Chapter - 1
Theories of Everything: Retrospective and Perspective

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Abstract

The problem of creation a universal system of knowledge, including mythology, religion and modern science, is analyzed. Three classes the theories of everything (mythology and philosophy, physics and metascience) are observed. The question of the interaction of different knowledge systems and their role in the development of modern culture is studied. Aspects of formalization (optimal representation) of these three branches of human culture from the system point of view and the attempt to create a unified system of knowledge are highlighted. Criteria developed that must be met by a universal system of knowledge. The basis of polymetric analysis as a universal theory of knowledge and its place in the modern culture ans applications for the resolution some problems of modern science are presented. The influence of these factors on the formation and development of civilizations is shown.

Keywords: Mythology, physics, synthesis, philosophy, theories of everything, metascience, polymetric analysis, I. Newton, R. Boscovich, A. Einstein

I. Introduction

The problem of creation a universal system of knowledge is connecting with the development of human civilization and the formation of all human culture [1-10]. Therefore, this problem must be considered from this point of view.

Conventionally, theories of everything can be divided into three classes: Esoteric mythological, including numerology and Pythagorean system and main philosophies of whole; rational, first of all physical theories of everything, including the unified field theory and metascientific systems, including the polymetric analysis [1-7].

All prehistoric cultural, mythological and philosophical systems can be divided into two types [3-7]. The first refers to the ritual systems of the open

type: the civilizations of the Mesopotamia of the Tigris and Euphrates, starting with Sumerian and ending with ancient Babylon. The second to the ritual systems of closed (esoteric) type: Ancient Egypt (cults of the god Thoth and the gods of the Sun) and related civilizations of Mexico [3, 4].

The systems of universal mythological-ritual type include esoteric systems: the tablet of the god Thoth, the Heliopolis ogdoada, the hexagrams of I-jing, the philosophy of Nagua, Patanjali, the Pythagorean system, etc [3, 4].

The creation of rational systems of knowledge is closely related to the creation of a deductive method (Aristotle, Occam, Descartes, etc.) [3-5, 11], including the axiomatic method (Euclid, I. Newton, W. Leibniz, etc.) [3-5, 11-13]. Therefore, this area is also given enough attention. This problem is also associated with the creation of universal principles (J. Bruni, P. Fermat, P. Mopertui, J.-L. Lagrange, V. R. Hamilton, W. Nernst, I. Prigogine, K. E. Shannon and others) [3, 4].

Physical theories of everything as theories of second class are analysed. The method of R. Y. Boshkovich, which is the historical roots, according to J. Barrow of modern physical theories of everything [2], and main physical theories of everything are analyzed too. The role I. Newton, A. Einstein, J. Maxwell, P. Dirac and other reseaches and its theories in the creation modern physical theories of synthetic type is observing too [1, 3, 4].

It shown that problem of creation the theories of everything in general sence is connected with creation of metascience (theory of whole)-universal system of analyses, synthesis and formalization the knowledge [3-5]. The six necessary conditions of the creation such a knowledge system were formulating [14].

The basis of polymetric analysis, as a representative of theories of the whole third class,-a universal system of analysis, synthesis and formalization of knowledge and its connection with other branches of knowledge and science are showing [3-5, 14-16]. Basic elements and structure of this theory: functional numbers, generalizing mathematical transformations, theory of informative calculations, polymetric measure and hybrid theory of systems are representing.

The place polymetric analysis in modern science is selecting. The main applications of polymetric analysis for the classification of various chapters of knowledge on the basis its simlicity-complexity are representing. The role of Polymetric Analysis in the creation of natural concept of foundations of mathematics and resolution of S. Beer centurial problem in cybernetics

(problem of comlexity the information) is noting. It shown, that Polymetric Analysis may be represented as theoretical foundations of modern computer science in A. Ershov sense [3, 14].

II. Mythology and Philosophy

The analysis begins with a description of ritual systems.

We will analyze octave ritual and mythological schemes (octave from the number 8), although in a specific dual representation [3, 4]. It is known that in the most ancient myths, beliefs and teachings, duality established a connection between good and evil, earth and heaven, god and the devil.

However, dualism alone is not enough to build an octave scheme. If anyone wants this system of knowledge to reach us, it must have a very compact appearance and attachment to the Earth. It is known that the sign of the Earth in the ancient Egyptians was a cross described by a circle. Or in the numerical sense - the number 4 (the number of sides of the world, the cross), which is central to the teachings of the ancient Greeks and Hindus. When we introduce duality, we get the number 8. This proof can be questioned, but the most famous ancient schemes were based on eight elements [3, 4].

These schemes include the Egyptian tablet of the god Thoth and the Mexican scheme of Nagua philosophy [3, 4]. With the help of his tablet, the god Thoth allegedly taught the Egyptians to count, to write; cultivate land and smelting metal. The similarity of the scheme of Nagua's philosophy and the tablets of the god Thoth allows us to conclude about the common roots of Egyptian and Latin American cultures and confirms the hypothesis of Tour Heyerdahl about the possibility of pre-Columbian discoveries in America [3, 4].

Eight gods are present in Egyptian mythology in many myths. He is also in the myth of the creation of the world. Different role is assigned to the god Thoth, if in the ritual scheme of the first two Egyptian dynasties he is given the main role, then in the Heliopolis and Memphis ritual schemes it is already the god of the moon, he is the god of wisdom.

The figure of eight is also present in the hexagrams of the Chinese book of changes "Yi Jing" and the decade of the Sephiroth of Kabbalah [3, 4].

Later, the number 8, as one of the main elements, is included in Pythagorean system (the number of love) and other teachings. In the 70's-80's of our century in the Mediterranean excavated several octave elements-from 8-block quarters to amulets, which are dating of VI-V centuries BC.

It is worth noting that later octave schemes may have been inspired by other notions of harmony and beauty, became the canons of the whole school, which existed for several centuries. And the basis changed under the influence of certain ideas. At what price? In the II-IV centuries, the emperors of Central China sentenced to death people who used in music pentad (five), not octave scale [3, 4].

The first to synthesize the Egyptian and Sumerian-Babylonian systems into a single system was made by Pythagor [3, 4], whose school, by the way, preached the heliocentric system and, probably after its defeat in Syracuse, created the architectural marvel excavated by German archaeologists in 1980-83 years [3, 4].

