he has noted that the $G \cdot c \cdot \hbar$-physics theory, as General physical theory, is possible. Drawing of cube shows that in the basement of General physical theory are the physical theories $G \cdot c, \hbar \cdot c$ and Gh. We will look at the equations of base (basic) variables m, r, t these theories.

Gc **-Physics**	$\hbar c$ **- Physics**	**-Physics**	$Gc\hbar$ **Physics**
$m_{Gc} = \frac{c^2 \cdot r_{Gc}}{G}$	$m_{hc} = \frac{\hbar}{c \cdot r_{hc}}$	$m_{Gh}^3 = \frac{\hbar^2}{G \cdot r_{Gh}}$	
$m_{pl}^2 = \frac{\hbar \cdot c}{G}$			
$t_{Gc} = \frac{G \cdot m_{Gc}}{c^3}$	$t_{hc} = \frac{\hbar}{c^2 \cdot m_{hc}}$	$t_{Gh} = \frac{\hbar^3}{G^2 \cdot m_{Gh}^5}$	
$t_{pl}^2 = \frac{G \cdot \hbar}{c^5}$			
$r_{Gc} = c \cdot t_{Gc}$	$r_{hc} = c \cdot t_{hc}$	$r_{Gh}^5 = G \cdot \hbar \cdot t_{Gh}^3$	
$r_{pl}^2 = \frac{G \cdot \hbar}{c^3}$			

What shortages and irregularities have these theories?

I. In the physics-$\mathrm{h} \cdot \mathrm{c}$ the first the shortage has become clear was V. Heisenberg; from the uncertainty relation:

$$\Delta x \cdot \Delta p \geq \hbar,$$

it follows, that Δx or Δp cannot be zero simultaneously but can have infinitely big and infinitesimally small values. This principle of uncertainty takes place for all the variables:

$$m \cdot r \geq \frac{\hbar}{c} \quad m \cdot t \geq \frac{\hbar}{c^2} \quad \frac{r}{t} \geq c \quad .$$

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[1] **A.Zelmanov** and **V. Agakov**, "**ELEMENTS OF GENERAL THEORY OF RELATIVITY**" M.: 1989. p. 12. (in Russian)

It clearly shows that these variables, m, r, t, in the physics-$h \cdot c$ - cannot have zero numerical value, but can be infinitely big and infinitesimally small.

That is, the theory cannot be delivered from these infinities, uncertainty remains in infinitely big and infinitesimally small limits, hence the problems arise, which resulting in the renormalization theory. Physics -$h \cdot c$, having introduced into the science the rational concepts of quantum and quantization could not secure itself from the infinitesimal uncertainties, could not describe final quanta physical systems and their physical properties.

Einstein's discontent by Quantum theory is caused just by this circumstance.

II. However we can show that the same uncertainty suffered also the $G \cdot c$ - physics, the creator of which was Einstein himself. So,

$$\frac{m}{r} \geq \frac{c^2}{G} \quad \text{or} \quad \frac{m}{t} \geq \frac{c^3}{G}, \quad \frac{r}{t} \geq c .$$

It can be seen that in theory $G \cdot c$ the variables m, r, t can have any numerical values, except zero. The constant value G and variables m, r, t have not saved us from indeterminacies of infinity …

III. The same in physics-$G \cdot h$:

$$m^3 \cdot r \geq \frac{\hbar^2}{G}, \quad m^5 \cdot t \geq \frac{\hbar^3}{G^2}, \quad \frac{r^5}{t^3} \geq G \cdot \hbar .$$

The science during all its development struggles to be saved of such uncertainty, from infinitely big and infinitesimally small …

IV. We will try to reach this goal, h expressed each of variables m, r, t in forms of constants $G, c, \hbar$. The first, who tried to do so, was the great German thinker Max Planck on which name these quantities are called

$$m_{pl}^2 = \frac{\hbar \cdot c}{G}, \quad r_{pl}^2 = \frac{G \cdot \hbar}{c^3}, \quad t_{pl}^2 = \frac{G \cdot \hbar}{c^5}$$

It seems to me, it is an end. Physics- $G,c,\hbar$ has reached its ultimate goal, it now saved from indeterminacies, after all, Planck's constants, $m_{pl}=10^{-5}\text{г}$ $r_{pl}=10^{-33}\text{см}$ $t_{pl}=10^{-43}c$ have the finite numerical values. That is why many, scientist, starting from **M.Bronstein**, have been assured that the future physical theory will be based on $G,c,\hbar$ constants: *" Possibly, the creation of the general physical theory also will be related to introduction of new concepts, ideas and representations. While only separate attempts creation of the relativistic quantum gravitational theory, which naturally should coincide with the general physical theory are made or make its essential part. The basic equations of last, anyway, its most general equations, should contain three universal constants:* γ, $1/c$, $\hbar$. *It is not excluded, however, that in such theory there will be no most general differential equations at all, but the principles will be formulated, allowing to work out the equations for any special cases supposed by it."*[1]

It became clear now, what to be saved; However, it is impossible to be secured from infinities by means only of constants $G,c,\hbar$. For example, from an inequality $\Delta x > \sqrt{\hbar \cdot G/c^3} \approx 1.6\cdot 10^{-33}\text{см}$ it follows that the distance cannot be lesser, than r_{pl}. This inequality is called the *"personal error of measuring of coordinates"*[2]. That is, Δx cannot be less, than r_{pl}, but can be as high as necessary. In this case the limit for infinitesimally small is available, but it is not present for infinitely big. In this case, the problem is in elimination of "a particular error", that is, it is necessary to save Δx from the infinitely great values. As quantity Δx has the lower limit, in a numeric form equal to $r_{pl}=10^{-33}\text{см}$ it should

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[1] **A.Zel'manov and V. Agakov**, "**ELEMENTS OF GENERAL THEORY OF RELATIVITY**" M.: 1989. p. 11. (in Russian)

[2] **Yu. Vladimirov GEOMETRICAL PHYSICS,** M., 2005. p. 571. (in Russian)

have also an upper limit - the maximal numerical value. But, how to find it?

. As many physicists, even today, doubt that the quantities $G,c,\hbar$ are the universal constants, let we now conduct the experimental check-up. Let us take the relation $m_{pl}^2 = \hbar \cdot c/G$ and, separately, the constants $G,c,\hbar$.

1) In physics $G \cdot c$, quantity $\hbar$ is not considered as a constant. Since it has the dimensionality of pulse I (torque) the **Planck's** equation can be expressed in the form of $m_{pl}^2 = I \cdot c/G$, and in the case of $\mathrm{m_{pl}} = 10^{-5}$г we obtain, that $I = \hbar$. However, if to increase $\mathrm{m_{pl}}$ n time, then As many physicists, even today, doubt that the quantities $G,c,\hbar$ are the universal constants, let we now conduct the experimental check-up. Let us take the relation $m_{pl}^2 = \hbar \cdot c/G$ and, separately, the constants $G,c,\hbar$.

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2) In physics $\hbar \cdot c$ we will accept that $m_{pl}^2 = \hbar \cdot c/G_o$, where $\mathrm{G_o}$ is variable and at value $\mathrm{m_{pl}} = 10^{-5}$г $G = G_0$. In this case, increasing $\mathrm{m_{pl}}$ n time we will obtain $G_o = G/n^2$, and decreasing n time - $G_o = n^2 \cdot G$.

Certainly, $\mathrm{m_{pl}}$ can vary not only n time but also $\sqrt{n}$ time, and in this case $G_o = G/n$ or $G_o = n \cdot G$. That is why, starting with Dirac, many believed that the constant G is actually the variable. **Landau,** quite rightly, demanded not to neglect the effects of gravitation in the

quantum interactions in elementary particle physics. $I = n^2 \cdot \hbar$, and if to decrease n time, we will obtain $I = \hbar / n^2$.

2) In physics $\hbar \cdot c$ we will accept that $m_{pl}^2 = \hbar \cdot c / G_o$, where G_o is variable and at value $m_{pl} = 10^{-5}$ ₴ $G = G_0$. In this case, increasing m_{pl} n time we will obtain $G_o = G / n^2$, and decreasing n time - $G_o = n^2 \cdot G$. Certainly, m_{pl} can vary not only n time but also $\sqrt{n}$ time, and in this case $G_o = G / n$ or $G_o = n \cdot G$. That is why, starting with Dirac, many believed that the constant G is actually the variable. **Landau,** quite rightly, demanded not to neglect the effects of gravitation in the quantum interactions in elementary particle physics.

3) In physics-$G \cdot \hbar$, the speed of light c is not considered as constant and the equilibrium condition considered above will become $m_{pl}^2 = \hbar \cdot V / G$ or $V = \hbar \cdot m_{pl}^2 / G$, whence follows, that in the case of $m_{pl} \cdot n$ we will obtain $V = n^2 \cdot c$, and in the case of m_{pl} / n the requirement will be written as $V = c / n^2$ Discussing these three cases, it becomes clear, that in all these equations for **Planck's** quantity one more dimensionless quantity, which I call the Armon number is hidden:

$\hbar c / G m^2 = n^2 = G m^2 / \hbar c$ or $\sqrt{\frac{\hbar c}{G m^2}} = n = \sqrt{\frac{G m^2}{\hbar c}}$,

Where n is the sequence of natural numbers, but restricted from both sides, $1 \le n \le$ ₴ $= 10^{62}$ U. Here ₴ $= const.$ is the Armon constant, and n - is the Armon variable. By Armon number we understand both constant value, ₴ and variable n, and also their mathematical combinations like $n/$₴, ₴$/n^2$, or ₴$\cdot \sqrt{n}$, ₴$\cdot n$ etc. Thus, **Planck's** quantities have the correct value only for n=1. But $G, c, \hbar$ -physics is not restricted to it; thank to Armon ₴ it is possible to be saved and fromother indeterminacies. For example, it is possible to obtain

$\Delta x < \sqrt{G \cdot \hbar \cdot^2 / c^3} \approx 10^{29} cm$, that is Δx cannot have the numerical value exceeding $r_z = ^2 \cdot r_{pl} = 10^{29} cм$, and the quantity $r_z = 10^{29} cм$ is an upper limit of cosmological expansion of our Universe. Introduction Armon number not only solves the problem of indeterminacies of infinitely big and infinitesimally small of basic variables depending on m, r, t, but, generally, all the physical quantities composed of variables m, r, t. That is why it is necessary to call the General physical theory as "physics-$G \cdot \hbar \cdot c \cdot^2$ " or the theory of four constant and four variables (m, r, t, n).

Now it is necessary to dwell on reviewing of mathematical apparatus of physics-$G \cdot \hbar \cdot c \cdot^2$ ». **Prigogine** has called one of his books **" THE END OF DEFINITENESS "**and it reflects the crisis mood of physicists at the end XX century. I disagree essentially with this approach; on the contrary, the science goes out crises, overcoming the indeterminacies. I would term physics-$G \cdot \hbar \cdot c \cdot^2$ as opposed to Prigogine,**" THE END OF UNCERTAINTY "**. Does not exist infinitely major and infinitesimal. All has the limit. Many scientists guessed that the mathematical apparatus based on concepts of infinitesimally small in the General physical theory will not be applied in the future. In this case we will recollect words of **Zel'manov** again *« it is not excluded, however, that in such theory there will be no the most general differential equations at all, but the principles will be formulated, allowing to work out the equations for any special cases supposed by it ».***Y Vladimirov** on this occasion has said so:*« The Parallel existence of quantum theory and GTR, belonging to different dualistic metaphysical paradigms, superimposes the limitation from below on the field of applicability of classical coordinates, and thereby leads to the number of conceptual problems on the essence of mathematical apparatus of the differential calculus, which is starting with the postulate on existence of*

infinitesimal displacements in co-ordinate space-time. It is one more form of paradigm problems in the theoretical physics»[1].

In the general physical theory, by means of Armon, all physical quantities and parameters obtain the minimal and maximal finite numerical values. And, for each particular case and form of physical systems this Armon number plays the role of coefficient of change of physical properties, $m_{pl} \geq m_K$ for masses it is quantization coefficient, $m_{pl} \leq m_K$ for these masses is integration coefficient. Moreover, in all these cases with its particular numerical value.

But that is not all. Physics-$G \cdot \hbar \cdot c \cdot^2$ should be saved from all forms of indeterminacies, and till now we spoke only about disposal of the infinite absolute numerical values of physical properties.

But after all, the physical quantities can have both positive and negative numerical values. We will return to the physical theories $\mathrm{G \cdot c}, h \cdot \mathrm{c}$ and $G \cdot \hbar$. From the basic equations the variable $\mathrm{m,\ r,\ t}$ of these theories logically implies that these variables essentially cannot have zero values:

$$\frac{m}{r} = \frac{c^2}{G} = const. \qquad m \cdot r = \frac{\hbar}{c} = const. \qquad m^3 \cdot r = \frac{\hbar^2}{G} = const.$$

$$\frac{m}{t} = \frac{c^3}{G} = const. \qquad m \cdot t = \frac{\hbar}{c^2} = const. \qquad m^5 \cdot t = \frac{\hbar^3}{G^2} = const.$$

$$\frac{r}{t} = c = const. \qquad \frac{r}{t} = c = const. \qquad \frac{r^5}{t^3} = G \cdot \hbar = const.$$

Thisi is correct and clear, since parameters $\mathrm{m,\ r,\ t}$ represent the substantional properties of physical systems and the zero values for these parameters would mean that the physical system does not exist. This deduction plays an important role in physics-$G \cdot \hbar \cdot c \cdot^2$. At first sight it seems and it follows directly from the logic that as variables

[1] **Yu. Vladimirov GEOMETRICAL PHYSICS,** M., 2005. p. 570. (in Russian)

m, r, t can have numerical values distinct from zero, then possible variants are $m > 0,\ r > 0,\ t > 0$ and $m < 0,\ r < 0,\ t < 0$. However, the case $m > 0,\ r > 0,\ t > 0$ and its consequences contradict not only to the **Newton's** mechanic, but also, generally, to the classical physics, and is deprived of physical content. is not present, and There cannot be in the Nature the final and local physical system with the negative space, time and inertial mass. This hindrance is general, both for all particular physical theories and for physics $G \cdot \hbar \cdot c \cdot^{2}$ or for General physical theories.

However, $G \cdot \hbar \cdot c \cdot^{2}$ -physicist, negating the existence of negative inertial mass, quite accepts the concept of negative gravitational mass (negative gravitational charge[1]), confirms and justifies the physical existence and necessity, as well as the consequence of such masses.

Generally, the necessity of negative gravitational mass arises for explanation and substantiation of the negative curvature[2] of space and the negative curvature is necessary for an explanation and substantiation of the structure of flat space. That is, with concept of curvature of space there is the necessity for positive curvature of space and the possibility, and necessity of negative curvature of space. And as the concept of curvature, $K = 1/r^2$ is directly related to the density of mass or energy, that is, with the gravitational charge (mass), the concept of curvature K, thanks to genius of Einstein, first of all has arisen in physics-$G \cdot c$ with the final curvature $K = G \cdot \rho / c^2$ or $K = G \cdot \varepsilon / c^4$. I have simply

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[1] Throughout this book by negative matter, negative mass and negative component the author has in mind the negative gravitational mass.

[2] For the first time this was discussed be **A. Friedman** in his paper **"ON THE POSSIBILITY OF THE WORLD WITH CONSTANT NEGATIVE CURVATURE OF SPACE"** (see **Physics Uspekhy**, 1963r, V. LXXX, # 3), where he emphasized: *"… the stationary world with the constant negative curvature of space is possible only for zero or negative density of matter …"*.

developed and improved the **Einstein's** equation to derive the structure of flat space, carefully following the general principle of disposal of indeterminacies. I thought so, because from the equation $K/\varepsilon = G/c^4$ conditions follow $\varepsilon \neq 0$ and $K \neq 0$ then we have logically two variants 1) $\mathrm{K} > 0$ and $\varepsilon > 0$ or 2) $\mathrm{K} < 0$ and $\varepsilon < 0$. It means that the sign of curvature of space K depends directly on the sign of the averaged density of gravitational charge or energy. Hence, the physical cause and sourse of negative curvature is the averaged density of gravitational charge-energy. After that, in theory of Armon (in the General physical theory) the general equation of flat space (the inside structure of our Universe), which is ideally symmetric deduced directly:

$$K + (-K) = \frac{G \cdot \varepsilon}{c^4} + \frac{G \cdot (-\varepsilon)}{c^4} .$$

Later we found out that physics-$G \cdot \hbar$ (where the gravitational charge also is equal to $\sqrt{G} \cdot m$) the sign of curvature of space also depends directly on sign ε or ρ: $K^7 = \frac{\varepsilon^3}{\hbar^4 \cdot G}$ Or $K^5 = \frac{\rho^3 \cdot G}{\hbar^2}$.

Addition

It is known long ago that the dimensionality $G \cdot m^2 = \hbar \cdot c = q^2 = e^2/\alpha$. Hence, it seems quite possible that in the $\hbar \cdot c$ physics the space local curvature K plays a certain and essential role. It is possible that the sign (positive or negative) of the generalized quantum charge $\left(e = \sqrt{\hbar \cdot c \cdot \alpha}\right)$ or the electrical charge $\left(e = \sqrt{\hbar \cdot c \cdot \alpha}\right)$ also directly depends on the space curvature K. In the $\hbar \cdot c$-theory $\rho_{\hbar c} = \hbar/c \cdot r_{hc}^4$, and $\varepsilon_{hc} = \hbar c/r_{hc}^4$; accepting that $K_{hc} = 1/r_{hc}^2$, we will obtain $\rho_{hc} = \hbar \cdot K_{hc}^2/c$ or $\varepsilon_{hc} = \hbar \cdot c \cdot K_{hc}^2$, whence it is clearly seen that the sign of the density of

mass or energy remains positive at any sign of K. However if we introduce $\hbar \cdot c = q^2 = e^2/\alpha$ in equation $\varepsilon_{hc} = \hbar \cdot c \cdot K_{hc}^2$ then we will obtain $\varepsilon_{hc} = q^2 \cdot K^2$, or $\varepsilon_{hc} = e^2 \cdot K^2/\alpha$, whence $q = \sqrt{\varepsilon_{hc}}/K$, or $e = \sqrt{\varepsilon_{hc} \cdot \alpha}/K$, and it is seen that, let us say, positive or negative sign of electrical charge is caused by the sign of K, or vice versa. In a word, they are interdependent.

3.8. The Basics of GchU Cosmology

3.8.1 True physical reason of accelerated expansion of the Metagalaxy. Improvement of concepts.

The up-to-date or the so-called Standard cosmological model cannot accurately establish even the subject of its study, the principal notion, around which the concepts of this science are developed. It seems to be clear that the Cosmology studies the Universe, or it is a science about the Universe. But till now this science cannot answer the question, which excited still **Einstein**: Is our world, our Universe final or infinite? This uncertainty is the principal one among the shortages of the up-to-date cosmology. Though many of scientists intuitively consider that our world is the final Universe, and then it, varying, always should have a beginning and an end, alike all final and local physical systems. The theory of Armons justifies the local and final essence of our Universe and distinguishes it from the Infinite and Eternal Universe.

1. Thus, I accept the point of view that there is the Eternal Universe or Meta Universe, which never can become a direct subject for examination and study of a science. And our finite and local Universe is one of a whole class of such Universes. This very class of local physical systems is studied by the Cosmology. It, as a science, should study not a single and unique physical system, but discover that this physical object, which seems to be unique, belongs to a single total class of physical systems, that the laws and regularities featuring this object are general for all physical

systems that belong to this class. That is, the perfect cosmology should solve the problem of the set of Universes …

The following discrepancy is between the concepts of "the finite Universe" and the "Metagalaxy".

"Within many decades there was a belief that the sizes of the Metagalaxy (10^{28}*cm) coincide with the boundaries of the cognizable world, and consequently it should be identified with the Universe,* - writes **I.L. Rosental** et.al. in the book **" COSMOLOGY AND PERFECT VACUUM"** - *However there is also a point of view in the cosmology that the Metagalaxy is only a small part of our world and consequently identification of the Metagalaxy with the Universe is rather wrongful".* Then he distinguishes the following concepts: *"We will call the totality of objects arranged now in a space volume in a radius of* 10^{28}*cm as Metagalaxy. In this case we did not consider (for simplicity) evolution of the Metagalaxy in time. The Universe is the totality of the objects cognized at the moment. This concept reflects the level of our knowledge on the world. Only the coincidence of the both concepts within several decades has led to their identification"*[1]. While it is possible to agree with **Rosental** in the issues of definition of the Metagalaxy, it is absolutely impossible to agree with his definition of the Universe. Here again the indefinite and tangled approach of the modern cosmologists to the problem was reflected, though it is true that it is related to the knowledge level.

Identification of the Universe and Metagalaxy in the standard model is not a harmless, but a serious formality having significant consequences for the science, and of course, these consequences are negative in nature. What is necessary to be liberated from and to accurately distinguish is that the Metagalaxy is integrity of D bodies of different "generations", galaxies and their superclusters, a local physical system which arises and develops in flat space of our Universe, in parallel with

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[1] **I.V Arkhangelskaya I.V., I.L Rosental I.L., A.D. Chernin**. **THE COSMOLOGY OF PHYSICAL VACUUM**, KomKniga, 2006 p. 9-10 (in Russian)

cosmological evolution of this Universe. Our Metagalaxy is always located in flat space, but it has its self-mass (which, of course, has positive sign), and has its own positive space curvature caused by this mass.

That is why the standard cosmic model can describe the evolution of the Metagalaxy in general and in the rough, however it cannot explain the basic problems of the classical cosmic model and only adds new and new problems to them.

Our Universe is a finite, local physical system, which consists of positive components – the lattice of primary black hole, and negative components - $\bar{g}$ fields of anti-gravitons. The primary black hole lattice has positive mass, and $\bar{g}$ - anti-gravitons - negative, but total masses of these two components are equal to each other, and the positive space curvature caused by one component, is compensated (flattened) by the negative curvature caused by the other one. Then, as a result, the internal structure of our Universe is formed with its flat space. In this flat space the Metagalaxy is formed, as integrity of freely moving physical systems. The **birth and evolution of the Metagalaxy is related and caused by the origin and evolution of our Universe and its structure, that is, the structure of flat space.**

In the Armon theory our **Universe and the Metagalaxy differ from each other with their physical parameters, laws and regularities of development and evolution, as the** whole and a part, the system and its element differ.

Their physical parameters never coincide generally during the cosmological evolution, they are always different.

Let's return to the negative consequences of identification of the Universe and the Metagalaxy.

The classical cosmology states, that the scattering of galaxies testifies in favor of that, that the averaged density of matter of the Universe decreases in time and since, according to the cosmological principle, the whole space is filled with galaxies, hence, it means, that the Universe as an integrity, is expanded.

Hubble's remarkable discovery – scattering of galaxies, or, another fine discovery of astronomers in 1998-1999 merely evidences that the Universe as an integrity, "expands", and nothing else. But moving of galaxies away from each other (even if accelerated), being related to and caused by the expansion of the Universe, is not identified with the expansion of the Universe. Scattering of galaxies and their superclusters is a **result** of expansion and evolution of the Universe. And here the cause is not to be confused with the effect at all. Nevertheless, these are different concepts and all this means that the observed accelerated scattering of galaxies, or accelerated expansion of the Metagalaxy, in my strong opinion, does not mean accelerated expansion of the Universe.

It is an important conclusion, which is grounded on the basic difference of the Universe and the Metagalaxy.

Recently physicists often speak about the " naturalness" principle; but let me ask them how such global physical systems, similar to our Universe, can sometimes expand exponentially (at inconceivable scales), sometimes decelerate, and then again expand with the acceleration? It is not only "unnatural", but also represents not quite a reasonable theory that, unfortunately, still dominates at present.

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All physical parameters defined by the modern astronomical observations and assigned to the Universe, are mainly physical, characterizing the Metagalaxy. Generally, the up-to-date achievements of the standard cosmic model concern our Metagalaxy rather than our Universe.

Astronomers have explored the part and the volume of our Universe, whence the electromagnetic waves reach. In this way Hubble's constant H was determined, as well as the largest "visible" distance R_H and the average density of matter in Hubble's volume V_H defined with their help, called "critical average density - $\rho_c = H^2/G$. According to astrophysical observations $H \approx 10^{-18}\,\mathrm{sec}^{-1}$, and $R_H \approx 10^{28}\,cm$, hence,

$\rho_c \approx 10^{-29}\, g/cm^3$ whence the visible mass of our Universe is determined:

$m_H \approx \rho_c \cdot V_H \approx \rho_c \cdot (R_h)^3 \approx 10^{-29}\, g/cm^3 \cdot (10^{28} cm)^3 \approx 10^{55}\, g$.

According to some astronomical observations, the total mass of galaxies and their superclusters in the Hubble's volume V_H is equal $M_{MG} \approx 10^{20} \cdot m_\Theta \approx 10^{53} g$, ($m_\Theta$ - is the average mass of the Sun and all stars). This value of M_{MG} is the self-mass of the Metagalaxy.

This dark energy with the mass of $m_H = 10^{55} g$ is evenly distributed and fills the volume V_H inside galaxy, in superclusters of galaxies, and in the "hollow" existing between them called as "void"[1].

So, galaxies and their superclusters located in volume V_H move apart from each other with acceleration, i.e., the Metagalaxy is expanded with acceleration. Now, if the volume of Metagalaxy V_H coincided with the volume of our Universe, then it would turn out that the space of the Universe expands thanks to the scattering of galaxies from each other.

A very "unnatural" conclusion. After all, galaxies and their superclusters are large astrophysical objects, for the existence and, moreover, for accelerated scattering of which, a "ready" space is needed. That is, the radius of our Universe R_H should be, at least, an order higher than the radius of Metagalaxy r_n.

Our point of view has a certain base, moreover, it was confirmed by experience and observations. I am referring to the so-called background or relict radiation. It is proved experimentally, that the energy of one relict quantum is equal $E_{rp} \approx 10^{-15} erg$, and the Compton wavelength $l_{rp} \approx 10^{-2} cm$. Thus, by means of these parameters of the

[1] Void – space free from clusters of galaxies and stars. They were first discovered in 1978 by **S. Gregory and A. Layard**.

relict quantum it is possible to discover the parameters of our Universe E_n and R_n. Our principal outcomes are the laws of the following level:

$$R_n^2 = \frac{\hbar^3 \cdot c^4}{G \cdot E_{rp}^4} \quad E_n^2 = \frac{\hbar^3 \cdot c^{15}}{G^3 \cdot E_{rp}^4} \quad \left(E_n = \frac{E_{pl}^3}{E_{rp}^4} \right)$$

$$R_n^2 = \frac{c^3 \cdot r_{rp}^4}{\hbar \cdot G} \quad E_n^2 = \frac{c^3 \cdot r_{rp}^4}{\hbar \cdot G^3} \quad \left(R_n = \frac{r_{pl}^2}{r_{rp}} \right)$$

Where E_{rp} - is the energy of relict photon, and r_{rp} is its Compton length. Substituting the experimentally obtained values of parameters of the relict photon, for the Universe parameters we will obtain $R_n \approx 10^{29} cm$ and $E_n \approx 10^{78} erg$ $\left(M_n \approx 10^{57} g \right)$.

