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# About the physical foundation of some Contemporary paradigms

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**Abstract**

We applied the early developed analytic approach which has been successfully used to model the macroplastic deformation of FCC polycrystalline solids, for analysis of some not fully understood and explained phenomena in our visible Universe. Such phenomena include: the main moral norms foundation, structure and evolution mechanism of the Universe, the basic management principles, micro-mechanisms of climate changes, carrier types of the baryonic, Dark matter and the Dark Energy in the Universe, justification of the Chapligin gas models applicability. So wide range of the phenomena is analyzed based on four main assumptions: all the above phenomena and processes are caused by nonstationary stochastic processes (NSPs); all NSPs are analogous each other in their basic development laws; the laws are experimentally verified by the early developed analytic approach which good describes one of NSPs - macroplastic deformation of polycrystalline FCC metals, Big Bang was the abnormal vacuum energy fluctuation and comprise two successive stages – energy and material products generation. Based on the assumptions, the Universe evolution was considered as the main NSP (the grand NSP) providing uniform spreading the energy and material products of the Big Bang. As consequences of the first and second laws of thermodynamics, which are assumed to be good verified in our visible Universe, necessities were shown, respectively, to endless existence of life phenomena in general in the whole or poly-Universe, together with conservation of individual life for each living creature (local NSPs. Proceeding from the assumed spherical symmetry of the Big Bang both products and the energy original distributions together with the principally limited time period of the Big Bang development, spherical rings structure of the whole Universe was proposed. Based on the structure, two possible variants of the energy and matter carriers motion within the Universe were discussed: 1) - motion in radial directions out of the Big Bang epicenter, which is characterized by the maximum possible average speed and minimum stopping collides with the other material objects early or simultaneously created by the Big Bang; 2) – the curved motion along the circle-like trajectories which provides minimum average speed of a material object and maximum motion resistance in the Universe due to stopping interaction with the other simultaneously generated material objects. The observed non-monotonic time dependence for the speed of our visible Universe expansion is in accordance with the approach predictions. Calculated time moment (about 14 billion years from the Big Bang appearance) is in accordance with the duration of our Universe existence. Numerically evaluated percentages for the contributions to the energy and matter fluxes for the various types of elementary particles are shown to be in accordance with the known contents of the baryonic Matter, Dark Matter and Dark Energy in our visible universe. Early predicted countless number of the approach constitutive nonlinear differential equation solutions were associated with the corresponding number of the mono-universes together with the energy and matter carriers in each of them. A mechanism for participating the mono-universes in the expansion of the whole, poly-universe was proposed. Two possible variants of the approach predicted development of a NSP: "military" and "civilian", were associated with the mechanisms of "wave-particle" duality, social management and the climate changes in agreement with the known facts. Time dependencies of the square density of the energy carriers and the stress caused the Big Bang energy gradient were calculated and their reciprocal mutual dependence was shown at finishing stage of our visible Universe evolution, in accordance with the known Chaplygin gas models.

**Keywords:** Paradigms, Non-Stationary Stochastic Processes, Two Stage Big Bang, Moral Norms, Baryonic And Dark Matters, Dark Energy, Poly- And Mono- Universes Evolution, Velocity Of A Mono- Universe Expansion, Possible Micro-Mechanisms Of Social Management And Climate Changes, Chaplygin Gas

## Introduction

As it well known, one of a definition of a paradigm is a set of basic notions and approaches which are in common and widest use in a branch of human intellectual activity: science, culture, religion etc [1]. It is also of overall acceptance that we, the other living creatures and all things around us are components of our visible Universe, where all possible phenomena appear and processes develop. Origination of our visibleUniverse is considered to be the Big Bang which may be imagine as abnormal energy fluctuation that gradually transforms into material objects which transfer the Big Bang generated energy out of its epicenter. All material objects or energy carriers in the Universe have to obey common for them or "nature" laws defining the fundamental rules together with some specific features of the objects behavior. For centuries the above notions correspond separation of humans having unique intelligence against to the rest our Universe and constantly trying to create a logically perfect picture of the surrounding nature. At that, the history of human modern civilizations shows that namely the people ideas about surrounding world as objectively, independently of the humans existing set of objects and ability of a human to understand and described it, are the most stimulated factors of the civilizations and sciences development [2]. Meantime, during the human history there appeared the other theoretical constructions (scientific, philosophical, religious) propagating the other ideas. The history shows a wide spreading the ideas, the origin some of which may be explained by desire of their creators to get some practical benefits. As relevant examples to consider, the Copehagen interpretation of the quantum mechanics and the "black box" basic idea in cybernetics practically simultaneously appeared in 20-ths years of 20-th century may be analyzed. Such situation is similar to the other one, when scientific ideas became basics of the most dangerous social doctrines. We mean the Darwing theory of evolution and derivative from it fashism and communism. Nevertheless, further we shall be based on the traditional notions about objectivity of the world surrounding humans and its ability to be exactly understood by them. So, we suppose that driving force of the human social, economic and scientific developments is scientific investigations and their achievements. Such investigations are practically conducted based on the analogies of various nature phenomena. This principle is used at our time in fact not only in mathematics , but in the other branches of science and is confirmed by numerous experimental facts [3,4]. As an example, the phase transformations in crystalline solids and the plastic deformation of the solids may be considered [5-7]. Besides, the principle of analogy for various natural phenomena and processes is a foundation of such modern field of cybernetics as artificial intelligence, functioning of which is based on the preliminary learning some typical, well known phenomena, formulation of stable rules of their development and further using the rules to describe novel phenomena. Due to absence of commonly accepted criterion for workability evaluation for the analogy principle, effective working of the analogies in scientific investigations, probably should be measured by the results of their practical applications. The wide spreaded now and shortly described above one of the contemporary paradigms, however may lead to some dangerous consequences for the humans, one of which is known as inverse Flynn effect [8]. A possible explanation of the effect is overloading the contemporary physical theories and models by abstract mathematics, that makes the theories difficult to understand for the most people. Besides, there are still open discussions about the requirements of practically all known religions regarding enforcing the high moral norms, saving living conditions for all living creatures, forecasting alternatively the fate of the Universe. The same may be said about trends to enlarge the human and other living creatures individual lives etc., that is expressed at our times by the efforts for the industry sustainable development, increased attention to improve medical care etc. Additionally, there are also theoretically unresolved problems related to possibility of existence of numerous (multi) Universes, back in time travelling, social management and climate changes micro-mechanisms etc [9,10]. In some recent researcheshigh effectiveness was shown for the early developed investigation approach based on analytic consideration of the plastic deformation of FCC metal policrystals as a non-stationary stochastic process (aNSP) [11-15]. As may be seen from the works, the approach is directly grounded on some commonly accepted fundamental notions of the dislocation theory, theory of random processes, linear stability analysis for real solutions of the third order, non-linear differential equation [15,16]. Based on the high adequacy of the calculated within the approach frame stress - strain curves with the experimental ones for the FCC polycrystals, it was concluded a possibility to expand the approach to the other NSPs [14].