From the Egyptian ritual system came the alphabetic (phonetic) writing. 22 letters were created as an alternative coding system for Egyptian hieroglyphic writing [3, 4] in the sixteenth century BC. These 22 signs became the basis of the first phonetic Sinai script, and in the tenth century BC-the Phoenician [3, 4, 17]. The Phoenicians, like the "wanderers" of the Mediterranean, spread it throughout the Mediterranean. Thus arose the Greek, Latin, Gothic, and Slavic alphabets. Hebrew and Arabic are practically the successors of the Sinai and Phoenician scripts.

It is known from linguistics that the minimum alphabet has 21-22 letters [3, 4, 17] (Phoenician, Hebrew), this alphabet (number of letters) is at the same time an abbreviated form of writing Egyptian hieroglyphic writing. In other words, the modern alphabet and compound writing are an optimized representation of all known types of writing.

From ancient Egyptian mythology it is known that in the tablet of God Thoth was placed not only mathematical, but also linguistic knowledge of ancient Egyptians (or Atlanta, God Thoth came out of the sea). Is it possible, using the eight-element sign system, to create in a deductive way at least a semiotic system that in a certain way corresponds to the language?

In support of the fact that the semiotic optimized approach should be chosen as the basis for creating a single language, such facts are said. It is known that the syntactic, and sometimes the morphological composition of the language, not to mention the phonetic, is changed by about 70-80% for every 500 years [3, 4, 17]. Even such relatively young languages as English and Ukrainian [3, 4] have undergone many changes during their existence, not to mention the Chinese and dead languages Sumerian, Egyptian, Jewish, etc.). For the starting point of constructing a single rule, it is not necessary to look for any linguistic structural starting points (after all, only types of letters are

three: hieroglyphic, hieratic and syllabic [3, 4, 17]). In addition, the socio-cultural environment has a great influence on the process of language formation.

Proceeding from this, we suggest such constructive-information approach to the description and creation of languages. Let's start with the number 8 (the minimum number of characters of the optimal operating mathematical system). In order to move from mathematics to the linguistic system, it is necessary, as a minimum, to have twice as many signs, that is, 16 [292, 294].

But minimal alphabet has 21-22 letters [3, 4, 17] (Phoenician, Hebrew), this alphabet (the number of letters) is simultaneously a shortened form of the writing of the Egyptian hieroglyphic letter (phonetic system). In other words, the modern alphabet and composite letter are an optimized representation of all known types of writing.

Taking 16 as the minimum number of characters of the "logical" letter and using some values of the coefficients of information surplus we have [3, 4]:

Phoenician, Hebrew (k_1 = 1,4) – 22 letters.

Greek, Latin (k_2 = 1,618) – 26 letters.

Ukrainian (k_3 = 2) – 33 letters.

According to the information theory, a normal spoken language has an informational surplus of 1,4. The surplus of 1,618 (the "golden proportion") is in languages the peoples of which have done most of all for the development of art and science. In other languages we have languages whose peoples made a significant contribution to the development of linguistics, various social experiments. In this review, it is possible to include modern hieroglyphic languages, because there, as in the Egyptian language, there are phonetic transcriptions (for more eastern languages, usually $k_i > 2$).

The approach to linguistics can be expanded with the help of the scheme depicted on Fig.1.

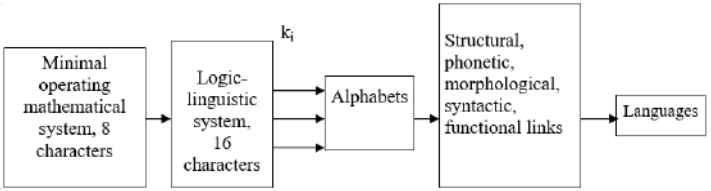

Fig 1: Polymeric linguistic scheme [3, 4]

This schema (Fig. 1) may be represented as variant of decoding the tablet of god Thot and Pythagorean system [3, 4].

As can be seen from this scheme, such a deductive approach in linguistics can be used for a comparative historical analysis of the emergence and dying of languages in certain civilizations or for certain tasks, as well as the conditions for the synthesis and differentiation of languages.

In general, the scheme of Fig. 1 can be replaced, for example, by introducing optimized communications into a logical-linguistic system (based on this principle, algorithmic languages, Latin), but then there will be additional difficulties with languages such as Chinese, etc. Similarly, you can use a functional-logical (polymetric) approach to linguistics. This is due in the first place to its "linguistic" (the parameter of the connectedness is larger unit).

Number 22 is basis of Egyptian monadology by J. Dee [18] and similar V. Shmakov system [19].

From the point of view the theories of everything it is possible to consider also the emergence of monadology.

It was the monad as a universal origin considered in 1440 by Nicholas of Cusa [7, 20], in 1564 the famous English astrologer and mathematician J. Dee [7, 18] published his hieroglyphic monadology, where he tried to recreate certain traditions of Egyptian esotericism, Pythagorean numerology and Platonism (Xenocrates). In 1591, J. Bruno's monadology appeared with a "deviation" into the materialist realm [7, 21]. It should be noted that monadology from the "Egyptian" point of view was considered by V. Shmakov [7, 19]

J. Bruno singled out philosophy, physics and mathematics. Each of these sciences had its minimum: philosophy-a monad, physics-an atom, mathematics-a number [8].

The most cited today is the monadology of 1714 by W. Leubniz [7, 22]. The monad is seen as a simple indivisible spiritual substance of being. Based on evidence known from ancient philosophy, Leuniz denies the possibility of the existence of a single substance, which taught B. Spinoza. Leubniz argues that the concept of a single substance denies the possibility of the existence of motion, the variability of being. Therefore, he turns to an infinite number of substances-monads. Monad-a self-sufficient unit of being, capable of activity, self-movement, activity. A monad is a simple substance.

A complex substance always depends on simple ones, and therefore a complex formation cannot be considered a substance at all. Therefore, monads do not change under the influence of other monads, each of them is self-sufficient, and therefore represents a self-sufficient world, an inviolable harmony, which is the strongest in the world. As the most perfect harmonious formations, monads have one thing in common - "harmony". In the case where there are two identical monads in the world, it must be admitted that they will be identical. Thus, monads differ in their qualities. Monads have three main varieties according to the degree of their development. The lower form is characterized by "perception" (spiritually passive ability to perceive). Higher monads are able to have senses and clear ideas. Leibniz calls them "soul monads." Monads of the highest degree are capable of "apperception" (consciousness) and are called "monads-spirits" [22].