In the Armon theory, which includes four universal constants (G, c, h and $\aleph = 10^{62} = \text{const.}$) and on the basis of four variables (m, r, t, n), the parameters of our Universe $R_n \approx 10^{29} cm, M_n \approx 10^{57} g, T_n \approx 10^{19} s$ are considered the maximum values of physical parameters determining the end of cosmological evolution, or determining the upper bound of expansion.

$$M_\aleph = m_{pl} \cdot \aleph = 10^{57} g, \quad R_\aleph = r_{pl} \cdot \aleph = 10^{29} cm, \quad T_\aleph = t_{pl} \cdot \aleph = 10^{19} s$$

* * *

The difference between the Universe and the Metagalaxy is very essential. Metagalaxy is a part of the Universe, but the structure of our Universe is not determined at all and not restricted to galaxies and their superclusters, that is, to the so-called “large-scale structure” of Metagalaxy. Not at all. The self-mass of Metagalaxy composes the 10^{-5} part of the positive mass of the Universe. If one presents figuratively, our Universe is similar to an egg, the yolk of which is a shone, light mass, and the egg white is the "dark" and "invisible" structure of flat space of our Universe, which not only encloses the yolk-Metagalaxy, but also penetrates into it. This flat space of our Universe is organized of two components, of “dark energy” which, in our strong opinion, is negative mass-energy, and of the lattice of primary black hole, that is of

components of the positive mass. These two components balance each other, forming the general flat space inside our Universe, with its physical properties and consequences, thanks to which in this inertial medium our Metagalaxy arises and develops, therewith - in parallel and proportionally to formation of the flat space.
However, if the internal structure of the Universe – the flat space-time is organized with the velocity $c = const.$, the evolution of the Metagalaxy takes place in an absolutely other mode…

3.8.2 Solution of the "dark energy"problem

The invisible is learnt by means of the visible
DAVID ANHAGHT

3.8.3 What we know and what we do not know about the dark energy.

Numerous special papers and books are written about dark energy, various attempts for the explanation and description of physical essence of this phenomenon were done (vacuum, quintessence, phantom energy etc.), and however any of these theories was not able to discover the essence and the microstructure of this physical phenomenon. Because of examinations three basic properties of dark energy were discovered:
1) The dark energy is uniform, uniformly spread in space. It is not grouped.
2) It does not interact even a little noticeably by means of the known fundamental types of interaction - except for gravitation. The dark energy does not radiate and does not absorb the fundamental particles.
3) It has repulsion property.
This is everything that is known about this new physical matter. I will add still the most important thing: it is known, that this new physical matter is not similar to any form of matter known to us until today. However, scientists do unsuccessful attempts to explain this dark matter by analogy to physical properties of the known forms of matter.

Perhaps, this is the reason that many things remain really dark and not clear about the dark matter until today.

1) It is not known, what physical essence the dark energy has, what form of matter it is.

2) Its physical characteristics and, especially, the average density ρ are unknown; are they variables or constants?

3) What the principal physical characteristics of matter - the universal repulsion (antigravitation) are caused by ?

4) What is the microstructure of this dark energy?

5) The thermodynamic properties of dark energy are not clear.

6) Why does not the dark energy radiate and does not absorb fundamental particles? On the other hand, why it is uniformly distributed in space and not grouped?

Here is the variety of problems, answers to which are unknown for the present. But all physicists who deal with problems of dark matter, understand that discovery of its physical essence will be a real revolution not only in cosmology, but also in physics … *"Recognizing of the fact of existence of dark energy has qualitatively changed the situation in physics, indicating the insufficiency of our knowledge of microcosms. It will not be an exaggeration to say that identification of the physical nature of dark energy is the central problem of the up-to-date natural sciences"*[1].

For a start, let us say that all the researchers, whatever different approaches they had, agreed in one, that the dark energy possesses physical properties of antigravitation (repulsion). This is the principal physical property thanks to which dark energy became observed on cosmic scales[2]. And it is not surprising that all attempts to explain the

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[1] **V. N. Lukash, V. A. Rubakov, DARK ENERGY: MYTHS AND REALITY**, **Physics Uspekhy**, **178** 2008 N3

[2] It is necessary to underline one basic circumstance; astronomers observe not dark energy itself, but the physical consequences caused by it - the accelerated expansion of galaxies and their superclusters. Though the outstanding astrophysicist, academician **V.L. Ginzburg**, in the list of the major problems of physics of the XXI century ranks

physical essence of dark matter are grounded on **Einstein's** gravitational theory - on the Gc physics and on its different modifications, without going beyond the frames of Gc -physics and without the jump from the gravitational theory to uniform (and symmetric) theory of gravitation and anti-gravitation.

Have physicists ever thought why the electromagnetic field equations are extremely symmetric? Because they describe and reflect two opposite, but simultaneously uniform, interdependent forces and interactions. The perfection of **Maxwell's** theory is in this. That is why **Einstein** was not satisfied by his basic equation of gravitational field

$$R_{\mu\nu} - \frac{1}{2} \cdot g_{\mu\nu} \cdot R = \chi \cdot T_{\mu\nu} .$$

It is not symmetric and has not a static or stationary solution. To obtain such the solution, **Einstein** added the term $\Lambda \cdot g_{\mu\nu}$ in the equation, where Λ describes antigravitation, which should balance gravitation, and for providing stationarity of Λ it is considered constant, $\Lambda = const$. However, **Einstein's** equations of gravitational field did not obtain a symmetric and ideal form, did not become the theory, capable to feature the unity of attraction and repulsion. From the very beginning it is to be noted that, in my strong opinion**, all investigations and theories** (starting from "inflationary" scenarios and finishing with ΛCDM theory that is the most recognized theory for today), **which anyhow based on the Gc physics with constant Λ, are radically wrong, reflect nothing at all and essentially cannot feature the microstructure and physical essence of the dark matter**.

This is not a mere statement, but a deduction grounded on long and in-depth studies. Instead of being engaged in an ungrateful job, criticizing or negating the different explanations of dark energy, I will present arguments of the Armon theory or Gch^2 physical theory. For

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the problem of dark energy to 23rd place, in my strong opinion, the decision of this problem is of paramount importance and has fundamental value for the modern physics.

this purpose, obeying the requirements of regularities of evolution of physics or the physical theory, we will begin with, on what Einstein has been stalled. Based on the principle of dimensionality, we will represent the equation of gravitational field in the final form,

$$K = G \cdot \varepsilon / c^4 \text{ or } K = G \cdot \rho / c^2 ,$$

where $K = 1/r^2$ - is the space curvature, and ρ and ε - are the average **densities of** mass and energy, accordingly. Stationary values G and c already impose an essential constraint on variables ρ, ε and K,

$K/\varepsilon = G/c^4 = const.$, $K/\rho = G/c^2 = const.$,

It follows from here that variables ρ, ε and K cannot have the zero value, $\rho \neq 0$, $\varepsilon \neq 0$ and $K \neq 0$. From this stringent deduction it follows that if

1) $\rho > 0$, then $K > 0$ or 2) $\varepsilon > 0$, then $K > 0$

2) $\rho < 0$ then $K < 0$ $\varepsilon < 0$, then $K < 0$

That is, the essence of the space curvature is the sign; it is directly related with and caused by the essence of ρ and ε, by their signs. It means, that if the physical reason of the positive space curvature is the positive gravitational mass-energy (positive gravitational charge), then the physical reason of the negative space curvature is unequivocally the negative gravitational mass (charge),

$$-K = G \cdot (-\varepsilon)/c^4 \qquad \text{or} \qquad -K = G \cdot (-\rho)/c^2 .$$

We simply develop sequentially the **Einstein's** initial and correct ideas that the gravitation is equivalent to the space curvature, the space curvature is caused by the density of matter's mass or energy. Simply we try to get rid of the uncertainties in this problem.

1) We have already got rid of one uncertainty $\rho \neq 0$, $\varepsilon \neq 0$ and $K \neq 0$ and as a result, we have specified that the negative space curvature, equivalent to antigravitation and repulsion, is unequivocally caused by the average density of negative gravitational mass-energy.

2) The Second uncertainty which follows from **Einstein's** equation $K = G\varepsilon/c^4$, is that, that K and $\varepsilon(\rho)$ can have infinite values the positive or negative; that is why the **Einstein's** (Gc-physics) theory could not describe local and finite physical systems without boundary conditions. This property imported the negative collapse and anti-collapse problem into Physics (and Cosmology), which, according to **Wheeler's** statement caused the most major crisis of physics, which has not been overcome yet to date.

To get rid of this uncertainty, it is necessary to apply resources of Gch² -physics. With the help of **Planck's** constant $\hbar$ we can restrict, on the one hand, the numerical values of variables K and $\varepsilon(\rho)$:

$$K_{pl} = 1/r_{pl}^2 = c^3/(G\cdot\hbar),\ \varepsilon_{pl} = c^7/G^2\cdot\hbar,\ \rho_{pl} = c^5/(G^2\cdot\hbar).$$

As we see, K and $\varepsilon(\rho)$ have obtained the limiting numerical values:

$$|K| = K_{pl} = 10^{66} cm^{-2},\ |\varepsilon| = \varepsilon_{pl} = 10^{115} erg/cm^3,\ |\rho| = \rho_{pl} = 10^{93} g/cm^3.$$

Nevertheless, we cannot be satisfied only with it. It is necessary to put limitations on physical variables from two sides, both from below, and above.

For limitation of the parameters K and $\varepsilon(\rho)$ on the other hand it is necessary to apply the Armon constant U.

$$|K_{\text{ₐ}}| = K_{pl}/\text{²}^2 = c^3/(G\cdot\hbar\cdot\text{²}) = 10^{-58} cm^{-2},$$
$$|\varepsilon_{\text{ₐ}}| = \varepsilon_{pl}/\text{²}^2 = c^7/G^2\cdot\hbar\cdot\text{²}^2 = 10^{-9} erg/cm^3$$
$$|\rho_{\text{ₐ}}| = \rho_{pl}/\text{²}^2 = c^5/(G^2\cdot\hbar\cdot\text{²}^2) = 10^{-31} g/cm^3,$$

.

So, we have freed themselves from uncertainties of infinitely large and infinitesimally small numerical values. However, this is not everything yet; after all, the definition of the minimum and maximum numerical values of parameters K and $\varepsilon(\rho)$ assumes that we deal with already finite and local physical systems, in their extremely compacted and extremely expanded states.

And as these two limiting states of parameters K and $\varepsilon(\rho)$, and also the parameters $\mathrm{m, r, t}$ which lie in their basis, are expressed by constants $\mathrm{Gch^2}$, it means that these invariable and constant parameters describe static or stationary state of this system.

3) The third uncertainty, which always tormented **Einstein**, is that his gravitational field equations were not capable to give a solution describing the static or stationary state. Even artificial or, as he says, physically not justified introduction of constant Λ into these equations, did not help to obtain stable and stationary cosmological model. Why? Because:

a) Λ, which reflected antigravitation, was considered as constant, and, the most important thing,

b) Λ, which had dimensionality of space curvature, in these equations had no corresponding expression for a physical reason, for the source giving rise to this curvature.

We already cleared up above that the reason of attraction is the average density of positive mass-energy, and the reason of repulsion is the average density of negative mass-energy; this means that following the correct reasoning, the attraction can balance the corresponding repulsion, and we can make the correct, symmetric and balanced state for cosmological model:

$$1)\ K_{pl} + (-K_{pl}) = G \cdot \varepsilon_{pl} / c^4 + G \cdot \left(-\varepsilon_{pl}\right) / c^4 \text{ or}$$

$$c^3 / (G\hbar) - c^3 / (G\hbar) = G \cdot \varepsilon_{pl} / c^4 + G \cdot (-\varepsilon_{pl}) / c^4 \text{, where}$$

$$\left|\varepsilon_{pl}\right| = c^7 / \left(G^2 \cdot \hbar\right)$$

$$2)\ K_{\text{₂}} + (-K_{\text{₂}}) = G \cdot \varepsilon_{\text{₂}} / c^4 - G \cdot \varepsilon_{\text{₂}} / c^4$$

These are the very equations describing two static or stationary states of our Universe in $\mathrm{Gch^2}$-cosmology. A question arises right away, how to describe transition from one stationary (static) state into another, how to describe the processes of expansion or compression? Certainly, by means of Armon variable n; after all, **Planck's** all values, as we already have shown above, comprise in the hidden form the numerical value of the Armon variable $n = 1$; hence, for description of dynamics of

Gch² –cosmology, it is necessary to substitute variable value n in the cosmological equation, for the constant value U:

$$\left(1/n^2\right)\cdot\left[c^3/\left(G\cdot\hbar\right)+\left(-c^3/\left(G\cdot\hbar\right)\right)\right]=G\cdot\varepsilon_n/c^4-G\cdot\varepsilon_n/c^4\,,$$

where $\varepsilon_n=\left|-\varepsilon_n\right|=\left|K_n\right|\cdot c^4/G$.

The Armon variable n, increasing from unity to ² $=10^{62}$, describes the cosmological expansion, and decreasing from ² to unity, describes the cosmological compression. As we can see, these two processes have finite boundaries. However, it is interesting that both in the stationary state, and in the variable one, the cosmic model is extremely stable. In the Literature, common misperception, according to which the static (stationary) and state variables are completely independent of each other. They are considered as separate processes, and the unity and even interdependence of these opposite states is generally ignored. In one case the stationary and static state, and in the other – the variable and not static, evolutional, or degradation state is exaggerated and absolutized, not understanding that in a static and stationary state there is the certain moment of motion and change, and in the change, evolution (or degradation and decay) there is the moment of rest and static nature or stationarity. The genius French mathematician and thinker A**. Poincaré** very well understood this: *"In the spaces between these jumps the Universe remains motionless; various instants, during which this invariable state of the Universe is conserved, obviously, cannot be divergent from each other. We come, thus, to the discontinuous course of time, to atom of time"*. If **Einstein** and all his followers had known this proposition **of Poincaré**, today we would have a ready cosmic model, which could describe both static and evolutional states. Meanwhile all cosmic models, available today, describe either static, or the evolutional state, that shows the incompleteness of these theories.

Our cosmic model (Gch² -cosmology) describes both the static state of our Universe and evolution, during which the $\left|m_n\right|, r_n, t_n$ parameters of our Universe vary proportionally $\left|m_n\right|=m_{pl}\cdot n$, $r_n=r_{pl}\cdot n$, and

$t_n = t_{pl} \cdot n$. That is, as **Poincaré** foresaw, chronon - quantum of time t_n, and doing a "jump", the transition from one chronon to another m_n and r_n vary under the law $m_n = c^3 \cdot t_{pl} \cdot n/G$, $r_n = t_{pl} \cdot c \cdot n$.

The most important thing is that in comparison with t_{pl}, the time interval between two chronons is very small and has no physical meaning, and, hence, after each chronon of time our Universe varies "stepwise", and before the arrival of the following chronon, remains invariable, in a static state. Thus, varying from one static state and reaching the following one, during the evolution our Universe makes $^2 = 10^{62}$ "jumps" of change, and has static and stationarity state of the same number. That is why our cosmological model does not vary; it is stable both during the static state, and during evolution (change). This is the criterion of perfection and symmetry of our cosmological equation. However, the problems of getting rid of uncertainties, which gad disturbed **Einstein,** do not come to end with this.

4) **The Fourth** uncertainty that perhaps has the most essential value for Physics is related to the solution of the problem of **flat space**. Below we will specially dwell on the concept of "flat space", which lies in the basis of all fundamental physical theories. Now we will state that neither **Newton**, nor **Einstein** and his followers could give the explanation to flat space, to its principal physical property, the inertia, and to the physical structure of flat space.

Meanwhile, the flat space has a complicate physical structure. The flat space is not a hollow, not a vacuum and not ether, it is not without mass-energy, and as the cosmological equations of the Gch^2 theory show, the flat space – is the balanced formation from positive and negative mass-energy, which is never violated, neither in static and nor in evolutional state. However, the total mass of positive and negative components making the flat space (inside the structure of our Universe), is equal to zero $m_{tot} = m_{pos} + m_{neg} = 0, (m_{pos} = m_{neg})$, the total force of gravitation and antigravitation, caused by these components, is always equal to zero $F_{tot} = F_g + F_{\bar{g}} = 0$,

$\left(F_g = \left|F_{\bar{g}}\right| = F_{pl} = c^4/G = const.\right)$. Also $\varepsilon_{tot} = 0$, $\rho_{tot} = 0$, $P_{tot} = 0$, $a_{tot} = 0$ and so on, except for the volume $V_n = r_n^3$ and time t, the latter is often called as the age of the Universe. However, it does not mean that the flat space of our Universe is empty and that the matter in it is absent.

Here, I consider necessary to dwell on the problem of finiteness and boundedness of flat space.

It is usually considered that the flat space is infinite and that the radius of this space is infinite, hence, if space of our Universe is strictly flat then our Universe "is open", unbounded, etc. This is another delusion of the modern Physics and Cosmology, which is the result of lack of the conception on the physical essence and structure of flat space.

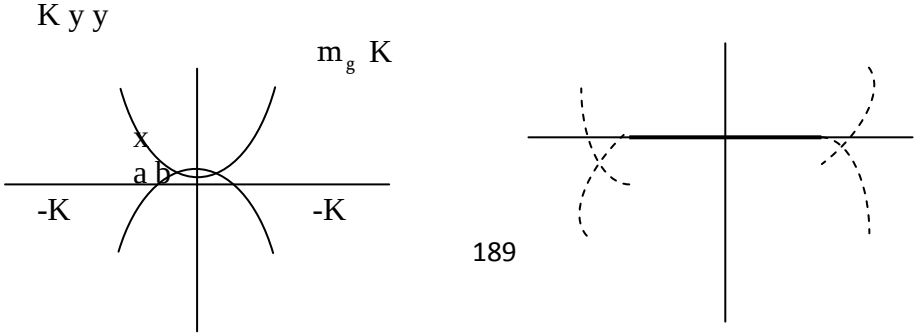
Our Universe is strictly, and not approximately flat, but this does not hinder it to be a finite and restricted physical system.

$$K_n + (-K_n) = G \cdot \varepsilon_n / c^4 + G \cdot (-\varepsilon_n) / c^4 ,$$

where $K_n = \left|-K_n\right| = 1/r_n^2$.

The formula $K_{tot} = K_n + (-K_n) = 0$ is correct, however it does not mean, that $r_{tot} = 0$; on the contrary, always $r_{tot} = r_n + r_n \cdot i \approx r_n > 0$. As it is seen from our cosmological equation, the positive space curvature, which is equivalent to the attraction caused by positive energy-mass, balances, restricts and rhymes the negative space curvature, which is equivalent to the repulsion caused **negative component**- by the antigravitation.

The contrary is also true; the negative curvature restricts and rhymes the positive curvature. As a result, the flat space with its finite parameters comes out. It can be shown diagrammatically in the Figure



$m_{\bar{g}}$

Fig. a Fig. b

a) **Fig. a** separately shows the positive and negative space curvatures caused by positive and negative mass-energy, which do not correlate to each other.
b) **Fig. B** shows schematically the structure of flat space - the segment ab shows finiteness and boundedness of flat space, which is obtained by correlation, unity and interaction of positive and negative curvatures.

* * *

Let us return to the problem of the physical essence of dark energy though we, in effect, did not leave it. It is easy to assume that the average density of negative energy-mass $(-\varepsilon_n)$, which is on the right side of our cosmological equation, regards exactly the dark energy. The basic physical property of this dark energy is the antigravitation–repulsion, which is equivalent to the negative space curvature $(-K_n)$, the present place of which, as **Einstein** supposed, is in the left - geometrical side of the equation. So, I would argue that **so-called dark energy, found in the observations, is the matter of our Universe, which possesses negative gravitational mass-energy.** It always balances the positive component of our Universe – the matter possessing positive mass-energy, and they jointly create the flat space of structure of our Universe[1]. There is no more any quintessence, any vacuum and any phantom energy.

So, having got rid of misunderstandings and erroneous opinions, it is necessary to specify from the very beginning what I understand as the negative mass or negative gravitational mass.

1) First of all, it is necessary to understand accurately that for gravitational mass:

[1] and in any local part and in any volume of our universe

a) the active gravitational mass and

b) the passive gravitational mass,

are relative and make meaning only in the case we deal with interactions of gravitational masses with different sizes and values, for example: $m_{Moon} < m_{\otimes} < m_{Sun}$. The mass of our Earth in comparison with the gravitational mass of the Sun is the passive gravitational mass, and in relation to the Moon is the active gravitational mass.

However, gravitational masses (charges) of non-free physical systems are equal to each other by their absolute value; there is no large and small gravitational mass (charge). All of them possess either positive or negative gravitational elementary charges that is quanta of positive and negative mass $\left|m_g\right| = 10^{-67}\, g = const$.

Hence, in relation to non-free physical systems, division of gravitational mass into active and passive masses is meaningless, because they possess positive and negative elementary mass (charge) **of the same** size.

2) Second, for getting rid of **the exotic** properties of negative mass discovered in the studies of **G. Bondi** and **R.L. Forward**, it is necessary to consider that physical systems with negative gravitational charge have also the zero inertial mass. Moreover, generally**, there is no negative inertial mass in the nature**; hence, the false conceptions related to negative inertial mass are excluded.

It is to be added that the lack of inertial mass, in general, is one of the principal properties of non-free physical systems. Therefore, not only the non-free physical systems with negative gravitational charge, but also the non-free physical systems with positive gravitational charge do not have inertial mass. In case of non-free physical systems, the equivalence principle is violated and this is their specific character, unlike the free physical systems.

3) Third, though positive and negative gravitational charges of non-free physical systems are similar to the electromagnetic charges by some of their properties (they are elementary ones and not divided into parts and stable values), they essentially differ from them. Positive and

negative charges and non-free systems that are their carriers, colliding and interacting with each other and are not subjected to annihilation as **R. Forward** and others considered. The negative gravitational mass, as well as positive, are substantive properties (attributes) of matter, they cannot destroy each other and disappear. These charges can change their "places", but not annihilated. For example, Armon in the state of minimon has positive gravitational charge (g), and turns from minimon into maximon during the change of this positive charge into negative ($\bar{g}$) or vice versa.

4) Fourth, the non-free systems with negative and positive gravitational mass are gravitationally isolated systems. They do not exchange energy - heat with each other. For example, positive and negative components of our Universe do not increase or reduce their heat at the expense of each other. These components are isolated from each other thermodynamically, that means that these components do not exchange the energy - heat. Hence, the supposition of **Forward** and **Terletsky**, that in the system made of positive and negative components, the positive component infinitely increases its heat and the negative component, accordingly, reduces, and they balance each other by this, is false.

Again, we have the paradox of infinitely large and infinitesimally small, this time in a thermodynamic problem. The above-stated four points are sufficient for getting rid of these thermodynamic infinities. In the Armon theory, both positive and negative heat has minimum and maximum values, within the boundaries of which they can vary, not going beyond these boundaries.

For the sake of justice, it is necessary to say that prof. **Terletsky** though was inclined to the opinion that between "minus-particles" and "plus-particles" if not strong, then at least the weak interactions are. In addition, in his book, he provided the sufficient place for these discussions; however, he considered possible also the existence of only gravitational interaction between positive and negative components. *"Quasi-equilibrium of the systems consisting of plus-particles, at the presence in the nature of minus-particles, may be, obviously, provided if*

one supposes that the minus-particles interact with plus-particles only gravitationally and that other forms of interaction (strong, electromagnetic, weak) between plus - and minus-particles completely absent. In this case, any system of plus-particles can practically be considered adiabatically isolated from minus-particles and consequently can be considered as being in a state of thermodynamic equilibrium. The equilibrium can be violated only because of interchanging of gravitons of the system of plus-particles with the system of minus-particles. However, such processes are extremely improbable and cannot lead to significant effects.

If, according to the assumption made above, the gravitational interaction takes place between minus-particles and plus-particles, the minus-particles can generally be discovered only in phenomena on cosmic scales at the gravitational fields created by large accumulations of these particles"[1].

3.8.4 Microstructures and macroscopic properties of dark energy.

Having clarified that dark energy is the matter with the negative gravitational mass-energy, which balances the positive component of our Universe, we will consider now its macro properties and composition – the microstructure.

From the very beginning, first, it is to be emphasized that, in our opinion, dark energy or matter with negative mass-energy, essentially differs from the vacuum of the cosmic model ΛCDM and from other offered alternative versions (quintessence, etc.) with its macro properties.

1) As the part of our Universe, **the negative component,** dark energy is variable and also **stable**. Dark energy is variable as the average density of its mass-energy varies under law ΛCDM and depends on numerical value n.

[1] **Ya. Terletsky**, **PARADOXES OF THE GENERAL RELATIVITY**, M, 1968, p. 101.

Dark energy is stable, in the meaning that $|\varepsilon_n|$ has minimum and maximum numerical values, when n=1, then $|\varepsilon_n| = \varepsilon_{pl} = c^7 / (G^2 \cdot \hbar) = const.$ and if $n = 2$, $|\varepsilon_n| = \varepsilon_{pl} = \varepsilon_{pl} / 2^2 = const.$ that corresponds to two static and stationary states of our Universe. Thus, the average density of mass or energy of dark energy is not absolutely invariable or absolutely variable.

2) Dark energy varies proportionally to change of the radius of our Universe – according to law $|E_n| = c^4 \cdot r_n / G$ and not by $E_{DE} = P \cdot V$ (where pressure $P = const.$). This is the very important circumstance. There are no such physical systems in the nature, the energy/mass of which would vary directly proportional to the change of volume, leaving invariable the average density or the pressure P of energy-mass equivalent to it.

3) Dark energy possesses the property of antigravitation because it has the negative gravitational mass-energy. And the equation of the state of our Universe is defined by the total of corresponding parameters of dark energy and the positive component: $\varepsilon_{pos} + \varepsilon_{neg} = 0$, or $\varepsilon_n = |-\varepsilon_n|$, or $P_{pos} + P_{DE} = 0$, $P_n = |-P_n|$, since $|\varepsilon_n| = |p| = |\rho \cdot c^2|$, then $\varepsilon_n = |-P_n|$.

4) Dark energy is not grouped and is not congested because the antigravitation and repulsion are its born property. Here it is necessary to dwell on the principal idea of the paper[1] *" The vacuum-like medium in this scenario imparts the pulse to the expansion not to itself (inflation), but to the new-born* ***Friedman****'s medium"*. The founder of the vacuum-like medium **Gliner**, also constructed his theory on a wrong basis (based on **Friedman's** cosmology with the constant Λ), with the help of which **Gut**, **Linde**, **Starobinsky**, etc. have created the inflationary theory. However, eventually **Gliner** understood that this so-called vacuum-like medium could not **expand itself by repulsion**. Already

[1] **E. B. Gliner**. "**INFLATIONARY UNIVERSE AND THE VACUUMLIKE STATE OF PHYSICAL MEDIUM**". **Physics Uspekhy,** Volume 45:213–220, 2002.

many contributors understand this. For example, **Chernin** in his known paper[1] *"Speaking in the language of **Newton's** physics, the vacuum creates force but is not influenced (as macroscopic media) by either external gravitational forces, or by its own anti-gravitation"*.

If, as **Chernin** underlines, dark energy is a vacuum-like medium, or "**Einstein-Gliner's (EG)** vacuum" then antigravitation and repulsion are not the direct property of dark energy, but the **effect** caused by it. **Chernin** underlines: *"... The **Einstein** force of anti-gravitation created by the **EG**-vacuum* $F_E = 2 \cdot \rho \cdot v \cdot 4 \cdot \pi \cdot R \cdot G/3$. *Force of anti-gravitation has a sign opposite to the sign of the **Newton** force and it does not decrease with increasing of distance, but increases linearly ... Though dark energy is a strictly relativistic object, nevertheless, **Newton's** approach gives (as in the relativistic case) the equation for effective force. The effect of anti-gravitation amplifies (doubles) also thanks to that that the effective gravitational* density *of dark energy is expressed in the form of* $-2\rho v$ *".*

So, unlike the common belief, in the Armon theory the negative component of our Universe (dark energy), by its physical nature possesses the repulsion. Antigravitation is not only macroscopic property of dark energy, but also microscopic - quanta of dark energy are anti-gravitons $\bar{g}$, which are non-free physical systems, that is, they have no inert mass, but have only negative gravitational mass (a negative gravitational charge) $m_{\bar{g}} = 10^{-67} g = const.$ Unlike gravitons, anti-gravitons are not grouped, since they repulse each other. Thus, according to our opinion, the dark energy (anti-gravitons) repulses not only the positive component of our Universe, but also itself, because the anti-gravitons $\bar{g}$, being its components, possess repulsion, i.e. are elementary charges of anti-gravitation.

It means that if in the composition of our Universe the dark energy (the negative component) would dominate, the space would infinitely

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[1] **A. D. Chernin,** "**DARK ENERGY AND UNIVERSAL ANTIGRAVITATION**", **Physics Uspekhy**, Volume 51: 253-282, 2008.

expand, and its matter, infinitely dissipating, would disappear. In addition, this, i.e. the anti-collapse, as well as the absolute collapse, is strictly forbidden by the energy conservation law, or the eternity law. That is why the dark energy cannot prevail in our Universe, neither today, or in the past. Also the positive component (positive mass-energy) cannot prevail in the beginning of expansion of our Universe, but, these two components always counterbalance each other, which leads to flat space of structure of our Universe. However, they counterbalance each other with certain homogeneous distribution. Simply the dark energy is distributed fine-grained homogeneously as anti-gravitons $\bar{g}$, repulsing each other, they are not grouped. In addition, the positive component is distributed coarse-grained homogeneously, its "grains" are primary black holes.