## Physical Foundation of the Basic Ethical Norms

It is well known that a NSP may be defined as such changes in time of an object attributes which have characteristic time moments of their beginning and finishing[16]. So, using the analogy principle , let's consider a possibility of quantitative analysis the basic features of our Universe evolution within the frame of the above mentioned, early proposed analytic approach [2-7,11-15]. In order to abandon the mistaken impression about an illustration of the Dunning-Cruger effect by the text below, it should be emphasized that the ground of the attempt is the above mentioned close analogy of all NSPs with each other, together with fundamental cosmology concept about appearance of the Big Bang as the beginning event for the grand NSP [8,17,18]. Besides, the macro-plastic deformation process may be considered as an analog of the Universe evolution as during the latter NSP an energy is probably carried by the "strings" which may be analogous to the line crystal lattice defects or dislocations [17,18]. Before we proceed, it should be noted that the most data related to the Universe evolution are very restricted in their verification by the direct experiments. So, as the truth criterion during indirect comparison of a model developed with the experimental data having been known by the time, the coincidence of the model predictions with as more as possible known experimental results and theoretical notions should be probably taken into account. Proceeding from the above, we shall use further the well known features of the behavior of a typical free explosion which is happened typically in a "point" of space and time. Probably the main characteristic features of such explosion are: theoretical conservation of the full original amount of the explosion energy, gradual transformation of the original form of the energy into other ones, such as creation of new

material objects (explosion products), kinetic energy of their motion, potential energy of their interactions etc. Among the features it is also the next, very important one: uniform distribution of the original amount of the energy and the explosion products in any possible radial directions, of course, under the condition, of the uniform transport properties of the explosion surroundings near its epicenter. Under the context of the Universe evolution, it is natural, obviously to suppose full obeying the above basic conditions, especially: conservation of the Big Bang full energy within the whole or poly-universe, together with the uniform Big Bang material products distribution there after its appearance. It should be noted the supporting the just formulated assumptions by practically all available cosmological data [17,18]. Taking into account the non-stationary, stochastic character of the whole Universe evolution process, in general, we shall reference to it further as the grand NSP. Meantime, its components connected with transferring various specific forms of the Big Bang energy or products, we shall consider as local NSPs. So, proceeding from the above, e.g. the full energy conservation law, we may conclude that such NSP as the Universe evolution, or grand NSP, cannot be fully stopped, or disappear. Meantime, any local NSP may disappear in one point of the Universe, but - have to start at the same or another point, at a time determined by the Geizenberg uncertainty relation for an energy and time. As examples of such local NSPs the known transformations of elementary particles may be considered. Evidently that a human or any other living creature in the whole Universe is also a carrier of a part of the energy and information initially generated by the Bib Bang or is a participant of the grand NSP together with possible specific local NSPs. That is why, conservation of an original homogeneous distribution of the energy or the original level of the entropy, has to be provided by means of conservation of every human or another living creature life. Meantime, taking into account possible existence of countless number of mono-Universes, as it will be discussed below, we may suppose not conservation of a part of the whole Big Bang energy within our visible mono-Universe or any other one. However, we suppose conservation full of the Big Bang energy within the whole poly-Universe. Hence, destroying the life in our visible mono-Universe does not contradict to the basic law of energy conservation in the whole poly-Universe, e.g. the energy may not to be conserved within a mono-universe, contrary to the whole or poly-universe, where full energy initionally generated by the Big Bang is mandatory conserved. Thus, in general, we may conclude once more that the whole energy of the Big Bang has to be conserved within the whole poly-Universe, but may not be conserved within each mono- Universe including our visible one. Additionally, we should take into account the requirement concerned with uniformity conservations for the whole products of the Big Bang distributed between mono-universes and within each of them. In other words, the full destroying individual life of a human or another living creature in the whole poly-Universe is impossible due to both fundamental laws: energy conservation and initial uniform distribution conservation for the products of the Big Bang. At the same time, for each mono-universe the corresponding part of the Big Bang energy may not be conserved due to its transferring to surrounded mono-universes. However, due to conservation of the uniformity for the products distribution between the mono-universes and inside each of them, individual lives cannot fully disappear. Besides, possible realization of such scenario in one mono-universe has to be compensated by additional increasing the number of individual life events in the same or other mono-universes. So, according to the above analysis, an individual life may disappear in one mono-universe, but – have to re-appear simultaneously in the same or other mono-universes. Besides, all individual lives never can simultaneously disappear in the same mono-universe as well as in any other separate mono-universe. The last requirement flows from the 2-nd law of thermodynamics despite its probabilistic character, which however provides rigorous, strong, notions in respect to a big amount of described objects. In other words, we may say that an individual life phenomenon is very sensitive to surrounded conditions and may disappear under unsatisfactory ones. The conclusion is confirmed by numerous relevant observations. Thus, the above, just formulated consequences of the fundamental laws of our whole Universe, may be considered as a foundation of the well-known moral and contemporary ecological requirements or the corresponding paradigms So, we suppose that the above notions about full conservation of life is mandatory true for the whole or poly- Universe, but – conservation of the individual lives are probably true in a separate mono- Universe.

## Physical Foundation of Two Possible Social Management Mechanisms

Type or mechanism of the social management is an object of continuous interest and research efforts of theoreticians and practical researches [19,20]. Probably, the biggest attention to the problems of improving its effectiveness is paid at last some decades [19]. The main reason of the situation probably is the exactly proven cruisial role of the management in providing high effectiveness of industrial processes [20]. Despite the contemporary situation, improving the management may be considered as having the old history. Probably, as the oldest attempt to solve the management related problems, one may consider the change the Old Commandment to the New Testament more than 2000 years ago. It is well known that the Old Commandment describes situations when God governs humans directly, through His Prophets. In such cases Prophets transfer God's commandments directly to the people and require their restrict obeying. In the cases of not obeying the requirements the people has punishments. The people lived under such management mechanism for some centuries until the low effectiveness of the mechanism became evident, that forced God to make global flood. Later on, finally the next step was made – to manage people by inform everyone individually about the God's plans, that was made by showing the people the most trustable event: innocent death of the God's Sun- Jesus Christos. The modern history of the humankind also provide many examples of low final effectiveness of dictatorships and benefits of democracy, despite many lacks of the latter. The relevant examples of the notions are also existed in science and technologies: "military" and "civilian" phase transformations, dictators or totalitarian regimes in some countries etc. As the modern example of the relevant theoretical results, an analytic approach conclusion should be considered [15]. As it was mentioned above, the approach was first applied for quantitative description of the 3-d order NSPs one of the most known once is the macroplastic deformation of FCC metal poly-crystals. Later on some

aspects of our visible mono-Universe were successfully considered. So, two possible management styles are predicted by the developed approach to NSPs description: "military" or "dictator" and "civilian" or "democratic". One of the main features, distinguishing them is a rapid transition of management objects to the final state, but never –in full volume for the case of "military" style. Moreover, under the "democracy" management style application, some decrease in speed of transferring management objects to the final state should be observed, which, however, is changed by continuous acceleration of the transferring [6,7].

