МАТЕМАТИЧНЕ МОДЕЛЮВАННЯ В ПРИРОДНИЧИХ НАУКАХ ТА ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ

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A.D. Romaniuk, Cand. Tech. Sci., Docent, oleksandrromaniuk5@gmail.com
Dnieper State Technical University
R.A. Romaniuk, student, ruslana.romaniuk@web.de
Technical University of Munich

GENERAL BASES OF THE PHYSICAL AND MATHEMATICAL MODEL FOR VOLUME UNIVERSE

The physical and mathematical model of the three-dimensional Universe, developed on the basis of the theory of volume numbers, is a self-realization of the singular point of the "Emptiness" in the energy-information-time field, the evolutionary processes in which are caused by the influence of not only the past on the future, but also the future on the past. The energy-information-time continuum is continuous, infinite and eternal in its essence, but discrete in observation, perception and implementation.
***Keywords**: universe; energy; time; information; observer.*

Розроблена на основі теорії об'ємних чисел фізико-математична модель об'ємного Всесвіту являє собою самореалізацію сингулярної точки «Пустоти» в енергетично-інформаційно-часове поле, еволюційні процеси в якому обумовлені впливом не тільки минулого на майбутнє, а й майбутнього на минуле. Енергетично-інформаційно-часовий континуум є безперервним, нескінченним і вічним у своїй суті, але дискретним за спостереженням, сприйманням та реалізацією.
***Ключові слова**: Всесвіт; енергія; час; інформація; спостерігач.*

Problem's Formulation

At this stage of human development, the Universe is considered as a three-dimensional space containing material objects of different parameters and characteristics that evolve over time. This can be compared with the geocentric or heliocentric view of the World of our predecessors. Therefore, any factors and facts that do not fit into the corresponding models of the Universe lead to attempts to wedge them in one way or another into three-dimensional space. All this indicates that the cosmological Universe is only an element of a more complex and harmonious «System».

How is this «System» arranged, which is our «Home» - the Universe? According to the authors of this article, the most appropriate term for the name of this «System» is the term volumetric Universe. The Universe is an embodiment of eternity and infinity, which can be understood intuitively but, now, it is not possible to give a clear and unambiguous definition from a scientific and philosophical point of view, and it is unlikely that it will ever be possible.

An attempt to compose a model of such a universe is the purpose of this article.

Analysis of recent research and publications

Cosmological models of the Universe were developed based on three-dimensional space, that is, by choosing a three-dimensional coordinate system, without specifying the beginning of this

system. But as practice has shown, these models were not able to describe many processes taking place in the real world. The solution — the expansion of the system was proposed by Einstein, introducing the concept of «space-time continuum» [1]. Accordingly, time is considered as the fourth dimension. Based on space-time, several models have been proposed that include additional dimensions, usually spatial or additional temporal. However, the question of how many measurements are needed to describe the universe remains open to this day.

From the point of view for the generally accepted scientific approach, the position of the body in space is described by three generalized coordinates. But it is possible that these coordinates in the real world can be dependent on each other. Let's do a thought experiment. Consider a screw mechanism in which the screw and nut parts rotate and translate simultaneously. The meshing step determines the dependence of the angular coordinate on the linear one and, accordingly, vice versa. Thus, we have only one generalized coordinate. That is, knowing the step of engagement on the linear movement for the part, we can determine its angle of rotation and, accordingly, vice versa. Now suppose that an outside observer is not able to determine the meshing pitch and the nature of the motion transmission. He will observe two independent movements, rotational and translational. Therefore, from his point of view, the system has two degrees of freedom, and not one that takes place in reality. Therefore, it is possible that the independent coordinates of three-dimensional space from one observer may be «dependent» from another observer.

In addition, it should be noted that when choosing a coordinate system on the axes, the same measurement is postponed, the distance that is measured in meters. Therefore, time, which is measured in seconds, violates this harmony. Therefore, it is not advisable to consider time as the fourth dimension, since space (one, two or three-dimensional) is, in principle, characterized by only one parameter. But the space-time continuum describes many processes of the world and, accordingly, such a parameter as time should be considered. Accordingly, the model of the Universe should be a system that is not based on three-dimensional space, which, most likely, is an element for a more complex and harmonious «System».

The main question is what do we mean by the term Universe. In the present work, an attempt is made to consider the entire spectrum of the World, not only that which is more or less accessible to our understanding and intuitive awareness, but also something incredibly obvious.