It should be noted that the gradation of monads into three main varieties somewhat resonates with the concept of Plato's numbers: arithmetic, sensory and ideal [3, 4]. Arithmetic numbers correspond to pure mathematics proper, sensory-to numbers to applied mathematics, ideal-to numerology, mysticism, and so on. From this point of view, Plato's number can be considered as a "mathematical" part of the tablet of the god Thoth.

Monads do not have spatial (physical) properties, so they are not sensually given. They are given only to the mind. Sensory body data are combinations of monads that differ in which monads they consist of. Man embodies a set of monads in which the leading role is played by monads who are able to realize. The union of monads is not accidental, it is defined by "predicted harmony", which manifests itself in the self-change of monads in harmony with other monads [22].

The reasons for the change of monads can be external and internal. Each of the monads contains both the past and the future. The foreseen harmony makes it possible to become available to all the qualities that are present in each of the monads in undiscovered form. The process of cognition, therefore, Leibniz sees as the development of the ability to create and realize ideas. He denies the existence of innate ideas, man from birth has only some innate principles (instincts) [22].

Sensory cognition is considered by him as the lowest degree of rational cognition. The well-known expression "There is nothing in the mind that has not previously passed through the senses" Leibniz complements the position - "except the creations of the mind itself." The mind discovers the essential, the necessary, and the senses the accidental, the empirical. Therefore, the

truths are different: empirical-the truths of fact; mental - the truth of the theory. Leibniz attributes the main tenets of mathematics and logic to the truths of the mind. Leibniz considers mathematics and logic as the main sciences of the mind, which inform man about the world, not given sensually. These are the sciences of "all possible worlds" (as opposed to the philosophy he defines as the science of this real world) [22].

A special place in relation to the theories of everything has Indian philosophy. Indian philosophy and culture must be approached from the point of view by Indira Gandhi's statement: “This is similar to the process of cognition-the deeper you get into the essence of things, the more mysterious they are and the better you understand how much is not yet known" [10].

Philosophy in India has predominantly spiritualistic nature [10]. Only spiritualism, not India's grand political structure or social organization, given it possibility to withstand the destructive effects of time and the progress of history [10].

According to Sarvapali Radhakrishnan, Indian philosophy and culture is a synthesis of many systems [10].

In its historical development, Indian philosophy is divided into three periods: the Vedic period (1500-500 BC); classical, or Brahmanical-Buddhist (500 BC-1000 AD) and the postclassical period, or Hindu (from 1000) [10].

The systems of Indian philosophy and culture belong to both the ordered and disordered part of knowledge, although more often they still have more deviations towards the disordered part of knowledge. An example of the theory of everything in Indian philosophy is the absolute sought by Sri Aurobindo [19]. It should be noted that in a sense the Absolute of Sri Aurobindo is similar to the monad by W. Leubniz [10, 22]. However, the Absolute Sri Aurobindo had a slightly different scope. The elementary part of the Absolute resonates with the basic provisions of the construction of the Kabbalistic decade of the Sephiroth [3, 4].

Indian philosophy and culture are a synthesis of many cultures, so over time the systems became more complicated. If we speak in the language of hybrid systems theory, then there was an evolution of systems from simpler to more complex. This is especially well illustrated by the example of the emergence of literary vernaculars of India, which are now only regional 22. The development of science in the system sense, as a rule, goes the opposite direction as in European philosophy, from complex systems and concepts to simpler [3, 10].

If religion and belief are mainly more complex systems, then in Indian culture there may be simpler systems. The main reason for this is that here, as a rule, the system is created for the harmonious existence of man in the universe. That is why in Indian systems there is less systemic uncertainty, as in Judaism, Christianity and Islam [3, 4].

III. Physical theories of everything

Modern science arose mainly due to Euclid, who axiomatized mathematics, and Archimedes, who respected experiment, and their followers [1-4, 11, 23]. In the Middle Ages, thanks to R. Bacon, W. Ockham, T. Brahe, J. Kepler, G. Galileo, R. Descartes, F. Bacon, I. Newton, W. Leibniz and their followers, these ideas were developed and laid the foundation of science [1-4, 11].

All these methods can be represented in a condensed form through the Newtonian four rules of inference in physics [13]:

Rule 1. Nature should not be required to give reasons other than those, which are true and sufficient to explain the phenomena.

Rule 2. Therefore, as far as possible, we must attribute the same reasons to manifestations of nature of the same kind.

Rule 3. Such properties of bodies, which can neither be strengthened nor weakened, and which are in all bodies over which it is possible to carry out tests, should be considered as properties of all bodies in general.

Rule 4. In experimental philosophy, propositions derived from phenomena by general induction must be considering accurate or approximately correct, notwithstanding the possibility of opposing hypotheses, until there are phenomena by which they are either further clarifing or declared invalid.

Roughly speaking, I. Newton generalized Euclidean axiomatic method from mathematics on mechanic and later on other sciences [13] and realized R. Bacon-Descartes thesis “Science is as much a science as it has mathematics” [3-5].

Concept the theory of everythings on the basis modern theoretical physics was created and developed by J. Barrow [2]. He made deep historical analysis this problem and noted its main peculiarities [2]. These peculiarities are connected with structure of corresponding physical theories [2].

Of the trends that have influenced the development of modern theories of everything, according to J. Barrow [2], it should be noted the concept of R. Boskovich. Fig. 2 shows its scheme of universal forces.

Here, along with attraction (part of the curve above the abscissa axis), repulsion (part of the curve below the abscissa axis) was introduced. The change in the force of interaction between two "heavy points" as the distance between them changes is given by a wavy curve that passes through the sequence of points DFHKMOQSTV. The distance between them is determined along the obscissa axis AC; the magnitude of the force changes along the ordinate AB. The force has a repulsive character when the graph line is located above the AC, and an attraction character if the graph is below this axis. At very large distances (in the vicinity of point V and behind it), the action of this force is described by Newton's law of universal gravitation. The repulsion that occurs between the points when the distance tends to zero prevents matter from collapsing to zero dimensions. Examining this graph, Boskovich notes: “A law of this kind at first glance seems to be a very complex result of a random combination of several different laws. But in fact it is very simple, and it can be depicted in the form of one continuous curve. … One glance is enough to be convinced of this” [2].