## Some Other Consequences of the Approach Application to the Universe Evolution and Climate Changes Possible Variants of the Visible Universe Components Motion

It should be emphasized that if the Big Bang products are arranged uniformly with radial symmetry and the Big Bang been defined by both the start and finishing time-points, such assumptions allow to imaging our whole Universe as spherical "layer" which is limited by spheres corresponding the above time-moments. Hence, two possible variants (regimes) of energy (information) exchange by means of material objects motion. should be considered within our visible or mono-universe as well as whole one or the poly-universe. One of the transferring energy regime may develop by a motion of an energy or matter carrier from a point located within the layer of the Big Bang product in an approximately radial direction, along a straight line. Evidently, the motion may develop as: - back to the epicentre of the Big Bang (or to the past), as well as - to the out of the layer (to the future of the Universe evolution). During the motion the last type of a motion, a material energy carrier has to cross some spheres which correspond, respectively, to the earlier or later appeared material objects and local NSPs development during a mono - Universe evolution. Evidently, that such type of the motion may be associated with the direct "traveling in time". On the other hand, the same material energy carrier can move only within some narrow volume (along a curved or approximately part of a circle trajectory) along with the other material objects created practically simultaneously with the considered one, which all also carry the Big Bang energy. Such type of the object motion develops exclusively along some very closely located spherical surfaces each of them corresponds to different but very close to each other moments of time. Here, it is important to discuss general relation of the motion velocities for the above regimes [15]. As it was shown i, the 1-st or the "military" motion regime of the macroplastic deformation is characterized by the rather high velocity compared with 2-nd or "civilian" one under the close values of the approach constants, especially at the beginning of the macroplstic flow [12-15]. Besides, for the case of the energy transferring during our visible mono-universe evolution, the 1-st motion mechanism has to develop by passing very large distances along a straight line with overcoming all existing obstacles, only due to the action of definite external force [12-15]. It means relatively weak stopping effects caused by an interaction of the moving object with the other Big Bang material product objects. So, this variant may be considered as a high speed, non-diffusive or "military" one, by analogy with the well-known " martensitic" phase transformations in crystalline solids and single slip in the course of the respectively oriented FCC mono-crystal deformation [5-7,23]. The considered regime of the energy carriers motion in the Universe is also analogous to the wave propagation in the space fulfilled by numerous fluctuating material objects such as virtual elementary particles Meantime, the second motion regime can develop only along a curved or part-of-a"circle" trajectory and requires a helping interaction with the other material products of the Big Bang in order to develop [12-15]. Evidently also, that during the motion regime the resistance from some of the Big Bang products appeared at close but early time - moments in respect to a considered one has to be overcome due to the interaction. So, one may conclude that such motion regime is analogous to the "diffusion" process that is also known as "civilian" phase transformation or multiple glide in crystalline solids [5-7]. Such motion regime develops under the conditions of weak "driving" force but mainly– due to the interactions between crystal atoms – in solids or the material objects among Big Bang products. The both above conclusions are in agreement with results of the early developed analytic model , It should be noted here, that described above differences between the two possible regimes of the Big Bang energy carriers motion may be clearly observed under the condition of big distances between starting and finishing motion points [12-15]. This situation is analogous to the well-known one from mathematics when anybody wants to define, particularly, length of a circle as a limit of a polygon perimeter under the condition of unlimited increasing number of the polygon sides.

Another possibility exists for the case of small in size material objects. Evidently, that small in size objects may be arranged closer to an another any size object compared with both big in size ones.

Really, let's consider the typical double slit experiment numerical conditions [24]. Slit separation in a screen, which is macroscopic material object, is L = 1.0 mm = $10^{-3}$ m, wavelength of the used in the experiment sodium light quantum, been in fact little in size material object, is $\lambda = 6 \cdot 10^{-5}$ cm $= 6 \cdot 10^{-7}$ m. Numerical evaluation of the quantity: L.R, where R is an approximate size of a little in size material object, here - the photon of the sodium light, gives: $L \cdot R_p = 10^{-3} \cdot 6 \cdot 10^{-7} = 6 \cdot 10^{-10} \approx 10^{-9}$ In other words, the little in size material object may be arranged about 1 mm from a macroscopic one (or the screen with two slits) to demonstrate quantum effects of its behavior [23]. Meantime, based on the above consideration we should conclude that a material object of a size for example $R \approx 1$ cm $= 10^{-2}$ m, should be situated on the distance $L \sim 10^{-7}$ m $\approx 10^{-4}$ mm from another one to obey the above conditions of the slit experiment providing observing wave behavior of the object. So, typical macroscopically measurable separating distance for macro- objects ( $\sim$1 mm) does not allow to observe their wave behavior. Additionally, as it also follows from the geometrical consideration, the trajectories, corresponding to the above discussed two motion regimes are practically indistinguishable for the material objects of small sizes together with all their characteristics under the small distances

between the limiting points. It means that under the condition of small distances separating material objects of equal small sizes, the both above energy carriers motion mechanisms develop simultaneously and make equal contributions to the corresponding NSP. It should be emphasized that just given conclusions are in good accordance with well-known experimental data concerned with wave – particle duality for the objects having small sizes. On the other hand, for the case of the macroscopic objects arranged on relatively big distances the no duality is observed.

### So, Based on the Above, we Should Make the Following Conclusions:

• strong demonstration of quantum behavior of all material objects has to appear in early Universe e.g. at small sizes of the material objects - not far after the Big Bang;
• during the Universe evolution, creation and increasing in size material objects the quantum effects weaken and at our stage of the evolution may be observed only for a limited type little in size objects [24,25].