Formulation of the study purpose

From an analysis of the models for the cosmological Universe, we can conclude that the spatial coordinates reflect only the material aspect of the world and attempts to «squeeze» into the coordinate system the other parameters that characterize it do not look logical, and in some cases not possible. We are talking about such parameters as: energy; time; information.

Energy. This parameter must be considered more deeply and wider than is currently the case [2]. This is not only mechanical, internal, electromagnetic, chemical, nuclear, gravitational, vacuum and hypothetical dark energy, but also a parameter that is much more diverse than Richard Feynman’s energy concept [3].

Time. It is necessary to consider time not only as a parameter characterizing the duration of processes or events, that is, as one of a single space-time coordinates [1], but also from the standpoint of time itself being. We observe the time from the position not the time itself is moving relative to us, but we are moving relative to time. It is from this point of view that time should be considered.

Information. For unknown reasons, it is not considered as one of the main characteristics for the Universe, even though all world events are not only synthesized with the help of certain information but also identified with the help for information [4]. We should also consider the information that Nikola Tesla spoke of, that the knowledge, strength and inspiration are already existing in some outer space where we could find them and transform into physical experiences.

Thus, the main parameters that characterize the Universe — personifying eternity and infinity, which we observe and realize intuitively, are energy, time and information. Accordingly, the development of a physical and mathematical model of the Universe should be based on its fundamental parameters.

Presenting main material

To build a physical and mathematical model of a three-dimensional Universe, we use the theory of volume numbers developed by the authors [5,6], according to which volume numbers can be represented both by points of space and by vectors of Fig. 1.

General algebraic formula for volume number

$$V = a + bi + cj,$$

where: a, b, c – real numbers; i – imaginary unit; j – spatially indefinite unit.

Trigonometric formula for recording volumetric number

$$V = \rho(\sin\Theta\cos\varphi + i\sin\Theta\sin\varphi + j\cos\Theta),$$

where: ρ – is the length of the radius vector of the corresponding point; φ – longitude; Θ – polar distance.

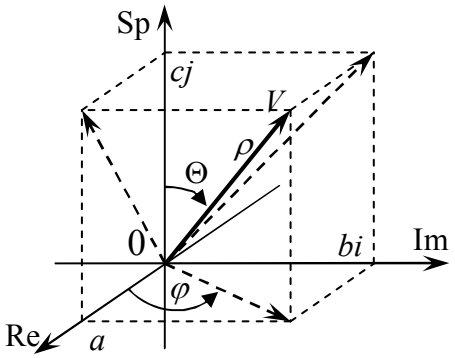

Fig. 1. Geometric interpretation of volume numbers. Re – the real axis, Im – the imaginary axis, Sp – the spatially indefinite axis

The number a is called the real part of the volume number; bi – its imaginary part (b – the coefficient of the imaginary part); cj – its spatial part (c – coefficient with the spatial part). Giving all possible real values, we get all possible volumetric numbers.

Algebraic operations on volume numbers are performed in the same way as on complex numbers or on ordinary trinomials, assuming that:

$$i \times i = i^2 = -1;$$
$$j \times j = j^2 = -1;$$
$$i \times j = j \times i = 0.$$

Based on the theory of volume numbers, the Universe can be represented as a spatial coordinate system Fig. 2, in which an arbitrary volume number V corresponds to a certain event [7].

We describe the main elements of this model.

The center of the coordinate system is the point for the singular «Emptiness» 0 – «Start». The origin contains something different, but this different is something whole and indivisible, and possibly both at the same time. This is something that is infinitesimal, but contains infinitely large, imagine how:

– «initial energy» – 0, outside the point of a singular emptiness is realized in the form for all kinds of energies. World spirit, matter, substance, antimatter, etc.;

– «initial time» – i, outside the point of a singular emptiness it is realized as a parameter characterizing the duration for the corresponding transformations or actions of evolutionary processes, events. World soul, time, time coordinate of an event, spirituality, etc.;

– «initial information» – j, outside the point of a singular emptiness it is realized in the form of laws and rules that determine the processes for transformation of the initial and formed objects and system parameters. Worldwide mind, thought, knowledge, experience, etc.