Thus, speaking in the same language of **Newton's** physics, the attraction of the positive component and the repulsion of the negative - dark energy of our Universe, always counterbalance each other:

$$F_{attr} + F_{rep} = 0,\ a_{attr} = -G \cdot m_{pl} \big/ r_n^2 ,$$

$$a_{rep} = G \cdot |\rho_n| \cdot r_n,\ -a_{atr} = a_{rep},\ |F_{rep}| = F_{atr} = F_{pl} = \frac{c^4}{G} = const.$$

The repulsion force and the attraction force always remain equal to each other modulo (and different in sign) throughout all evolution of our Universe.

5) The following important feature of dark energy is that it interacts with the positive component only with substantive interaction, i.e. by means of its gravitational mass-energy, or by means of the negative space curvature. It does not assume, but excludes the exchange of energy-heat with the positive component. It means that the dark energy is isolated thermodynamically from the positive component of our Universe. Thus, thanks to this important feature, the dark energy does not absorb and does not radiate ordinary electrically charged particles, it does not participates in strong, weak and electromagnetic interactions.

What can we tell about the microstructure of the dark energy? As we already mentioned, it consists of anti-gravitons $\bar{g}$. Like gravitons g, they should not be confused in any way with the elementary particles investigated in the quantum physics, and, in particular, with quantum of Einstein's gravitational field - with "classical" graviton. Not to think out new terms and to follow the tradition, we simply named these our non-free systems, i.e. the elementary charges of positive and negative gravitational mass as "gravitons and anti-gravitons", to underline their basic physical features – the attraction and the repulsion. Our gravitons and anti-gravitons are limiting quanta of energy and heat – gravitationally and thermodynamically isolated quanta (charges).

I repeat, while gravitons do not occur in a free condition, but are always grouped in free physical systems - in ordinary particles and in black holes, the anti-gravitons $\bar{g}$ are never grouped, but always repulsing each other, are evenly distributed in space.

From our cosmological equations we already know, that the dark energy (the negative component) consisting of anti-gravitons, and the positive component (which basically consists of primary black holes - primary black hole) consisting of gravitons, as a part of our Universe are always equal to each other with their absolute numerical value of the average density of energy-mass $\varepsilon_{pos} = \varepsilon_{DE}$, $\rho_{pos} = \rho_{DE}$ However, as already mentioned above, the positive component is mainly concentrated in primary black hole, while the dark energy - in anti-gravitons $\bar{g}$, which "penetrate" into our Universe in portions of $|m_{pl}| = 10^{-5} g$, but not separately, but with the same positive mass, i.e. in the composition of pseudominimon, since the pseudominimon has such composition. So, our Universe consists of U. number of pseudominimons. It means, that the mass of dark energy consists of U. number of portions of negative gravitational mass, thus, during evolution of our Universe $|m_{DE}| = m_n = n \cdot m_{pl}$, and at the end of evolution - under the law

$|m_{DE}| = 2 \cdot n \cdot |m_{\bar{g}}|$, and at the end of expansion $|m_{DE}| = m_{\text{в}} = 2^2 \cdot |m_{\bar{g}}| = 10^{57} g$. Thus, it appears, that the number of anti-gravitons varies under the law $N_{\bar{g}} = 2 \cdot n$, and in case of $n = 2$, $N_{\bar{g}} = 2^2$.

At the end of cosmological evolutions the dark energy consists of U^2 number of anti-gravitons.

It is impossible to find out the dark energy, its components, anti-gravitons, in laboratory conditions as they interact with the positive energy-mass only gravitationally. As Einstein and Terletsky have noted, the matter with mass density with negative sign, physically manifests itself in cosmological scales. Antigravitation of dark energy has never been discovered by astronomers.

Now we will clarify the change of the average mass density $\rho_{\bar{g}}$ of anti-graviton $\bar{g}$ of cosmological evolution. From the very beginning we have accepted, that anti-graviton is an elementary gravitational charge, its mass remains invariable $|m_{\bar{g}}| = 10^{-67} g = const.$ This invariance follows from the equation

$$|m_{\bar{g}}|^2 = m_{\bar{g}}^2 = \frac{\rho_{\text{в}} \cdot \hbar^2 \cdot G}{c^4} = \frac{\rho_{pl} \cdot \hbar^2 \cdot G}{2^2 \cdot c^4} = const.$$

However, $m_{\bar{g}} = const.$ does not mean, that the average density of anti-graviton ρ too is am invariable value. On the contrary, it means, that the spatial volume of its localization is variable. Since the dark energy is homogeneous and is evenly distributed in our Universe (in volume $V_{\text{в}}$), then $\rho_{DE} = \rho_{\bar{g}}$, as uniformity of dark energy is fine-grained and is caused by equal distribution of anti-gravitons $\bar{g}$. This means that in case of $n = 2$, $|\rho_{DE}| = |\rho_{\bar{g}}| = \rho_{\text{в}} = 10^{-31} g/cm^3$. Here it is to be noted the following: today it is often talked "about the problem of cosmic coincidences". **A.Chernin** writes about it: *"It is not the first time the*

cosmology faces the problem of numerical coincidence; this theme has an old history, emerged from the discovery of the coincidence of large numbers by ***Dirac****. But the coincidence of cosmic densities represents an absolutely new page of this history, though in this variant too the problem has something common with that discussed on the theme of coincidence earlier"*[1].

Still **Stanyukovich** noticed that the physical medium dictates and forces physical systems being in this medium, for example, elementary particles, to change according to how the medium changes to remain in thermodynamic balance with the medium. Therefore, as **Stanyukovich** considered, in parallel with the expansion of our Universe, the elementary particles should be changed in the appropriate way. As it will be shown below, we speak about one of the great laws of the Nature, the law that is true for any stage of evolution of our Universe.

1) First, average densities of mass-energy of the dark energy and the positive component are always equal to each other with their absolute numerical values $|\varepsilon_{T\Theta}| = \varepsilon_{пол}$,; $|\rho_{T\Theta}| = \rho_{пол} = \rho_{pl} / n^2$

2) Besides, the average density of mass-energy of one anti-graviton $\bar{g}$ is always equal to $\varepsilon_{DE} = \varepsilon_{\bar{g}}$, $\rho_{DE} = \rho_{\bar{g}}$;

3) The parameters ρ or ε of the positive component of primary black hole, characteristic elementary particles and D bodies during evolution always try to be comparable to the parameters ρ_n or ε_n of the positive component $|\rho_{DE}| = \rho_n = \rho'_{BH} = \rho'_D = \rho_K$;

4) During expansion of our Universe, the Metagalaxy always consists of D bodies of corresponding level (of expansion phases), and adds its mass m_{MG} with $m_{MG} = 10^{-10} g$ up to $m_{MG} = 10^{52} g$ (i.e. adds by U. times), and $\rho_{MG} = \rho_n$ in case of n = ², always; and today $\rho_{MG} = \rho_{₂} = 10^{-31} g$.

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[1] **A. Chernin**, **COSMIC VACUUM**, **Physics Uspekhy**, 2010, V. 171, N11.

That is, $\rho_{MГ} = \rho_D^{'}$ where $\rho_D^{'}$ is the average density of the full-scale condition of supercluster of galaxies $\rho_D^{'} = 10^{-31} g/cm^3$.

But let us return to $\rho_{\bar{g}}$, to the change of anti-gravitons $\bar{g}$ to provide conservation of law $|\rho_{\bar{g}}| = |\rho_{DE}| = \rho_n$, spatial volume of localization of anti-graviton $\bar{g}$ should be changed. It is known, that in case of $n = 2$, $|\rho_{\bar{g}}| = \rho_2 = 10^{-31} g/cm^3$ as $|m_{\bar{g}}| = 10^{-57} g$, it means that in this case $V_{\bar{g}} = |m_{\bar{g}}| / |\rho_{\bar{g}}| = 10^{-37} cm^3$. If one considers that anti-graviton, nevertheless, is a quantum, then it is possible to apply to it the formula for Compton wavelength $l_K = \hbar / c \cdot |m_{\bar{g}}| = 10^{29} cm$. Considering this value as spatial parameter of anti-graviton, we can determine, assume that $V_{\bar{g}} = 10^{-37} cm^3$. From here $r_{\bar{g}}^2 = 10^{-37} cm^3 / 10^{29} cm = 10^{-66} cm^2 = r_{pl}^2$.
This is especially interesting for the theory of strings.
It is difficult to imagine a quantum, which has Compton wavelength $l_{\bar{g}} = 10^{29} cm$ and cross-section $r_{\bar{g}}^2 = 10^{-66} cm^2$. If one accepts that $r_{\bar{g}}^2 = r_{pl}^2 = const.$ is invariable, then $|m_{\bar{g}}| = 10^{-67} g = const.$, we have only to draw a conclusion that $l_{\bar{g}}$ varies under the law: $l_{\bar{g}} = r_{pl} \cdot n^2 / 2$, where $\left(n^2/2\right)$ is the quantum gravitational correction or factor of compactification - decompactification not having the dimension. Only in this case $|\rho_{\bar{g}}| = |\rho_{TЭ}| = \rho_n = \rho_{pl} / n^2$ in any stage of cosmological evolution. It is to be added that the anti-graviton temperature does not vary in the course of expansion $|T_{\bar{g}}| = |E_{\bar{g}}| / k = 10^{-46} эрг / k = 10^{-31} K = const.$
Antigraviton is the quantum of negative energy-heat, and graviton is the quantum of positive energy-heat. Our graviton differs from the one in the general theory of relativity also with this.

3.8.5 Structure of flat space and the direct physical reason of the accelerated expansion of the Metagalaxy

We have already discussed the structure of flat space, that is our Universe, and we already know that the dark energy consisting of anti-gravitons, is counterbalanced by lattice of primary black holes, generating the flat symmetric space, in which also our Metagalaxy arises and develops.

Here it is necessary to add and tell about the feature of flat space, as a certain force field.

As we know, in theories of fields there are such concepts, as "field intensity ", "lines of forces". However, it is not clear until now, what this field intensity represents, what is the "mechanism" of its origination. Soviet physicist **Frenkel** has clearly specified it. *"... What the mechanism of occurrence of field intensity is concluded in? There is no answer to this question... what is the field intensity caused by presence of electrons, having in each point of space a certain value and a certain direction and being the immediate reason of occurrence of momentum... What changes have been caused in space by presence of...charges?"* This problem requires the solution not only for usual gravitational or electromagnetic (in general, for all types of quantum fields), but also for the most fundamental field - the flat space-time. Moreover, the solution of this problem, first of all, depends on identification of structure of flat physical space, its physical nature as unique force field.

One should never represent flat space, as emptiness, vacuum or as the medium without lines of forces.

It is obvious from our equation that the structure of our Universe – the flat space, is formed of positive and negative (dark energy) components, of the gravitation and anti-gravitation force fields, caused by them. Our cosmological equation is very similar by its structure to the equations of electromagnetic field. *"In the general case, the electromagnetic field is the imposition of electric and magnetic fields "*[1].

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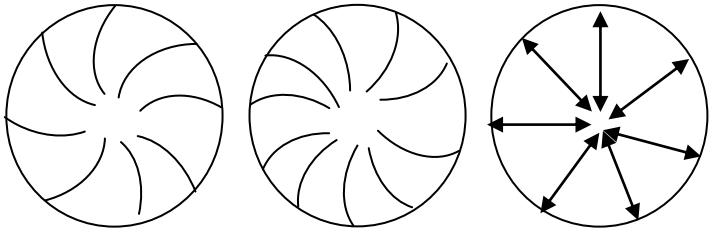
[1] **L.D. Landau** and **E.M. Lifshits** "**FIELD THEORY**" M, 1972

In our theory of flat space, thanks to the rule of $a_{tot} = a_{attr.} + a_{rep} = 0$ the motion of free physical systems does not give acceleration to the flat space. The inertia occurs in this way. By their dimension, the acceleration a and the field intensity are identical, so the field intensity of dark energy and the field intensity of the positive component (lattice of primary black hole), are equal by their numerical value, but are opposite in direction. That is why they compensate each other, but do not destroy. This is a very important circumstance. As a whole, the flat space is the imposition of the field of dark energy with the negative curvature, that is, the anti-gravitation, and the field of positive component (lattice of primary black hole) with positive curvature. This imposition can be schematically represented in this way:



A B. C.

Where Fig. A shows, let us say, the field of lines of forces with negative curvature generated by anti-graviton $\bar{g}$, in the volume of its localization. Fig. B represents the field of lines of force with positive curvature generated by graviton g if, of course, we imagine for a moment that the positive component is fine-grained homogeneity of gravitons g. Fig. C represents the field of force lines of flat space. The arrows show that the repulsion and attraction counterbalance each other and the field has no curvature. It is to be noted that except the similarity to the electromagnetic field, the field of flat space strongly differs from the fields of positive and negative components, of which it consists, always counterbalance each other. It is impossible for one of them to dominate over the other. Then, unlike the electromagnetic field, the flat space has primary and fundamental physical nature. It is also global.

Here it is necessary to dwell on another important circumstance. The total (or full) intensity of the field of flat space is equal to zero $\vec{E}_{tot} = \vec{E}_{pos} + \vec{E}_{neg} = 0$ ($|\vec{E}| = a$). But it does not mean that the flat space has no lines of forces at all, as well as does not mean that the flat space is deprived of matter or energy-mass, though $m_{\bar{g}} + \sqrt{2} \cdot m_{BH} = 0$. This means that though the lines of forces of positive and negative components counterbalance each other, but do not destroy and cause the counterbalanced network of lines of forces of flat space. The free physical system appeared in one local part of this global network, violates, with the size comparative with its positive mass, the balance of the network of force lines of flat space, of course, in favor of force lines of positive curvature, in favor of gravitational field, since free physical systems have gravitational mass equivalent to the positive inert mass. Antigravitons in the nature cannot be grouped and generate complex physical systems, therefore in flat space there cannot be physical systems consisting of anti-gravitons. Here is one more answer to the questions exciting **Einstein**.

It is very likely that the electric charges also (as other sources of quantum interaction), as assumed by **Frenkel**, are able to change space, in which they have appeared. Running forward, let us notice that our Metagalaxy is an integrity of free physical systems (with the exception of primary black holes, which though are free physical systems and basically in motionless and "frozen" condition; they are moving directly only when they unite and increase their mass). Appearing and developing in flat space of our Universe, our Metagalaxy always has inside it the positive curvature which, of course, decreases during formation and expansion of D bodies of the Metagalaxy, finally reaching today $K = 1/r_{mg}^2 = 10^{-58} cm$. It is very close to flat space, but yet is not flat space, as it is the positive curvature generated by positive mass $m_{mg} = 10^{52-3} g$. Thus, the positive weight of the Metagalaxy violates the balance of the network of force lines of flat space of our Universe, in favor of positive curvature.

Now, since the quantum interactions of all kinds arise and exist, basically, in the Metagalaxy, in its space with positive curvature[1], then, probably, these quantum interactions[2] and their specific quantum characteristics (quantum numbers) arise and exist to overcome and counterbalance this positive space curvature (the gravitation caused by large positive masses) and force lines of this field with positive curvature, thereby providing the "right" for free motion for themselves. In my opinion, **Vladimirov's** idea is close and consonant with my position, which still requires in-depth studies: " *Fundamental physical interactions, excepting gravitation, can be understood as manifestation of additional dimensions of the curved physical space / time* "[3].

* * *

Let us clarify one more question and again return to the basic theme of this paragraph. Today it is often written not only about the dark energy, but also about the dark matter. In Gch² cosmology, as we have already found out, the dark energy is counterbalanced by the other component of our Universe – the lattice of primary black holes.

$$m_{tot} = 2 \cdot m_{\bar{g}} + m_{BH} = 0$$

Since the primary black hole do not radiate light, they are invisible, it is possible to call them also the dark matter[4]. However, to avoid the mess, we will call the things by their proper names: the positive mass of our Universe is concentrated in primary black holes, and the mass of the Metagalaxy makes 10^{-5} part (and **no more**) of the positive mass of our Universe. In the Metagalaxy, the dark matter basically consists of D bodies, which too are black holes by their nature, but strongly differ from them both by structure and by the evolution mode. We will speak

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[1] strong and electroweak interactions arise and exist in primary black holes, in their space with positive curvature

[2] strong, weak and electromagnetic

[3] **Y.S. Vladimirov METAPHYSICS**. Moscow: BINOM; 2002. (in Russian).

[4] Academician **Markov** in the last articles published in **Physics Uspekhy**, puts forward the assumption, that the dark matter can be gas of primary holes with Planck's masses, or consist of Markov maximons.

in more details about it, and in general, about laws of occurrence and development of various components of the positive component of our Universe in the Chapter IV of this book.

3.8.6. What is the reason of expansion of our Metagalaxy?

From Gch² cosmic model it became clear that the dark energy (field of anti-gravitons) is counterbalanced by the positive component of our Universe - gravitational force lines of primary black hole in practically any volume, and, hence, the dark energy itself cannot affect the galaxies and their superclusters in a way to remove them from each other, moreover with acceleration. That is, the dark energy, its anti-gravitation is neutralized thanks to the gravitation of the positive component, and thus, **the dark energy cannot be the direct physical reason of expansion of the Metagalaxy**. In our Universe, the Metagalaxy is an independent physical system arisen and formed from the very beginning of evolution, with mass and other physical characteristics, with specific features of its structure and development. I specially underline the *autonomy of our Metagalaxy*, because as we have already shown, its identification with our Universe leads to the mess. In reality, they are different things. Inside our Universe, very flat space dominates, in the conditions of which our Metagalaxy arises and develops from the very beginning, and which is a completely free physical system. And all free physical systems, since they too have positive inert mass, both in internal, and in the external plan are counterbalanced thermodynamic systems, in comparison with the medium, that is, in comparison with the structure of flat space of our Universe, whose $T_{tot} = T_{pos} + T_{neg} = 0$, that is the absolute zero thermodynamic balance. Certainly, free physical systems can have thermodynamic balance inside them, but it is an energy-dominant (or thermic energy-dominant) condition, and still it strongly differs from the zero thermodynamic balance. That is why, free physical systems, as a whole, are unbalanced, and can always be changed, they tend to absolute zero balance, but changing, never reach to absolute zero, but only minimum value of positive heat. Here is the

answer to **Prigogine's** big question: *"Why does the general future exist? Why does the time arrow specify the same direction? It can mean only that our Universe represents a comprehensive whole. It has a general origin, which already entails symmetry violation in time. Here we face with cosmological problems"*[1]. Our Metagalaxy, the duration of time of its development as a whole, goes into the duration of evolution of our Universe and the time arrow coincides with the direction of time of our Universe. We have already talked about how the direction of time of our Universe arises.

It is clear from above that the Metagalaxy, being in the medium of flat space with a temperature of $T_{tot} = 0$, "strive" for freezing and reduction of heat. But how can one reach it? The answer is simple - only having expanded the volume, it will be possible to reduce heat. Thus, we have once again returned to the question of expansion of the Metagalaxy, but this time the prospect for natural deepening of the question is opened: since the body is closely connected both with the average density of mass-energy and with the pressure, it is necessary to compare similar parameters of flat space (the medium, in which our Metagalaxy exists and develops) and of Metagalaxy. The comparison shows, that $P_{MG} \neq P_{tot} = 0$ and $P_{mg} \neq P_{tot} = 0$. Is it not clear, that we have pressure drop that, naturally causes the so-called hydrodynamic force, which with acceleration (like explosive effect) expands our Metagalaxy. This expansion, being slowed down, eventually stops, when $\rho mg = \rho_{\text{г}} < 10^{-31} g/cm^3$ (in connection with the specification of $^{2} = 10^{62}$ U=10^{62} digital factor).

Thus, **the direct physical reason of the accelerated expansion of the Metagalaxy is the hydrodynamic force arising because of the difference of pressures**.

Certainly, I am not inclined to underestimate the role and the importance of the dark energy (field of anti-gravitons). Eventually, the

[1] **I. Prigogine**, **END OF CERTAINTY**, p. 142

flat space, without which not only the primary black hole lattice, but also our Metagalaxy would not appear at all, is obliged to it for its existence. All matter is obliged to it and to its basic physical properties – anti-gravitation, for its existence. This is not a mere coincidence, that genius **Hegel** gave a more important and constructive place to universal repulsion, than to gravitation. It is easy to assume that the dark matter not only is not an immediate cause of expansion of the Metagalaxy, but also is not the physical reason of evolution of our Universe, and is only responsible for formation of flat space. The latter is formed and develops (evolves) thanks to increase in portions of positive and negative mass/energy $\left(\left|m_{pl}\right| = 10^{-5} g\right)$ by n times. We have already mentioned

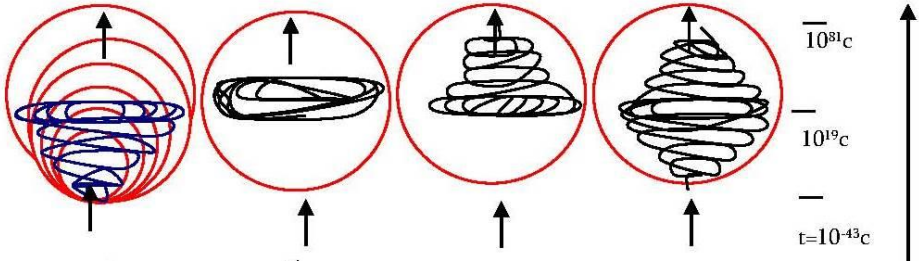
$$10^{-5} g \to 10^{57} g$$

that $m_{tm} = m_{\bar{g}} + m_{pl} = 0$ where m_{tm} is the total mass inside pseudominimon and, thus, because of increase of pseudominimons with quantity $n = 2$, the total mass of our Universe is added, in case of $n = 2$, that is, at the evolution culmination, $m_{\Sigma} = 2^2 \cdot m_{tm} = 2^2$, $m_{\bar{g}} + \sqrt{2} \cdot m_{BH} = 0$ when $m_{bh} = 10^{26} g$. We have to add only that non-free physical system consisting of pseudominimons, is a pseudomaximon. That is, what we call the "our Universe", is actually a pseudomaximon , which has zero balance inside, but in the external plan has charge of $\bar{g}$ anti-graviton. In turn, our pseudomaximon, as a comprehensive whole, is the negative gravitational charge of our maximon. Therefore, maximon is indifferent to internal evolution of its charge, since in the external plan the elementary negative charge of maximon is always constant, to the moment until maximon, under corresponding conditions, changes the gravitational positive charge into negative and, thus, turns into minimon.

$10^{-5} g \to 10^{57} g$

Let us return, however, to the evolution of our Metagalaxy. Since , $m_{MG} \cdot m_n / 10^5 = n \cdot m_{pl} / 10^5$, then $m_{tot} = n \cdot \left(^2 \cdot m_{\bar{g}} + m_{pl} + m_{pl} / 10^5 \right)$, hence, at $n = ^2$, $m_{mg} = 10^{62} \cdot m_{pl} / 10^5 \approx 10^{52} g$ [1]. If the positive component of our Universe increases $10^{-5} g \to 10^{57} g$, the mass of the Metagalaxy will increase $10^{-10} g \to 10^{52} g$. Thus, in the course of increase and spiral spinning of the mass of the Metagalaxy, D bodies are continuously formed and develop which, uniting, continuously increase their mass, reaching a certain border $m_D = 10^{47} g$, which already represents a pre-supercluster. Certainly, what is involved is the preliminary condition of supercluster of galaxies. Then, in turn, 10^5 m_D bodies are formed and they expand. During this evolution they turn to galaxies. During the full-scale condition, their integrity forms today's visible Metagalaxy[2].

The process of origination, development and degradation, decomposition of our Universe and of our Metagalaxy within its frameworks, can be schematically presented in this way:



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[1] In this case our cosmological equation will have the form: $1 / \left(r_2 + r_{mg} \right)^2 + \left(-K_2 \right) = G \cdot \left(\varepsilon_2 + \varepsilon_{mg} \right) / c^4 + G \cdot \left(-\varepsilon_2 \right) / c^4$

[2] The so-called "dark flux" found out by observations, is probably a confirmation of spiral (vortex) spinning of our Metagalaxy

Fig. ***a*** $t_n \approx 10^{19}$ sec of our Universe minus 10-15 billion years, but the Metagalaxy has not finished its evolution yet, while it still is on the way of acquisition of disk-shaped stationary rotary movement; 10-15 milliard years more and the Metagalaxy will receive a kind of a stationary condition represented on Fig. ***b***. This is the "mature" period of our Universe, when $t_z = 10^{19} s$. Then the period of degradation of both our Universe, and our Metagalaxy begins, which is already accompanied by the matter outflow from our Universe - regular release of pseudominimons. This process comes to its end in $t_n = 10^{81}$ sec. It is to be noted that degradation and disintegration process begins already when our Universe - pseudomaximon, was released from our Armon and joined with another Armon (became a gravitational charge of another maximon).

IV. Armon Structure of Universe

1. Introduction

The Universe or Eternal Universe is an infinite hierarchical structural chain of Armons, i.e. the direct components of the Universe are Armons. Re-phrasing the statement of the Ancient Greek philosopher, we can say: ***There is nothing in the World (i.e. in the Universe), except Armons, and all that is except Armons, exists in Armons, thanks to Armons and through Armons***.

First of all, it regards the non-free physical systems, since Armons too belong to this general type of physical systems. Thus, Pseudoarmons, which are positive and negative gravitational charges of Armons, cannot exist out of Armons, even when they exist independently-freely (in the form of components of Armons), they exist in Armons.

Exactly in the same way, Gravitons and Antigravitons, which are gravitational charges of Pseudoarmons, cannot exist out of Pseudoarmons and even more, out of Armons. As a part of Pseudoarmons, Antigravitons play the role of the Dark Energy, i.e. the role of the anti-gravitating medium, while Gravitons, which always are in a grouped state, in the form of elementary particles and black holes (black holes), as a part of Pseudoarmons play the role of positive component.

There is nothing to tell in general about the free physical systems[1] in the above-stated sense. Armons "do not feel" their existence, Armons even "do not guess" about their existence. Armons are indifferent, irrespective to the existence of the free physical systems. For Armons these systems are, as though, physically irrelevant, Armons do not

[1] about the metagalactic matter, about primary black holes and D bodies, about elementary particles

physically interact with them. In the same way, we "do not feel" existence of Armons, practically we are not able to interact with them. However, it does not mean that Armons do not exist really, that we exist out of Armons.

To understand the structure of the Universe, it is enough to take from the infinite hierarchical chain of Armons three directly related steps or links of this hierarchy for consideration. Either for example our Armon, it can be in the state of minimon, or in the state of maximon; there is no third state. As we exist, and our Universe evolves, it means that our Armon is in the state of maximon. The anthropic principle has nothing to do here. If our Universe has $|m_{\bar{g}}| = m_n > m_{pl}$, then our Universe and the non-free physical systems similar to it are pseudomaximons. It means that our Universe today is a pseudomaximon and plays the role of the negative gravitational charge for our Armon, which is maximon. Thus, we have identified that our Armon is in the state of maximon. Moreover, it means that our maximon consists of U. number of minimons[1] and pseudominimons:

$$m_{tot(макс)} = ^2 \cdot m_g + ^2 \cdot m_{\bar{g}} = m_{pl} + (-m_{pl}) = 0$$

But in the external plan, our maximon has negative gravitational mass, i.e. $\bar{g}$ charge (= pseudomaximon, which has complex structure inside, but $m_{tot} = m_{инерт.} = 0$).

At the same time, our maximon, with systems identical to it - i.e. with other maximons and pseudominimons, the total number of which is $^2 = 10^{62}$ is a part of another minimon (a hierarchical step or level "higher"). These concepts of "lower" or "higher" have certain sense in relation to our Armon, while in relation to the infinite structure of the Universe they lose any meaning.

Thus, maximons consist of minimons, and minimons consist of maximons. Armons, changing gravitational charge under certain

[1] Each of these Minimons in its turn consists of ^{2} number of other maximons (and pseudomaximons) a hierarchic step or level "lower".

conditions (pseudomaximons or pseudominimons) are transformed from minimons into maximon and back. At first sight, it may seem that Armons, as if, are absolutely eternal, are eternally transformed from one state into another. But it is not the case: each Armon has its "individual life", it is born and dies. When our maximon changes its charge to positive[1], i.e. is transformed into minimon, it means first, that our Armon has completed its "individual life", it is the **end** of our Armon's existence. Secondly - this minimon is a newborn Armon, this is the beginning of the "life" of a new Armon. This minimon (this new Armon in the state of minimon) is identical with our Armon in the state of minimon, but these are different Armons: our minimon consisted of other maximons and pseudominimons, unlike this new minimon. And when this new minimon is transformed into a new maximon with a new negative charge - with a new pseudomaximon, i.e. similar to our Universe, then a similar theory in it (like theory of Armons) will be written by another person, who will hardly resemble me. Like Armons, Pseudoarmons too have their individual life – are born and die.