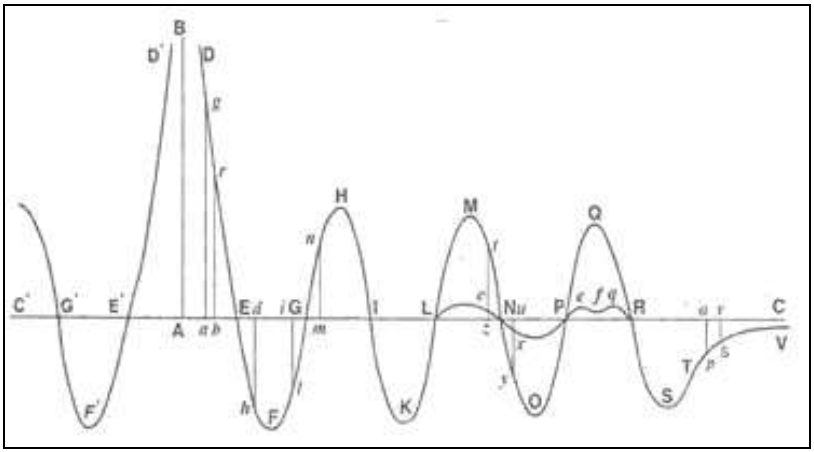

Fig 2: The original graphic representation of the universal law of forces by R. Boshkovich, published in his theory of natural philosophy for the first time in 1758 [2]

As we can see, roughly speaking, this concept represents the main trends in the creation of current theories of everything (a unifird field theory) [1-4].

The theoretical physics developed as deductive science on the basis the Newtonian rules of inference in physics. Basic chapter of modern physics are sytnthetic theories: Newtonian mechanics-synthesis terrestrial and celestial mechanics in one system; Maxwell electrodynamics-synthesis magnetizm, electricity and optics in one system; theory of electroweak interaction and theory of great unification [1-4]. In thic case we have problem of including the gravitation in universal theory of all possible interaction [1-4].

This problem may be analysed with help the Einsteinian theory of general relativity [1-4]. Roughly speaking, this theory may be represented as expanding variant of resolution the W. Weber problem the synthesis the electromagnetism and gravitation in one system [3, 4].

Basic eqution of general theory of relativity has next form:

$$G_{\mu\nu} = T_{\mu\nu}, \quad (1)$$

Where $G_{\mu\nu}$ is Einstein tensor, $T_{\mu\nu}$-energy-momentum tensor.

Einstein tensor $G_{\mu\nu}$ is potential energy of system, energy-momentum tensor $T_{\mu\nu}$ is kinetic energy of system. Therefore Eq. (1) is equation of energy balance [24]. Therefore, this eqution, and its simpler variant-Fridman equation, is main in the modern cosmology [24].

Later Eq. (1) was supplemeted by cosmological term $\Lambda_{\mu\nu}$ [3, 4, 24]. A. Einstein sometimes included or threw him out of his equations. In modern cosmology this term is painted and includes other types of interactions (weak and strong) [3, 4]. Therefore, Einsteinian theory of general relativity may be represented as variant the unified field theory or physical theory of everything [2–4]. Some part of cosmological term (potential energy) is corresponded by dark matter and other some part (kinetic energy) is corresponded by dark matter.

We must note the problem of quantization in physical theories of everthing. P. Dirac introduced this procedure (method of second-order quantization) in his quantum theory of harmonic oscillator [25]. This method was called the operator of second-order quantization [25]. Later this procedure was introduced in all theories, which are connected with quantum mechanics, including theory of electroweak interactions and theories of great unification [1-4].

Procedure of second-order quantization may be connected with A. Einstein programm in next way. This procedure is included in the parts of Einsteinian cosmological terms, which are connected with corresponding quantum theories. This program was developing in modern cosmological theories, including Big Bang theory [3, 4]. For macroscopic (Newtonian) gravitation the problem of its quantization is absented. For Einsteinian gravitation this problem is included in proper terms of its equation.

Roughly speaking, the Einstein method of creation the unified field theory (gravity) can be considered a more complete implementation of the scheme of R. Boskovich (Fig. 2) [2].

The physical theories of everything are connected with universal physical quantity a action and entropy. Action principle is one of fundamental principles of pysics. One of foundator of this principle P. M. Maupertui argued that this principle could be the basis for the existence of a single god [12]. Action principle is basis of classic theoretical mechanics [12] and Lagrangian formalism of Quantum mechanics [25]. Entropy laws are the basis of thermodynamics and information theory (Shannon's theorem) [3, 4]. L. de Broglie in his “Hidden thermodynamic of particles” [26] shown a equivalence of quantity of ordered information (normalized on Planck constant action) and disordered information (normalized on Boltzman constant entropy) for closed systems [27]. This fact allowed creating theory of informative-dynamical structures [3, 4].

According to J. Barrow, the creation of a physical theory of everything, if only it exists, can only be a necessary, and not a sufficient factor in cognizing the world [2]. To solve this problem, he focuses on the need for eight ingredients: physical laws; initial conditions; classification of forces and particles; world constants; violation of symmetry; principles of organization; systematic selection errors; categories of thinking. But it is the basic ingredients of creation all possible physical theories and models, which used for the creation physical theories of everything too [2].

J. Barrow believes that one of the main principles of theory is the principle of algorithmic compression [2]. In principle, from the point of view of information theory, this is may be represented as more modern law of synthesis, which is included in the tablet of the god Thoth and in the Newtonian four rules of inference in physics [3, 4].

IV. Universal theories of everything. Polymetrical analysis

Theories of everything in general case must have metascientific nature. According to [5, 14] the basic conditions of this metascience must be next:

1. It must be open theory or theory with variable hierarchy.
2. This theory must be having minimal number of principles.
3. It must based on nature of mathematics (analysis, synthesis and formalization all possible knowledge).
4. We must create sign structure, which unite verbal and nonverbal knowledge (mathematical and other) in one system.
5. We must have system, which is expert system of existing system of knowledge and may be use for the creation new systems of knowledge.

6. Principle of continuity must be true for all science.

These conditions must be used for the creation any dynamic science, which can be presented as open system.

An example of so metascience is Polymetrical Analysis (PA) – theory of variable hierarchy (measure) [3-5, 14], which is created as system of optimal analysis, synthesis band formalization of knowledge.

This theory is created on the basis these 6 rules [3, 4]. Basic conceptnm of PA is formalization of triple minimum: philosophical (methodological), mathematical and concrete scientifically. This idea was beginning by J. Bruni for three unit of measure: number for mathematics, manad for philosophy and atom for physics [8]. But we must unite these three elements in one.

Basic elements of this theory and their bonds with other science are represented in Fig. 3 [3, 4].