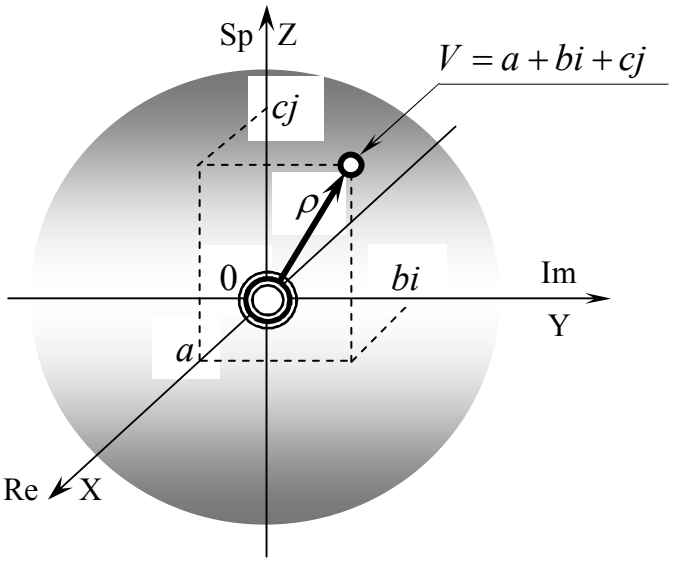

Fig. 2. A physical and mathematical model of a three-dimensional universe. X – the energy axis, Y – the time axis, Z – the information axis

Since mathematical actions, considering the equal sign, have a two-sided orientation, respectively, on the one hand

$$0 = i \times j = j \times i ,$$

and on the other

$$i \times j = j \times i = 0 .$$

Therefore, the initial energy contains the initial time – i, the action – $\times$ and the initial information – j. And, with the help of the action, the initial time and initial information can be converted into initial energy. That is, the «System» self-locking into a singular «Emptiness»

$$i \times j = j \times i = 0 = i \times j = j \times i$$

or

$$0 = i \times j = j \times i = 0 .$$

X axis. In the theory of volume numbers corresponds to real numbers, the real axis. In this model, the X axis is the energy axis. An infinite number of points on this axis correspond to a certain energy quantity a, which exists outside of time and information.

Y axis. In the theory of volume numbers corresponds to imaginary numbers, the imaginary axis. In this model, the Y axis is the time axis. Time is imaginary and expressed by the product of the energy component b and the imaginary time unit i.

Z axis. In the theory of volume numbers corresponds to spatially indefinite numbers, spatially indefinite axis. In this model, the Z axis is the information axis. Information is spatially indefinite and is expressed as the product of the energy component c by a spatially indeterminate unit of information j.

Considering the action factors, according to the properties and axioms of volumetric numbers $i \times i = -1$ or $j \times j = -1$ the parameters a, b, c, are synthesized, which are the basis for the self-realization of the «Beginning» beyond the point of a singular emptiness.

Since it is impossible to construct the Y axis and the Z axis provided that $b \equiv 0$ and $c \equiv 0$, respectively, the time bi and information cj contain energy components, without which they can be realized in any way, and even more so, to identify the «initial time» and «initial information» beyond the point of a singular emptiness is not possible. The coefficients b and c are called the energy carriers of the «initial time» and «initial information», respectively.

Thus, the physical and mathematical model of the three-dimensional Universe is an energy-informational-temporal continuum.

The events that take place in this continuum (Fig. 2) are described by volumetric numbers of the form

$$V = a + bi + cj,$$

and the process of their formation and origin by appropriate actions on them.

According to the model, «initial energy», «initial time» and «initial information» are invariant. These elements of the «System» determines the point for the singular «Emptiness», and is implemented outside its parameters a, b, c, which are characterized not only by a scalar value, but also by a direction vector. The corresponding isotropic vectors determine the directions for the energy arrow, the temporary arrow, and the information arrow of the three-dimensional Universe.

Any arbitrary event has its own evolutionary radius (Fig. 2)

$$\rho = \sqrt{a^2 + b^2 + c^2} = \text{const}.$$

According to which we have an infinite number of options for the development of the event, since ρ describes the evolutionary sphere of the point, which determines all kinds of probabilistic development options. From the constancy of the radius for evolution it follows that the evolutionary energy balance for a certain stage of an event development is constant. Whereas the total energy balance depends on the location of the event on the evolutionary sphere.