I wish to emphasize that in the Universe, Armons infinitely arise and "die", it is also some kind of circulation. However, the most interesting is that Armons themselves provide the circulation of all matter. Here, it is to be mentioned that the infinite hierarchical structural chain of the Universe is closed it means, that the infinite links of this chain are similar, identical as though they are repeated. Hence, cognizing one link, we cognize per se the entire structure of the Universe. And the most important thing is that the internal self-motion of the Universe, eternal circulation of Armons and the whole matter, ultimately, is caused by the closure of the infinite hierarchical structure of the Universe. The Universe consists of infinite number of Armons, half of which is in the state of minimons, and the other half - in the state of maximons. And here minimons are transformed into maximons and vice versa, i.e. if our sample Armon has already been born and is in the state of minimon, then, in the beginning our minimon, in the stationary

[1] frees itself from our pseudomaximon and gets another pseudominimon as its charge

state is a part of the "large" maximon, surrounded by ² number of minimons and pseudomaximons. Then the "large" maximon discharges its negative gravitational charge and gets a positive charge, as a result of which a reorganization, change in the internal medium takes place: minimons, including our sample minimon, collide with pseudomaximons, i.e. change their positive gravitational charges (pseudominimons) to negative (pseudomaximons) and thus are transformed into maximons. It is natural that when minimon changes its charge, i.e. acquires a pseudomaximon as negative gravitational charge, therewith promotes, forces all its internal composition to reconstruct, to change: All maximons ("small"), composing our sample minimon, in turn are immediately transformed into minimons, changing their gravitational charges. These transformations, transitions of Armons from one state into another, are interdependent. This natural mechanism of inter-transition is a result of the peculiar hierarchical structure of the Universe, where each **Armon, having, for example, positive gravitational charge, should consist of Armons with negative charges and vice versa**. For this very reason, when Armon changes its charge, i.e. passes from one marginal state into another state, then the charge change forces, physically influence the internal structure of Armon, forcing all Armons, making this internal structure to change their charges.

Each Armon consists of Armons with opposite gravitational charge. It is the new law of the nature.

Now about Pseudoarmons. pseudomaximons and pseudominimons play a double role:

1) in one case they play the role of gravitational charges for Armons,

2) in the other case they are components of Armons; only with the difference **that Armons should have gravitational charge, and the composing Pseudoarmons should have the same sign,** i.e. if it is a maximon, then the charge too should be pseudomaximon, and it consists of pseudomaximons and vice versa. It is also a peculiar law.

The most important thing is that the entire matter variety - from elementary particles, primary black holes and D bodies to the human

being arises, evolves, degrades and perishes as a part of Pseudoarmons, thereby transfers from one Armon into another as a part of Pseudoarmons. This is the circulation of the matter variety.
Each pseudominimon has a total mass of

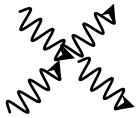
$$m_{tot} = ² \cdot m_{\bar{g}} + m_{pl} = 0$$

In the composition of pseudominimon, there is a free physical system with mass equal to - $m_D = m_{pl} / 10^5 = 10^{-10}$ g. This is an elementary particle; from particles similar to it, D bodies are formed at different levels of evolution. In the stationary state pseudomaximon consists of U number of pseudominimons, which are in a nonsteady state. The internal structure **of our Universe, i.e. of our pseudomaximon** is formed of positive and negative components of these pseudominimons:

m_{tot}=U(U $m_{\bar{g}}$ +m_{pl})=U^2 $m_{\bar{g}}$ + $\sqrt{²}$ m_{in}=0 .

But how?

minimon pseudominimon



pseudomaximon maximon

When our minimon changes its gravitational charge and obtains a pseudomaximon as a negative charge, our minimon is transformed into maximon. But in the external plan this change occurs for one chronon - $t_{pl} = 10^{-43}$ sec. And in the internal plan of our minimon changes also take place: 1) first of all, the internal structure of the minimon is reconstructed at once. For one chronon all component maximons are transformed into minimons, and instead of pseudominimons, pseudomaximons appear.

2) Secondly, changes occur in the gravitational charge itself. This charge-pseudomaximon too has a complicated structure: in the external

plan it has one $\bar{g}$ anti-graviton as a gravitational charge, and in the internal plan it consists of U. number of pseudominimons in changed, mixed state, i.e. in the internal plan pseudomaximon represents **our Universe** (or a system similar to it) in extremely expanded or in the culmination state of evolution. After that culmination state (in this state pseudomaximon was thrown, separated from the "parent" maximon and was in the stationary state until it was "seized" by our minimon), our "mature" pseudomaximon is merely obliged to decompose to separate parts, and its parts, as we already know, are pseudominimons. So, perhaps anti-graviton $\bar{g}$ (which ultimately plays the role of the general negative charge both for the pseudomaximon and for our maximon as a whole) is torn off from the "naked" pseudomaximon, or mixed, and as a result, the "old" one, i.e. our pseudomaximon "decomposes" into new pseudominimons. In the course of intermixing and compression or degradation of our Universe new pseudominimons are formed, which again, under the influence of anti-graviton $\bar{g}$, are integrated and form a new pseudomaximon. And this process lasts 10^{62} stages, only here, for the decomposing pseudomaximon (for our Universe) this time lasts $t_{end} = t_{\text{ж}} \cdot^{2} = 10^{81}$ sec. This is the lifetime of Armons and Pseudoarmons. While for the new pseudomaximon (the new Universe) this time lasts $t_{\text{ж}} = t_{pl} \cdot^{2} = 10^{19}$ sec U. = 10^{19}sec.

2. Armons and Pseudoarmons are local physical systems

Absolute zeros and infinities in the modern physics simply indicate the limitedness of our knowledge. To put it briefly, they arise “not from a good life”, and it is high time to change the situation – to get rid of the uncertainties of zeros and infinities. As is customary to say, physics is always local. Physics always studies local physical systems - with finite physical parameters. In this sense Armons are not an exception.

Armons are local physical systems with all consequences resulting from it.

1) It means that Armons are restricted in space and in time and in general, they have finite physical characteristics.

2) As local physical systems, Armons have beginning and end, are originated and destroyed. It means that any cosmological model, which pretends to describe the infinite and eternal Universe, is not true a priori, and mismatches the reality. And secondly, the cosmological model corresponding to the reality, should be local, free from any infinities, it should describe not only the evolution of our global system - the Universe, but also its origination and destruction, that is, should not avoid, but should explain what was before the Big Bang and what will be in the future, using the laws of physics …

3) As local physical systems, Armons should have their backbone centers.

4) Existence, change, and in general origination and destruction of any local physical system is caused by physical influences of the surrounding medium or internal interactions of the system, the component or the element of which is the local system under study. This means, that first, change of Armons, expansion and compression of Pseudoarmons, is caused by "external" medium or a "large" system, whose components they are. So, when it is spoken about the quantum birth of the Universe from vacuum, the physical reasons of such birth should be explained. This birth cannot be spontaneous, without reason (without reason or spontaneous can be only an eternal, infinite, but not local physical system). Alternatively, when it is spoken about the Big Bang, about expansion, then the physical reasons of its origination should be explained; the principle of "uncertainty" of the quantum theory should not negate the principle of causality, moreover, replace it. Secondly, Armon, as any local system, without fail, is in an interconnection and interaction with medium. It means, that it can influence and be subjected to influence, accordingly being subjected to a certain change. No one of modern cosmologists wishes even to hear about it, they live with an illusion that there is not anything at all out of our expanding space; and even if there are other worlds, we are isolated

from them in a way that any physical communication or interaction with them is excluded.

2.1 Properties of Armons as most fundamental type of matter

After talking about the generalities of Armons with local physical systems, I shall speak also about the properties of Armons. As Armons make a separate, special class of local physical systems, they differ from other types of physical systems, that is, they have certain (and essential at that) properties.

1) Armons differ from all other types of local physical systems with that **Armons consist of Armons**. That is, Armons do not consist of physical systems of low level of formation of matter, as all other basic types of local physical systems. The basic components of Armons are Armons. This property characterizes Armons as the most fundamental type of matter, as "pra-matter". However, here it is necessary to concretize - Armons have two extreme states - states of minimon and maximon. Therefore, if we say that Armons consist of Armons, we should explain that Armon in the state of maximon consists of minimons, and Armon in the state of minimon consists of maximons. Such structure of Armons provides the existence - origination, evolution, destruction of Armons.

2) Armons and all non-free physical systems are bearers of fundamental forces of the nature, Armon forces $|F_{\text{₂}}| = c^4/G$. In due time **Kant** and **Hegel** considered, that attraction and repulsion are one of the important attributes of matter, that they are congenital properties of matter. So, Armons possess attraction c^4/G and repulsion c^4/G.

3) Armons and Pseudoarmons are local physical systems, which are carriers of constant velocity c. Armons maintain this basic property under any conditions, at any influences. There is no any force in the nature, with the help of which it would be possible to suspend, reduce the velocity c of Armons.

4) Another property of Armons and Pseudoarmons is that they integrate gravitation and antigravitation, as well as quantum properties. At the

level of Armons, a true super-unification takes place; the physics of elementary particles is incomplete without the physics of black holes; even the theories of electroweak unification and great unification are incomplete, since they do not take into account the physics of black holes, do not consider gravitational-antigravitational effects.

In a word, Armons have very interesting, sometimes opposite properties, which, generalizing, I call the Armon dualism. (Physicists have already got used to different manifestations of dualism, so they will get used to this one too).

2.2 Small and big Armon symmetry

In its two transformations, Armon makes a peculiar symmetry; the same could be stated about the expansion and compression, or more exactly, about the evolution and degradation of Pseudoarmon. It is small Armon symmetry, while the static or stationary states of Armon (Pseudoarmon) and dynamic transformation phases together to compose the big Armon symmetry. Here a very important circumstance is to be noted: originating as minimon, Armon does not transform into maximon at once, but remains in this "frozen" state invariable, until the external medium is changed, and only in this case minimon, having gained an external impulse, changes its charge and becomes maximon. We have the same in case of both maximon and Pseudoarmon.

2.3 Manifestations of Armon dualism:

a) **Big and small Armon symmetry**. We have already spoken about it.

Armons and Pseudoarmons have properties similar both to those of black holes and elementary particles. The fact that our Universe possesses properties and laws of the system of equations (2) and (3), already testifies that Armons are similar to black holes, but Armons, nevertheless, essentially differ from black holes, since in the external plan they simultaneously possess properties very similar to those of elementary particles.

b) Another manifestation of Armon dualism. No one of free physical systems has such a property – Armon, in the internal plan, consists of two components: the positive and negative energy/mass. It provides flatness of space-time inside Armons.

2.4 Armon forces are fundamental forces of the nature

There is only one maximum force for Armons and all non-free physical systems, which I call Armon force. Armons "perceive" only this force, they vary only under the influence of this force, influence each other, join only with the help of this force, since they possess only these forces. Armons are indifferent to other forces …

Armon force is absolutely constant value modulo − $|F_{\text{₂}}| = c^4/G$.

minimons and pseudominimons have exactly such force of attraction, and maximons and pseudomaximons – Armon force of repulsion.

Moreover, how could Einstein not guess, that expression c^4/G means force, since it has dimension of force. (Here again the dimension postulate worked). In physics forces of different types are distinguished $F = G \cdot m_1 \cdot m_2/r^2$, $F = \mathrm{P}\cdot \mathrm{r}^2$, and so on. In the theory of Armons all these formulas are identical and express a uniform Armon force:

$F_{\text{₂}} = G \cdot m^2 \cdot/r^2 = \mathrm{P}\cdot \mathrm{r}^2 = c^4/G$

Formula of Armon force consists of two constant values − G and c, therefore Armon force is constant. The invariance of this force testifies that it is the *most fundamental force* of the nature. And, certainly, this force, by its nature is none other than force of mass interaction (gravitation and anti-gravitation), is it not seen from the formula?

The most surprising and delightful thing is that this force is present in Einstein's General Relativity Theory, in the form of Einstein's gravitation constant: $\chi = 1/F_{\text{₂}} = G/c^4$.

As already mentioned, the Armon forces are constant. In addition, this force of attraction in the positive component of the Universe does not vary at all stages of cosmological expansion, it always retains its

constant value $c^4/G = const$. This is a surprising fact: how powerful should be the force to overcome this attraction from the very beginning and therewith to expand the Universe?

Stop − We already know, that in the Universe $F_{12} = F_{21} = c^4/G$ always, i.e. forces of gravitation and anti-gravitation of the positive and negative components balance each other. In this case, how the cosmological expansion or, as I say, the formation of flat space of the structure of our Universe takes place? Till today physicists used to think in the following way: if there is attraction between galaxies or their superclusters, then there should be such a force, which would overcome this attraction and would expand the Universe. The cosmologists of the early XXI century think in a similar way: cosmological constant, vacuum medium, dark energy, quintessence, phantom matter; by such exotic types of matter they try to explain, prove the force of attraction, which seems to be capable to expand the Universe - having overcome the attraction of its components.

As we have already found out: a) independent on how the positive mass of the Universe changes, the gravitational force caused by it remains constant c^4/G, that is at any moment, for expansion of the Universe, there should be anti-gravitation force, exceeding modulo the. But after all there is not such a force in the nature, all possible forces are less than the **Planck's** force $F \le c^4/G$.

b) At each stage of expansion of our Universe, the forces of attraction and repulsion are always equal, since the positive and negative masses are equal. While the cosmological expansion or as I say, formation of flat space of our Universe, occurs at the expense of inflowing, (penetrations from outside) and increasing of the positive and negative masses - under the law $|m_n| = n \cdot |m_{pl}|$ or at the expense of addition of 10^{62} units of pseudominimons. And where these pseudominimons come from, how do they appear and are added, this already regards the

complicated structure of Armons, the "mechanism" of origination and destruction of Armons, about which we will speak separately.

Thus, inside Armons and Pseudoarmons, the Armon force of attraction and repulsion balance each other; while in an external plan minimons and pseudominimons possess Armon forces of attraction, and maximons and pseudomaximons – Armon force of repulsion. These Armon forces are equal each other modulo, but are opposite by their direction.

2.5 Rotational moment of Armons and Pseudoarmons

In the internal plan the full rotational moment of Armons and Pseudoarmons is equal to zero: $I_{tot} = I_{пол.} + I_{отр.} = 0$. We have the same situation also in the internal plan of our Universe, its total moment of momentum, as well as the total momentum, the total mass are equal to zero.

3 Armon number; Armon variable n and Armon constant U.

3.1 Conceptual unity of the universal constants G, c, h

The totality of the knowledge obtained during the historical development of physics can be transmitted by three symbols - G, c, h. That is, the result of the whole traversed road is the discovery of these three physical constants. In addition, this is not a mere coincidence that these constants are related to the names of **Newton**, **Einstein** and **Planck**, and accordingly symbolize **Newton's** physics, and **Newton's** relativistic quantum theories.

Many decades' scientists-physicists have tried to carry out **Einstein's** great dream - to create a general physical theory, one uniform theory that, reputedly, will be based upon the "three whales" – upon the constants G, c, h.

But how to find the key to integrating?

Numerical values of these constants are taken from experiment:

$$G = 6,7 \cdot 10^{-8}\, cm^3 \big/ \left(g \cdot \sec^2 \right)$$
$$c = 3 \cdot 10^{10}\, cm/\sec$$
$$h = 6,6 \cdot 10^{-27}\, g \cdot \sec^2 / cm^3$$

And it is not clear how they are determined. There is no any theory, which would explain, would prove the reason of an invariance of these physical values, and would explain why they are as they are.

It is to be noted beforehand, that while speaking about their conceptual unity, it is necessary to understand their interconnection, cross conditionality … And the key, the secret of this unity is contained in the following - if in the description of physical systems, the phenomena of all types, known to the modern physics, this unity has not been reached, then the occurrence of such unity is related only to the discovery of physical systems of a new type. That is, the constants G, c, h should play an essential role in the description of absolutely new class of physical systems.

It is clear that the sought, so-called **physical systems of the new type** should differ greatly and essentially from classes of physical systems known to us. Hence, it is necessary to search for unusual cases, "exotic" properties, processes …

As a basis we will assume the principle of dimensionalities according to which dimensionality of physical values directly indicates the formulas of these values. According to this statement, the three world or universal constants are expressed by the following formulas:

$$\begin{cases} G = cm^3 \big/ \left(g \cdot \sec^2 \right) = r^3 / m \cdot t^2 \\ c = cm/\sec = r/t \\ h = g \cdot cm^2 / \sec = mr^2 / t \end{cases} \qquad (1)$$

We will face unusual properties if we determine the parameters m, r, t of the sought physical object (system) by formulas $G = \dfrac{r^3}{mt^2}$ and $c = \dfrac{r}{t}$.

We will obtain:

$$\begin{cases} \mathrm{m} = \dfrac{\mathrm{c}^3\mathrm{t}}{\mathrm{G}} & t = \dfrac{Gm}{c^3} \quad r = ct \\ \mathrm{m} = \dfrac{\mathrm{c}^2\mathrm{r}}{\mathrm{G}} & t = \dfrac{r}{c} \quad r = \dfrac{Gm}{c^2} \end{cases} \qquad (2),$$

Formulas, from which it is clearly seen that m, r, t are directly proportional to each other. These are already unusual properties, all the more that between the parameters m, r, t stable, invariable dependences are established:

$$\left.\begin{array}{lll} \dfrac{m}{t} = \dfrac{c^3}{G} = const. & \dfrac{t}{m} = \dfrac{G}{c^3} = const. & \dfrac{r}{t} = c = const. \\ \dfrac{m}{r} = \dfrac{c^2}{G} = const. & \dfrac{r}{m} = \dfrac{G}{c^2} = const. & \dfrac{t}{r} = \dfrac{1}{c} = const. \end{array}\right\} \quad (3)$$

It follows from this, that at reducing or increasing of one of the variables m, r, t by n times, the others too are increased or reduced accordingly.

The first scientist that devoted himself to such problems was great thinker **Max Planck** after discovering constant h that was called after his name. **Planck** constructed formulas of physical values of different dimensionalities of the universal constants G, c, h:

$$m_{pl}^2 = \frac{hc}{G}$$

$$r_{pl}^2 = \frac{Gh}{c^3}$$

$$t_{pl}^2 = \frac{Gh}{c^5}$$

Unfortunately, these **Planck** values are often perceived till now separately, as values independent from each other. The unity of these values that is expressed by the stable proportions, existing between them is not perceived: $\frac{m_{pl}}{r_{pl}} = \frac{c^2}{G}$, $\frac{m_{pl}}{t_{pl}} = \frac{c^3}{G}$ or $\frac{r_{pl}}{t_{pl}} = c$.

This means that **Planck's** values too are subject to the regularities of formulas of system of equations (2) and (3).

At this level of reasoning it is already possible to formulate the initial definition of the sought physical systems - those physical systems, whose $|m|$, r, t parameters are directly proportional to each other and vary uniformly, we will call **Armons** (from Indo-European root "**Arm**", which means a seed, a root) and **Pseudoarmons**. It is true that first of all the black holes (black holes) obey the laws of the system of equations (2) and (3), however the positive and negative components of Armons and Pseudoarmons also separately obey these laws. In this sense Armons and Pseudoarmons are as though similar to black holes. This circumstance became a basis for some physicists to come to an erroneous opinion: supposedly our Universe is a black hole or is located in a black hole.

In truth Armons and Pseudoarmons differ from black holes by consisting of positive and negative components, which balance each other and as a result these our non-free physical systems do not have inertial mass: $m_{tot}=m_{pos}+m_{neg}=0$, where $m_{pos} = | m_{neg} | = \frac{c^2 r}{G} = \frac{c^3 t}{G}$.

But, it seems, I have a little digressed from the basic subject of this paragraph. Really, what is the conceptual value of constants G, c, h? All physicists understand, that in the future physical theory these three constants will play a fundamental role, but they do not realize, that together they should feature properties of the most fundamental physical systems where G, c, h are physical characteristics of these systems:

a) c expresses constant velocity of change of Armons and Pseudoarmons - in general non-free physical systems. And there is not any force in the nature, any means that could suspend, slow down this velocity.

b) h is the minimum moment of momentum of Armons and Pseudoarmons, as well as also their components, more exactly $|I| = h$ or $|I| = n^2 h$, when n=1. Components of our Universe at the moment n=1

have the following characteristics: I=h for the positive component, $|-\mathrm{I}| = \mathrm{h}$, for the negative component, and the total moment of momentum is always equal to zero. For finding-out of extremely expanded state of our Universe (our pseudomaximon), i.e. for finding the upper bound of expansion, evolution of the Universe it is necessary to know the maximum value n.

c) As to G - Newton's gravitational constant, it is Armon force coefficient, another important property of Armons and all non- free systems $F_z G = c^4$. What kind of force it is, we will find out further.

Thus, the conceptual role and the importance of constants G, c, h consists in that they express and describe the physical properties of Armons and non-free systems in general. As it is already easy to guess, the conceptual unity of constants G, c, h and establishment of a general or uniform physical theory is impossible without one more, new physical concept – Armon number which, as is seen from formula $I = n^2 h$, is a dimensionless value and, which is the most important thing, represents itself as coefficient of change of physical properties of Armons and Pseudoarmons. In general, in our theory the Armon number has diverse and interesting functions; together with the three universal constants, it does complete the theory of Armons; by means of Armon constant U. the upper limit of evolution of our Universe is determined, on the other hand, by means of Armon variable a certain dynamism is given also to non- free physical systems.

3.2 Coincidence of great numbers in Astroparticle Physics

Since **Dirac** and **Gamow**, physicists have numerously tried to give a certain explanation to the coincidence of the great numbers, which have been found out in the field of Cosmology and microphysics, not breaking the basic laws of modern physics. But before opening of the Armon number, all these attempts were unsuccessful, and the secret of coincidence of great numbers was coated by inaccessible mysteriousness. Though, as **Zel'dovich** and **Novikov** wrote in their well known book, - *"There is a belief among physicists that the dimensionless*

values essentially differing from unity, are subject to explanation, are a subject to (at least) a qualitative theory. This belief hits on the idea that the closeness of great dimensionless numbers from various natural phenomena specifies the presence of internal relations between these phenomena and can serve as a lighthouse indicating the path of science development"[1]. And really, opening of the Armon number gives the chance not only a) to reveal parameters of our Universe, as local physical system; to indicate the regularities of their change; to give their limit values, and b) to determine the interconnection and interdependence of the Universe and its basic components; the number of the basic components of the Universe, according to each stage of its evolution; as well as relation and interdependence of physical properties of the Universe and its basic components.

In a word, I consider the 80-year-old history of examination of the coincidence of great numbers as background of opening the Armon number.

Below I consider it necessary to mention only those basic inaccuracies, which have not given to my predecessors the opportunity to discover the Armon number.

It is to be noted that **Zel'dovich** and **Novikov** were triply right, when asserted, that "in the absence of logically closed theory the hints or indications to a role of great numbers are ambiguous"[2]. If not my philosophical substantiation of the Armon theory, conceptions of Armon structure, hardly would I manage to open the Armon number based upon studying of coincidence of great numbers. Einstein was right - concepts (ideas) are born first and only then, they are stated mathematically.

So, by means of constants G, c, h and masses m of elementary particles it is possible to gain $\frac{Gm^2}{hc} = g$ a dimensionless value, for a proton -

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[1] **Ya. B. Zeldovich, I. D. Novikov** "**STRUCTURE AND EVOLUTION OF THE UNIVERSE**", M 1975, p 668

[2] **Ibid.** p 669

$g_p = \frac{Gm_p^2}{hc} \approx 10^{-38}$. It is, actually, the relation of square proton mass to the square **Planck's** mass, so $g^{-1} = \frac{hc}{Gm_p^2} = \frac{m_{pl}^2}{m_p^2} \approx 10^{38}$. This is one great number taken from microphysics. From the great numbers that describe the Metagalaxy or our Universe, **Dirac** takes the total number of nucleons (considering our Universe as a local closed system). On the basis of the data available then, **Dirac** obtains $N = 10^{79}$ and, of course, comes to the conclusion that $N = g^{-2}$. Eventually, both **Dirac** and **Gamow** come to the conclusion that T_{UN} –the age of our Universe is equal to the product of the characteristic time $t_p = 10^{-24}$ s for a proton (nucleons) and g^{-1}.

$T_{UN.} = t_p \cdot g^{-1}$

It is clearly seen, that this formula will not work, since T_{BC} a variable, while the expression on the right side of the equation is constant. This means

1) either the right side of the equation should be a variable for the equation to work, or

2) it is necessary to view T_{UN}, as finite time fixing completion of expansion of the Universe and as such – a constant value.

First, we will discuss the second case. The **Dirac-Gamow's** formula has physical sense only in one case: if we suppose that the Universe is closed and it has an upper limit of expansion, that is, if we suppose that this formula fixes the moment of the end of expansion; that the expansion of our Universe has a beginning - $T_{UN} = t_{pl}$, which is a fixed constant, and naturally it should have an end - $T_{\max imum}$, which is also a fixed constant value, and in this sense is invariable. But in this case it is not clear, how the age T_{UN} of the Universe will grow, and from its minimum t_{pl} reach its maximum. And it is not clear then, why it is

necessary to take just t_p as a time unit, instead of, let us say, t_{pl}, all the more that nucleons appear later in the course of expansion …

Therefore, we will consider the first possibility **of overcoming** of inaccuracy of the **Dirac-Gamow's** formula, which is more interesting from the point of view of revealing the interconnection of physical systems, the phenomena of microcosm and Mega world.

As we have already mentioned, the first path to overcoming of inaccuracy of the formula $T_{\text{UN.}} = t_p \cdot g^{-1}$ is making the expression $\left(t_p \cdot g^{-1}\right)$ of the right side of the equation a similar variable as T_{UN}.

In due time **Dirac** (and others) numerously tried to correct the situation by this way, but ran to other extremes, since $\left(t_p \cdot g^{-1}\right) = \frac{h}{c^2 m_p} \cdot \frac{ch}{Gm_p^2}$ then, according to **Dirac**, one of the constants G, h, c, m_p should be a variable. And here revision of physical constants began; especially the gravitation constant G underwent a severe attack; unfortunately, such attempts are done even today, but it is in vain.

While the only correct path to the solution of the problem is transformation of the expression of the right side of the formula into a variable; it is related to new ideas, new approaches. At first sight it may seem, that we return again to the **Dirac's** point of view, to the idea that one of the four constants is variable, but it not absolutely the case. I think that we have to go in the way of generalizations. We are referring to the parameters m_p and g , rather than the absolute constants G, c, h.

What is g, it is a dimensionless value, a number, which expresses, let us say, the relation of the square of proton mass m_p to the square of Planck mass $g_p = \frac{m_p^2}{m_{pl}^2} = 10^{-38}$. However, it is found out that except this special case, g_p has a more general meaning. At the first stage of generalization it is found out that g_p also expresses the relation of the characteristic time of proton (nucleon) $t_p = \frac{h}{c^2 m_p}$, **Compton** length $r_p = \frac{h}{cm_p}$, to **Planck's** time and radius.

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

From here $\left(t_p \cdot g^{-1}\right) = t_p \cdot \frac{t_p^2}{t_{pl}^2} = \frac{t_p^3}{t_{pl}^2}$, becomes clear, that at this level of generalization $T_{UN} = \left(t_p \cdot g^{-1}\right) = \frac{t_p^3}{t_{pl}^2}$, the expression of the right side, even in the updated form, remains invariable. It drives to the following, deeper, more essential step of generalizations. It is known, that g expresses the relation of not only proton mass (m_p), and also electron mass (m_e) why no, also of all other elementary particles, including the characteristic particles of electroweak unification, great unification, even masses of relict photon to m_{pl}. For clearness we will give numerical values of g, expressing these relations:

$$g_{rp} = \frac{Gm_{rp}^2}{hc} = 10^{-62} = \frac{m_{rp}^2}{m_{pl}^2}$$

$$g_e = \frac{Gm_e^2}{hc} = 10^{-46} = \frac{m_e^2}{m_{pl}^2}$$

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

$$g_{e.w.u} = \frac{Gm_{e.w.u.}^2}{hc} = 10^{-31} = \frac{m_{e.w.u.}^2}{m_{pl}^2}$$

$$g_{g.u.} = \frac{Gm_{g.u.}^2}{hc} = 10^{-10} = \frac{m_{g.u.}^2}{m_{pl}^2}$$

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

So, in the given paradigm, since all elementary particles, in general all quantum particles have an important generality – their energy masses are less, than m_{pl}, with which their quantum essence is related, it is

possible to generalize their masses and corresponding g, representing by one general formula - $g_k = \frac{m_k^2}{m_{pl}^2}$ where the index k means quantum. At first sight it may seem that it is an unnecessary formality but as we will see below, it gives the chance to reveal regularities with rich content.

