Crisis of Fundamentality → Physics, Forward → Into Metaphysics → The Ontological Basis of Knowledge: Framework, Carcass, Foundation

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Metaphysics is not part of the building science,
but it is similar strong scaffolding, without which it is impossible
to construct a building. It may be even permissible to say:
metaphysics is transformed in physics in the process of development.[1]

E. Schrodinger

The question "What is fundametal?" tells us once again about the deepest crisis of the philosophical foundations of Fundamental Science in the history of its development. The present crisis of foundations is manifested as a comprehensive conceptual crisis, crisis of understanding [2], crisis of interpretation and representation[3], crisis of methodology[4], loss of certainty[5] not only in science but also in the Global Society. Fundamental Science "rested" on the understanding of matter, space, nature of the "laws of nature", fundamental constants, number, time, information, consciousness.

The current crisis of the philosophical basis of Fundamental Science is the sum of crises:

- Ontological crisis
- Epistemological crisis
- Gnoseological crisis
- Axiological crisis

This is the crisis of the fundamentality, the all-encompassing existential crisis of human existence, the cause of which is Fundamental Science.

The question "What is fundametal?" pushes the mind to two other questions → Is Fundamental Science fundamental? → What is the most fundamental in the Universum?

Several visions on "fundamental".

Theoretical physicist Mikhail Katznelson who was awarded the Benedict Spinoza Prize for developing the basic conception and concepts that fundamental science in the field of graphene operates: "Could it be that we have a successful theory that is internally harmonized and that works, which describes the world, but which does not tell us anything about what the world is? Can it be that by science we can not go deep enough? This is the main goal — depth. We are looking for a theory of everything, we are looking for fundamental laws, and we hope that we can find them by studying the world around us. I do not think it works. Here is a fundamental statement: I think our understanding of the world around us is in some sense definitive, it does not depend on a possible future understanding of some deeper levels. In this sense, I do not believe that fundamental physics is fundamental." [6]. Here we see the idea of the monofundamentality of the leader of cognition - physics.

John Horgan in the article "It's the End of Fundamental Physics ... Again": “In addition, what's called "fundamental" depends on the field of science. For a chemist, a theory of (emergent) chemical bonding is as fundamental as the theory of quantum electrodynamics would be to a physics. For an ecologist, a theory of the rise and fall of predator and prey populations is as fundamental as Maxwell's equations are to an electrodynamics expert. Neuroscience seems to be on the cusp of discovering a lot of fundamental principles in its own domains. What's applied to one kind of scientist may well be fundamental to another kind, so

the boundaries between the two are never sharply drawn. … Fundamental or not, it will always be a source of progress and intellectual stimulation. What more could we want?"[7] Here we already see the idea of the polyfundamentality of the hierarchical system of knowledge.

Very important for understanding the "fundamental" in the science of thought Karl Popper, who believed that in the empirical basis of science there is nothing absolute: "Science does not rest on a rock. The impudent building of its theories is erected, so to speak, on the swamp. It is like a house built on stilts. Piles sink into the swamp from top to bottom, but they do not reach any natural base; and if we stop trying to hammer these piles one more layer deeper, then not because we have reached a solid soil. We just stop, making sure that the piles are strong enough to withstand the building, at least for the moment."[8] Popper's other conclusion is extremely important for building a reliable foundation of knowledge and understanding "fundamentality": "I, however, believe that there is at least one truly philosophical problem that any thinking person is interested in. This is the problem of cosmology - the problem of knowing the world, including ourselves (and our knowledge) as part of this world. All science, in my opinion, is cosmology, and for me the value of philosophy is no less than science, it is solely in the contribution that it has made to cosmology."[9].

K.Popper puts forward an important idea for understanding the fundamentality - the idea of "three worlds": 1. The world of physical states, 2. The world of states of consciousness, 3. The world of objective ideological content. Popper explains the content of the last third world and defines it as the world of the products of the human spirit.[10**]** It is necessary to note the importance of the idea of "three worlds" for the further movement of thought to a deeper idea of the triune world as a holistic generating process in which the "knowing subject" is included in the center of this world.

One of the main sources of the crisis in Fundamental Science is the wrong understanding of the essence of the experiment. From a methodological point of view, the experiments lead to the cognition in the direction of phenomenalism. Questions about the essential foundations of knowledge about the true "fundamental" cease to excite scientists and science approved the cult of private problems.

The etymological dictionary defines the word "fundamental" comes from the Latin *fundamentalis* i.e. "underlying", then from *fundāre* "to provide a base or bottom, base", then from *fundus* - "bottom," and the further its roots go back to proto-Indo-European *bhu(n)d* — "bottom". To overcome the crisis of fundamentality means to achieve "ontological bottom" and build its structure.