### Foundation of the poly-Universe Possibility Existence

Additional consequences of the approach application to the whole Universe evolution may be formulated based directly on the early developed general analytic approach results [12-15]. As it was shown in, there is unlimited number of solutions for the constitutive nonlinear differential equation, that gives, particularly, the following information: - possibility for each Big Bang energy carrier to participate simultaneously in non-periodic and periodic motion types; sporadic changes of the motion type; each trajectory corresponds to a separate the energy carrier within a mono-universe; existence of unlimited number of the mono-universes within the poly-universe [12-15]. In terms of local NSPs, we may say that each above trajectory corresponds to a separate "daughter" energy carrier, Such a carrier is separated from a "parent" one, that continues to move progressively and conserves tiers with its "daughter" energy carrier. In other words, a several number of "daughter" energy carriers may be generated periodically by a "parent" one continuing to move non-periodically. To continue the analysis, we propose the following scheme of the Universe evolution. Based on the commonly accepted principles, Big Bang is considered to be an explosion which comprised two successively developed stages: the abnormal energy fluctuation, the energy of which is transferred out of a point of its origin by energy carriers that may be considered as virtual particles or the antique field quanta; transformation of the antique quanta into the known real material elementary particles. So, during the further consideration we shall reference to the energy and matter carriers as the energy ones due to the well-known Einstein energy – mass relation. Additionally, we suppose that the carriers were uniformly distributed within a big number mono-universes or "bubles" [24,25]. The mono-universities, in their turn are considered to be uniformly distributed in radial directions around a point of the explosion. Besides, there are no reasons to consider of the mono-universes as different ones in any relation. That is why, all mono-universes will be considered as fully identical to each other ones and to the whole or poly-universe as well. Hence, each mono-universe contains uncountable number of energy carriers, each of them transfers out a part of the full explosion energy generated by the Big Bang. One of the mono-universes is ours, the evolution of which we are observing now. It should be noted, however, some features distinguishing, to our mind, a poly-crystal from the poly-universe. One of the features is that the mono-crystals contrary to mono-universes existed at any time before an application of external energy gradient or deforming stress or deforming stress to a poly-crystal. Another distinguishing feature is that each metal mono-crystal has mainly two original crystallographic orientations and is randomly oriented in respect to external applied stress. Therefore, a local NSP of the macroplastic deformation does not begin simultaneously in each mono – crystal, but – only in the most favorably oriented ones with further involving the rest grains into the deformation.

Regarding mono-universes, however, based on the uniformity considerations, we suppose that each of them is fully identical each other ones including beginning the formation and the energy transferring development. In other words, we suppose that the energy of the Bing Bang begins to be transferred in all mono - universes simultaneously and the speed of the corresponding NSPs has identical time dependence observed experimentally [24,25] in our visible mono poly-universe observed experimentally [24,25].

Based on the theoretically deduced relations showing the ties between the parameters of the periodic and none-periodic motion of the energy carriers, we may state the following [12-15].
• A "parent" energy carrier, which started to move at a time moment, for example, t = 0, generate new "daughter" energy carriers with the period $T_1 \approx 0.56.t^*$. Such energy carriers, having been appeared, generate the next carriers with the same period and so on. At the same time, the "parent" energy carrier continues to move non-periodically, conserving the tiers with all its numerous "children".

So, we have a number of the "daughter" carriers which solely move periodically, but at the same time they have to be considered as inherent components of the original "parent" one. The above type of motion is typical for dislocations, which are linear moving objects carrying an energy within metal poly-crystals. So, based on the principle of all NSPs analogy, we may do an assumption about linear type of carriers, transferring the energy in the whole Universe. This assumption is an agreement with the well-developed "string" theory [18].

• The original "parent" energy carrier has to stop generating the "daughter" ones at the time $t_{fin} = t^* \cdot (1+\sqrt{2}) \approx 2.42 \cdot t^*$. In the case of moving dislocations, the situation corresponds to stopping multiple glide of the mobile dislocations due to their extra elongation and corresponding increasing their linear tension. According to the results given in [12-15] at that

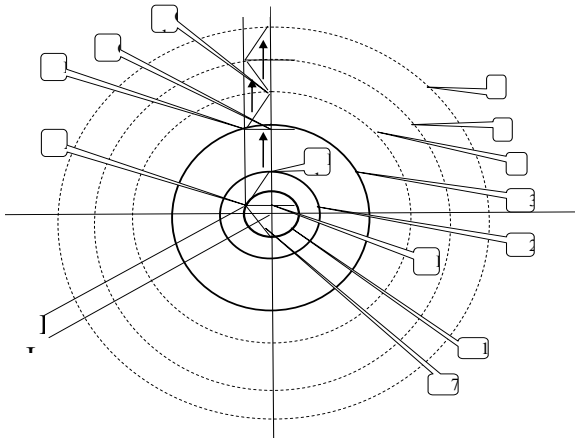
time the "parent" segment begins to act as a Franck-Reed source in a slip plane which is parallel to an original slip plane of the "parent" dislocation segment. This kind of the "parent" segment motion is also periodic but has the period $T_2 \approx 4.44.t^*$ [13,15]. Returning to a mono- universe evolution, it should be noticed absence of the relevant detail information. As a preliminary explanation of the behavior of the energy carriers in the Universe analogous to that described above, the "string" nature of the carriers may be proposed. Nevertheless, the additional investigations are necessary in this direction.

• Considering together the analytic approach and experimentally available data, we may state that the minimal speed of our visible mono - universe expansion is observed at about 5.8 billion years after the Big Bang. So, the finishing time for the change of the energy carries motion regime with the period $T_1 \approx 0.56.t^*$, in our mono - universe is $t_{fin} \approx 2.42.t^*$or 14 billion years, that is close to the time of existence of our visible mono - universe: 13.8 billion years.

• The time moments corresponding the periodically (with the period $T_1 \approx 0.56.t^*$) appeared events in our visible mono-universe are: 3.3; 6.6; 9.9 billion years from the Big Bang and may be associated with the super-nova explosions. In order to explain participation of mono-universe in the whole or poly-universe expansion let's consider a scheme shown on Figure.1

Evidently that, within each mono-Universe (a grain of a policrystal) there are its own energy carriers which can move as non-periodically as periodically in a corresponding (each grain) space region. These conclusions are in a good accordance with data known for plastic deformation of a polycrystal [7].

As it is shown on Figure.1, we assume that the Big Bang epicenter was located in the centre of all shown circles, which correspond space surfaces limiting the distribution of the Big Bang products in time. Here on the scheme, such circles corresponding an arbitrary time of observation under the poly-universe or time intervals after the Big Bang are shown as (1), (2)…(6). Here it should be noted that the circles (1) and (3) correspond the beginning and finishing the full Big Bang explosion. It means that the circle (2) has to correspond a time moment in the course of the Big Bang. This time-moment may be probably associated with a finishing the transformation of virtual particles or the antique field's quanta into real or material particles; leptons, mesons, barions etc., which finally form the material objects contained in a later mono-universe. The described picture corresponds to general contemporary notions about history of our visible Universe [9]. So, the circus which is limited by circle (3) we assume to be corresponded to the full finishing the Big Bang explosion, e.g. finishing formation of real elementary particles.