The advantage of this formula is that m_k is a variable, it can accept any value, it is less than the mass m_{pl}, accordingly, g_k also became variable, and in this sense g_k is already similar to the Armon variable n. From the above paradigm it can be seen that g_k^{-1} can have numerical values more than unity, exactly as in case of the Armon variable n. For this reason we only have to make them equal - $g_k^{-1} = n = \frac{m_{pl}^2}{m_k^2} = \frac{t_k^2}{t_{pl}^2}$.

Henceforth we can get rid of g_k at all and deal only with Armon variable n, all the more that the Armon variable n is more general, than g_k^{-1}; the variable n expresses proportionality of the change of m, r, t parameters of Armon (also of our Universe), it is also coefficient of growth of parameters m, r, t during expansion of Armon from the state of minimon: $M_n = nm_{pl}$, $R_n = nr_{pl}$, $\mathrm{t_n = nt_{pl}}$.

Thus, interposing the value $t_{pl} = \sqrt{\frac{t_k}{n}}$ in formula $\mathrm{t_n = nt_{pl}}$, or interposing the value $n = \frac{t_k^2}{t_{pl}^2}$ in the same formula, we will accordingly obtain formulas $\mathrm{t_n = \sqrt{n}t_k}$ and $\mathrm{t_n = \frac{t_k^2}{t_{pl}}}$ which, during the expansion of Armon (the Universe), express interdependence of this global physical system and the parameters of its characteristic elementary particle. And it regards all physical properties (m, r, t, ρ, E, T).

From the point of view of revealing of the inaccuracy of the Dirac-Gamow's formula, it is interesting to compare our laws $\mathrm{t_n = \sqrt{n}t_k}$ and

$t_n = \frac{t_k^3}{t_{pl}^2}$ with their formula $T_{UN} = t_p \cdot g_p^{-1}$. If we interpose the value $g_n^{-1} = \frac{t_p^2}{t_{pl}^2}$ into the latter, we will gain $T_{UN} = \frac{t_p^3}{t_{pl}^2}$, while we have - $t_n = \frac{t_k^2}{t_{pl}}$. It is seen from comparison that the Dirac-Gamow's formula is formal, while my law has a great depth of meaning, it is the law of nature.

The same thing could be told about the Dirac's formula - $N \approx \frac{c^3}{HGm_p} \approx g^{-2}$ where expression $\left(\frac{c^3}{HGm_p}\right)$ is equivalent to $\left(\frac{M_{BC}}{m_p}\right)$, thus $\frac{M_{UN}}{m_p} = \frac{m_{pl}^4}{m_p^4} \approx g^{-2}$, Dirac has actually, $M_{UN} = \frac{m_{pl}^4}{m_p^3}$ which essentially differs from my law $m_n = \frac{m_{pl}^3}{m_k^2}$.

3.3 Substantiation of Armon constant

As already mentioned, the Armon variable ($n \geq 1$) cannot have numerical values, less than unity, and this is determined by Planck's parameters. It is the boundary of compression of our Universe and the beginning of its expansion. However we already know that the expansion, Universe evolution too should have an upper boundary, and, naturally, it means, that the variable n cannot have infinitely large numerical value, it should have the maximum value, more of which it cannot be. This maximum value of a variable n I call Armon constant and I designate it with the capital letter U. of the Armenian alphabet. So the variable n is restricted from both sides - $1 \leq n \leq U$. We have to find out only the numerical value of U.

Taking into account that U=const., it is clear that $|m|$, r, t parameters of the positive and negative components of our Universe can reach maximum values $M_{\max} = \cdot m_{pl}$, $R_{\max} = r_{pl}$, $t_{\max} = \cdot t_{pl}$, it means that our Universe (our pseudomaximon) which expands, has **an upper boundary of expansion**.

If we find this upper boundary of evolution, we can therewith determine the numerical value of Armon constant $U = \frac{R_{\max}}{r_{pl}} = const$..

1) Within the framework of experimental possibilities of the modern physics, perhaps, the only possibility for definition of the upper boundary (R_u) of cosmological expansion is provided by constants $r_a = 10^{-8}_{\text{ñì}}$ and $m_a = 10^{-24}_{\text{ã}}$, parameters of hydrogen atom (the elementary atom) validated experimentally: $R_{\max} = r_a \frac{hc}{Gm^2_a} = 10^{29}_{\text{ñì}}$, whence

$= \frac{R_{\max}}{r_{pl}} = \frac{10^{29}_{\text{ñì}}}{10^{-33}_{\text{ñì}}} = 10^{62} = const$. thus - $1 \le n \le 10^{62}$.

There are also other approaches for "theoretical" substantiation of Armon constant U. We will consider some of them.

2) The modern physics has determined the time of the beginning of nucleosynthesis: $t_{\text{íñ}} \approx 1_c$. With the help of this too the time of the end of cosmological expansion can be determined: $t_u = U\, t_{pl}$

$t_u = \frac{t_{\text{íñ}} t_p}{t_{pl}} = \frac{l_c 10^{-24}_c}{10^{-43}_c} = 10^{19}_c$, whence $= \frac{t_{\max}}{t_{pl}} = \frac{10^{19}_c}{10^{-43}_c} = 10^{62}$.

3) Let us return to the problem of stability of proton, since the definition of t_u by formula $t^2_{\max} = \frac{t_{\text{âæ(p)}} \cdot t^2_p}{t_{pl}}$ also depends on the experimental definition of the "lifetime" of proton.

Today experimental data contradict theoretical predictions. Experiment shows that protons "live" longer, than the theory of Grand unification predicts - $t_{âæ(p)} = 10^{29-31}$ years.

In my opinion, the time of stability of proton can be determined by formula $t_{âæ(p)} = \frac{t_{íñ.}^2}{t_{pl}}$. In this case we will have $t_{âæ(p)} = 10_c^{43}$. The threshold of stability of proton is 10_c^{43} and though it is rather problematic to reach it through experiment, if it is possible at all in the next decades, but from the point of view of our problem this indicator gives the chance to determine the numerical value of the constant U.

$t_{z}^{2} = \frac{10_{c}^{43} \cdot \left(10_{c}^{-24}\right)^2}{10^{-43}} = 10_{c^2}^{38}$, $t_z = 10_c^{19}$, whence $U = 10^{62} = const.$.

Thus, the experimental results of the searches of proton stability would simultaneously become one more experimental acknowledgement of the presence and definition of the upper boundary of cosmological expansion.

4) Astrophysicists have already determined long time ago the duration of the existence of the Sun and other similar stars: $t = \frac{10_{ýðã}^{52}}{10_{\overline{ñ}}^{33}} = 10_c^{19}$. In my strong opinion, also this is related to the end of the cosmological expansion. The same formula $t = \frac{E}{L}$ can be generalized also for galaxies and their superclusters, and again we will obtain the exponent $t = 10_c^{19}$, which coincides with $t_z = 10_c^{19}$. Thus, this circumstance too can be accepted as acknowledgement of the constant $U = 10^{62}$.

5) Physicists are very interested in spatial scale $r = 10_{ñì}^{-2}$. First, it has been already found out long time ago, that in these scales quantum electromagnetic forces are equal to weak gravitational forces. That is, it

is one original boundary where the quantum force and the gravitation coincide, they are equal. I have already mentioned that there is Armon force - $F_z = \frac{c^4}{G}$. This is the largest force existing in the nature and even a constant force. Now let us compare this force to the forces, characteristic for the spatial scale $r = 10^{-2}_{\text{ñì}}$: $F_k = \frac{hc}{r^2} = \frac{hc}{\left(10^{-2}_{\text{ñì}}\right)^2} = 10^{-13}$; and the gravitational force, arisen between the characteristic elementary particles of this spatial scale, is equal to this quantum force: $F_g = \frac{G10^{-20}_{\tilde{a}} \cdot 10^{-20}_{\tilde{a}}}{\left(10^{-17}_{\text{ñì}}\right)^2} = 10^{-13}$.

From here too we have $U = \frac{F_z}{F_g} = \frac{10^{49}}{10^{-13}} = 10^{62}$.

6) Spatial scale $r = 10^{-2}_{\text{ñì}}$ signifies an important event of the cosmological expansion. At this level of cosmological evolution, because of violation of the symmetry of electroweak unification, electromagnetic force is segregated. Thus, at this stage, four basic physical forces necessary for the further evolution of matter, for occurrence of complex types of matter, including cosmic bodies and life are formed. Taking into account that $\frac{r_p = 10^{-2}_{\text{ñì}}}{r_{pl} = 10^{-33}_{\text{ñì}}} = 10^{31}$, it seems to me that there are enough bases for the statement that this is the logarithmic half of the path of cosmological expansion, all the more that since this stage, in the following half of expansion, the decisive leading role belongs to gravitation.

In a word, I am sure that the general physical theory (**Zelmanov's** definition) not only unites GR and quantum physics, but also unites the universal constants G, c, h on the basis of the Armon number and with their help opens and describes a fundamental type of matter – non-free

physical systems. The absolute constants G, c, h, [2] [1] lie in the basis of this general physical theory (in a restricted sense – of the theory of Armons).

Here, running ahead, I would mention the following: after opening of the background, relict radiation by **Wilson** and **Pensias** in 1965, several decades have passed, and during this time no one of scientists tried to obtain, derive the modern physical characteristics of the Universe directly from physical characteristics of the relict quantum. Why? Because they did not know the laws discovered by me:

$$M_{\text{ý}} = \frac{m_{pl}^3}{m_k^2} = \frac{m_{pl}^3}{m_{\text{ð.ô.}}^2} = \frac{\left(10_{\text{ýðã}}^{16}\right)^3}{\left(10_{\text{ýðã}}^{-15}\right)^2} = 10_{\text{ýðã}}^{78} = 10_{\text{ã}}^{57}$$

$$t_{U} = \frac{t_{\text{ð.ô.}}^2}{t_{pl}} = \frac{\left(10_{\text{c}}^{-12}\right)^2}{10_{\text{c}}^{-43}} = 10_{\text{c}}^{19}$$

$$r_{\text{ý}} = \frac{r_{r.p.}^2}{r_{pl}} = \frac{\left(10^{-2}\,cm\right)^2}{\left(10^{-33}\,cm\right)} = 10^{29}\,cm$$

Is not it a miracle: registering the radiation quantum, which have reached us from depths of milliard years, by its physical properties, parameters we specify rather accurately the global physical characteristics of our expanding global medium - the Universe. First, apparently, the present parameters of the Universe are by order of magnitude greater than the indexes accepted in the science today:

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[1] $U_{\text{ý}} = 10^{62}$ I leave the specification of the numerical factor of this constant to be done by experts, though in my opinion it can variate in a range of the numbers 6-13. For me the number 10^{62} is convenient for performance of calculations in the order of its value. Though, **Archimedes** wonderfully considered that our world consisted of 10^{63} atoms.

$M = 10^{56}_{\text{ã}}$, $t = 10^{18}_{c}$, $R = 10^{28}_{c}$. Even, from these observations of indexes gained by experiment, they should guess that the parameters of our Universe are subject to the laws of the formulas of the system of equations (2) and (3). Anyhow, relict radiation too, actually, testifies that our Universe (our pseudomaximon) expanding or developing, has already come closer to its limit, in any case, it is at the last stage of expansion: $\frac{M_z}{m_{pl}} = \frac{T_z}{t_{pl}} = \frac{R_z}{r_{pl}} = 2$.

It testifies not only that the Armon variable has equaled with U. (n=U.) by the order of magnitude, but also that $E_{\text{ð.ô.}} = 10^{-15}_{\text{ýðã}}$ has the limiting value for the characteristic quantum particles of the Universe, that is:

$$m_k \geq \sqrt{\frac{m_{pl}^3}{M_z}}:$$

4. GchU. Cosmic model

4.1 Physical characteristics of our Universe

Critical parameters (variable parameters m, r, t, ρ, E, T)

Let us give the formulas expressing interdependences, interconditionalities of variable physical parameters:

$$m_g = \frac{c^2 r_g}{G} \quad r_g = ct_g \quad t_g = \frac{r_g}{c}$$

$$m_g = \frac{c^3 t_g}{G} \quad r_g = \frac{Gm_g}{c^2} \quad t_g = \frac{Gm_g}{c^3}$$

$$m_g^2 = \frac{c^6}{G^3 \rho_g} \quad r_g^2 = \frac{c^2}{G\rho_g} \quad t_g^2 = \frac{1}{G\rho_g}$$

$$m_g = \frac{E_g}{c^2} \quad r_g = \frac{E_g G}{c^4} \quad t_g = \frac{GE_g}{c^5}$$

$$m_g = \frac{T_g k}{c^2} \quad r_g = \frac{G T_g k}{c^4} \quad t_g = \frac{G k T_g}{c^5}$$

$$\rho_g = \frac{c^6}{G^3 m_g^2} \quad E_g = m_g c^2 \quad T_g = \frac{m_g c^2}{k}$$

$$\rho_g = \frac{c^2}{G r_g^2} \quad E_g = \frac{r_g c^4}{G} \quad T_g = \frac{c^4 r_g}{G k}$$

$$\rho_g = \frac{1}{G t_g^2} \quad E_g = \frac{t_g G^5}{G} \quad T_g = \frac{c^5 t_g}{G k}$$

$$\rho_g = \frac{c^{10}}{G^3 E_g^2} \quad E_g^2 = \frac{c^{10}}{G^3 \rho_g} \quad T_g^2 = \frac{c^{10}}{G^3 k^2 \rho_g}$$

$$\rho_g = \frac{c^{10}}{G^3 T^2 k^2} \quad E_g = k T_g \quad T_g = \frac{E_g}{k}$$

It is clearly seen from here that the parameters m_g, r_g, t_g, E_g, T_g are directly proportional to each other and only ρ_g is in inverse proportion to them. That is, increasing or reducing one of the parameters m, r, t, E, T n-fold, the others too are increased or reduced n-fold, while ρ is reduced or increased accordingly n^2-fold. Thus, at expansion of our Universe, its parameters vary according to the following laws:

$$\begin{aligned} M_n &= m_{pl} \cdot n \\ R_n &= r_{pl} \cdot n \\ t_n &= t_{pl} \cdot n \\ \rho_n &= \rho_{pl} \cdot n^{-2} \\ E_n &= E_{pl} \cdot n \\ T_n &= T_{pl} \cdot n \end{aligned} \quad (4)$$

Eventually, expanding, the Universe reaches an extremely expanded state of pseudomaximon: n = U.:

$$\begin{cases} M_{\text{U}} = m_{pl} \cdot^{2} = 10^{57}_{\text{ã}} \\ R_{\text{U}} = r_{pl} \cdot^{2} = 10^{29}_{\text{ñì}} \\ t_{\text{U}} = t_{pl} \cdot^{2} = 10^{19}_{\text{ñ}} \\ \rho_{\text{U}} = \rho_{pl} \cdot^{2} \cdot^{-2} = 10^{-31}_{\text{ã}/\text{ñì}^{3}} \\ E_{\text{U}} = E_{pl} \cdot^{2} = 10^{78}_{\text{ýðã}} \\ T_{\text{U}} = T_{pl} \cdot^{2} = 10^{39}\,K \end{cases} \quad (5)$$

Here it is to be noted that the equations of system of equations (2) and (3) (4) and (5) in their general form regard both positive and negative components of our Universe, i.e.:

$$|-M_n| = M_n = m_{pl} \cdot n$$
$$|-\rho_n| = \rho_n = \rho_{pl} \cdot n^{-2}$$
$$|-E_n| = E_n = E_{pl} \cdot n$$
$$|-T_n| = T_n = T_{pl} \cdot n$$

* * *

Now let us discuss the interdependences of the parameters of the positive component of the Universe and its components - the characteristic elementary particle.

Again let us consider **Planck**'s values. Through combinations of the constants G, h, c **Planck** obtained not only the values m_{pl}, r_{pl}, t_{pl}, but also the parameters ρ_{pl}, E_{pl}, T_{pl} and others.

$$m_{pl}^2 = \frac{hc}{G} \text{ whence } \frac{Gm_{pl}^2}{hc} = 1 \text{ and } \frac{hc}{Gm_{pl}^2} = 1$$

$$r_{pl}^2 = \frac{Gh}{c^3} \qquad \frac{Gh}{c^3 r_{pl}^2} = 1 \qquad \frac{c^3 r_{pl}^2}{Gh} = 1$$

$$t_{pl}^2 = \frac{Gh}{c^5} \qquad \frac{Gh}{c^5 t_{pl}^2} = 1 \qquad \frac{c^5 t_{pl}^2}{Gh} = 1$$

$$\rho_{pl} = \frac{c^5}{G^2 h} \qquad \frac{c^5}{G^2 h \rho_{pl}} = 1 \qquad \frac{G^2 h \rho_{pl}}{c^5} = 1$$

$$E_{pl}^2 = \frac{hc^5}{G} \qquad \frac{hc^5}{GE_{pl}^2} = 1 \qquad \frac{GE_{pl}^2}{hc^5} = 1$$

$$T_{pl}^2 = \frac{hc^5}{G(k^2)} \qquad \frac{hc^5}{G(k^2)T_{pl}^2} = 1 \qquad \frac{G(k^2)T_{pl}^2}{hc^5} = 1$$

It is already known that $n \geq 1$. The inequalities $\frac{Gm_g^2}{hc} \geq 1$ and $\frac{hc}{Gm_k^2} \geq 1$ satisfy this condition, where m_g and m_k are gravitational and quantum variable masses accordingly since $m_g \geq m_{pl}$, and $m_k \leq m_{pl}$.

Since we have two separate system of equations (2) and (3) of laws for gravitational and quantum variable masses,

$$m_g = \frac{c^2 r_g}{G} \qquad m_k = \frac{h}{c r_k}$$

$$m_g = \frac{c^3 t_g}{G} \qquad m_k = \frac{h}{c^2 t_k}$$

$$m_g^2 = \frac{c^6}{G^3 \rho_g} \qquad m_k^4 = \frac{h^3 \rho_k}{c^3}$$

$$m_g = \frac{E_g}{c^2} \qquad m_k = \frac{E_k}{c^2}$$

$$m_g = \frac{T_g k}{c^2} \qquad m_k = \frac{T_k k}{c^2}$$

then, in Planck's limiting case, when $m_g = m_{pl}$ and $m_k = m_{pl}$, we obtain two formulas: $\rho_g = \frac{c^6}{G^3 m_{pl}^2}$ and $\rho_k = \frac{c^3 m_{pl}^4}{h^3}$, of course – $\rho_g = \rho_k$.

It turns out that also in the case of variables m_g and m_k, $\rho_g = \frac{c^6}{G^3 m_g^2}$ and $\rho_k = \frac{c^3 m_k^4}{h^3}$ ρ_g and $\rho_к$ are equal to each other, hence $\frac{c^6}{G^3 m_g^2} = \frac{c^3 m_k^4}{h^3}$, whence $m_g^2 = \frac{h^3 c^3}{G^3 m_k^4}$, which means that $m_g^2 = \frac{m_{pl}^6}{m_k^4}$ or $m_g = \frac{m_{pl}^3}{m_k^2}$.

All these, first of all, testify that the positive mass and all other physical characteristics of our Universe in general and its characteristic elementary particles are interconnected and interdependent. Knowing, let us say, any parameter of the characteristic particle of the given level of expansion of our Universe, it is possible to deduce with its help not only other variable characteristics of this elementary particle, but also global parameters of the Universe at the given stage of evolution. And, secondly, the average density of the positive component corresponding to any level of expansion, is equal to the average density of the characteristic particle of the given level: $\rho_n = \rho_k$. Or the average density of the energy of the positive component of the Universe at any stage of expansion, is equal to the density of energy of the characteristic particle of that level: $\varepsilon_n = \varepsilon_k$.

All this is very good, but the formula $T_g = \frac{c^5 t_g}{Gk}$ does not express the change of the heat of cosmological medium during expansion, that is, this formula expresses only the heat, equivalent to increasing energy of

the Universe in the course of expansion under the law $T_g = \frac{E_g}{k}$. It also does not express the change of average-distributed heat of the expanding medium …

Since at each step, at each level of expansion, the average density ρ and temperature T of cosmological medium are equal to the average density and temperature of the characteristic particle of this medium, we can relate the parameters of the positive component of the Universe to the parameters of the characteristic particle.

Here it is necessary to dwell only on parameters ρ_n and T_n. We have already found out that $\rho_n = \rho_k$, $\rho_n = \frac{c^3 m_k^4}{h^3}$, and since $m_k = \frac{T_k k}{c^2}$, then $\rho_n = \frac{T_k^4 k^4}{h^3 c^5}$. Equating this formula with the law $\rho_n = \frac{1}{G t_n^2}$, we will have $t_n^2 = \frac{h^3 c^5}{G k^4 T_k^4}$. It is the dependence of the positive temperature T_n on time t_n at expansion. Here is the exact law, approximate variant of which - $T_{UN} \approx \frac{10^{10}}{\sqrt{t}}$, is well-known to cosmologists.

From the law of the change of the positive temperature, by means of the formula $E = Tk$ we can deduce also the energy of characteristic elementary particle of the positive component of our cosmological medium: $t_n^2 = \frac{h^3 c^5}{G E_k^4}$ or $E_k^4 = \frac{h^3 c^5}{G t_n^2}$. In this case it is possible to give a new variant of the formulas expressing the interconnections, interdependency of physical characteristics of the possible component of the Universe:

$$m_n = \frac{c^2 r_n}{G} \quad r_n = c t_n \quad t_n = \frac{r_n}{c}$$

$$m_n = \frac{c^3 t_n}{G} \quad r_n = \frac{G m_n}{c^2} \quad t_n = \frac{G m_n}{c^3}$$

$$m_n^2 = \frac{c^6}{G^3 \rho_n} \quad r_n^2 = \frac{c^2}{G\rho_n} \quad t_n^2 = \frac{1}{G\rho_n}$$

$$m_n^2 = \frac{h^3 c^{11}}{G^3 E_к^4} \quad r_n^2 = \frac{h^3 c^7}{G E_к^4} \quad \mathbf{t_n^2 = \frac{h^3 c^5}{G E_x^4}}$$

$$m_n^2 = \frac{h^3 c^{11}}{G^3 k^4 T_к^4} \quad r_n^2 = \frac{h^3 c^7}{G k^4 T_к^4} \quad t_n^2 = \frac{h^3 c^5}{G к^4 T_к^4} \quad \left(t_n^2 = \frac{10^{40}}{T_k^4} \right) \qquad (6)$$

$$\rho_n = \frac{c^6}{G^3 m_n^2} \quad E_к^4 = \frac{h^3 c^{11}}{G^3 m_n^2} \quad T_к^4 = \frac{h^3 c^{11}}{G^3 k^4 m_n^2}$$

$$\rho_n = \frac{c^2}{G r_n^2} \quad E_к^4 = \frac{h^3 c^7}{G r_n^2} \quad T_к^4 = \frac{h^3 c^7}{G k^4 r_n^2}$$

$$\rho_n = \frac{1}{G t_n^2} \quad E_к^4 = \frac{h^3 c^7}{G t_n^2} \quad T_к^4 = \frac{h^3 c^5}{G k^4 t_n^2}$$

$$\rho_n = \frac{E_к^4}{h^3 c^5} \quad E_к^4 = h^3 c^5 \rho_n \quad T_к^4 = \frac{h^3 c^5 \rho_n}{k^4}$$

$$\rho_n = \frac{k^4 T_к^4}{h^3 c^5} \quad E_к^4 = k^4 T_k^4 \quad T_к^4 = \frac{E_k^4}{k^4}$$

In the formulas of the system (6) the parameters E_k and T_k are the physical characteristics of elementary particles − characteristic elementary particles of the positive component, thereby, they simultaneously characterize the positive component as a whole. For this reason, I rank them to the basic characteristics of the positive component of the Universe and I designate them by symbols E_n' and T_n'. Thus, we obtain:

$$M_n = const.R_n$$

$$M_n = const..t_n$$

$$M_n^2 = \frac{const.}{\rho_n}$$

$$M_n^2 = \frac{const.}{\left(E_n'\right)^4}$$

$$M_n^2 = \frac{const.}{\left(T_n'\right)^4}$$

It is clearly seen that

a) the parameters M_n, R_n, t_n are directly proportional to each other and having changed one of them by n times, the others too will change by n times;

b) the parameters M_n, R_n, t_n are inversely proportional in this case not only to ρ_n, but also to E_n' and T_n'. Therewith, if we increase R_n let us say, by n times, then ρ_n will decrease by n^2 times, E_n' and T_n' will decrease by $\sqrt{n}$ times.

Thus, having the **Planck** values as initial, we obtain:

$m_n = m_{pl} \cdot n$	or in case of n = ²	$m_{\text{²}} = m_{pl} \cdot ^{\text{²}}$
$r_n = r_{pl} \cdot n$	or in case of n = ²	$r_{\text{²}} = r_{pl} \cdot ^{\text{²}}$
$t_n = t_{pl} \cdot n$	or in case of n = ²	$t_{\text{²}} = t_{pl} \cdot ^{\text{²}}$
$\rho_n = \rho_{pl} \cdot n^{-2}$	or in case of n = ²	$\rho_{\text{²}} = \rho_{pl} \cdot ^{\text{²}}{}^{-2}$
$E_n' = E_{pl} \cdot n^{-\frac{1}{2}}$	or in case of n = ²	$E_{\text{²}}' = E_{pl} \cdot ^{\text{²}}{}^{-\frac{1}{2}}$
$T_n' = T_{pl} \cdot n^{-\frac{1}{2}}$	or in case of n = ²	$T_{\text{²}}' = T_{pl} \cdot ^{\text{²}}{}^{-\frac{1}{2}}$

4.2 Odyssey of "the cosmological constant", solution of the problem

If "the cosmological constant" had a juridical education it surely would sue cosmologists for its rape during decades.

No any concept was exhausted so, as **Einstein's** this ingenious plan. In 1998, by means of efforts of astronomers the cosmological constant Λ was revived, this time as an "absolute truth" …

For me it is important to find out whether Λ is really constant or not. Why **Einstein** entered this "universal constant" into his equations to provide the static state of his model of the Universe, to prove that $R_{UN} = const$. But after **Hubble's** opening it was found out that the radius of the Universe is variable. It turns out that the cosmological constant is an unnecessary fiction?

Λ has the same dimensionality, as the space curvature; hence according to the principle of dimensionality, they are equivalent or identical concepts: $K = \Lambda = \frac{1}{r^2}$ where r − is the radius of the Universe and simultaneously the radius of its space curvature. Hence with change of radius of the Universe, also K is changed. Thus, in GchU-cosmology we become free from the cosmological constant Λ and we use figure K instead of it, for designation of the space curvature.

But the variable K_n has two limiting values: $\left|K_{pl}\right| = \frac{c^3}{Gh} \approx 10^{66}\,cm^{-2}$ and

и $\left|K_{z}\right| = \frac{c^3}{Gh^{2}} = \frac{\left|K_{pl}\right|}{2^{2}} = 10^{-58}\,cm^{-2}$.

It becomes clear that during expansion of the Universe the space curvature K, or rather the module of the curvature decreases, and during compression – it is increased.

The theory of Armons is interesting that it gives the chance to express any physical parameter through other parameters, as if, they transfer into each other (perhaps, it is the effect of the deepest generalizations). So, it is possible to express K through any parameter of the Universe. I am interested in the mutual relationship of energy and K

(space curvature). As we have already found out $r_n = \frac{E_n G}{c^4}$ which, having placed into the formula $K_n = \frac{1}{r_n^2}$, we will have $K_n = \frac{c^8}{G^2 E_n^2}$, that is, during expansion of the Universe K_n (the positive curvature) decreases, and energy of the positive component is increased.