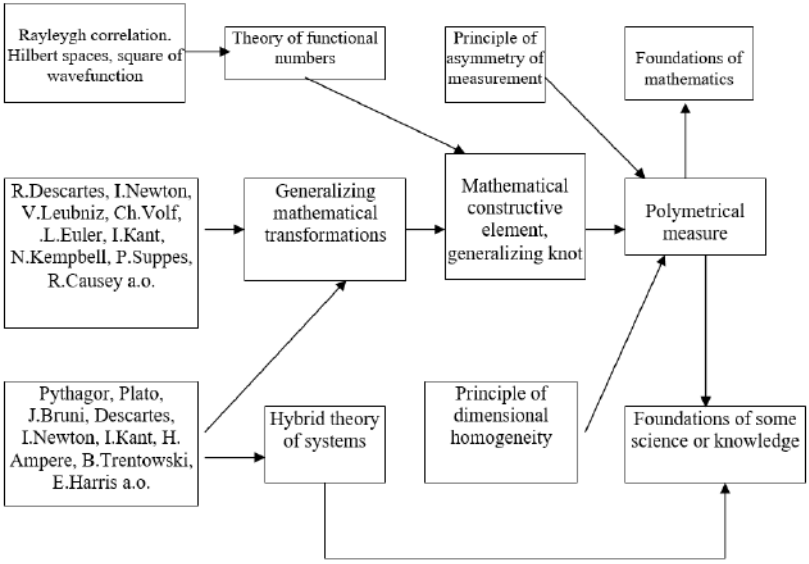

Fig 1: Scheme of polymetric method and its place in modern science [3, 4].

Basic mathematical elements of PA are functional elements of quadratic forms (functional numbers) [3, 4].

Second constituents of PA are generalizing mathematical transformations, which are allowing connecting the mathematics (roughly speaking the ordering and formalization) with proper science.

Third constituent of PA is system aspects: creation of proper system of analysis, synthesis and formalization the knowledge.

This concept allows formalizing the Pythagorean phrase “Numbers are ruling the World” [3-5].

Now we represented basic axiomatic of PA according to [3, 4].

Definition 1: Mathematical construction (constructive) is called set all possible elements, operations and transformations for resolution corresponding problem. The basic functional elements of this construction are called constructive elements.

Definition 2: The mathematical constructive elements $N_{x_{ij}}$ are called the functional parameters

$$N_{x_{ij}} = x_i \circ \overline{x}_j \qquad (2)$$

Where x_i, $\overline{x_j}$ – the straight and opposite parameters, respectively; $\cdot$ – respective mathematical operation.

Definition 3: The mathematical constructive elements $N_{\varphi_{ij}}$ are called the functional numbers

$$N_{\varphi_{ij}} = \varphi_i \circ \overline{\varphi}_j . \qquad (3)$$

Where $\varphi_i = \varphi_i(x_1,...,x_n,\overline{x}_1,...,\overline{x}_n)$, $\overline{\varphi_j}\left(x_1,...x_n,\overline{x_1}...\overline{x_m},...N_{x_{ij}},...\right)$ are the straight and opposite functions, respectively; $\circ$ – respective mathematical operation.

Remark 1. Functions φ_i, $\overline{\varphi}_j$ may be have different nature: mathematical, linguistic and other.

The theory of generalizing mathematical transformations is created for works on functional numbers [3, 4].

Definition 4: Qualitative transformations on functional numbers $N_{\varphi_{ij}}$ (straight A_i and opposite $\overline{A}_j$) are called the next transformations. The straight qualitative transformations are reduced the dimension $N_{\varphi_{ij}}$ on i units for straight parameters, and the opposite qualitative transformations are reduced the dimension $N_{\varphi_{ij}}$ on j units for opposite parameters.

Definition 5: Quantitative (calculative) transformations on functional numbers $N_{\varphi_{ij}}$ (straight O_k and opposite $\overline{O}_p$) are called the next transformations. The straight calculative trasformations are reduced $N_{\varphi_{ij}}$ or corresponding mathematical constructive element on *k* units its measure. The opposite quantitative transformations are increased $N_{\varphi_{ij}}$ or corresponding mathematical constructive element on *l* units its measure, i.e.

$$O_k\overline{O}_pN_{\varphi_{ij}} = N_{\varphi_{ij}} - k \oplus p\,. \qquad (4)$$

Definition 6: Left and right transformations are called transformations which act on left or right part of functional number respectively.

Definition 7: The maximal possible number corresponding transformations is called the rang of these transformations

$$\operatorname{rang} A_i\overline{A}_jN_{\varphi_{ij}} = \max(i,j)\,; \qquad (5)$$

$$\operatorname{rang} O_k\overline{O}_pN_{\varphi_{ij}} = \max(k,p)\,. \qquad (6)$$

Remark 2: The indexes *i, j, k, p* are called the steps of the corresponding transformations.

These transformations may be having various natures. Roughly speaking it may be mathematical, linguistically and other transformations and its combinations.

For this case we have finite number of minimal types the generalizing transformations (only 15 [3, 4]).

Basic elements of PA are the generalizing mathematical elements or its various presentations-informative knots [3, 4]. Generalizing mathematical element is the composition of functional numbers (generalizing quadratic forms, including complex numbers and functions) and generalizing mathematical transformations, which are acted on these functional numbers in whole or its elements [3-5]. Roughly speaking these elements are elements of functional matrixes.

This element ${}^{stqo}_{nmab}M_{ijkp}$ may be represented in next form

$${}^{stqo}_{nmab}M_{ijkp} = A_i\overline{A}_jO_k\overline{O}_pA^r_s\overline{A}^r_tO^r_q\overline{O}^r_oA^l_n\overline{A}^l_mO^l_a\overline{O}^l_bN_{\varphi_{ij}}\,. \qquad (7)$$

Where $N_{\varphi_{ij}}$ – functional number; $O_k, O_q^r, O_a^l, \overline{O}_p, \overline{O}_o^r, \overline{O}_b^l$; $A_i, A_s^r, A_n^l, \overline{A}_j, \overline{A}_t^r, \overline{A}_m^l$ are quantitative and qualitative transformations, straight and opposite (inverse, with tilde), (*r*) – right and (*l*) – left.

Polyfunctional matrix, which is constructed on elements (7) is called informative lattice. For this case generalizing mathematical element was called knot of informative lattice [3, 4]. Informative lattice is basic set of theory of informative calculations. This theory was constructed analogously to the analytical mechanics [3, 4].