**Figure**

As regards to the mono-universes, they should be imagine as parts, for example I and II on Figure 1, of the rings. The rings are limited in radial directions by the circles corresponding to the starting point for the poly-universe creation and an observation time. The parts or mono-universes, in general case, are slightly curved, contrary to the case shown on Fig.1 for illustration, in respect each other (I-st and II-nd mono-universes) that leads to breaking or voids formation on a border of the neighboring mono-universes (such I-st and II-nd). Evidently, the voids may be considered as drains for the energy dissipation. Going further, the circles (1) and (3) we shall consider as corresponding to the time of the start ( the circle 1) and full finishing (the circle 3) the Big Bang. It is important to emphasize here that under the absence of material objects it is impossible to define a location of an object in the poly- and mono-universe. Meantime, only due to existence of several material objects it is possible to determine their relative positions in respect to the Big Bang epicenter or their configurations. In other words, it is impossible to define relative locations of material objects due to the absence an origin of the coordinates which has to be connected with one of the objects. However, under the presence of several material objects any of them may be used as the space and time coordinate origin together with their motion with definite direction. The same actions, evidently, may be possible if starting point for the measuring space distance and time development for any event the Big Bang explosion is considered. So, only after of the Big Bang starts and its products appearance. together with the products further relative motion, it is possible to determine time and space coordinates of material objects by repeatedly measuring the relative coordinates of the same ones. Therefore, the motion of the Big Bang products due to conservation of the whole Big Bang energy provides relative

changes of the products configurations that should be considered as changes of the products space-time coordinates. In order to proceed, we approximated the circle (2), corresponding to a finishing time - moment for the first stage of the Big Bang explousion, by the triangel for geometric simplicity. So, rectangle ABCD should be associated with such a mono-universe in its initial state. As it was noted above, for the closest approximation of a circle, a polygon with an uncountable number of sides should be applied that is in accordance with uncountable number of the solutions for the constituent non-linear differential equation [14]. Which were associated with mono-universes. Based on the shown scheme, lets consider a part of the volume occupied by the Big Bang products, e.g. a part of the spherical ring volume filled with the energy carriers being in some initial states. As an example of the above – rectangle ABCD, and possible changes of its form during a mono-universe expansion we shall analyze. It should be noted that, such an analysis may by conducted for any rectangle (e.g. mono-universe) analogous to ABCD and situated at any part of the spherical ring volume due to the supposed isotropic the Big Bang products radial distribution. For the considered, as well as for any similar situation, the motion of the Big Bang energy carriers away from its epicenter in a radial direction has to develop under an action of the energy gradient to conserve the Big Bang full original energy. Such a motion of the carriers provide in fact the shear "deformation" of an initial rectangle ABCD (or a mono-universe) comprising the Big Bang products, that leads to the ring (e.g. a mono-universe) expansion away from the epicenter. It should be emphasized once more, that in the situation shown on Fig. 1, we consider the rectangle ABCD for illustration of the proposed mechanism of a mono-universe expansion. As it seen from the illustrative scheme, during the expansion such an initial rectangle (ABCD) transforms into a parallelogram: ABC1D1. It should be noted that such a transformation of the geometric figures is similar to formation of martensite crystals by the shear mechanism [5-7]. It is necessary to note also the following: - the above just described transformation may develops in any point within the Big Bang products arrangement, (within a spherical ring) in any time-moment of their evolution (motion away from the Big Bang epicenter); - the energy carriers providing the transformation or the shear deformation, move only in radial directions away from the Big Bang epicenter. So, we assume the same mechanism development within all possible rectangles (mono-universes) which may be constructed on countless sides of the initial approximating polygon (7). Besides due to successive spreading the energy carrier motion along the radial directions, we shall get expansion of the outer circle (3) to the 4-th, 5-th ones and so on. Thus, finally we shall get elongation of all possible polygons (mono-universes) along the directions of the full energy gradient or corresponding force action.

Evidently that the above interpretation of the analytic approach results and proposed mechanism requires additional thorough analysis in respect to our visible mono-universe evolution features. However, the preliminary analysis shows the following: - an agreement of the above results with some psychology models assuming existence of several rigorous scenarios for a human life development as well as - possibility to ground the multiverse interpretation of the quantum mechanics [10,22]. Thus, the above considered results of the early developed analytic approach application to the NSP of our visible mono-universe evolution analysis combined with the analogy principle, give an opportunity to provide physical grounding to the contemporary paradigms in the fields of morality, ecology, cosmology: necessity to protect, conserve and enlarge human and other living creatures lives; possibility to travel in various directions in time; possibility of existence of numerous universes including our visible one [12-15].

## The Climate Changes Micro-Mechanisms Analysis

Climate changes are objects of thorough studies for some last decades due to their direct effects on any life phenomena on Earth. It is well known that the most of the climate changes are consequences of the complex heat exchange processes between the Sun and the Earth. That is why, probably, a comprehensive theoretical understanding the climate change phenomena is absent so far. So, in order to proceed, we shall analyze some general, available climate changes data. Lets begin from the facts that the Earth obtain energy from the Sun by the radiation, which transfers the heat to the Earth atmosphere by direct contact of the Sun rays with gaseous atoms in the Earth atmosphere. This is evidently the first stage of the energy transferring which includes also redistribution of the heat by various diffusive mechanisms providing its uniformity However, the Earth atmosphere is not homogeneous in density due to existence of large areas of oceans and terrains with different physical properties. It is well known that they together leads to the cyclones formation [30]. So, we may suppose the diffusive mechanism of the heat transfer by cyclones. Meantime, during the cyclones development, the volumes of the high atmospheric pressure inevitably appear. Just into such volumes the Sun radiation gives an opportunity to reach the Earth surface directly. Thus, the heat transferring from the Sun to the Earth in our days is mainly started by cyclones which are accompanied by anticyclones formations. We have to emphasized on our historical period of the climate observations because of known the Earth climate changes in the past when no terrains existed and possible changes in the future. Here it should be emphasized the analogy between just given consequences of cyclones and anticyclones development and the macroplastic deformation of some polycrystalline FCC metals revealed in [5-7]. As it was shown in, such FCC poly-crystals as Ag, Ni, Cu are characterized by practically simultaneous development of the first (non-diffusive, "military") and the second (diffusive, "civilian") regime of the dislocation motion [12,15]. As a result, the metals have rather high plasticity (true elongation) or are characterized by long development of the plastic flow. In contradiction to the above metals there is Al, where the same dislocation motion regimes also develop but – in different (not overlapping) time or true strain intervals. It is well known also the lower plasticity of the polycrystalline Al compared with the other FCC metals. So, applying the early obtained results to the cyclones and anticyclones today development, we may suppose that their combination observed today, provides a variant of the climate and weather development which is favorable for a life existence, contrary to any other variant which has to be considered as abnormal and was observed when a life was absent [12,15].