Based on the model of the volumetric Universe (Fig. 2), an arbitrary event corresponds to a certain volumetric number V. According to a geometric interpretation, volume numbers completely fill eight octants of the number space, provided that a, b, c – take any value from $-\infty$ to $+\infty$. Thus, the energy-information-time continuum can be considered as a continuous energy-information-time field.

Volume numbers in which the coefficients a, b, c are equal in absolute value by pair are called mirror numbers. Based on this, we consider an arbitrary event V_I, which takes place in the first octant of the energy-information-time field (Fig. 3).

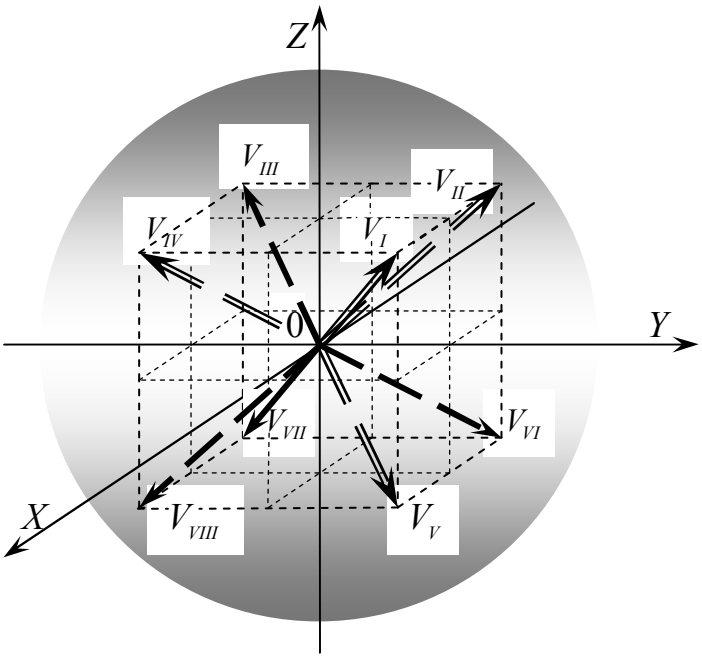

Fig. 3. Mirroring events of the volumetric Universe

This event V_I corresponds to first-order mirror images V_{II}, V_{IV}, V_V relative to the corresponding planes: information-time (YZ); energy information (XZ); energy-time (XY). Mirrors of the second order $V_{III}, V_{VI}, V_{VIII}$ relative to the axes Z, Y, X of the event V_I are also mirror images of the first order of the event V_{VII}, which is the opposite event or mirror image of the third order of the event V_I relative to the origin of coordinates. Opposite events are causal events of the energy-information-time field. The definition of an arbitrary event by the observer determines the instantaneous identification of all orders mirror images. Considering the distribution of mirror events by octants (Fig. 3), it can be argued about the reciprocal mirror image of events in a three-dimensional Universe. Therefore, it is not possible to determine which event is the initial on the evolutionary sphere; this concept is relative. Unambiguously, we can only affirm the center of this sphere.

A sufficient and necessary condition for unambiguous identification of events in a three-dimensional universe is:

– point of the observer location;
– activity of the observer;
– width of the observation range;
– accuracy and division value for the «observing scale» of the observer.

Consider the possible options for determining the field of available events.

Given the fact that the observer is part of the system, it is logical to assume that it will primarily be available to the events of that octants energy-information and time field, where it is located. The point for location is determined by the identity of the energy-information-time characteristics of the observer and the corresponding octant for the volume Universe.

The activity of the observer, depending on the level for development, intuition and experience gained, determines its width of the observation range, as well as the accuracy and value for the division of the «observation scale».

If the observer is in the first octant and his activity is close to zero, then he will be able to observe only the event V_I. With an average width of the observation range, in addition to event V_I, events V_{II}, V_{IV}, V_V will be available.

It is also possible that only events V_{II}, V_{IV}, V_V fall into the observation range and are considered as a whole, then the observer will only have an idea about the event V_I. This is due to the fact that the sum is

$$V_{II} + V_{IV} + V_V = V_I .$$

Accordingly, it is possible that the initial event can be identified by its mirror images. A special case should be noted. If the values of energy carriers are equal in their moduli, then the events V_{II}, V_{IV}, V_V form an equilateral triangle, which is the base of the tetrahedron with the vertex V_I. A similar tetrahedron forms a causally entangled event V_{VII} and its mirror images $V_{III}, V_{VI}, V_{VIII}$. If these figures are projected onto a plane perpendicular to the axis that passes through their vertices V_I and V_{VII}, then an ancient symbol is formed – the star of David. Is this a coincidence, and who knows what information is encrypted in the oldest symbols of humanity?