Basic elements of this theory are [3, 4]:

1. Informative computability *C* is number of possible mathematical operations, which are required for the resolution of proper problem.
2. Technical informative computability $C_t = C\sum_{i=1}^{n} t_i$ where t_i – realization time of proper computation.
3. Generalizing technical informative computability $C_{to} = k_{AC} C_t$, where k_{ac} – a coefficient of algorithmic complexity [3, 4].

Basic principle of this theory is the principle of optimal informative calculations [3, 4]: any algebraic, including constructive, informative problems have optimal resolution for minimum informative computability *C*, technical informative computability C_t or generalizing technical informative computability C_{to}.

The principle of optimal informative calculations is analogous to action and entropy (second law of thermodynamics) principles in physics.

The principle of optimal informative calculation is more general than negentropic principle the theory of the information and Shennon theorem [3, 4]. This principle is law of the open systems or systems with variable hierarchy. The negenthropic principle and Shennon theorem are the principles of systems with constant hierarchy.

Idea of this principle of optimal informative calculation may be explained on the basis de Broglie formula (8) [26] (equivalence of quantity of ordered and disorder information) [3, 4]. Therefore we can go from dimensional quantities (action and entropy) to undimensional quantity – number of proper quanta of information or after generalization to number of mathematical operations. Thus, theory of informative calculations may be

represented as numerical generalization of classical theory of information and analytical mechanics according to computational point of view [3, 4].

$$\frac{S_e}{k_B} = \frac{S_a}{\hbar}, \tag{8}$$

which was obtained from the analysis of thermodynamics point [3, 4], a measure of disordered physical information (number of photons) equally structured information (where $S_a -$ action; $\hbar$ – Planck (Dirac) constant, S_e – entropy, k_B – Boltzmann constant).

Through (8) the ratio of the increase of entropy for nonequilibrium processes (open systems) can be expanded at the action, that is, in other words, the physics of open systems can be built and for action functional too [27].

Roughly speaking the formula (8) is the mathematical form of next law: quantities of ordered and disorder information is equaled in each closed system.

We can introduce of dimensionless quantity S_g, which was called generalizing measure.

$$\frac{S_e}{k_B} = \frac{S_a}{\hbar} = S_g, \tag{8a}$$

For this case basic optimal principles of physics and information theory may be represented in the next form

$$dS_g \geq 0. \tag{9}$$

A sign equal (=) in (9) is corresponded to case of closed systems, A sign greater-than (>) is corresponded to case of open systems [27].

In [14] was shown that Yu. Klimontovich “thermodynamically” theory of optimal systems may be expanded on ordering part of physics too:

$$dS_a \geq 0. \tag{9}$$

In this case we have for the equals sign, roughly speaking, the action principle, to note the event more – physics of open systems.

But formula (9) allows to transit to other nonphysical systems. Quntity S_g may be represented number of proper mathematical operations, including transformations.

Modern science is complex system. The evolution of each science is realization the transition from complex to simple system. The change of structure of science and appearance of new chapters of science are caused the change of notions, including axiomatic, which must explain new chapters of knowledge [3, 4].

For classification the computations on informative lattices hybrid theory of systems was created [3, 4]. This theory allow to analyze proper system with point of view of its complexity,

The basic principles of hybrid theory of systems are next: 1) the criterion of reciprocity; 2) the criterion of simplicity.

The criterion of reciprocity is the principle of the creation the corresponding mathematical constructive system (informative lattice). The criterion of simplicity is the principle the optimization of this creation.

The basic axiomatic of hybrid theory of systems is represented below.

Definition 8. The set of functional numbers and generalizing transformations together with principles reciprocity and simplicity (informative lattice) is called the hybrid theory of systems (in more narrow sense the criterion of the reciprocity and principle of optimal informative calculations).

Criterion of the reciprocity for corresponding systems is signed the conservation in these systems the next categories:

1) The completeness;
2) The equilibrium;
3) The equality of the number epistemological equivalent known and unknown notions.

Criterion of the simplicity for corresponding systems is signed the conservation in these systems the next categories:

1) The completeness;
2) The equilibrium;
3) The principle of the optimal calculative transformations.

Criterion of reciprocity is the principle of creation of proper informative lattice. Basic elements of principle reciprocity are various nuances of completeness. Criterion of the simplicity is the principle of the optimality of this creation.

For more full formalization the all famous regions of knowledge and science the parameter of connectedness σ_t was introduced. This parameter is

meant the number of different bounds the one element of mathematical construction with other elements of this construction. For example, in classic mathematics σ_t = 1, in linguistics and semiotics $\sigma_t > 1$. The parameter of connectedness is the basic element for synthesis in one system of formalization the all famous regions of knowledge and science. It is one of the basic elements for creation the theory of functional logical automata too.

At help the criteria of reciprocity and simplicity and parameter of connectedness the basic famous parts of knowledge and science may be represent as next 10 types of hybrid systems [3 – 5]:

1. The system with conservation all positions the criteria of reciprocity and simplicity for all elements of mathematical construction ($N_{\varphi_{ij}}$ and transformations) is called the *simple system.*
2. The system with conservation the criterion of simplicity only for $N_{\varphi_{ij}}$ is called the *parametric simple system.*

Remark. Further in this classification reminder of criteria of reciprocity and simplicity is absented. It means that these criteria for next types of hybrid systems are true.

3. The system with conservation the criterion of simplicity only for general mathematical transformations is called *functional simple system.*
4. The system with nonconservation the principle of optimal informative calculation and with σ_t = 1 is called the *semisimple system.*
5. The system with nonconservation the principle of optimal informative calculation only for $N_{\varphi_{ij}}$ and with σ_t = 1 is called the *parametric semisimple system.*
6. The system with nonconservation the principle of optimal informative calculation only for general mathematical transformations and with σ_t = 1 is called the *functional semisimple system.*
7. The system with nonconservation the principle of optimal informative calculation and with $\sigma_t \neq 1$ is called *complicated system.*

8. The system with nonconservation the principle of optimal informative calculation only for $N_{\varphi_{ij}}$ is called *parametric complicated system.*
9. The system with nonconservation the principle of optimal informative calculation only for general mathematical transformations and with $\sigma_t \neq 1$ is called *functional complicated system*.
10. The system with nonconservation the criteriums of reciprocity and simplicity and with $\sigma_t \neq 1$ is called *absolute complicated system*.

With taking into account 15 basic types of generalized mathematical transformations we have 150 types of hybrid systems; practically 150 types of the formalization and modeling of knowledge and science.