## Relations of the Chaplygin Gas Models With the Nsp Analytic Modeling Results

It is well known that among the unresolved problems of modern physics, the ones concerned with the phenomena of the Dark Matter and Dark Energy existents are the most important and actual [18,24,25]. The problems are in a close relations to the contemporary paradigm of modern cosmology: creation of our Universe by the Big Bang and its further inflation up to nowadays. Numerous models have been developed by now to explain the phenomena [6,19,24]. Among such models the most perspective ones are considered to be the Chaplygin gas (CG) models [19,24]. There have been developed some types of the CG models which describe various aspects of our visible mono-universe evolution. However, no universal and successful CG model has been developed yet. Taking into account the various successful predictions of the early proposed analytic approach of NSPs development, lets consider compatibility of the early proposed analytic results with the modern CG models. As it is known the base of any CG model is the equation of state (ES) in the form [19].

$$P = - A/\rho^{\alpha} \qquad (1)$$

where: P – is a stress acting on a system of energy carriers, MPa,
ρ - volume or square density of the energy carriers, $m/m^3$
$0 < A < \infty$ and $0 < \alpha < 1$- are constants
Due to considering a thermodynamic system of energy carriers, it is necessary to take into account the existence of minus sign in the equation (1) which appearance depends on succession of the thermodynamic interaction of a system and surrounding reservoir [27]. Namely: the minus sign corresponds to doing work under a system by a reservoir and vice versa. Taking this into account, further we shall consider any ES in absolute values. During considering wider ranges of cosmological data, some modified CG models were also proposed, where the corrected ES was used [19]. To go further, let's consider the following relations which flow, respectively, from the dislocation theory and the developed analytic model of a NSP development [12-16].

$$\dot{\gamma} = \rho \cdot b \cdot V, \quad (2) \qquad V = c \cdot \exp(- (P_0/P)^n)$$

where: $\dot{\gamma}$-is the dimensionless velocity of a system shear deformation during its expansion from an epicenter of an energy gradient action, in a radial direction as a result of the NSP development. Due to high importance of the quantity for the analysis, we shall consider its meaning in detail later using the scheme shown in Figure.1.b – absolute minimal expansion of a system in its radial direction due to the system shear deformation as a result of one of the numerous system energy carriers going out the visible system limits (Burgers vector of a plastically deformed crystal), m;
c – maximal possible speed of a single energy carrier motion in a system (speed of sound in a deformed crystal);
P0 – maximum possible stress can be applied to a system without its destroing;
P = P(t)– current value of the external stress applied to a system;
t - current time of the NSP development resulting to a system expansion;
n = n(t) – parameter of the analytic approach associated with degrees of freedom for a single energy carrier in a system.
Elementary algebraic transformations of the above relations using expressions of the dislocation theory [16] and the approach , yield [12-15]:

$$\rho = \dot{\gamma} / b \cdot V, \quad (3) \qquad c/V = \exp(P_0^n/P^n), \qquad \rho = (\dot{\gamma}/c \cdot b) \cdot \exp(P_0^n/P^n) \quad (4)$$

As it seen from the above, the last (4) of the obtained relations: ρ = ρ (P,n) in fact describes the dependence ρ = ρ(t) because of P = P(t), and n = n(t). It should be noted here that the above last two relations provide substantial differences in the following calculated time dependencies: c/V = c/V(t) and ρ = ρ (t) for the 1-st and 2-nd regimes of a NSP development [12-15]. Moreover, the use of the time dependence exp(P0n/Pn) for the 1-st regime does not provide any coincidence of the calculated and the known Chaplygin gas relations: ρ = ρ (P). So, one of the conclusions having been made is as follows: only 2-nd regime of a NSP development in a thermodynamic system under the expanding external stress corresponds to the considered phenomena.. That is why, we shall consider further the relevant expressions providing only the 2-nd regime of a NSP development. As it was noted above, an additional consideration is needed for the case of our visible universe evolution due to application of the analytic model originally developed for the case of the tensile plastic deformation. One of the quantity which has to be evaluated for the further the approach application is γ´– the dimensionless speed of our visible Universe expansion. A possible mechanism of the Universe expansion as a result of the grand NSP development we shall discuss now using the scheme shown on Figure. 1 for illustration. We shall base on the given above consideration of the nominal initial state of our mono- universe, which corresponds to some time since the Big Bang appearance and includes the following main elements: epicenter of the Big Bang originally located in the centre of all spherical surfaces limiting the spreading of the Big Bang products at various moments of time. Besides, we also suppose that the Big Bang products motion can develop uniformly in any radial direction, that provides shear deformation of an initial space area. As an example, we considered an arbitrary choosen initial spatial rectangle area ABCD which transforms to a parallelogram: ABC1D1 due to the shear deformation. In other words, we propose to consider shear deformation which provides elongation of the initial rectangle area ABCD in a radial direction relative the Big Bang epicentre because of transformation: ABCD □ ABC1D1. It is important to note

here that the: above space transformation is similar to the formation of a martensite crystal [5-7,16]. Thus, we suppose that the motion of all existing energy carriers along the all possible radial directions during our visible mono-universe evolution provide its expansion.