On the other hand, we have the formula expressing the mutual relationship of radius r_n and the energy of the characteristic particle of the positive component of the Universe:

$r_n^2 = \frac{h^3 c^7}{G E_k^4}$, which, having placed into $K_n = \frac{1}{r_n^2}$, we will have $\left| K_n = \frac{G E_k^4}{h^3 c^7} \right|$. This is what is called "equivalence of the cosmological term and vacuum energy" in the modern physics. Here we have already come closer to one of the most serious theoretical problems of perfect cosmology − "to the Problem of Λ term in the late Universe" (formulated by **Zel'dovich** and his employees), or to put it simple, to the problem of "vacuum energy". The theoretical disorder related to the problem of Λ term results from the following:

1) First of all: "in the expanding Universe, with the equation of state, the density of energy remains constant: ε =const.". We are referring to the equation of state of vacuum medium (or vacuum-like medium): $p = -\varepsilon$, which was necessary for the inflationary theory for providing of exponential expansion, by means of effective gravitational repulsion.

What a contempt for "the naturalness principle"! In my theory $|\varepsilon_n| = |p_n| = \frac{c^4}{G}|K_n|$ (we omit the numerical factors: 8π). It means, that the density of energy of the positive and negative components of the Universe, alike the positive and negative curvature of space are variables. But these parameters have limiting – minimum and maximum

values: $\left|\varepsilon_{pl}\right| = \frac{c^4}{G} \cdot \left|K_{pl}\right| = \frac{c^4}{G} \cdot \frac{c^3}{Gh} = \frac{c^7}{G^2 h} = \text{const.}$, and in the extremely expanded condition: $\left|\varepsilon_{\text{г}}\right| = \frac{c^7}{G^2 h^{\text{г}\,2}} = const.$

Hence, the variable $\left|\varepsilon_n\right|$ has two limiting values: $\left|\varepsilon_{pl}\right| \approx 10^{114}\,\text{erg}/\text{cm}^3$ and $\left|\varepsilon_{\text{г}}\right| \approx 10^{-10}\,\text{erg/cm}^3$. The most important thing is that the change of energy and mass density related to the change of the radius r_n of the Universe is provided here: $r_n^2 = \frac{c^4}{G\varepsilon_n}$ and $r_n^2 = \frac{c^2}{G\rho_n}$. Really, Anaxagoras was right: everything is related to everything- it is impossible, somehow is not natural that the volume is increased, and the average density remains invariable. In any case, in GchU - cosmology it is impossible. While, in ΛCDM – cosmology, the theoretical contradiction – "the problem of vacuum energy" is that the density of energy of vacuum is considered constant - $\varepsilon_v = \text{const.}$

$\varepsilon_{\text{г}} = \frac{\varepsilon_{pl}}{\text{г}^{\,2}} = 10^{-10}\,\text{erg/cm}^3$ cannot be absolutely constant, because it is the minimum characteristics of the positive component of the extremely expanded state of the Universe.

2) From the point of view of the physics of elementary particles, it is a very small value, and the quantum-physical explanation of this value, ostensibly being the density of energy of vacuum, remains unclear.

The theory of Armons gives a "natural" explanation of this problem. We have already found out that $K_n = \frac{1}{r_n^2}$ can have not only constant, fixed values, but also variables: it decreases in proportion to cosmological expansion, accordingly the density of energy of the positive component of the Universe decreases under the law: $\varepsilon_n = \varepsilon_{pl} \cdot n^{-2}$ $\left(\rho_n = \rho_{pl} \cdot n^{-2}\right)$. In the end of expansion: $\varepsilon_{\text{г}} = \varepsilon_{pl} \cdot \text{г}^{\,-2} = 10^{-10}\,erg/cm^3$ $\left(\rho_n = \rho_{pl} \cdot \text{г}^{\,-2} = 10^{-31}\,g/cm^3\right)$.

Now, about the other side of the problem. According to the theory of Armons, K_n can be expressed through energy (or mass) of the characteristic elementary particle: having placed the formula $r_n^2 = \frac{h^3 c^7}{G E_k^4}$ into $K_n = \frac{1}{r_n^2}$, we will have $K_n = \frac{GE_k^4}{h^3 c^7}$, which, in extremely expanded state gives $K_z = K_{pl} \cdot {}^{-2} = \frac{GE_{ð.ô.}^4}{h^3 c^7}$, whence $K_U \sqcup 10^{-48} (Ãýâ)^4$.

The theory of Armons has found out that $\rho_n = \rho_k$, so $\rho_n = \frac{c^6}{G^3 m_n^2}$ and $\rho_n = \frac{m_k^4 c^3}{h^3}$. Does it mean that K_n is caused by physics of m_k? Do energy/mass of relict quantum determine ρ_z, or, on the contrary, expansion of the Universe, which is accompanied by reduction of the average density of mass and energy of the positive component, forces relict quanta to spend, lose energy to the value - $2{,}7K = 10^{-12}$ Ãýâ? This is the only physical explanation. The medium, expanding and varying, forces its components to vary accordingly, and as we will see further, it forces not only the characteristic elementary particles to vary, but also "space" bodies - primary black holes and D bodies. And since the mass of the positive component of our Universe, is mainly concentrated in primary black holes, also the density of energy of the positive component is determined by density of primary black holes.

5. Cosmological evolution or expansion of our Universe

Cosmological evolution or as traditionally called, the Universe expansion is defined by continuous inflowing from outside of n number of pseudominimons, from the totality of which the internal structure of the Universe is formed.

5.1 Unity of positive and negative components of the Universe

As it was already mentioned, Armons and Pseudoarmons essentially differ from black holes (with which they have many common features: the key parameters of both Armons and black holes obey the laws of system of equations (2) and (3)) therewith black holes is only a gravity thickening of positive mass, and Armon consists of two equal components - positive and negative energy/mass. Certainly in black holes too there is a negative energy/mass as it penetrates everywhere, but in black holes the amount of the negative energy/mass is insignificant in comparison with the positive one.

This means, I assert, that one of the specific properties of Armon (one of the manifestations of the Armon dualism) is the unity of the positive and negative components. (By the way, the string theory would win, if it took as a basis the idea of Armon theory). But why is such unity important for Armons and Pseudoarmons?

Perhaps for the reason, that they cannot have a gravitational mass defect, they are not subject to this physical law, this process. The sequence of ideological development of physics leads to the idea that the quantum-gravitational unified phenomena take place in Planck's spatial scales, in other words, unification of micro and macro phenomena, systems is carried out in Planck's (extremely small) scales. That is, the problem is that it is necessary to place the big one (even too big) into a small one … May be, the big space can be placed into the small space thanks to the supercurvature of space compactification. But how to place the big energy/mass in the small one? Markov and others tried to solve this problem by means of such a physical phenomenon, as the gravitational mass defect or, more generic, by means of the mass defect. However, gravitational mass defect exists for the physical systems having positive inert mass. Besides, this process is accompanied by radiation, which reduces the mass of the system. In case of non-free physical systems it is excluded, as they do not have inert mass.

Besides, two Armons cannot unite, let us say, to make a new system, it is excluded. In a word, inside Armon the positive mass is

compensated by negative mass of corresponding quantity, which too increases during the cosmological expansion.

5.2 Cosmological expansion and the problems related to it

The modern conceptions about the cosmological expansion "are ugly and illogical: in one case the Universe expands with monstrous velocity till the unimaginable sizes, as the Inflationary theory confirms, then this expansion passes through **Hubble's** mode, then thanks to the dark energy again starts to expand with acceleration … Can the physical system, a global integrity evolve with such an ugly image? Doesn't it contradict the "naturalness"principle?

The theory of Armons asserts, that our Universe (pseudomaximon) expands with constant velocity and uniformly: $c = \frac{r_n}{t_n}$. In this case, how to be with the known fact opened by astronomers in 1998, that galaxies scatter (from each other) with acceleration. Again let us recollect **Einstein's** words, - "A few years later **Hubble** showed, by a special investigation of the extra-galactic nebulae ("milky ways"), that the spectral lines emitted showed a red shift which increased regularly with the distance of the nebulae. This can be interpreted in regard to our present knowledge only in the sense of **Doppler's** principle, as an **expansive motion of the system of stars** in the large — as required, according to **Friedman**, by the field equations of gravitation. **Hubble's discovery can, therefore, be considered to some extent as a confirmation of the theory**"[1]. Pay attention to the words underlined by me: Einstein does not identify the scattering of galaxies with the Universe expansion. The scattering of galaxies simply testifies to the Universe expansion, and nothing else. The scattering of galaxies is not the expansion of the Universe. The first one is, most likely, the consequence of the second one. The Universe expansion is the reason, while the scattering of galaxies - a consequence. The consequence shall

[1] **A. Einstein**, **COLLECTED WORKS**, Volume 1, p. 600

not be passed for the reason. What does all this mean? It means that the observed accelerated scattering of galaxies and their superclusters does not mean at all the accelerated expansion of the Universe; the latter expands with a constant speed.

Accelerated scattering of galaxies, or rather, as Einstein called: "*Allround expansion of system of stars*", in my strong opinion, concerns the Metagalaxy – the aggregation of all stars, galaxies and superclusters of galaxies. We have already spoken about the reason of the accelerated expansion of the Metagalaxy.

Now let us consider another problem related to expansion, to a problem of origination, increase of positive and negative components of the Universe.

First of all, strictly speaking, the space does not expand, it arises, is formed by positive and negative components. What we call cosmological expansion actually is increase of the volume and masses of these two components of the Universe (pseudomaximon), which means origination, formation of flat space. That is, if for a wonder it would be possible to deduce negative and positive masses from the present condition of our Universe, the space would not remain, the space would disappear. It is a question of principle: if galaxies scatter, if superclusters of galaxies expand, then the space, in which these objects expand, should be formed in advance. This means that cosmological expansion - origination, formation of flat space is closely connected with the origination, increase of positive and negative components.

From here we can come to the major conclusion: like the cosmological evolution has its beginning and the end, the process of increase, accumulation of these two components has the beginning and the end. That is, the positive component and the dark energy of the Universe increases in proportion to expansion, rather, **in proportion to their increase, the space arises, is formed ("expands") in the Universe.** In addition, it means, that origination of these masses occurs continuously during the period of cosmological evolution. (I can imagine, what clamor will this my statement raise: my approach has nothing general

with the theory of continuous creation of matter of **Hoyle**, **Bondi** and **Gold**, except the mere idea). It means, that creation of matter, quantum evolution of matter, origination and formation of primary black holes, stars and galaxies continues today and will come to the end in 10-15 billion years.

5.3 Periodization of cosmological evolution

The entire process, the whole way of cosmological evolution can be conditionally **divided** into **62 stages** (according to the number of the exponent of the constant U), **12 steps**, each of them consisting of 5.2 stages; **6 jumps**, each jump consists of 10.4 stages or two steps; and **three jumps**, each of them consisting of 20.7 stages or four steps.

Therewith:

1) During the cosmological evolution, at transition from one stage to another, insignificant physical changes take place.
2) Proceeding from one step to another, certain new physical changes, new processes take place.
3) Proceeding from one jump to another, already serious essential physical changes take place.
4) And deeper, radical physical changes occur during transition from one jump to another.

Here it is talked of evolution of matter diversity, that is, evolution of the positive component of the Universe, since only within it the fundamental types of quantum interactions - strong, weak and electromagnetic interactions occur and act.

The beginning, certainly, is the value n=1: the beginning of the evolution - $t_{pl} = 10_c^{-43}$.

$t_z = 10_c^{19}$	$z = 10^{62}$	End of cosmological evolution
$t_n = 10_c^{14}$	$n = 10^{57}$	
$t_n = 10_c^{9}$	$n = 10^{52}$	Nuclear synthesis

$t_n = 10_c^4$	$\mathrm{n} = 10^{47}$	
$t_n = 10_c^{-2}$	$\mathrm{n} = 10^{41}$	
$t_n = 10_c^{-7}$	$\mathrm{n} = 10^{36}$	
$t_n = 10_c^{-12}$	$\mathrm{n} = 10^{31}$	Infringement of symmetry of Electroweak unification
$t_n = 10_c^{-17}$	$n = 10^{26}$	
$t_n = 10_c^{-22}$	$\mathrm{n} = 10^{21}$	
$\mathrm{t_n} = 10_{\mathrm{c}}^{-28}$	$\mathrm{n} = 10^{15}$	
$t_n = 10_c^{-33}$	$\mathrm{n} = 10^{10}$	Infringement of symmetry of Grand unification
$t_n = 10_c^{-38}$	$\mathrm{n} = 10^{5}$	
$t_{pl} = 10_c^{-43}$	$n = 1$	Beginning of cosmological evolution; continuous origination of positive and negative energy/mass

6. The basic components of our Universe and the Metagalaxy

6.1 Graviton and anti-graviton

To understand the physical processes occurring during expansion of the Universe, first of all it is necessary to find out what components arise right at the beginning in the expanding volume, then to find out their physical nature (parameters), evolution or possible changes, possible interactions and so on.

We have already found out, that the most fundamental quantum of both positive and negative components $|m_k| = m_{pl}/^2 = 10^{-67} g = const.$ By tradition, we have called the quantum of positive mass as graviton - $m_g = 10^{-67} g.$, and the quantum of dark energy, or negative mass - anti-graviton $\left|-m_{\bar{g}}\right| = 10^{-67} g.$ Since m_g and $m_{\bar{g}}$ are constant, they originate at the very beginning of the expansion - at the first

chronon $\left(t=10^{-43}\,\text{sec}\right)$. Therewith, anti-gravitons arise by repulsing each other, and gravitons, by attracting each other, are grouped in the structure of primary black holes and elementary particles.
Let me remind that

$$m_{pos.}=n^2\cdot m_g \qquad m_{\text{▪}\,(pos)}=\text{▪}^{\,2}\cdot m_g=10^{57}\,g$$

$$\left|m_{BE}\right|=n^2\cdot\left|m_{\bar{g}}\right| \qquad \left|m_{\text{▪}\,(BE)}\right|=\text{▪}\cdot\left|m_{\bar{g}}\right|=10^{57}\,g$$

If the positive component consisted only of m_g, all matter diversity, including us, would not have any chance of occurrence.
Now let us dwell on some qualities and physical parameters of $m_{\bar{g}}$. Asserting that during the whole period of cosmological expansion $m_{\bar{g}}=10^{-67}\,g=const.$ we, apparently, face a serious contradiction: on the one hand the negative energy/mass has $\rho_{BE}=c^4\left|m_{\bar{g}}^2\right|/\left(G\cdot h^2\right)=10^{-31}=const.$, on the other hand we know, that $\rho_n=\rho_{BE}$ which means that the density of negative (dark) energy is variable. Here there is no any dangerous contradiction, simply the formula $\rho_{BE}=c^4\cdot m_{\bar{g}}^2/\left(G\cdot h\right)$ fixes the average density of negative energy during completion of the cosmological evolution. That is $\left|\rho_{BE}\right|=c^4\cdot\left|m_{\bar{g}}^2\right|/\left(G\cdot h^2\right)=\left|\rho_{\text{▪}}\right|=const.$ But if consider the law $\left|\rho_n\right|=\left|\rho_{BE}\right|=\rho_{pl}/n^2$ we should find out how $\rho_{\bar{g}}$ varies during expansion. Since $m_{\bar{g}}=10^{-67}\,g=const.$ its **volume** is variable. (How come, they will object to us, how such an insignificant quantum can have spatial sizes and volume). Knowing the minimum average density of anti-graviton:, $\rho_{BE}=10^{-31}\,g/cm^3$. we can define its volume of localization $V_{\bar{g}}$: $V_{\bar{g}}=r^3=m_{\bar{g}}/\rho_{m_{\bar{g}}}=10^{-67}\,g/\left(10^{-31}\,g/cm^3\right)=10^{-37}cm^3$..
This means, when n=U. and $\left|\rho_{\text{▪}}\right|=\left|\rho_{pl}\right|/\text{▪}^{\,2}=\left|\rho_{m_{\bar{g}}}\right|=10^{-31}\,g/cm^3$, the

volume of anti-graviton is equal $v_{m_{\bar{g}}} = 10^{-37} cm^3$. It is very interesting, how this volume arises. Let us recollect that $m_{\bar{g}}$ nevertheless is a quantum object, hence, the formula $l = h/(c \cdot m)$ of **Compton** wavelength $l = h/(c \cdot m_{\bar{g}}) = h/(c \cdot 10^{-67} g) = 10^{29} cm$ is true for it. Certainly this was bound to happen: the gravitational radius of mass $|m_{\bar{g}}| = 10^{57} g$ is equal to $r_{\bar{g}} = G \cdot |m_{\bar{g}}| / c^2 = 10^{29} cm$, and Compton wavelength of graviton and anti-graviton is also equal to: $l_{\bar{g}} = 10^{29} cm$. We can put this value into the equation $V_{\bar{g}} = r^3 = 10^{-37} cm^3$: $V_{\bar{g}} = l_{\bar{g}} \cdot r^2 = 10^{-37} cm^3$, whence $r_{\bar{g}}^2 = 10^{-66} cm^2$, that is it is equal to r_{pl}^2.
We obtain a very interesting picture (especially for stringers): anti-graviton is a formation with section $r_{pl}^2 = 10^{-66} cm^2$ and length $l_{\bar{g}} = 10^{29} cm$, the section is invariable, and $l_{\bar{g}}$ is variable: $r_n = l_{\bar{g}}$. But $l_{\bar{g}}$ varies under the law $l_{\bar{g}} = n^2 \cdot r_{pl} / 2$ where expression $n^2/2$ is the compactification factor. This is one of the important functions of the Armon number. Thus, eventually it was found out how the volume (hence, also the average density) of anti-graviton varies during the expansion: $V_{\bar{g}} = r_{pl}^2 \cdot l_{\bar{g}} = r_{pl}^2 \cdot n^2 \cdot r_{pl} / 2 = r_{pl}^3 \cdot n^2 / 2$, whence it is clearly seen, that in case of n=1, $V_{\bar{g}} = 10^{-99/2} = 10^{-161} cm^3$, and in case of $n = 2$,. $V_{\bar{g}} = 10^{-99 \cdot 2} = 10^{-37} cm^3$.This also means that if the density of the quantity of anti-gravitons in the beginning of expansion was equal to 10^{161} units in $1 cm^3$, then at the end of the cosmological evolution it is 10^{37} units in $1 cm^3$. That is, though the amount of anti-gravitons increases with expansion of the Universe, under law $N_{\bar{g}} = 2 \cdot n$, but ρ_{N_g} decreases (reduces).

2) After finding-out the changing quantity of anti-gravitons, we can also establish the justice of the factor $n^2/2$. Thus, $\rho_{N_{\bar{g}}} = N_{\bar{g}}/V_n$ where $N_{\bar{g}}$ is the amount of anti-gravitons, and v_n is the expanding volume of the Universe. We need to find $N_{\bar{g}}$. When n = U, $N_{\bar{g}}$ is a fixed value: $m_{\text{ч}_{(BE)}} = 2^2 \left|m_{\bar{g}}\right| = 2^2 \cdot 10^{-67} g = 10^{57} g$, that is $N_{\bar{g}} = 2^2$. Now we can return back, when n=1 $N_{\bar{g}} = n^2$, and it means, that in the beginning of the expansion $|m_{BE}| = n^2 \left|m_{\bar{g}}\right| = 10^{-67} g$, which contradicts the equation $\left|m_{n_{(BE)}}\right| = m_{n_{(pos)}} = n \cdot m_{pl} = 10^{-5} g$. So, it becomes clear that the quantity of anti-gravitons is not determined by the formula $N_{\bar{g}} = n^2$, but is determined by the law $N_{\bar{g}} = 2^{\cdot n}$. It means that in case of n=1, in the first chronon of expansion $t_{pl} = 10^{-43}\,\text{sec}$, immediately $m_{\bar{g}}$ anti-gravitons and m_g gravitons arise in U quantity, total sum of masses of which is equal to $m_{n_{(BE)}} = 2^{\cdot n \cdot m_{\bar{g}}} = 2^{\cdot 10^{-67} g} = 10^{-5} g$. And when n = U, then $N_{\bar{g}} = 2^2$ and $m_{\text{ч}_{(BE)}} = 2^2 \cdot m_{\bar{g}} = 10^{57} g$.

Thus we have found out the law of change of the amount of anti-gravitons (gravitons), which too is expressed through the Armon number: $N_{\bar{g}} = 2^{\cdot n}$: $\rho_{N_{\bar{g}}} = N_g/V_n = 2^{\cdot n}/\left(n^3 \cdot r_{pl}^3\right) = 2^{\ }/\left(n^2 \cdot r_{pl}^3\right)$ and since $V_{\bar{g}} = 1/\rho_{N_{\bar{g}}}$, having placed the value $\rho_{N_{\bar{g}}}$, we will receive $V_{\bar{g}} = n^2 \cdot r_{pl}^3/2$ where $n^2/2$ - is the compactification factor.

So, we can make a certain notion about the physical parameters and characteristics of anti-graviton - quantum of negative or dark energy:

$$m_{\bar{g}} = m_{pl}/2 = 10^{-67} g = const.$$

$$E_{\bar{g}} = 10^{-46} erg = const.$$

$$S = r_{pl}^2 = 10^{-66} cm^2 = const.$$

As to the characteristic time, anti-graviton has $t_{\bar{g}} = h \Big/ \left| c^2 \cdot m_{\bar{g}} \right| = 10^{19}$ sec. There is also $t_{ов} = t_z \cdot t_{pl} \big/ t_{\bar{g}} = 10^{-43}$ sec, occurrence time (but I repeat: $m_{\bar{g}}$ and m_g are not destroyed, do not arise or their destruction and occurrence is conditional, they are the least quanta, portions of energy and as those they can mix up and again divide, and it can be considered as the beginning and the end of their existence). Time of the life or duration of "life" of anti-graviton also makes sense: $t_{LT} = t_z^2 \big/ t_{bb} = 10^{81}$ sec $= const.$.

The other characteristics are variable:

$$l_{\bar{g}} = r_{pl} \frac{n^2}{2},$$

$$N_{\bar{g}} = 2 \cdot n,$$

$$t_{\bar{g}} = t_{pl}\left(\frac{n^2}{2}\right)$$

$$\left| \rho_{\bar{g}} \right| = \rho_n = \frac{\rho_{pl}}{n^2}$$

$$\left| \varepsilon_{\bar{g}} \right| = \left|\varepsilon_{ТЭ}\right| = \varepsilon_n = \frac{\varepsilon_{pl}}{n^2}$$

Graviton has almost identical physical parameters, only with the difference that it has positive gravitational mass, i.e. it is capable to attract, and thanks to which gravitons are grouped, creating all varieties of the positive component.

Discussing the properties, physical characteristics of quanta of dark energy - anti-gravitons, we revealed that spatial volume of localization of these negative gravitational charges in the process of cosmological evolution varies, reaching $v_{\bar{g}} = 10^{-37}$ cm^3. In modern theories of quantum gravitation it is often spoken about quanta or about atoms of space. For example, the Loop theory of quantum gravitation also asserts

that the space consists of atoms of space. As the representative of this theory **Li Smolin** confirms, these atoms of space have a volume equal to r_{pl}^3, and in the Universe the amount of these knots - quanta, is equal to $\frac{V_{вс}}{V_{pl}} = \frac{10^{84}_{см^3}}{10^{-99}_{см^3}} = 10^{184}$. **It is a formal approach,** since: first, the physical carrier of this atom of the space, the quantum particle (formation) which is localized in this small volume and is the carrier of this space is overlooked. And secondly, spatial volume of localization of this particle should be considered as a variable value. This volume can deform, decrease or increase.

Thus, if consider the atom of space - the minimum volume as r_{pl}^3, we should notice that the carrier of this volume is the mass m_{pl}, hence if the Universe volume consists approximately of 10^{184} knots, the mass of the Universe will be equal to $m_{BC} = 10^{184} \cdot m_{pl} = 10^{180}_{ã}$, and it contradicts observations.

Thus, in our equation $V_n = n^3 r_{pl}^3$, n^3 is considered as quantity of atoms of space, but it does not coincide with the quantity of anti-gravitons and gravitons, of which negative and positive components of the Universe consist. That is, the space of our Universe is formed by gravitons and anti-gravitons. Therefore, the spatial volume of our Universe can be expressed by the equation $v_n = N_{\bar{g}} \cdot v_{\bar{g}} = ² \; nv_{\bar{g}}$, whence it is seen that $N_{\bar{g}}$ and $V_{\bar{g}}$ are variables and, what is the most important, the volume of our Universe consists of the same quantity of quanta of space, of which the quantity $m_{\bar{g}}$ consists $m_{₂\,(îòð\ )}$ of our Universe: $\frac{V_₂}{V_{\bar{g}}} = ² \; ² = \frac{m_₂}{m_{\bar{g}}}$. The same regards gravitons, with the difference that gravitons are grouped in different gravitational clots and by means of attraction arising between them, form local curvatures of space … In a word, the space, the volume of the Universe is equal to $v_n = ² \; n \cdot v_g$. Since the positive

component of our modern Universe is basically concentrated in primary black holes, which also finally consist of gravitons and as we will see further these primary black holes are separated from each other by distance $\ell_{\text{чд}} = 10^{19}_{\text{см}}$, i.e. each primary black hole occupies a space volume in size of $v_{\text{чд}} = \ell^3_{\text{чд}} = 10^{57}_{\text{см}}$, whence $v_n = {}^{2}\, n \cdot v_g = \sqrt{2} \cdot v_{BH} \approx 10^{87}_{cm^3}$.

It is to be added only that the mass of graviton is connected with m_k, $m_{\text{чД}}$ and m_n by the following formulas:

$$m_g = \frac{m_k^2}{m_{pl}} \cdot \left(\frac{n}{2} \right) = 10^{-67}_{\text{г}} = const.$$

$$m_g = \frac{m_{pl}^3}{m_{BH}^2} \cdot \left(\frac{n}{2} \right) = const.$$

$$m_g = \frac{m_{pl}^2}{m_n} \cdot \left(\frac{n}{2} \right) = const.$$

$$m_g = \frac{m_n}{2 \cdot n} \cdot \frac{m_{pl}}{2} = const.$$

6.2 Characteristic elementary particle

During cosmological evolution within the Universe, different formations arise from positive energy/mass. The basic ones of them are quantum, elementary particles and black holes. As it has been already mentioned, despite all distinctive features, quantum elementary particles have general properties:

1) First of all, all elementary particles have positive energy/mass, i.e. are subject to gravitation.

2) Their quantum nature is defined by $m_k \le m_{pl}$ (or $E_k \le E_{pl}$).

3) They are quanta expressing the average distribution of the positive component, corresponding to each level of cosmological expansion, therefore I call them **characteristic elementary particles** of each level

of cosmological evolution, which always have $\rho_k = \rho_n$, with all consequences resulting from it.

4) This generalized characteristic quantum particle has **general regularities**: during cosmological expansion, let's say, its mass varies under the law - $m_k = m_{pl} \Big/ \sqrt{n}$, and in general all its physical parameters are wonderfully interdependent and are connected not only with variable physical parameters of the positive component of the expanding Universe, but also with primary black holes.

Here it is to be emphasized that insignificant deviations from these mentioned laws are connected with the obtained specific features of elementary particles (quantum numbers).