Only first six types from ten of hybrid systems may be considered as mathematical, last four types are not mathematically in classical sense. Therefore, HTS may be describing all possible system of knowledge. Problem of verbal and nonverbal systems of knowledge is controlled with help of types the mathematical transformations and parameter connectedness [3, 4].

V. Polymetric Analysis and Universal Problems of Modern Science

Now we represent basic problems of modern science, which can resolve with help Polymetrical Analysis [3–5].

These problems are next:

1) Creation united system of optimal formalization the knowledge [3, 4].
2) Creation of natural concept the foundations of mathematics, which is based on nature of mathematics [3, 4, 30].
3) Creation universal theory of open system [3, 4, 27].
4) Resolution of S. Beer centurial problem in cybernetics [14, 31, 32].

The large value in modern science has concepts of reduction and resolutions of various problems of modern science. Problem of resolution of proper problems may be represented as reduction or transformation this problem in form, which is necessary for using [3, 4].

In mathematical physics many complex problems of nonlinear Hamiltonian dynamics were reduced to systems of proper linear equations asccording by famous Japanese mathematician M. Sato with colleagues [4]. Therefore, we are formulated general theorem of reduction as general Sato

theorem: Any nonlinear system of nonlinear integral-differential equations, that represents correctly problem of mathematical physics, may be reduced to system of linear algebraic equations. Moreover groups of monodromy of these two systems are coincided [4].

Presently we'll go to classifications. We'll ask question that we must make, if we have little information even for the construction of system integral-differential equations, to say nothing of systems of linear algebraic equations? In modern theoretical and mathematical physics chapter of physical and chemical kinetics is least "regularized" on present day. Therefore, general Sato theorem must be expanded on classification too, another words on correlations between basic physical characteristics, which are caused proper physical phenomena. That is to say, that such old way of creation science as classification is correctly coordinated with problems of modern theoretical and mathematical physics [3, 4]. This results wass used for the justification main concepts of Relaxed Optics [4].

Polymetric Analysis may be used for the resolution many problems of modern science in whole and with using concrete theories. These problems are included in its structure.

So, HTS may be used for the classification and creation old and new chapters of all science, including computing science [3, 4].

HTS may be used for the represented of evolution of systems in two directions: 1) from simple system to complex system (example, from classic to quantum mechanics) and 2) conversely, from complex system to simple system (example, from formal logic to mathematical logic) [3, 4].

Hybrid theory of systems is open theory. Parameters of openness are number of generalizing mathematical transformations and parameter of connectedness. Thereby we have finite number of types of systems, but number of systems may be infinite. Hybrid theory of systems allows considering verbal and nonverbal knowledge with one point of view [3, 4]. Therefore this theory may be represented as variant of resolution S. Beer centurial problem in cybernetics (problem of complexity) [14, 31, 32].

HTS may be used for the classification and creation old and new chapters of all science, including computing science [3, 4, 33-36].

HTS may be represented as application PA (theory of informative calculations) to the problem of calculation [3, 4]. This theory was used for the problem of matrix computation and problem of arrays sorting [4].

HTS may be connected with problem of computational complexity. This

problem was appeared in modern cybernetics for resolution of problem the transition from infinite (analytical) to discrete representation of computing procedures [3, 4]. In may be connected with 4 and 5 Smale problems [3, 5, 33].

PA may be represented as “dynamical” expanding formalization of Errol E. Harris polyphasic concept of modern science [37]. But Harris method is philosophical and “static”, polymetric method is “dynamic”. PA allows selecting and changing measure and hierarchy of proper systems.

Hybrid theory of systems is open theory [3, 4, 27]. Parameters of openness are number of generalizing mathematical transformations and parameter of connectedness. Thereby we have finite number of types of systems, but number of systems may be infinite. Hybrid theory of systems allows considering verbal and nonverbal knowledge with one point of view [3, 4]. Therefore this theory may be represented as variant of resolution S. Beer centurial problem in cybernetics [14, 31, 32], the way which was representede by J. Casti [38].

HTS may be used for the classification of knowledge and science with point of view of their complexity [3, 4]. These results may be represented as theorems, which are presented in [3, 4].

Once again we return to the foundations of mathematics [23, 39–41]. Classical mathematics is characterized by parameter of connectedness that is equal to one. It means that quite complex and sophisticated mathematical system is not mathematical in the classical sense. But the foundations of mathematics we have a theory with a broader subject base as classical mathematics (including mathematical logic and set theory). This theory is in our view should include formalizing the procedure (functional numbers and criteria of reciprocity and simplicity), process analysis and synthesis (qualitative and quantitative transformation) and the problem of uniqueness (parameter of connectedness). This theory is also essential to have provisions that take into account its opening from the system point of view. In polymetric analysis meet this requirement parameter of connectedness and possible failure of certain provisions of criteria of reciprocity and simplicity. The theories of «structural lines» in the foundations of mathematics do not meet these requirements. Detail analysis of this problem is presented in [3, 4].

Modern theories of foundations the mathematics are representing by threre directions: 1) logical B. Russel, A. Whitehead); 2) formal (D. Gilbert, P. Bernays) and 3) intuitionistic (L. Brauer and A. Heiting). First is based on logic, second on arithmetic or set theory. But these theories are closed theories and its base on procedure of formalization the knowledge. Therefore

in this case the inter-hierarchic paradoxes, as Russel paradox, are existed [5]. These two concepts neglect the problem of selection of proper mathematical construction. Intutionistic (constructive) concept is base on the problem of selection the proper mathematical construction for the resolution the corresponding problem [5].

We must remember that nature of mathematics is analysis, synthesis and formaslization of any branch of knowledge [40]. Therefore the theories of foundation the mathematics must include all three partsw of its nature.

The definion of mathematiczs on the bassis its nature was given by Ch. Volf (1716) [4]: “Mathematics is the science of measuring everything that can be measured. It is usually described as the science of numbers, the science of quantities, that is, of those things that can increase or decrease. Since all finite things can be measured in all that they have in themselves finite, that is, what they are, there is nothing in the world to which mathematics cannot be applied, and since there can be no more precise knowledge than when the properties of things can be measured, then mathematics leads us to the most perfect knowledge of all possible things in the world”.

Ch. Volf disciple Leonard Euler gives definition of mathematical quantity [4]:

1. First of all, the quanrity is called everything that is capable of increasing or decreasing, or of what something can be added or from which something can be subtracted.

Thus, the amount of money is an amount because it allows additions to or subtraction. Then weight is a magnitude for the same reasons.