## Numerical Evaluation of the Data Values Used in Calculations

So, to provide further evaluation of applicability of the early proposed analytic approach to the mono-universe evolution, we must verify the conclusions of the approach with the known phenomena. To do so, we shall specify as precise as possible the corresponding available experimental data values. Here, however, it is necessary to emphasize probably the main feature of such data: absence of rigorous numerical values for the most of them due to difficulties to conduct direct experiments and measurements. Nevertheless, due to the absence of other possibilities, lets begin with the grand NSP for which consider the relative, dimensionless velocity of size changes for a system being under an external energy gradient. Here we are about the value $\gamma^{"}$ for our visible mono-universe. For the case of such local NSP as the macroplastic deformation during tensile loading of a policrystal, such a variable is an experimental prerequisite of the applied test procedure and has as a rule values: 10-3…10-6 s-1. For the case of our mono-universe evolution we shall be based on the following considerations. As it was mentioned above, the density of the energy carriers, ρ, we have defined using the formula (2) or (3) which includes dimensionless speed of our mono-universe expansion, $\gamma^{"}$, and the absolute minimal shear b caused by one of the energy carrier going out our visible mono-universe, Because of practical absence of available data concerned with the both quantities, ρ and $\gamma^{"}$, we shall proceed from that our mono-universe is reached its visible diameter: Dvu = 8.8•1026 m during own expansion in the course of its existence e.g. by the time which was directly measured as $T_{vu}$ ~ 14 billion years +~379000 years or about $4.5•10^{17}$s. Besides, to define dimensionless speed, we divided the ordinary average speed of our mono-universe expansion to a distance on which we can observe and control any object from the Earth e.g. the radius of the our visible mono-universe: $R_{vu} = D_{vu}/2 = 4.4•10^{26}$ m. In addition, the distance $R_{vu}$ has to be also close to the path which is gone by any energy material carrier in a direction of the relevant force or the energy gradient action in the whole or poly-universe. So, we shall consider relation $D_{vu}/(T_{vu}.R_{vu}) \approx 4.4•10^{-18}$ $s^{-1}$, as the numerical evaluation of the dimensionless velocity of our visible mono-universe size changes. Further, we have to evaluate the density of the energy carriers using the above given relation as: $\rho = \gamma^{"} / b•V$. Here it is necessary to emphasize the important role of the numeric value of b in the above relations. Namely, if we shall consider b as a diameter of a barion (~ $1.5.10^{-16}$ m) which is a representative of the order (baryonic) matter, then we have: $\rho \approx 4.4•10^{-18} / (1.5.10^{-16}•V) \approx 3.10^{-2}/V$. Evidently, this case corresponds the transferring the Big Bang energy preferably by barions which should be considered going out of our visible mono-universe after they reach the above distance which is considered to be the radius of our visible mono-universe. On the other hand, it is possible to consider b as a characteristic of the other types of the energy carriers. As an example we may use the value which is close to the minimal object size may be directly measured today [32-34]: ~ 10-19m. So, we shall have for such a case: $\rho \approx 4.4•10^{-18}/(9.10^{-18}•V) \approx 0.5/V$. The one more case of transferring the Big Bang energy to the end of our visible mono-universe may be provided by the carriers having diameter close to $10^{-18}$ m. Then, we shall have for the density of such carriers: $\rho \approx 4.4•10^{-18} /(4.10^{-17}•V) \approx 0.11/V$. The time dependencies of the ρ in the above cases are shown in Fig. 2. It is important to note the different types of the energy carriers for the above cases of the Big Bang energy transferring. Before we proceed, lets verify the above numeric evaluations by using the data related to our mono-universe expansion feature. As it was shown, one of the feature is that the expansion was not uniform in time: during ~ 5 billion years ago or, in average, ~ $1.3•10^{17}$ seconds from now to the past, there started the acceleration of our mono-universe evolution which is developing now[28]. Meantime, more earlier, closer to the Big Bang epicenter, there was the mono-universe deceleration which was last detected at ~ 11 billion years or $3.5•10^{17}$ seconds ago from now. It is important to take into account, the practical coincidence of the above mentioned experimental evaluations with the results obtained by our approach application (see Figure.2a).

Besides, according to and the data, there was evaluated that probably extrapolated mentioned above age of the Universe existence is: about 14 billion years plus additional time period just after the Big Bang occurrence: 379 000 years until nowadays that as a whole is equal to about 14.2 billion years or ~ 4.5 $.10^{18}$ seconds up to now [29,31]. Taking into account the results of the analytic approach based calculations which demonstrate the same time dependence character for an energy carrier velocity, we have calculated the velocity values at the time about 4.5•1018 seconds from the Big Bang, which according to corresponds to nowadays [12-15,28,29]. As a result of the calculations we obtain the following speed values: from ~ $1.10^5$ to ~ $9.4.10^4$ km/s under the following values of the analytic approach constants: $A_2 = 10^{2…5}$; t* = $1.3•10^{17}$ s. On the other hand, based on the Hubble`s law, we have practically the same our mono-universe expansion velocity under the Hubble constant values: 75…77 km/(s Mpc), for the same our localization point in the Universe or the time of our its existence [31]. Further, we had to define the quantity ρ. Based on the above definition, see the relations (2) and (3), it is necessary to take into account various elementary particle types which are considered to be a base of the material Big Bang products and potentially able to transfer the Big Bang energy. One of the main type of the particles been the base of the ordinary matter are barions, diameter of which is about $1.5•10^{-16}$ m Such particles as: neutrino and quarks [33,34]. For this type of the Big Bang energy carriers at a time about $4.5•10^{17}$ seconds corresponding nowadays, we have the baryon density as: 0.03 $m^{-2}$ . Besides, it is well known, that there are the tinier particles in our mono-universe: rP < $10^{-16}$ m. Such particles may correspond to the Dark Matter and the Dark Energy. Assuming, respectively, $r_p = 4•10^{-17}$ m and $r_p = 9•10^{-18}$ m, we shall have the following the particle densities: 0.1 $m^{-2}$ and 0.5 $m^{-2}$. It is important to note the calculated percentages of contributions for the above various particles into the whole amount of the energy transferred at our time by the grand NSP in our mono-universe. The

percentages are, approximately, as follows: 78 %, 18 %, 5 % respectively, for the above particle types. As it seen, the calculation results are in a good agreement with the known relevant literature data concerned with, respectively, the Dark energy, Dark matter and baryonic or ordinary matter [31-34]. It should be emphasized that the above well known evaluations of the percentages are rather close to the fully theoretically calculated levels of them, obtained on the basis of the early developed independent approach [12 - 15]. So, taking into account the above verified results related to the time dependence character and specific speed values of our mono-universe expansion, as well as calculated contributions of various types of elementary particles as the energy carriers, into general balance of the Big Bang energy transferred, we may conclude the principle numerical applicability of the early developed analytic approach to analysis of the cosmological phenomena. Besides, we may also suppose that the Dark Energy carriers are a part of the whole number of the Big Bang energy carriers which are elementary particles that interact exclusively with each other but not interacting with the other particles in the Universe, due to they are in a very deep self-interacting energy well or have very large energy of the self interaction. Meantime, the Dark Matter may be formed by the particles being in less deep self-interacting energy well that allows them to take part in a weak interaction with the ordinary matter what our measurement instruments made of. Going further, we calculated time dependences $\rho = \rho(t)$ and $P = P(t)$, which are shown on Figure 2. As it seen, all of the dependencies $\rho = \rho(t)$ and $P = P(t)$ calculated at various values of the model constants, shown on the Figure 2, have the analogous character, which corresponds to the reciprocal dependence $\rho = \rho(P)$ well known for the Chaplygin gas from the literature [24,25].