G. Reichenbach has proved that the emergence of ordered systems in the evolution of nature emanates from its fundamental properties. He concludes: «Explanation means logical derivation from the fundamental properties of the physical world.»"[11]

In the study of nature, we see two levels of fundamentality: ontological and epistemic. **The ontological fundamentality** is knowledge about the most general properties, limit (extremal) values and the essential (noumenal, being) structure of the primordial (generating, basic) level of cognition of nature. The ontological fundamentality of knowledge is an understanding event. Understand means to "grasp" the ontological structure, to "grasp" the "logos" ("the law of laws", "meta-law") in its all-encompassing and ultimate meaning. **The epistemic fundamentality** is knowledge about the general properties, a phenomenal structure and values of the selected level of the knowledge of nature ("laws of nature"), based on the experimental study of phenomena. Epistemic fundamentality there is operationalistic (parametric, pragmatic) fundamentality, an explanation event. Epistemic fundamentality leaves an undisclosed (hidden) logos ("law of laws") and its invariants.

In the process of cognition, fundamental knowledge acts as a link between world outlook knowledge and theoretical knowledge. The fundamental is the potential for constructing the architectonics of cognition. Therefore, fundamental knowledge is distinguished among others not only ontological and epistemological, but also as a value function. In fundamental knowledge, the utmost idealization of the selected of nature is realized, in the concretization of which the subsequent development of knowledge of this natural sphere is expressed. [12] One of the main causes of the medern crisis in Fundamental Science is the domination of epistemic fundamentality and a disparaging attitude toward metaphysics, ontology.

Edmund Husserl notes that the replacement of true being by the world of mathematized theories began with the arithmetization of geometry: "In some ways, this arithmetization of geometry, as it were, leads to the emasculation of its meaning. The actual space-time ideals that initially appear in geometric thinking under the customary title of "pure contemplation" are transformed into pure gestalt numbers, into algebraic entities. In algebraic calculations, the geometric meaning itself recedes into the background and even disappears altogether; only after the end of the account, we remember that the numbers, of course, meant some values... Later this leads to a fully realized methodical shift: a methodical transition from geometry to pure analysis, considered as a special science, and the results achieved in it are applied to geometry." [13] Husserl insisted that the method of science is a departure from the most fundamental discoveries of the ancient speculation with its fundamental distinction of science proper - ἐπιστήμη from art, crafts - τέχνη. "To throw off the clutter of matter", about which Galileo spoke, is not possible. Mathematics is used in physics only as a method of evaluation, and not as a method of precise calculations.[14] The outcome of this process is neither accuracy, nor understanding, and "loss of certainty."[5]

The crisis of the philosophical foundations of Fundamental Science is vividly, deeply and distinctly represented in the Scientific Journal "Metaphysics" edited by the theoretical physicist, Yuri Vladimirov professor of the Moscow State University. [15] In particular, Yuri Vladimirov notes in article "Fundamental Theoretical Physics and Metaphysics": "The main goal of theoretical physicists is to build a physical picture of the world on the basis of a single generalizing category, but they come to this goal from different angles."[16] But this "*generalizing category*" is absent today in fundamental physics. As a result, there is no **generalizing structure** that will give a strong foundation to all knowledge and a new heuristic.

Neo-positivists 1920-1940-ies. tried to free physics from metaphysics, but from the beginning of the 1960s. began to develop postpositivist trend in the philosophy of science: K. Popper, T. Kuhn, I. Lakatos, J. Agassi, M. Vartofsky. They showed a significant role for metaphysics in the development of scientific theories.[17]. A key article of M. Vartofsky is entitled "Metaphysics as a heuristic for science", in which he convincingly demonstrated that metaphysics "historically has been and continues to be a heuristic means for scientific research and theory building." Metaphysics "creates the basic models of scientific understanding. Being a kind of exercise for gaining the skills of self-critical construction of theories, metaphysics not only creates for science its primary models, but - perhaps more importantly - formulates the terms of the conceptual structure of any model as an understanding condition."[18].

One of the main reasons of the crisis science of the XX century - a narrowed understanding of the experiment. In the end, phenomenalism produces the belief that reality is what stands in the experiment. The system as a way to streamline ontologically independent elements is a

Central concept and goal of all integrative efforts. But the systemic approach is not identical with the view of the world as an entity. The whole is that it does not contain the mechanisms of articulation of its parts or elements, where there are no "seams" from their connections. Outcome: deontologization of knowledge, loss of intuition of fundamentality. The problem of its unity inevitably passed into the plan of formal constructions, in which tables and graphs of mutual transitions and functional connections become decisive means of proof. The solution of the problem of the unity of knowledge, "grasping" and understanding of the fundamental sources is associated with a change in the notions of reality. It is necessary to overcome fenomenologizm in the systemic approach that prevails today in modern science.[19].