2. There are many different kinds of variables that are not accounts, and they come from different sections of mathematics, each of which deals with its kind of quantities. In general mathematics is nothing more than a science of magnitude that deals with finding ways how to measure the latter.
3. However, it is impossible to determine or measure one quantity otherwise than to accept as another known value of the same genus and to indicate the relation in which it is to it.

Therefore, PA may be represented as natural concept of foundations of mathematics too [3-5].

If we consider polymetric concept in terms of H. Kantor expression [3, 4] "The essence of mathematics lies in its freedom", this freedom is included in the variable measure.

PA is more general as cybernetics. It may be used as metascience and expert system for real systems and theory of formation of new scientific systems [1, 2].

PA is universal system of synthesis of knowledge. But this synthesis is realized through measure (number). Each science or knowledge has own treasures and measure. Therefore, problem of division science on philosophy and other sciences (see N. R. Campbell [3, 42]) is very relative. The classification science and knowledge with help polymetric concept, according to simplicity-complexity of optimal formalization, is fuller and more corresponded of present state and development of science and knowledge. In this case the polymetric theory of measure and measurement as element of PA is more precision formalization N. R. Campbell concept of basic and derivative measurements [42] as P. Suppes and J. Zinnes [43] and R. Luce and E. Galanter E. methods [44].

Selection of quadratic forms as basic elements of PA is further development of direction of observation many scientists: Pythagor (Pythagorean theorem), Plato (three types of numbers), Descartes (using Pythagorean theorems for creation analytical geometry), B. Riemann (creation Euclidean space as generalizing of analytical geometry), D. Hilbert (Hilbertian spaces) etc [3, 4].

PA may be used as theoretical foundations of computer science too. According A. Ersov basicproblems of modern computing science is formalization the phrase of canadian philosopher L. Hall “everything that goes from the head is reasonable” [3].

It describes this science in your standing and development more simple, optimal and sufficient as logical or constructive concepts 3, 4], and may be used as expert system for existing sciences and instrument for creation of new sciences.

Polymetric analysis may be used for more full formalization of neuronets [3, 4, 36]. Basic concept of creation PA is concept of triple optimum (minimum): mathematical, methodological and concrete scientific [3, 4], therefore it may be used for all possible systems of knowledge.

Thus, we show that Polymertric Analysis is general theory of open systems and may be used for the resolutions various problems of system type for many sciences. It may be represented as metamathematics is more widely sense as “logical” Kleene metamathematics [41]. PA may be represented as metaknowledge, metascience and metamathematics together in one system.

If see to development of science with system point of view we have to general classifications. First is Euclid's "Elements" as classification of basic chapters of mathematics [1, 3, 4]. Second is Aristotle's classification of science. Roughly speaking, modern mathematics is the expansion of Euclid's "Elements", and modern science is expansion of Aristotle's classification [3, 4].

But modern science and mathematics is more complex systems as in Euclides and Aristotle times. It is polyphasic system [37]. But it must be open system [3–5]. This metascience must include elements of integration (synthesis) and differentiation of knowledge and science. It must be theory with variable measure and hierarchy. The generalizing mathematical element may be represented as element of more general measure. Set of this elements with principles of assymetry o measurement and dimensional homogeneity is basis of polymetric theory of measure and measurements [3, 4]. This theory may be represented as more full formalizatiom N. Campbell concept [3–5, 42].

PA may be represented as more general theory of everything as physical theories of everything, including anthropic principle [1–4]. Thus, the physical theories of everything in J. Barrow's sense [2] are created by the inductive-deductive method, which base on the structure of modern physics using N. Bohr's principle of premality. At the same time, polymetric analysis is a system of analysis, synthesis and formalization of any field of knowledge, including science [3, 4]. Roughly speaking, J. Barrow's method is based on I. Newton's gravity law, and polymetric analysis is based on the expanded formalization of Newtonian four rules of inference in physics.

Therefore, we must include the elements of simplicity-complexity these systems for its comparative analysis. S. Beer problem of century in cybernetics is one of central problem of modern knowledge and science, including mathematics (two Smale problems) too. This problem has two aspects: first – system (global) and second – local scientifically [4, 5].

From mathematical point of view PA is expansion of mathematics on all possible systems of knowledge and science with point of view the simplicity-complexity Mathematics must be no instrument for the resolve pure mathematical problems [3–5, 45]. It must be expert system for old systems of knowledge and science and scientific prognostication system for new systems of knowledge and science.

According to V. Arnold [45] mathematics is précised knowledge. But science is ordered knowledge [3, 4]. PA allow expand the mathematics on all knowledge and it show that we can have universal system of formalization

the knowledge. Roughly speaking this system is constructed analogously to computer: processors of this computers are generalizing constructive elements and informative lattice [14].

Such expansion of mathematics is corresponded to basic thesis of computer science and allow to bond mathematics (précised knowledge) [45], science (ordered knowledge) and other chapters of knowledge in one system.

PA may be represented as system in E. B. de Condillac sense about minimal number of basic principles [46]. Only two criteria (reciprocity and simplicity) allow formalizing all knowledge.

PA may be represented as answer on E. Wigner problem of creation the more universal system science or metascience [3, 4]. He said that necessity in more strong of science integration is caused the reciprocal of mathematics, physics and psychology for natural sciences. But development of computing science allows transiting this problem on all science and knowledge. Therefore, only generalizing computing science as PA may be represented the universal system of foundation of science.

In the polymetric method, the theory of numbers is synthesized with the theory of generalized mathematical transformations, which can be successfully associated with the whole set of operations that are used or will be used in modern computer and computer science.

PA is more general system of synthesis science and knowledge as cybernetic in F. George sense [47]. Therefore, Polymetrical analysis may be represented as generalizing of cybernetics too. [48].

PA may be presented as formalization A. Svidzinskii concept “Culture is self-organization of noosphere” in more general sense [9].

VI. Conclusions

1. Three types of theories of everything are analyzed.
2. The mythological ritual and philosophical systems as theories of everything is carried out and their connection with modern science is shown.
3. The origin and evolution of rational deductive theories are analyzed, starting with J. Bruno and ending with the theories of single fields.
4. The necessity of creation of the universal (system) theory of everything and as its realization as the polymetric analysis are represented

5. The role of Polymetric Analysis in the resolution the system complex problems of modern sciences (foundations of mathematics, S. Beer centurial problems in cybernetics and classification sciences and knowledge) is analyzed.

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