6.2.1 Main basic characteristics

$$m_к = \frac{h}{cr_к} \quad r_к = \frac{h}{cm_к} \quad t_к = \frac{h}{c^2 m_к}$$

$$m_к = \frac{h}{c^2 t_к} \quad r_к = ct_к \quad t_к = \frac{r_к}{c}$$

$$m_к^4 = \frac{h^3 \rho_к}{c^3} \quad r_к^4 = \frac{h}{c\rho_к} \quad t_к^4 = \frac{h}{c^5 \rho_к}$$

$$m_к = \frac{E_к}{c^2} \quad r_к = \frac{hc}{E_к} \quad t_к = \frac{h}{E_к}$$

$$m_к = \frac{kT_к}{c^2} \quad r_к = \frac{hc}{kT_к} \quad t_к = \frac{h}{kT_к}$$

$$\rho_к = \frac{c^3 m_к^4}{h^3} \quad E_к = m_к c^2 \quad T_к = \frac{c^2 m_к}{k}$$

$$\rho_к = \frac{h}{cr_к^4} \quad E_к = \frac{hc}{r_к} \quad T_к = \frac{hc}{kr_к}$$

$$\rho_к = \frac{h}{c^5 t_к^4} \quad E_к = \frac{h}{t_к} \quad T_к = \frac{h}{kt_к}$$

$$\rho_к = \frac{E_к^4}{h^3c^5} \quad E_к^4 = h^3c^5\rho_к \quad T_к^4 = \frac{h^3c^5\rho_к}{k}$$

$$\rho_к = \frac{k^4T_к^4}{h^3c^5} \quad E_к = kT_к \quad T_к = \frac{E_к}{k}$$

These are the laws expressing the key parameters of elementary particles and their interdependence. Certainly, there are numerous quantum processes and phenomena, description of which assumes certain deviations from these laws, depending on certain conditions and circumstances, on specific quantum (numbers) features of elementary particles. But these basic, fundamental laws and regularities determine stable, invariable, constant dependences between the basic physical parameters of these quantum micro objects:

$$m_k r_k = \frac{h}{c} = \text{const}$$

$$m_k t_k = \frac{h}{c^2} = \text{const} \quad r_k^4\rho_k = \frac{h}{c} = \text{const} \quad t_k^4\rho_k = \frac{h}{c^5} = \text{const}$$

$$\frac{m_k^4}{\rho_k} = \frac{h^3}{c^3} = \text{const} \quad \frac{r_k}{t_k} = c = \text{const} \quad t_k E_k = h = \text{const}$$

$$\frac{m_k}{E_k} = \frac{1}{c^2} = \text{const} \quad r_k E_k = hc = \text{const} \quad t_k T_k = \frac{h}{k} = \text{const}$$

$$\frac{m_k}{T_k} = \frac{k}{c^2} = \text{const} \quad r_k T_k = \frac{hc}{k} = \text{const}$$

$$\frac{\rho_k}{E_k^4} = \frac{1}{h^3c^5} = \text{const} \qquad \frac{E_k}{T_k} = k = \text{const}$$

$$\frac{\rho_k}{T_k^4} = \frac{k^4}{h^3c^5} = \text{const}$$

Here I said nothing new.

6.2.2 Interconnection and conditionality of parameters of characteristic quantum particle and variable parameters of the positive component of the Universe.

As I already mentioned, at any stage of expansion of the Universe, the average density of the positive component is equal to the average density of the characteristic particle of the given level of expansion: $\rho_n = \rho_k$ or $\varepsilon_n = \varepsilon_k$ and, having equaled the formulas $\rho_n = \frac{c^6}{G^3 m_n^2}$ and $\rho_k = \frac{c^3 m_k^4}{h^3}$, we will receive the law $m_n^2 = \frac{h^3 c^3}{G^3 m_k^4}$, or $m_n = \frac{m_{pl}^3}{m_k^2}$.

And in general, on the basis of equation $\rho_n = \rho_k$ it is possible to receive the mutual relations of all key parameters:

$m_k^2 = \frac{m_{pl}^3}{m}$ $\quad m_k = \frac{m_n}{n\sqrt{n}}$ $\quad m_k = \frac{m_{pl}}{\sqrt{n}}$ in case of n=U.

$r_k^2 = r_n r_{pl}$ $\quad r_k = \frac{r_n}{\sqrt{n}}$ $\quad r_k = \sqrt{n} r_{pl}$ $m_k = \frac{m_2}{2\sqrt{2}}$

$t_k^2 = t_n t_{pl}$ $\quad t_k = \frac{t_n}{\sqrt{n}}$ $\quad t_k = \sqrt{n} t_{pl}$ $m_k = \frac{m_{pl}}{2}$

$\rho_k = \rho_n$ $\quad \rho_k = \rho_n = \frac{\rho_{pl}}{n^2}$

$E_k^2 = \frac{E_{pl}^3}{E_n}$ $E_k = \frac{E_n}{n\sqrt{n}} \left(E_k = E_n'\right)$ $\quad E_k = \frac{E_{pl}}{\sqrt{n}}$

$T_k^2 = \frac{T_{pl}^3}{T_n}$ $T_k = \frac{T_n}{n\sqrt{n}} \left(T_k = T_n'\right)$ $\quad T_k = \frac{T_{pl}}{\sqrt{n}}$

Peer attentively at these equations, they are those laws, about which several generations of physicists dreamt; as my great compatriot **Gr. Narekatsi** said: "learn big things from small and insignificant ones". Certainly, the relationship of each parameter of the

characteristic particle to all parameters of the positive component represents a certain interest; I will give examples of some of them:

$$m_k^2 = \frac{m_{pl}^3}{m_n} \qquad r_k^2 = r_n r_{pl} \qquad t_k^2 = t_n t_{pl}$$

$$m_k^4 = \frac{h^3}{Gcr_n^2} \qquad r_k^4 = \frac{G^3 h m_n^2}{c^7} \qquad t_k^4 = \frac{G^3 h m_n^2}{c^{11}}$$

$$m_k^4 = \frac{h^3}{Gc^3 t_n^2} \qquad r_k^4 = \frac{hGt_n^2}{c} \qquad t_k^4 = \frac{hGr_n^2}{c^7}$$

$$m_k^4 = \frac{h^3 \rho_n}{c^3} \qquad r_k^4 = \frac{h}{c\rho_n} \qquad t_k^4 = \frac{h}{c^5 \rho_n}$$

$$m_k^4 = \frac{h^3 c^7}{G^3 E_n} \qquad r_k^4 = \frac{G^3 h E_n^2}{c^{11}} \qquad t_k^4 = \frac{G^3 h E_n^2}{c^{15}}$$

$$m_k^4 = \frac{h^3 c^7}{G^3 k T_n} \qquad r_k^4 = \frac{G^3 h k^2 T_n^2}{c^{11}} \qquad t_k^4 = \frac{G^3 h k^2 T_n^2}{c^{15}}$$

$$\rho_k = \rho_n \quad E_k^4 = \frac{h^3 c^{15}}{G^3 E_n^2} \left(E_k^2 = \frac{E_{pl}^3}{E_n} \right) \qquad T_k^4 = \frac{h^3 c^{15}}{G^3 k^6 T_n^2} \left(T_k^2 = \frac{T_{pl}^3}{T_n} \right)$$

$$\rho_k = \frac{c^6}{G^3 m_n^2} \qquad E_k^4 = \frac{h^3 c^7}{G r_n^2} \qquad T_k^4 = \frac{h^3 c^{11}}{G^3 k^4 m_n^2}$$

$$\rho_k = \frac{c^2}{G r_n^2} \qquad E_k^4 = \frac{h^3 c^{11}}{G^3 m_n^2} \qquad T_k^4 = \frac{h^3 c^7}{G k^4 r_n^2}$$

$$\rho_k = \frac{1}{G t_n^2} \qquad E_k^4 = \frac{h^3 c^5}{G t_n^2} \quad T_k^4 = \frac{h^3 c^5}{G k^4 t_n^2} \left(\begin{matrix} T_k = T_n^{'} \\ T_k^2 = \frac{10^{20}}{t_n} \end{matrix} \right)$$

$$\rho_k = \frac{c^{10}}{G^2 E_n^2} \quad E_k^4 = h^3 c^5 \rho_n \qquad T_k^4 = \frac{h^3 c^5 \rho_n}{k^4}$$

$$\rho_k = \frac{c^{10}}{G^2 k T_n^2} \qquad E_k^4 = \frac{h^3 c^{15}}{G^3 k^2 T_n^2} \quad T_k^4 = \frac{h^3 c^{15}}{G^3 k^4 E_n^2}$$

An interesting circulation of parameters and formulas turns out, everything, really, is connected with everything. Hence, everything can

be defined, learnt by means of everything. Isn't this the very thing the human being is striving for?

I have the right to assert confidently that the laws and regularities above had not been realized and opened in the modern Physics and Cosmology before they were revealed by me except the variants $t^2 = 1/(\rho \cdot G)$ and $T^2 = 10^{20}/t$ which till now are considered as formulas expressing mutual relationship of "age", average density and average temperature of the Universe, but actually they express also the mutual relationship of "age" of our Universe and average density and temperature of its basic component - characteristic quantum particle. And since $\rho_k = \rho_n$ and $T_k = T_n'$, for this reason these formulas, which were revealed by experimental method, did not prevent, but helped calculations of scientists. Till now there is not an accurate idea about that the point particle can have density of mass or energy, which can coincide and coincides with ρ_i or ε_n of certain level of evolution of the Universe.

The block of these laws allows connecting the microworld with the Mega world, micro and macro objects and their parameters.

And in general I think, that at studying of any physical system, its parameters, physical properties, it is necessary (as the General theory of systems teaches) to consider them at least in two profiles, from two points of view: 1) in relation to the basic composing elements and their physical parameters and 2) in relation to the "big" system, the component of which the considered object is, and its parameters …

Let us provide the table of numerical values of change of parameters of characteristic quantum particle during cosmological evolution:

See Table 4,1at the end of the book.

As it is seen from the table, in case of $n = 2$, $m_k = 10^{-15} erg$, and all parameters of this characteristic quantum particle coincide with quantum of relict electromagnetic radiation: with relict photon. Isn't this

possibility of definition of global parameters of the Universe by the parameters of this photon a miracle? It is surprising that since 1965, scientists have not taken the advantage of this possibility.

6.2.3 Dependences of parameters of characteristic quantum particle and primary black holes.

As of today it has been so much written and told about the black holes, in particular about the so-called primary black holes, however it still remains unknown why they arise, since the Nature does not create various types, forms of matter in vain. These primary black holes arise necessarily during the Universe evolution, which means that they execute a very important function in the course of this cosmological evolution. In a word, we will speak about it in details in the following, separate paragraph, while here I simply want to underline that in the expanding Universe primary black holes are one of the important and basic components of its positive component. So, the positive mass has two basic components: the characteristic quantum particle and the primary black hole. Apparently, physics was divided into two independent, separate concepts not only by the process of historical development of this science, but also by the Nature. But Her Majesty Nature, has not only separated these two diametrically different formations, but also has strictly defined their interconnection and interdependence, has not only established their contrast, but also the unity, which is manifested by the unity of gravitation and the quantum phenomena. In this connection, **Hoking's** service is invaluable in the theoretical substantiation of "the phenomenon of quantum evaporation" of black holes. Opening of this quantum effect of gravitation, actually, was the first sign in the field of revealing of dependences between parameters of black holes and elementary particles. **Hocking** established that black holes should radiate; the temperature of this radiation is equal: $T_{TR} = h \cdot c^3 / \left(8 \cdot \pi \cdot G \cdot k \cdot M_{BH}\right)$

This is all. Unfortunately nobody, even the author has made useful conclusions of this law. While this law means that primary black holes radiates quantum particles with mass - m_k and, as a matter of fact, expresses mutual relationship of the mass of primary black hole and T_k of the radiated quantum particle: $T_k = h \cdot c^3 / (G \cdot k \cdot m_{BH})$ (virtually, without the factor 8π).

Hoking's this law is enough to deduce from it the dependences of all parameters of primary black hole and the characteristic quantum particle:

$$m_k = \frac{m_{pl}^2}{m_{BH}} \qquad r_k = r_{BH} \qquad t_k = t_{BH}$$

$$m_k = \frac{h}{c r_{BH}} \qquad r_k = c t_{BH} \qquad t_k = \frac{r_{BH}}{c}$$

$$m_k = \frac{h}{c^2 t_{BH}} \qquad r_k = \frac{G m_{BH}}{c^2} \qquad t_k = \frac{G m_{BH}}{c^3}$$

$$m_k^2 = \frac{h^2 G \rho_{BH}}{c^4} \qquad r_k^2 = \frac{c^2}{G \rho_{BH}} \qquad t_k^2 = \frac{1}{G \rho_{BH}}$$

$$m_k = \frac{h c^3}{G E_{BH}} \qquad r_k = \frac{G E_{BH}}{c^4} \qquad t_k = \frac{G E_{BH}}{c^5}$$

$$m_k = \frac{h c^3}{G k T_{BH}} \qquad r_k = \frac{G k T_{BH}}{c^4} \qquad t_k = \frac{G k T_{BH}}{c^5}$$

$$\rho_k = \frac{\rho_{BH}^2}{\rho_{pl}} \qquad E_k = \frac{E_{pl}^2}{E_{BH}} \qquad T_k = \frac{T_{pl}^2}{T_{BH}}$$

$$m_k = \frac{c^7 h}{G^4 m^4{}_{BH}} \qquad \mathrm{E_k} = \frac{\mathrm{hc}^3}{\mathrm{Gm}} \qquad T_k = \frac{h c^3}{G k m_{BH}}$$

$$\rho_k = \frac{h}{c r_{BH}^2} \qquad E_k = \frac{h c}{r_{BH}} \qquad T_k = \frac{h c}{k r_{BH}}$$

$$\rho_k = \frac{h}{c^5 t_{BH}^4} \qquad E_k = \frac{h}{r_{BH}} \qquad T_k = \frac{h}{k t_{BH}}$$

$$\rho_k = \frac{hc^{15}}{G^2 E_{BH}^2} \qquad E_k^2 = h^2 G \rho_{BH} \qquad T_k = \frac{h^2 G \rho_{BH}}{k}$$

$$\rho_k = \frac{hc^{15}}{G^2 k^4 T_{BH}^4} \qquad E_k = \frac{hc^5}{GkT_{BH}} \qquad T_k = \frac{hc^5}{GkE_{BH}}$$

So, the primary black hole, corresponding to each level of expansion, radiates characteristic quantum particles, corresponding to this level. I will provide the table:

n	m_n г	$m_{BH}g$	$m_K g$ г	$r_{чд}$ см	r_K см	$t_{чд}$ с	t_K с	$\rho_{чд}$ г/см^3	ρ_K г/см^3	$\rho'_{чд}$ г/см^3
10^{62}	10^{57}	10^{26}	10^{-36}	10^{-2}	10^{-2}	10^{-12}	10^{-12}	10^{31}	10^{-31}	10^{-31}
10^{52}	10^{47}	10^{21}	10^{-31}	10^{-7}	10^{-7}	10^{-17}	10^{-17}	10^{41}	10^{-10}	10^{-10}
10^{42}	10^{37}	10^{16}	10^{-26}	10^{-12}	10^{-12}	10^{-22}	10^{-22}	10^{51}	10^{10}	10^{10}
10^{31}	10^{26}	10^{10}	$10^{-20,5}$	10^{-18}	10^{-18}	10^{-28}	10^{-28}	10^{62}	10^{31}	10^{31}
10^{21}	10^{16}	10^{5}	10^{-15}	10^{-23}	10^{-23}	10^{-33}	10^{-33}	10^{72}	10^{51}	10^{51}
10^{10}	10^{5}	10^{0}	10^{-10}	10^{-28}	10^{-28}	10^{-38}	10^{-38}	10^{83}	10^{73}	10^{73}
10^{0}	10^{-5}	10^{-5}	10^{-5}	10^{-33}	10^{-33}	10^{-43}	10^{-43}	10^{93}	10^{93}	10^{93}

E_{BH} erg	E_K erg	T_{BH} K	T_K K	N_{bh} $\sqrt{n}$	E_{BH} erg	E_K erg	T_{BH} K	T_K K	N_{bh} $\sqrt{n}$
10^{47}	10^{-15}	10^{63}	10^{0}	10^{31}	10^{47}	10^{-15}	10^{63}	10^{0}	10^{31}
10^{42}	10^{-10}	10^{58}	10^{6}	10^{26}	10^{42}	10^{-10}	10^{58}	10^{6}	10^{26}
10^{31}	10^{-5}	10^{53}	10^{11}	10^{21}	10^{31}	10^{-5}	10^{53}	10^{11}	10^{21}
10^{31}	10^{-10}	10^{47}	10^{16}	$10^{15,5}$	10^{31}	10^{-10}	10^{47}	10^{16}	$10^{15,5}$
10^{26}	10^{5}	10^{42}	10^{21}	$10^{10,3}$	10^{26}	10^{5}	10^{42}	10^{21}	$10^{10,3}$
10^{21}	10^{11}	10^{36}	10^{26}	10^{5}	10^{21}	10^{11}	10^{36}	10^{26}	10^{5}
10^{16}	10^{16}	10^{31}	10^{31}	1	10^{16}	10^{16}	10^{31}	10^{31}	1

primary black hole of any level radiates elementary particles with $m_k = \frac{m_{pl}^2}{m_{BH}}$, but absorbs from this the particles having energy (mass) more than this. The absorption cutoff is determined by formula $m_{k'}^2 = \frac{m_{pl}^3}{m_{BH}}$. For example, in case of n = U: $m_{BH} = 10_{\tilde{a}}^{26}$, which radiates elementary particles with masses $m_k = 10_{\tilde{a}}^{-36}$ (most likely, relict neutrino with $T = 2K$), but absorbs particles with $m_k = 10_{\tilde{a}}^{-21} > m_k > 10_{\tilde{a}}^{-36}$, that is the $m_{BH} = 10_{\tilde{a}}^{26}$ body basically consists of elementary particles with masses $m_k = 10_{\tilde{a}}^{-21}$.

n	m_{bh} g	m_K g	m_K g	ρ_{bh} g/cm^3	ρ_{BH}' g/cm^3	$\rho_к$ g/cm^3	$\rho_к'$ g/cm^3
10^{62}	10^{26}	10^{-36}	10^{-21}	10^{31}	10^{-31}	10^{31}	10^{31}
10^{52}	10^{21}	10^{-31}		10^{41}	10^{-10}	10^{-10}	
10^{42}	10^{16}	10^{-26}	10^{-15}	10^{51}	10^{10}	10^{10}	10^{51}
10^{31}	10^{10}	10^{-21}		10^{62}	10^{31}	10^{31}	
10^{21}	10^{5}	10^{-15}	10^{-10}	10^{72}	10^{51}	10^{51}	10^{72}
10^{10}	10^{1}	10^{-10}		10^{83}	10^{73}	10^{73}	
1	10^{-5}	10^{-5}	10^{-5}	10^{93}	10^{93}	10^{93}	10^{93}

6.2.4 Periodic regularities.

As it is shown, the primary black hole evolution and evolution of the characteristic quantum particles, as well as the change of their

energies/masses and quantities N_{BH}, N_k, are also strictly related to cosmological expansion. This dependence is a strict law, it excludes, negates hyperbolized ideas of the inflationary theory radically. These regularities of change of physical properties of primary black hole and characteristic elementary particles show an obviously visible periodicity. At each jump (10^{10}) of evolution, essential change of characteristic quantum particles takes place: their energy/mass decreases by 10^5 times, and the quantity is increased, that is an important event takes place in the evolution of elementary particles, which is accompanied, undoubtedly, with gravitational processes (with participation of primary black hole).

The quantity of the characteristic quantum particles varies under the law $N_к = n\sqrt{n}$

6.3 Primary black holes

In the course of the cosmological expansion not only the characteristic quantum particles, but also Primary black holes arise[1].

Following the tradition, I call these gravitational clots primary black holes, and their primacy is conditioned not by the time of their origination, as **Zel'dovich, Hocking** and others assumed, (in the theory of Armons their origination and evolution goes on till now), but by the primary role.

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[1] In the Armon theory, or rather, in the General theory of physics as we underlined, there are no **absolute black holes**, the absolute collapse is impossible. What we call primary black hole and D bodies, are relative BH or white holes, i.e. their mass cannot have radius less than r_g, the internal and external requirements do not allow them to be subjected to the absolute collapse. On the contrary, dark energy and flat space force the primary black hole and D bodies to expand - $r_{BH} \geq r_g$. This in turn means, that primary black hole, D bodies, are forced to increase their mass according to the law $m_{BH} = c^2 \cdot r_g / G$.

Again let us return to the initial formulas: $G \cdot m_g^2 / (h \cdot c) = 1$ (where $m_g = m_{pl}$) and as $\left(\frac{G m_{g'}^2}{hc} \right)^2 = 1$ (where $m_{g'} = m_{pl}$), it is possible to equate: $\frac{G m_g^2}{hc} = \frac{G^2 m_{g'}^4}{h^2 c}$, whence $m_g^2 = \frac{G m_{g'}^4}{hc}$ or $m_g = \frac{m_{g'}^2}{m_{pl}}$ where $m_{g'}$ is the mass of primary black hole, and $m_g = m_n$, then $m_n = \frac{m_{BH}^2}{m_{pl}}$. Since $m_{pl} = \frac{m_n}{n}$, then $m_n = \sqrt{n} m_{BH}$, and $m_{BH} = \sqrt{n} m_{pl}$. In the extreme case n = U: $m_{BH} = \sqrt{2}\, m_{pl} = 10^{26}$ ã. It is extremely large, maximum mass of primary black hole. $m_{BH} = \sqrt{2}\, m_{pl} = const.$ and primary black hole has this mass during the end of the evolution.

6.3.1 Main physical properties of primary black hole.

It is clear that physical properties of primary black holes are also described by the equations of the block (2) and (3):

$$r_{BH} = \frac{G m_{BH}}{c^2}$$

$$t_{BH} = \frac{G m_{BH}}{c^3}$$

$$\rho_{BH} = \frac{c^6}{G^3 m_{BH}^2}$$

$$E_{BH} = m_{BH} c^2$$

$$T_{BH} = \frac{m_{BH} c^2}{k}$$

In case of n=U, $r_{BH} = \frac{G \cdot 10^{26}_{\tilde{a}}}{c^2} = 10^{2}_{\tilde{n}\grave{i}}$, $t_{BH} = 10^{12}_{\tilde{n}}$, $\rho_{BH} = 10^{31}_{\tilde{a}/\tilde{n}\grave{i}^3}$, $E_{BH} = 10^{47}_{\acute{y}\eth\tilde{a}}$, $T_{BH} = \frac{E_{BH}}{k} = 10^{31}\hat{E}$. Of course, it is quite different temperature on the surface of the primary black hole horizon with the mass of $m_{BH} = 10^{26}_{\tilde{a}}$: 2.7 K, and we will reveal the reason of it later.

6.3.2 The laws expressing the relationship between the parameters of primary black hole and the positive component of the Universe.

We already know that $m_{BH} = \frac{m_n}{\sqrt{n}}$, and $r_{BH} = \frac{r_n}{\sqrt{n}}$, $t_{BH} = \frac{t_n}{\sqrt{n}}$ and so on.

Thus:

$$m_{BH}^4 = \frac{hcm_n^2}{G} \quad \left(m_{BH}^2 = m_{pl} \cdot m_n\right)$$

$$r_{BH}^4 = \frac{Ghr_n^2}{c^3} \quad \left(r_{BH}^2 = r_{pl} \cdot r_n\right)$$

$$t_{BH}^4 = \frac{Ght_n^2}{c^5} \quad \left(t_{BH}^2 = t_{pl} \cdot t_n\right)$$

$$\rho_{BH}^2 = \frac{c^5 \rho_n}{hG^2} \quad \left(\rho_{BH}^2 = \rho_{pl} \cdot \rho_n\right)$$

$$E_{BH}^4 = \frac{c^5 hE_n^2}{G} \quad \left(E_{BH}^2 = E_{pl} \cdot E_n\right)$$

$$T_{BH}^4 = \frac{c^5 hT_n^2}{Gk^2} \quad \left(T_{BH}^2 = T_{pl} \cdot T_n\right)$$

As in the case of the characteristic quantum particle, here it is possible to express any physical parameter of primary black hole by the

parameters m_n, r_n, t_n, ρ_n, E_n, T_n and again we get a beautiful turnover, transmutation of formulas and parameters:

$$m_{BH}^4 = \frac{hcm_n^2}{G} \qquad r_{BH}^4 = \frac{Ghr_n^2}{c^3} \qquad t_{BH}^4 = \frac{Ghr_n^2}{c^7}$$

$$m_{BH}^4 = \frac{c^5 hr_n^2}{G^3} \qquad r_{BH}^4 = \frac{Ghm_n^2}{c^7} \qquad t_{BH}^4 = \frac{Ghm_n^2}{c^{11}}$$

$$m_{BH}^4 = \frac{c^7 ht_n^2}{G^3} \qquad r_{BH}^4 = \frac{Ght_n^2}{c} \qquad t_{BH}^4 = \frac{Ght_n^2}{c^5}$$

$$m_{BH}^4 = \frac{c^7 h}{G^4 \rho_n} \qquad r_{BH}^4 = \frac{h}{c\rho_n} \qquad t_{BH}^4 = \frac{h}{c^5 \rho_n}$$

$$m_{BH}^4 = \frac{hE_n^2}{Gc^3} \qquad r_{BH}^4 = \frac{GhE_n^2}{c^{11}} \qquad t_{BH}^4 = \frac{GhE_n^2}{c^{15}}$$

$$m_{BH}^4 = \frac{hT_n^2 k^2}{Gc^3} \qquad r_{BH}^4 = \frac{GhT_n^2 k^2}{c^{11}} \qquad t_{BH}^4 = \frac{GhT_n^2 k^2}{c^{15}}$$

$$\rho_{BH}^2 = \frac{c^5 \rho_n}{G^2 h} \qquad E_{BH}^4 = \frac{c^5 hE_n^2}{G}$$

$$\rho_{BH}^2 = \frac{c^{11}}{G^5 hm_n^2} \qquad E_{BH}^4 = \frac{c^9 hm_n^2}{G}$$

$$\rho_{BH}^2 = \frac{c^7}{G^3 hr_n^2} \qquad E_{BH}^4 = \frac{c^{13} hr_n^2}{G^3}$$

$$\rho_{BH}^2 = \frac{c^5}{G^3 ht_n^2} \qquad E_{BH}^4 = \frac{c^{15} ht_n^2}{G^3}$$

$$\rho_{BH}^2 = \frac{c^{15}}{G^5 hE_n^2} \qquad E_{BH}^4 = \frac{c^{15} h}{G^4 \rho_n}$$

$$\rho_{BH}^2 = \frac{c^{15}}{G^5 hT_n^2 k^2} \qquad E_{BH}^4 = \frac{c^5 hT_n^2 k^2}{G}$$

In the original circulation of these formulas we see excellent laws (and these laws pour out so generously from "the gold horn" of the Armon theory): for example: average density ρ_n of the positive mass (energy) of our Universe is determined by m_{BH} :

$\rho_n = \frac{c^7 h}{G^4 m_{BH}^4}$. Who knew about it? This is a small discovery[1]. And the each one of the given laws alike. Let us take the law $t_n^2 = \frac{G^3 m_{BH}^4}{c^7 h}$ which shows that at any moment of cosmological expansion primary black hole there should have a corresponding mass m_{BH}. And since t_n and m_{BH} are directly proportional to each other, it means that throughout the cosmological expansion the mass of primary black hole will be continuously increasing. And from the law $m_n = \sqrt{n} m_{BH}$ it results that

[1] The density of the dark energy is mistakenly considered as positive and constant in the science, as a result of which a theoretical problem called "the problem of vacuum energy", arose. First the fictitious concept of "vacuum-like medium" was circulated. Now it is called a "space vacuum". Then it was identified with the concept of "quantum vacuum" which had a real, physical content, it expresses the lowest energy level of quantum system.

And at last considering that the space vacuum prevails in the Universe, hence it should be featured by some quantum theory.

And here I show, that ρ_n , the density of mass of the positive component of the Universe (which modulo is equal to the density of dark energy) and can be described, expressed also by the average density of primary black hole - ρ_{BH} and ρ_K of the characteristic quantum particles, or other physical properties of these objects.

Why not? Since the positive mass of our Universe is mainly concentrated in primary black hole. Hence: $\rho_n = G^2 \cdot \hbar \cdot \rho_{BH}^2 / c^5$ or $\rho_n = c^7 \hbar / \left(G^4 \cdot m_{BH}^4 \right)$, and the density of energy: $\varepsilon_n = G^2 \cdot \hbar \cdot \rho_{BH}^2 / c^3 = G^2 \cdot \hbar \cdot \varepsilon_{BH}^2 / c^3$ or $\varepsilon_n = c^5 \cdot \hbar / \left(G^4 \cdot m_{BH}^4 \right)$. The same is $\rho_n = c^3 \cdot m_k^4 / \hbar^3$ or $\varepsilon_n = c^5 \cdot m_k^4 / \hbar^3$

the quantity $N_{BH}=\sqrt{n}$ of primary black holes too is increased in proportion to the expansion.