The foundation of modern physics is split. Two fundamental theories, the general theory of relativity and quantum field theory are not compatible ideologically, logically and mathematically, logically. The program of superstrings and membranes, the mainstream of fundamental physics, claims first of all to solve this problem. The history of physics shows that progress in natural science requires a new level of methodology. The string program opens up new theoretical and mathematical possibilities, but it lacks ontological depth.[20]

In modern fundamental physics, all fundamental physical concepts and categories are subject to critical review. The relevance of ontological problems in modern fundamental physics is growing rapidly due to the growing level of abstraction of theoretical and mediation of empirical knowledge. E. Schrödinger paid serious attention to philosophical aspects. He published about 100 articles on general scientific and philosophical themes. Following Plato, Schrödinger singled out the notion of "Unified" as the most important.[21] The solution of the problems of modern Fundamental Physics requires the creation of a deeper ontology that encompasses all levels of the Universe as a holistic generating process. Unfortunately most of the theories developed do not introduce any new ontology. [22]

The question of the reality and materiality of fundamental physical objects is becoming more acute and complex. This suggests that there is a need to deepen the notion of "matter" in order to enter a new ontology and thereby solve the urgent problems of modern fundamental physics. In modern science, and primarily in modern fundamental physics, the role and significance of interpretation become increasingly important and relevant. This is determined by the growing indirect character of cognition, the ever increasing theoretical character of fundamental research and all cognition. Heisenberg noted: "... for a physicist, the possibility of describing in ordinary language is a criterion of what degree of understanding is achieved in the relevant field of knowledge." [23].

Thus, it can be concluded that the basic physical theories do not have ontological fundamentality. They are not built on a strong ontological basis and are phenomenological theories without ontological justification. The foundation on which they are built is not solid, their ontological structure (ontological basis) is not clarified. The ontological basis must be the same for all fundamental theories for all levels of the Universum existence.

The overcoming of the crisis in the foundations of knowledge, the "crisis of understanding," the "crisis of interpretation and representation," "trouble with physics," and "loss of certainty" is a solution to the ontologization of fundamental science, namely, "grasping" the ultimate fundamental structure as an ontological basis of knowledge: framework , carcass, foundation. An event of "grasping" the structure means understanding.[24] For such a "grasping" it is necessary to synthesize all the paradigms currently represented in Fundamental Physics and cognition in general.

The Most Fundamental in the Universum: The Primordial Generating Structure

What we observe as material bodies and forces
are nothing but shapes and variations in the structure of space. [25]

E. Schrodinger

The problem of the nature understanding is *the problem of ontological justification (basification) of fundamental knowledge*, namely, physics and mathematics *as the utmost deep sign systems*. For more than one hundred years, these two fundamental sign systems have "loss the certainty". In mathematics, the process of "loss of certainty" began with discovery of "non-Euclidean" geometries and lasted about 100 years, when the G. Weyl in 1946, said sadly: "We are now less than ever confident in primary fundamentals of mathematics and logic. We are going through our own "crisis" just like all and everything goes through it in the modern world."[26]

The peak of the crisis – mathematical "counter-revolution" of the late 19th century [27] and the epic of unsuccessful justification of mathematics in the first half of the 20th century. [28]
Now the problem of justification of mathematics for some strange reason is diligently "swept under the rug". It is not even included by the mathematicians in the "millennium problems". In the early 21th century, as the mathematician Yu.A. Neretin notes, "The situation in mathematics and mathematical physics of the last 10-15 years is quickly becoming more sinister... In particular, there is a crisis of the ability (and desire!) of mathematicians to understand each other". [29]

Ludwig Faddeev convinced that "as the physics solved all theoretical problems of chemistry, thereby "having closed" chemistry, and the mathematics will allow to create "theory of everything" and "will close" physics."[30] But how will mathematics be able to "close" physics if mathematics remains science without **ontological justification (substantiation, basification)**?

"The loss of certainty" in mathematics caused "the loss of certainty" in fundamental physics. It was fully reflected by physicists Lee Smolin [31] and Yury Vladimirov.[32]
Galileo Galilei wrote in "The Assayer", "Philosophy [i.e. physics] is written in this grand book — I mean the universe — which stands continually open to our gaze, but it cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics, and its characters are triangles, circles, and other geometrical figures, without which it is humanly impossible to understand a single word of it; without these, one is wandering around in a dark labyrinth". [33]
Almost one hundred years ago philosopher Pavel Florensky drew a conclusion which turned out to be extremely important for understanding of sources of modern crisis of understanding in fundamental science: "The problem of space lies in the center of the worldview in all arising systems of thought and predetermines the development of entire system. And, the more solid any system of thought is the more specific is determination of the space as the kernel of this system. Remember: worldunderstanding - spaceunderstanding." [34] The understanding of space which is the basic ideality of the fundamental science, is "grasping" of its ontological structure.