In cases where the width of the observation range is maximum, the observer can see mirror images of all orders with the initial event at the same time. And if these events are considered as a whole, then the voluminous Universe seems to the observer to be illusory. This is due to the fact that the amount

$$V_I + V_{II} + V_{III} + V_{IV} + V_V + V_{VI} + V_{VII} + V_{VIII} = 0 .$$

The accuracy and division value of the “observer scale” of the observer determines the discreteness of events. Consider a thought experiment in which, for simplicity of presentation, we will observe events only on the X axis. The accuracy and division value of the «observation scale» for our observer correspond to integers. Thus, events that correspond to integers 1,2, ...n, of this model will be available to him for observation. Suppose that at the time of observing event 1, the division value for the «observation scale» has changed and is 0.1. Accordingly, events 1,0; 1,1; 1,2; ...,; 2,0; ... will fall into the observer's field of vision. If, in this way, the division value of the «observation scale» is

continuously changed, then the number of observed events tends to infinity in a relatively small interval. From this experiment and the continuity of the numerical space, the condition for the continuity of the energy-information-time field follows. Consequently, the evolutionary process of self-realization for the singular «Emptiness» has a wave-like character, and the discreteness of observation for events is due to the accuracy and the dividing value of the «observation scale».

Self-realization can be represented as the process of projecting Fig. 4.

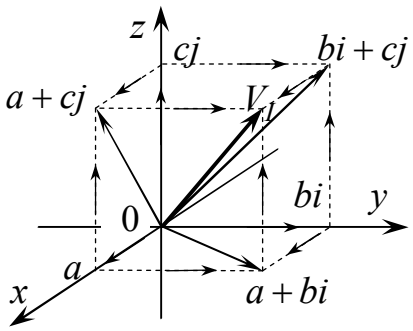

Fig. 4. Formation of a metamorphic field for a three-dimensional Universe

According to this scheme, the origin is projected into one-dimensional fields that form the axis X, Y, Z. Arbitrary points a, bi, cj of the respective axes are projected into two-dimensional fields that form the energy-time (XY), energy-information (XZ) and information-time (YZ) planes. Arbitrary points of the corresponding planes $a+bi, a+cj, bi+cj$ are projected into a three-dimensional field. The projection process can be either stepwise or complex.

The formed field is a metamorphic field of a three-dimensional Universe, which provides a relatively probabilistic nature for the implementation of events. The departure of the event from the historical arena of the metamorphic field is the reverse process, and the probability that this happens in stages is significantly higher than complex.

Temporary evolutionary processes of the development for an event occur in relation to the time axis. The proper time of an event is a metamorphosis of the event itself with respect to the original time. Thus, there is a course of events in relation to time. Consequently, the standard of time for a unique time identification for events in a three-dimensional Universe can be only «initial time».

Regardless of which octant the observed event is in, the evolutionary process occurs from the past to the future through the present. The relative nature of the time parameters is due not only to the observer, but also to the isotropic vectors of the direction of the temporary arrow in Fig. 5.

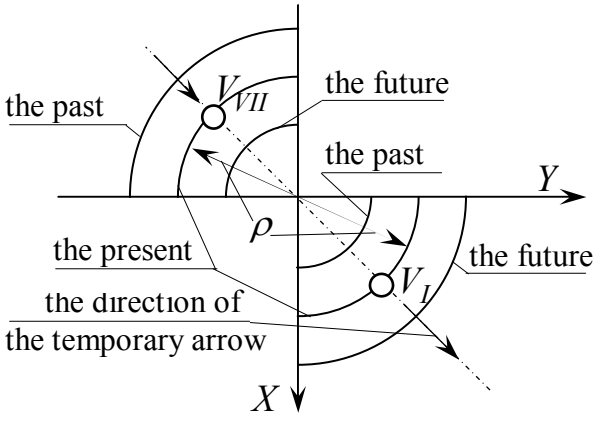

Fig. 5. The temporary arrow of the three-dimensional universe

Consider an arbitrary event V_I and its causally entangled event V_{VII}, which are located on the evolutionary sphere of radius ρ corresponding to the present moment (Fig. 5.). According to the reciprocal mirror image of events, it follows that, not only the past determines the future, but the future for the first octane determines the past of the seventh octant and, accordingly, the future of the seventh octant determines the past for the first. Therefore, although causally entangled events are identical only in the present, there is a probabilistic possibility from the past of one causal entangled event to determine the future for the second. Therefore, it makes no sense to build a «time machine», you only need to learn how to extract the relevant information from the energy-information-time field of a three-dimensional universe.