This deduction, of course, is new to the science, the point of view that primary black hole mainly arise in the beginning of the expansion, in the hadronic epoch, is still valid. For example in their opinion, primary black hole, with mass of $m_{BH}=10^{26}_{\text{ã}}$, arises at the moment of expansion $t=10^{-12}$, and this misunderstanding, the reason of which is the likeness of formulas $t_n=\frac{Gm_n}{c^3}$ and $t_{BH}=\frac{Gm_{BH}}{c^3}$, but they are not identical. Yes, the parameters of primary black hole too are subject to the laws of formulas of the system of equations (2) and (3). But a part is a component of the whole and cannot be identified with the whole. **All of the modern physics and cosmologists did not know the laws** $m_n^2=\frac{Gm_{BH}^4}{hc}$, $m_n=\frac{m_{BH}^2}{m_{pl}}$ or $m_n=\sqrt{n}m_{BH}$**,** otherwise they would have discovered long time ago the law $t_n^2=\frac{G^3m_{BH}^4}{c^7h}$, they would have realized that primary black hole with masses $m_{BH}=10^{26}_{\text{ã}}$, arise in the upper layer, close to the end of cosmological evolution, when $t_n\approx t_{\text{ç}}=10^{19}_{c}$, i.e. the origination of primary black hole with masses $m_{BH}\geq m_{pl}$ does not come to its end in the beginning of the expansion, but is continued almost to date. It testifies that it is not right to consider the characteristic time of primary black hole $t_{BH}=\frac{Gm_{BH}}{c^3}$, as the moment of origination of primary black hole of the given mass. (The characteristic time of primary black hole is determining for its interior components). Since we already know that $t_n=\frac{t_{BH}^2}{t_{pl}}$

n	m_n	m_{BH}	r_n	r_{BH}	t_n	t_{BH}	ρ_n	ρ_{BH}
1	10^{-5} ã	10^{-5} ã	10^{-33} ñì	10^{-33} ñì	10^{-43} ñ	10^{-43} ñ	10^{93}	10^{93}
10^{10}	10^{5} ã	10^{0} ã	10^{-23} ñì	10^{-28} ñì	10^{-33} ñ	10^{-38} ñ	10^{73}	10^{83}
10^{20}	10^{15} ã	10^{5} ã	10^{-13} ñì	10^{-23} ñì	10^{-23} ñ	10^{-33} ñ	10^{53}	10^{73}
10^{31}	10^{26} ã	10^{11} ã	10^{-2} ñì	10^{-18} ñì	10^{-12} ñ	10^{-28} ñ	10^{31}	10^{62}
10^{42}	10^{37} ã	10^{16} ã	10^{9} ñì	10^{-12} ñì	10^{-1} ñ	10^{-22} ñ	10^{9}	10^{51}
10^{52}	10^{47} ã	10^{21} ã	10^{19} ñì	10^{-7} ñì	10^{9} ñ	10^{-17} ñ	10^{-11}	10^{41}
U=10^{62}	10^{57} ã	10^{26} ã	10^{29} ñì	10^{-2} ñì	10^{19} ñ	10^{-12} ñ	10^{-31}	10^{31}

E_{BH} erg	E_K erg	T_{BH} K	T_K K	$N_{BH}=\sqrt{n}$	E_{BH} erg	E_K erg	T_{BH} K	T_K K	$N_{BH}=\sqrt{n}$
10^{47}	10^{-15}	10^{63}	10^{0}	10^{31}	10^{47}	10^{-15}	10^{63}	10^{0}	10^{31}
10^{42}	10^{-10}	10^{58}	10^{6}	10^{26}	10^{42}	10^{-10}	10^{58}	10^{6}	10^{26}
10^{31}	10^{-5}	10^{53}	10^{11}	10^{21}	10^{31}	10^{-5}	10^{53}	10^{11}	10^{21}
10^{31}	10^{-10}	10^{47}	10^{16}	$10^{15,5}$	10^{31}	10^{-10}	10^{47}	10^{16}	$10^{15,5}$
10^{26}	10^{5}	10^{42}	10^{21}	$10^{10,3}$	10^{26}	10^{5}	10^{42}	10^{21}	$10^{10,3}$
10^{21}	10^{11}	10^{36}	10^{26}	10^{5}	10^{21}	10^{11}	10^{36}	10^{26}	10^{5}
10^{16}	10^{16}	10^{31}	10^{31}	1	10^{16}	10^{16}	10^{31}	10^{31}	1

The definition "lifetime" of primary black hole, the upper boundary of their existence is of interest. The Armon theory determines the "length of life" of primary black hole by several formulas. For example:

$$t^2_{\text{âæ}(BH)} = \frac{t_n^3}{t_{pl}},\ t_{\text{âæ}(BH)} = \frac{t_{BH}^3}{t_{pl}^2},\ t_{\text{âæ}(BH)} = \sqrt{n}t_n$$

Determination of the length of life of primary black hole is important for identifying L_{BH} - the intensity of their radiation.

$$L_{BH} = \frac{E_{BH}}{t_{\text{âæ}(BH)}}.$$

6.3.3 Mode of origination and evolution of Primary black holes

Now we can bring also the Table, which describes the mode of origination and evolution of Primary black holes, change of the quantity of primary black hole - N_{BH}, $t_{\text{âæ}(BH)}$ of the lifetime and L_{BH} of the radiation intensity.

See Table 4.2 at the end of the book.

If we look attentively, an interesting regularity is evident: $\frac{t_{\text{âæ}(BH)}}{t_{BH}} = n$. What does it mean? We already know, that primary black hole radiates, emits characteristic quantum particles under the laws $m_{BH} = \frac{hc}{Gm_k}$ or $m_{BH} = \frac{hc^3}{GE_k}$, that is $m_{BH} = nm_k$. Any primary black hole during its life can radiate and radiates n number of quanta m_k. And since $t_{BH} = t_k$ (and $r_{BH} = r_k$), it is clear that $t_{BH} = t_k$ is the interval of the time of emission, radiation of each quantum. primary black hole having the greatest mass $m_{BH} = 10^{26}_{\text{ã}}$, during $t_{\text{âæ}} = 10^{50}_{c}$ of its existence, radiates 10^{62} number of quanta $m_k = 10^{-15}_{\text{ýðã}}$ of elementary particles (most probably neutrino with $T = 2K$). The law $E_k = L_{BH}\ t_{BH}$ also testifies to it: in case of n = U, $E_k = 10^{-3}_{\text{ýðã}/\text{ñ}} \cdot 10^{-12}_{c} = 10^{-15}_{\text{ýðã}}$.

Now it is clear, why the relict neutrino cannot be found out till now. The matter is that during $10^{19}_{\text{ñ}}$, each primary black hole with the mass of $m_{BH} = 10^{26}_{\text{ã}}$, radiates 10^{31} number of $E_V = 10^{-15}_{\text{ýðã}}$ neutrino. Since $N_{BH} = \sqrt{n}$, and the quantity of primary black hole with mass $m_{BH} = 10^{26}_{\text{ã}}$ is equal to $\sqrt{^2} = 10^{31}$, it means that all of them together radiate only 10^{62} neutrino for $10^{19}_{\text{ñ}}$. And it means that the quantity of neutrino in 1cm^3 is only 10^{-25}, i.e. in $\text{v} = 10^{25}_{\text{ñì}^3}$ volume there is only one neutrino with energy of $\text{E}_\nu = 10^{-15}_{\text{ýðã}} = 2\text{K}$. For comparison we must say that in 1 cm^3 there are 400-500 relict quanta, with $\text{E}_{\text{ðõ}} = 10^{-15}_{\text{ýðã}} = 2{,}7\text{K}$. Or in $10^{25}_{\text{ñì}^3}$ volume there are $5 \cdot 10^{27}$ relict quanta, therefore it is easy to register the background radiation flux, while the relict neutrino flux is difficult to register.

6.3.4 Lattice of primary black hole.

There is reasonable to consider that primary black hole are continuously increased in cosmological expansion both by quantity and mass and are uniformly distributed in a corresponding layer of the expanded volume, forming from respective m_{BH} an original lattice in each layer, in which primary black hole are located at equal distances from each other. So, since $m_n = N_{BH} m_{BH}$, then at each level of expansion the positive mass m_n is distributed among the N_{BH} number of primary black hole. Let's consider the case, when n = U.: $m_{\text{ì}} = 10^{57}_{\text{ã}}$, $\text{v}_{\text{ì}} = 10^{87}_{\text{ñì}^3}$, $N_{BH} = 10^{31}$, it means that $\dfrac{v_{\text{ì}}}{N_{BH}} = \dfrac{10^{87}_{\text{ñì}^3}}{10^{31}} = 10^{57}_{\text{ñì}^3}$, that is each $m_{BH} = 10^{26}_{\text{ã}}$ body occupies a volume of $10^{57}_{\text{ñì}^3}$, or these primary black hole are $10^{19}_{\text{ñì}}$ apart from each other. The l**attice of primary black hole is naturally formed thanks to the gravitation existing between them. And thanks to the dark energy, the lattice of primary black hole is not collapsed, but evolves**

to the limiting case (n = U.) and therewith stays in a stationary state. Later on this lattice starts to degrade. The spatial scale $\ell_{BH} = 10^{19}_{\text{ñì}}$, most probably, is the horizon radius (or thermal atmosphere) of primary black hole. And it is wonderful that in the volume of $v = 10^{57}_{\text{ñì}^3}$ and on the horizon surface the average density $m_{BH} = 10^{26}_{\text{ã}}$ is equal to:

$$\rho'_{BH} = \frac{10^{26}_{\text{ã}}}{10^{57}_{\text{ñì}^3}} 10^{31}_{\text{ã}/\text{ñì}^3} = \rho_{\text{ê}}.$$

The fact that primary black hole radiate m_k which have $\rho_k = \rho_n$, already evidences that these m_k "are born" on the horizon of primary black hole where the primary black hole have $\rho'_{BH} = \rho_n$.

Thus, the idea of the primary black hole lattice is the most important **discovery of** Gch U. – cosmology, which can be confirmed by observations or experiments during the coming years. The primary black hole lattice plays the basic role both during evolution of the Universe and after "compression" of Armon. It is a natural cradle, spatial medium and simultaneously the feeder and the transformer of the origin and development of the Metagalaxy inside our Universe. The primary black hole lattice together with the negative (dark) energy shapes, creates the flat space of our Universe, by quantity corresponding to each level of expansion.

I might mention also that gaining mass $m_{BH} = 10^{26}_{\text{ã}}$, primary black hole already ceases to grasp, absorb elementary particles from the surrounding medium; such a primary black hole is already energetically saturated. Since this moment ($10^{19}_{\text{ñ}}$) it is only "evaporated" and this quantum evaporation will last $10^{50}_{\text{ñ}}$.

n	m_n g	m_{BH} g	t_n s	N_{BH}	ρ_n	ρ_{BH}	ρ'_{BH}	r_n,cm	r_{BH},cm	ℓ_{BH}
10^{62}	10^{57}g	10^{26}	10^{19}	10^{31}	10^{-31}	10^{31}	10^{-31}	10^{29}	10^{-2}	10^{19} cm
10^{52}	10^{47} g	10^{21}	10^{9}	10^{26}	10^{-10}	10^{41}	10^{-10}	10^{19}	10^{-7}	10^{10} cm
10^{42}	10^{37} g	10^{16}	10^{-1}	10^{21}	10^{10}	10^{51}	10^{10}	10^{9}	10^{-12} cm	10^{2} cm
10^{31}	10^{26} g	10^{10}	10^{-12}	10^{16}	10^{31}	10^{62}	10^{31}	10^{-2}	10^{-17}	10^{-7} cm
10^{20}	10^{16} g	10^{5}	10^{-22}	10^{11}	10^{52}	10^{72}	10^{52}	10^{-12}	10^{-23}	$10^{-15,5}$ cm
10^{10}	10^{5} g	10^{1}	10^{-33}	10^{5}	10^{72}	10^{83}	10^{72}	10^{-22}	10^{-28}	10^{-24} cm
1	10^{-5} g	10^{-5}	10^{-43}	10^{1}	10^{93}	10^{93}	10^{93}	10^{-33}	10^{-33}	10^{-33} cm

In the end, I am simply obliged to recollect and discuss the remarkable idea of the academician **Markov** about the possible role of primary black hole - as the dark matter of the Universe. I will cite from his article on " **Possible existence of asymptotic freedom of gravitational interactions in nature** "[1]… possibility of occurrence of newcomers from the past into our Universe in the form of separate maximon or their groups during the various moments of history of our Universe nevertheless exists, and they could form medium of dark matter in the form of maximons, in the form of elementary white holes.

According to the idea developed above on the nature of dark matter only from maximons, the maximons not having el. charge practically do not interact with matter. Celestial bodies are transparent for them …

It is to be emphasized that the process of occurrence of the matter in our Universe coming from other Universes, can be considered as the process

[1] **M. Markov, Physics Uspekhy**, 1994, V164, N1

simulating the birth of matter, exactly in our Universe", " … pra-matter - gas of black holes - as a scalar field - is dark matter in the form of stable elementary holes or particles, mass of which is expressed in the form: $m = a\sqrt{hc/G}$.

But the substance of these particles is not found, for example, under **Schwarzschild** sphere.

… Such particles, including stable elementary black holes, practically do not interact with common matter, but rather strongly interact with each other".

I completely agree with **Markov's** opinion about origin of matter in our Universe coming from outside, and also with the idea of identification of primary black hole with dark matter; but only with allowing for the Armon theory: not only the positive mass appears from the past in our Universe (in the form of Planck's mass), but also the dark energy or mass of anti-gravitons, in the form of $(-\mathrm{m}_{\mathrm{pl}})$, and not separately from each other, but in unity - as a part of pseudominimon. But the mode of evolution of the positive and negative components is different. I agree with **Markov**, that the appearing elementary black holes, **or Markov's** maximons (not to be confused with Armon's maximons) make dark matter, but not the Metagalactic dark matter. We call the latter D bodies.

I do not agree with **Markov's** idea that these elementary black holes, which, as he fairly mentions, are not absolute black holes, do not evolve: he confirms the possibility of merging of black holes, but he considers that they are promptly evaporated up to Planck's mass. I consider, that primary black hole periodically unite in the process of cosmological evolution and at each stage the intensity of their quantum radiation is not so strong, so eventually primary black hole collect a large mass - $m_{BH} = 10^{26}_{g}$. Now let us imagine that the volume of our Universe is charged with "gas of the elementary black holes" of Markov. Each elementary black hole on the average would occupy a volume of - $V = 10^{25} cm^3$, i.e. average distribution of these black holes is such that they are $\ell \approx 10^{8}_{cm}$ apart from each other, and it means that the antigravitation of dark energy is much stronger, than the attractive force

arising between these elementary black holes. That is, if these elementary black holes are not unified, increasing their masses and distances, then the flat space of the Universe cannot be formed to the $v = 10^{87} cm^3$ volume.

6.4 Structure of the Metagalaxy.

6.4.1 D bodies: protosuperclusters of galaxies, protogalaxies.

We were convinced that the so-called dark energy is the negative energy/mass – aggregation of anti-gravitons, and that the so-called dark matter is the positive component of the Universe, or in other words, lattice of primary black hole. These two components are equal with their masses and together shape the expanding space of the Universe. The present coarse-grained homogeneous structure of our Universe is the lattice of primary black hole. As to the galaxies, the clusters and superclusters of these masses –the Metagalaxy composes only $1/10^5$ part of the positive component of the Universe. The experts call the distribution of this rather insignificant mass "large-scale structure of Metagalaxy". There are two basic approaches in the science to the formation of this structure. One of them is the traditional, classical approach, which comes from **Kant**. According to this approach, space bodies result from compression, condensation of cosmic dust. The other, not classical or so called Bjurakan approach asserts the contrary that these space bodies arise from superdense masses through differentiation, dispersion, explosion. How extremely opposite approaches, points of view. In such case the truth is always in the unity of these opposite approaches. Where from did the cosmic dust appear in the Universe or where from and how did the superdense bodies appear? It is clear that they are related with each other and are interdependent.

I am mainly interested in the superclusters of galaxies - these **immediate components of large-scale structure of the Metagalaxy.** Perhaps the fact, confirmed by observations, that superclusters are included in the process of cosmological expansion testifies to it: their volume is expanding in time. And it means that turning back the film of

cosmological expansion, we will see that the supeclusters were in rather compressed and superdense state in the past, without the composition of galaxies … Exactly how **V. Hambardzumyan** represented. For the same reason, in honor of our compatriot, we will call them as **Hambardzumyan** did - D bodies.

6.4.2 Basic physical characteristics of D bodies.

In the theory of Armons the D bodies too are black holes, but they differ from primary black hole both in structure, and the regularities of origin and evolution. The most important feature of the D bodies is that the most essential physical changes - the basic events of quantum evolution of matter occur in these bodies, of course, with participation of primary black hole.

And in general, formation and origination of stars, galaxies and other astrophysical bodies occurs inside D bodies, during their evolution, expansion.

In general, the D bodies of different levels of cosmological evolution coincide with the concept of Metagalaxy. For example, at the end of cosmological evolution, i.e. at present, the Metagalaxy too is a D body with a mass of $m \approx 10_g^{52}$, but to distinguish the Metagalaxy and superclusters of galaxies, we will call the latter D bodies. That is, today our Metagalaxy consists of extremely expanded D bodies (superclusters of galaxies) in number of 10^5.

Let's give the equations describing the physical properties of D bodies in the relationship with the parameters of the positive component of our Universe, as well as of primary black hole and characteristic elementary particles:

$$\mathrm{m_D} = \frac{\mathrm{m_n}}{10^5} \qquad m_D = \frac{m_{BH}\sqrt{n}}{10^5} \qquad m_D = \frac{m_к \cdot n\sqrt{n}}{10^5}$$

$$\mathrm{r_D} = \frac{\mathrm{r_n}}{10^5} \qquad r_D = \frac{r_{BH}\sqrt{n}}{10^5}$$

$$t_D = \frac{t_n}{10^5} \qquad t_D = \frac{t_{BH}\sqrt{n}}{10^5}$$

$$\rho_D = \left(10^5\right)^2 \rho_n \qquad \rho_D = \left(10^5\right)^2 \frac{\rho_{BH}}{n}$$

$$E_D = \frac{E_n}{10^5} \qquad E_D = \frac{E_{BH}\sqrt{n}}{10^5}$$

$$T_D = \frac{T_n}{10^5} \qquad T_D = \frac{T_{BH}\sqrt{n}}{10^5}$$

6.4.3 The main stages of evolution of D bodies

See Table 4.3 at the end of the book

V. Hambardzumyan did not consider the super dense D bodies as black holes, since he considered that the existence of absolute black holes was impossible. Really, black holes cannot exist in flat space, as absolute collapsars. Therefore, I consider D bodies as relative black holes. The flat space "forces them" to expand, to increase their mass by uniting and to reduce the mass density . That is why in the process of cosmological evolution D bodies collect mass and unite. As a result the Metagalactic mass is increased to the limit - $m_{mg} = 10^5 \cdot m_D = 10_g^{52}$, where $m_D = 10_g^{47}$ is the limiting mass of the D body.

The most important thing is the essential physical changes, which occur in these D bodies, at corresponding stages of their evolution.

For example, in case of n=10^{10}, $m_D = 1$г, in the upper layer and on the surface of D body symmetry of Grand unification is broken, this major quantum-gravitational physical event occurs not in the whole volume of expansion of the Universe, but within the scale of this local physical system - D bodies, or rather in its thermal atmosphere, with a horizon radius of - $r_D = 10_{cm}^{-24}$ and with the assistance of corresponding primary black hole, which in this stage of the cosmological evolution also have a mass of $m_{BH} = 1g$.

In case of n=10^{31} a D body arises with a mass of $m_D = 10^{21}_{ã}$, and a volume of $v_D = r_D^3 = 10^{-10}_{cm^3}$ in which the symmetry of electroweak unification is violated, with the assistance of primary black hole of the given level of cosmological evolution. primary black hole of this level have a mass of $m_{BH} = 10^{10}_{â}$ and they radiate elementary particles with a mass of $m_{ê} = \frac{m_{pl}^2}{m_{BH}} = \frac{\left(10_g^{-5}\right)^2}{10_g^{10}} = 10_g^{-21}$. These elementary particles also are the neutral, Higgs particles without spin, with the help of which the fundamental particles obtain mass. The same mechanism took place in case of n=10^{10}.

At the level of n=10^{42} a D body arises with a mass of - $m_D = 10^{32}_{ã}$, and already a quark- hadronic phase transition takes place in it: from quark-gluon plasma hadrons arise.

At the level of n=10^{52} too a "significant" event takes place: in D body $m_D = 10^{42}_{ã}$ processes of nuclear fusion take place.

At the level of n=10^{57} a D body $m_D = 10^{47}_{ã}$ is formed, which already cannot increase its mass at the following levels of expansion. It is already the superdense body - pra-supercluster of galaxies represented by **Hambadzsumyan**, which also expands in parallel to cosmological expansion. Galaxies arise in the course of its autonomous expansion. In the course of the further expansion of the Universe such D bodies-pra-superclusters in number of 10^5 arise. The totality of these expanding superclusters makes the mass of our Metagalaxy. Here another important event of evolution of matter is to be mentioned, which occurs at level of n=10^{57}. In the upper layer of the expanding D body with a mass of $m_D = 10^{47}_{ã}$ and a volume of $v_D = 10^{67}_{cm^3}$ a recombination process takes place, at which relict radiation is emitted from this volume. Thus, we conclude that the recombination process occurs not simultaneously in the whole volume of our Universe, but in the local physical system - in the D body and with some interval of time, D bodies periodically arising in number of 10^5. Most probably, the 10^{-5} exponent of

anisotropy of relict electromagnetic radiation is explained exactly by this.

It is not difficult to guess how the galaxies, clusters of stars and stars arise in the course of expansion of D bodies with a mass of $m_D = 10^{47} g$, i.e. how the D bodies are transformed into extremely expanded superclusters of galaxies. We will speak about it in detail in a separate book to be published. Here we will mention only about those observant facts, which contradict the standard cosmological model, but find their explanation within the limits of Gch² - cosmology:

a) The so-called "dark flux" found out by observations, is a confirmation of spiral (vortex) spinning of our Metagalaxy;
b) Occurrence of astrophysical black holes, with huge masses, within the limits of Gch² - cosmology, is explained by the concept of origination and evolution of D bodies.
c) Expansion of superclusters of galaxies is an established fact. It confirms our opinion that superclusters of galaxies are immediate elements of our Metagalaxy, and that expansion of these superclusters of galaxies causes occurrence and development of galaxies, clusters of stars and the stars themselves, and not vice-versa.
d) The periodicity, mode of occurrence and development of D bodies – pra-superclusters of galaxies, explains the origin of hollows – the so-called "voids".
e) The anisotropy of the relict electromagnetic radiation and its lack in "voids" too is explained by that, that the sources of the relict radiation are the D bodies.

Table 4.1

n	m_n g	$m_к$ g	r_n cm	$r_к$ cm	t_n sec	$t_к$ sec	ρ_n g/cm^3	$\rho_к$ g/cm^3	E_{nerg}	E_n'erg	$E_к$erg	T_n	T_n' K	$T_к$
10^{62}	10^{57}	10^{-36}	10^{29}	10^{-2}	10^{19}	10^{-12}	10^{-31}	10^{-31}	10^{78}	10^{-15}	10^{-15}	10^{93}	2,7	2,7
10^{52}	10^{47}	10^{-31}	10^{19}	10^{-7}	10^{9}	10^{-17}	10^{-10}	10^{-10}	10^{68}	10^{-10}	10^{-10}	10^{83}	10^{6}	10^{6}
10^{42}	10^{37}	10^{-26}	10^{9}	10^{-12}	10^{-1}	10^{-22}	10^{10}	10^{10}	10^{58}	10^{-5}	10^{-5}	10^{73}	10^{11}	10^{11}
10^{31}	10^{26}	10^{-21}	10^{-2}	10^{-17}	10^{-12}	10^{-27}	10^{31}	10^{31}	10^{47}	10^{0}	10^{0}	10^{62}	10^{16}	10^{16}
10^{21}	10^{16}	10^{-15}	10^{-12}	10^{-22}	10^{-22}	10^{-32}	10^{51}	10^{51}	10^{37}	10^{5}	10^{5}	10^{52}	10^{21}	10^{21}
10^{10}	10^{5}	10^{-10}	10^{-23}	10^{-28}	10^{-33}	10^{-38}	10^{73}	10^{73}	10^{26}	10^{11}	10^{11}	10^{41}	10^{26}	10^{26}
1	10^{-5}	10^{-5}	10^{-33}	10^{-33}	10^{-43}	10^{-43}	10^{93}	10^{93}	10^{16}	10^{16}	10^{16}	10^{31}	10^{31}	10^{31}

Table 4.2

n	m_n g	m_{BH} g	t_n sec	t_{BH}	t_{LTBH} sec	N_{BH}	L_{BH} erg/sec	$m_к$
1	**10**	10^{-5}	10^{-43}	10^{-43}	10^{-43}	**1**	10^{59}	10^{-5}g=10^{16}erg
10^{10}	10^{5}	10^{0}	10^{-33}	10^{-38}	10^{-28}	10^{5}	10^{49}	10^{-10}g=10^{11}erg
10^{20}	10^{15}	10^{5}	10^{-23}	10^{-33}	10^{-18}	10^{10}	10^{39}	10^{-16}g=10^{5}erg
10^{31}	10^{26}	10^{11}	10^{-12}	10^{-28}	$10^{3.5}$	$10^{15,5}$	10^{28}	10^{-21}g=10^{-1}erg
10^{42}	10^{37}	10^{16}	10^{-2}	10^{-22}	10^{10}	10^{21}	10^{18}	10^{-26}g=10^{-6}erg
10^{52}	10^{47}	10^{21}	10^{9}	10^{-17}	10^{35}	10^{26}	10^{7}	10^{-31}g=10^{-11}erg
10^{62}	10^{57}	10^{26}	10^{19}	10^{-12}	10^{50}	10^{31}	10^{-3}	10^{-36}g=10^{-15}erg

Table 4.3

n	m_n g	t_n sec	m_{BH}	N_{BH}	m_{MG} (m_D) g	ρ_n g/cm^3	P_{BH} g/cm^3	ρ_D g/cm^3	ρ'_D g/cm^3	$r_{n\ cm}$	L_{BH} cm	$r_{g(D)}$ cm	r_D cm
10^{62}	10^{57}	10^{19}	10^{26}	10^{31}	10^{52}	10^{-31}	10^{31}	10^{-20}	10^{-31}	10^{29}	10^{19}	10^{24}	10^{28}
10^{57}	10^{52}	10^{14}	10^{26}	10^{26}	10^{47}	10^{-20}	10^{31}	10^{-10}	10^{-20}	10^{24}	10^{15}	10^{20}	10^{22}
10^{52}	10^{47}	10^{9}	10^{21}	10^{26}	10^{42}	10^{-10}	10^{41}	1	10^{-10}	10^{19}	10^{10}	10^{15}	10^{18}
10^{47}	10^{42}	10^{4}	10^{21}	10^{21}	10^{37}	1	10^{41}	10^{10}	1	10^{14}	10^{6}	10^{11}	10^{13}
10^{42}	10^{37}	10^{-1}	10^{16}	10^{21}	10^{32}	10^{10}	10^{51}	10^{20}	10^{10}	10^{9}	10^{2}	10^{6}	10^{8}
10^{37}	10^{32}	10^{-6}	10^{16}	10^{16}	10^{26}	10^{20}	10^{51}	10^{31}	10^{20}	10^{4}	10^{-3}	10^{-2}	10^{3}
10^{31}	**10^{26}**	**10^{-12}**	**10^{10}**	**10^{16}**	**10^{21}**	**10^{31}**	**10^{62}**	**10^{42}**	**10^{31}**	**10^{-2}**	**10^{-7}**	**10^{-7}**	**10^{-3}**
10^{26}	10^{21}	10^{-17}	10^{10}	10^{11}	10^{16}	10^{42}	10^{62}	10^{52}	10^{42}	10^{-7}	10^{-11}	10^{-12}	10^{-8}
10^{21}	10^{16}	10^{-22}	10^{5}	10^{11}	10^{10}	10^{52}	10^{73}	10^{63}	10^{52}	10^{-12}	10^{-15}	10^{-18}	10^{-13}
10^{15}	10^{10}	10^{-28}	10^{5}	10^{5}	10^{5}	10^{63}	10^{73}	10^{73}	10^{63}	10^{-17}	10^{-19}	10^{-23}	10^{-18}
10^{10}	10^{5}	10^{-33}	1 г	10^{5}	1	10^{73}	10^{83}	10^{83}	10^{73}	10^{-23}	10^{-24}	10^{-28}	10^{-24}
10^{5}	1	10^{-38}	1 г	1	10^{-5}	10^{83}	10^{83}	10^{93}	10^{83}	10^{-28}	10^{-28}	10^{-33}	10^{-29}
1	10^{-5}	10^{-43}	10^{-5} г	1	10^{-10}	10^{93}	10^{93}	10^{93}	10^{93}	10^{-33}	10^{-33}	10^{-38}	10^{-33}

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