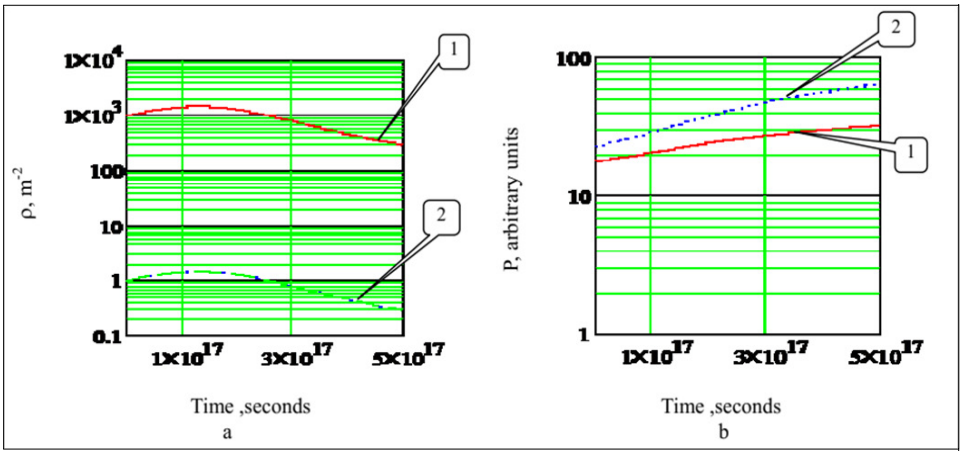



**Figure 2: Time Dependences of ρ and P Calculated According to the Early Developed Analytic Approach [12-15] at the Following Constants Values: A2 = 102 (curves 1), A2 = 105 (curves 2) , t* = 1.31017 Seconds. (a) – Square Density of Number of the Big Bang Energy Carriers; (b) – Stress (Volume Density of the Big Bang Energy Gradient) Leading to the Carriers Motion Providing The Visible Universe Expansion**

As it seen, all of the dependencies $\rho = \rho(t)$ and $P = P(t)$ calculated at various values of the model constants, shown on the Fig. 2, have the analogous character, which corresponds to the reciprocal dependence $\rho = \rho(P)$ well known for the Chaplygin gas from the literature However, the rigorous reciprocal dependence $\rho = \rho(P)$ may be evidently observed only in a definite interval of t: $t > 1.3.10^{17}$ seconds, including our time [24,25]. As may be seen from the graphs, a practically direct dependence P from ρ or vise versa there is at times $t < 1.3.10^{17}$ seconds, e.g. on early stages of our visible mono-universe evolution. It is necessary to emphasize the good accordance of the above results and conclusions with the observed data

## Approximating Relations for the Density of the Big Bang Energy Carriers and the Driving Energy for Their Motion

As it was noted above, there have to be theoretically determined relations between the square density of the Big Bang energy carriers and driving force (energy volume gradient or stress) for their motion. Based on the above calculated time dependencies (see Fig. 2) we have obtained such relations by approximating the time dependencies using algebraic expressions. Some main results of the approximation are shown on Fig. 3 together with the algebraic expressions, corresponding ordinary matter (5), dark matter (6) and dark energy (7).

$$P_{om} = 61.5 \cdot \rho^{-0.116} \quad (5); \qquad P_{Dm} = 70 \cdot \rho^{-0.111} \quad (6); \quad P_{DE} = 85 \cdot \rho^{-0.115} \quad (7);$$

As it seen, all the relations and the graphic dependencies on Fig. 3 have the similar character, well known for Cheplygina gas models [24,25].

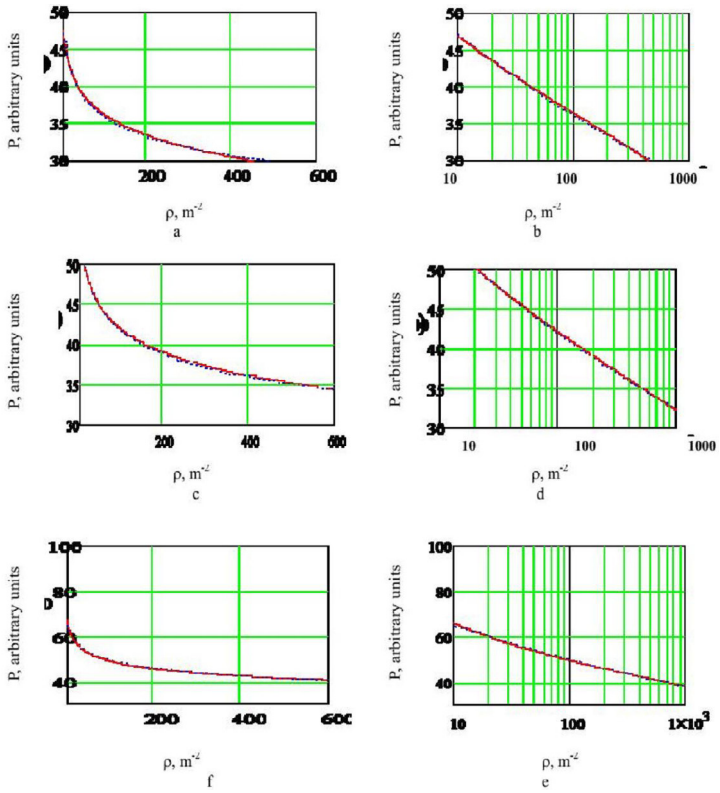



**Figure 3: Calculated Approximating Dependencies P = P(ρ) for the Various Types of the Big Bang Energy Carriers Having Different Radii $r_p$ and Associated with the known types of the Universe Components: (a), (b) – $r_p = 1.5 \bullet 10^{-16}$ m – Baryonic (ordinary) Matter; (c), (d) – $r_p = 1.5 \bullet 10^{-17}$ m – Dark Matter; (f), (e) – $r_p = 9 \bullet 10^{-18}$ m – Dark Energy. (a), (c), (f) Normal Coordinates; (b), (d), (e) Semi-Logarithmic Coordinates**

## Conclusions

• Based on the numerous common features of various NSPs, they have been considered as similar ones in respect to their development laws.

• An early developed analytic approach, well modeling one of the local NSPs – macro-plastic deformation of FCC poly-crystalline metals, is applied to analyze our whole Universe evolution considered as grand NSP.

• Some basic coincidence of the analytic approach results with the observed in our visible Universe evolution phenomena is shown that allows to deep understanding the relevant mechanisms and grounds some important contemporary paradigms in the fields of morality, religion, ecology etc.

• Non-monotonic time dependence of our whole Universe expansion speed is shown to be predicted by the analytic approach numerical evaluation in agreement with experimental observations.

• Existence of uncountable number of mono-universes is shown theoretically and a mechanism of their participation in the evolution of the whole poly-universe is proposed.

• Possible micro-mechanism of the climate changes on Earth is proposed and analized.

• Theoretical evaluations of the contribution of the Big Bang energy carriers of various sizes and types in the energy transferring flux are made together with the relevant percentage calculations. The calculation results obtained are in accordance with the literature data known for the Ordinary Matter, Dark Matter and Dark Energy.

• An assumption is made regarding nature of the Dark Matter and Dark Energy, according to which they are made of successively tinier elementary particles being carriers of the Big Bang energy

• Time dependences of the density of the Big Bang energy carriers and the driving energy gradient (stress) for their motion are calculated using the analytic approach. The widely discussed their reciprocal mutual dependence are observed and suppose to be realized on the latter stage of the Universe evolution.

• The reciprocal mutual dependencies for the density and the stress are approximated by the algebraic relations, parameters of which are in accordance with the literature data.

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