The evolutionary process of the development for an event occurs not only in relation to the time axis, that is, in the direction of the arrow of time, but also in the direction for the energy arrow and information arrow. The relative concepts of past, present and future in these areas are identical.

The evolutionary process of self-realization for the singular «Emptiness» is a parameter of motion that determines the infinitely large «mass» for the three-dimensional Universe, while the «mass» of rest is zero, or rather absent as such.

Conclusions

We will formulate the conclusions in the form of the basic postulates and laws for the three-dimensional Universe.

1. What has no beginning does not have an end, but what has a beginning accordingly has an end.

2. Outside the singular point of the «Emptiness», the «initial energy», «initial time» and «initial information» are invariant.

3. The infinitely large is the infinitely small, and the infinitely small contains the infinitely large.

4. The evolutionary energy balance for a certain stage of an event development is constant.

5. The universe is continuous, infinite and eternal in its essence, but discrete in observation, perception and realization.

6. Energy, time and information at any point in the energy-information-time field of the volume Universe are unlimited.

7. The energy-informational-temporal field of the three-dimensional Universe is the self-realization for the singular point of the «Emptiness».

8. The past, present and future are relative concepts not only in relation to time, but also in relation to energy and information.

The eternity and infinity of this World, which has a relatively probabilistic nature, lies in its existence and absence as such at the same time, therefore, to search for the «beginning» or try to determine its «end» may be not the right direction of the research.

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ЗАГАЛЬНІ ОСНОВИ ФІЗИКО-МАТЕМАТИЧНОЇ МОДЕЛІ ОБ'ЄМНОГО ВСЕСВІТУ

Романюк О.Д., Романюк Р.О.

Реферат

Аналіз моделей космологічного Всесвіту дав можливість зробити висновок, що основними параметрами, які характеризують Всесвіт, який уособлює собою вічність і нескінченність, який ми спостерігаємо і усвідомлюємо інтуїтивно, є: енергія, час і інформація.

Для побудови фізико-математичної моделі об'ємного Всесвіту використовували розроблену авторами теорію об'ємних чисел, виходячи з якої, Всесвіт може бути представлений у вигляді просторової системи координат, в якій довільному об'ємному числу відповідає певна подія.

Центр системи координат точка сингулярної «Порожнечі». Це щось, що є нескінченно малим, але містить в собі нескінченно велике, представлено як: «початкова енергія»; «початковий час»; «початкова інформація». Дані інваріантні параметри за межами точки сингулярної «Порожнечі» реалізуються і ідентифікуються за допомогою енергетичних носіїв, які характеризуються не тільки скалярною величиною, а й вектором напрямку, що обумовлює напрямок енергетичної, часової та інформаційної стріли. Таким чином, фізико-математична модель об'ємної Всесвіту є енерго-інформаційно-часовим континуум.

Будь-якій довільній події відповідає сім дзеркальних відображень і свій еволюційний радіус, що описує еволюційну сферу, точки якої і визначають всілякі ймовірні варіанти розвитку. З умови постійного радіуса еволюції випливає, що еволюційний енергетичний баланс для певного етапу розвитку події залишається постійним. Достатньою і необхідною умовою для однозначної ідентифікації подій в об'ємному Всесвіту є: точка знаходження спостерігача; активність спостерігача; ширина діапазону спостереження; точність і ціна ділення «шкали спостереження» спостерігача.

Еволюційний процес самореалізації сингулярної «Порожнечі» носить хвильовий характер і являє собою енерго-інформаційно-часове поле, дискретне за спостереженням, сприйняттям та реалізацією в будь-якій точці якого енергія, час і інформація необмежені, а його причинно-заплутані події зумовлюють ймовірність того, що не тільки минуле визначає майбутнє, але й майбутнє визначає минуле.

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