E. Husserl noted that the substantiation of mathematics consists in clearing of its **basic eidentical structure**.[35] Eidos lies in the basis of mathematical practics and represents the unity of different mathematical facts. But what way eidos is understood by consciousness and what way the connection between the act of catching of an eidos and the concrete mathematical reasoning is established? Here Gusserl's idea about **the intentionality of consciousness**, i.e. its orientation, can be remind. In his "Origin of Geometry" he describes "an eidetical catching" as the act of the science establishment of.[36]

N. Bourbaki has the fundamental idea of "*generating structures*" (**les structures mère**) in mathematics. [37] The problem of the "*generating structure*" construction is also facing

physics. [38] In a broader sense, this eidetical construction is an attempt to solve the problem of the knowledge justification (basification). This is the actualization of Husserl's idea: “Only to the extent, to which in case of idealization, the general content of spatio-temporal sphere is apodictically taken into account, which is invariant in all imaginable variations, *ideal formation* may arise, that will be clear in any future for all generations and in such form will be transferable by the tradition and reproducible in identical intersubjective sense.” [36]
We see here that the fundamental idea of E. Husserl meets the fundamental idea of P. Florensky about space and its understanding.

In ancient times the idea of triunity was the cornerstone of the worldview of our ancestors: The Earth is based on three pillars, three elephants, three turtles. Thanks to triune "basis", the entire depth of being was understood in generalized unique form. In the Middle Ages there was a tradition to use geometrical circle (sphere) for clearing of ratio of three divine hipostases (Gr. hipostasis – essence, basis); this tradition had come from antiquity and the era of early Christianity. R. Guardini in his research "The End of New Time" shown the perception of the World by antique and medieval person as follows: "…both have no common for us view of the infinite space-time continuum. For both the world is a limited entity, having outlines and form - figuratively speaking world is a sphere."[39] The mechanist paradigm of New times is a revolution in basic idealities of the worldview: the gnoseological space - "cube" ("Cartesian box") - forces out gnoseological space - "sphere".

Nowadays different ideas of gnoseological spaces without ontological justification are represented in physics: "curve", "slanting", "fluctuating", "extending" and "toroidal" spaces. [40] Mathematics is responsible for this "gnoseological bacchanalia" in fundamental knowledge. The centenary problem of an ontological justification (basification) of mathematics and knowledge in general, has become extremely sharp. It is connected mainly with understanding of the ontological structure of basic ideality – space.

Thus, the solution of the problem of basification of mathematics (knowledge) and therefore the understanding of world and worldview is the solution of the problem of ontological structure of space and creation of new model of basic ideality ("idea of ideas", "eidos of eidoses") establishing ontological framework, carcass and foundation of knowledge.

Hilbert's sixth problem - "Mathematical Treatment of the Axioms of Physics", presented in the report on the II International congress of mathematicians. He found it possible "to develop all physical constants to mathematical constants" and "to make science similar to geometry from physics science."[41]

S. Cherepanov notes that the problem of the justification (basification) of mathematics is not understood in the conceptual plan and all programs are inadequate. He gives the course of a solution: *to construct the model of regular process which does not dwell and always lead to something new and new*.[42] But we can not agree with approach proposed by S. Cherepanov. Problem requires more fundamental synthetic approach and synthetic method.

Construction of the model of the primordial process of nature as the basic maternal structure of fundamental knowledge ("**La Structure mère**") is conducted on the basis of **one axiom**, **one principle** and one "**material point**" - "point with a vector germ" (E.Cartan). The method - **the ontological construction**. "Ordo geometricus" dialectically extends and goes deep to "Ordo onto-topological", but not as "order of proof", and as "order of construction" of ontological basis of fundamental knowledge any more.

The tradition gives us the generalizing ontological axiom, funding the mindfulness center of religion and knowledge, **the ontological superextreme axiom → "In the Beginning was the Logos** …" / Ἐν ἀρχῇ ἦν ὁ λόγος …". where "Logos" is the "divine eternal law", the "law of laws", the origin of understanding, concept-attractor. From "Logos" the knowledge of being went in two directions → to the Creator and his Creation → Nature, Society, Person.

The basic generalize principle of ontological construction, the "**principle of principles**", the superextreme principle - "**principle of triunity**". The ontological principle of triunity funds all other ontological, gnoseological, methodological and axiological principles of

knowledge: compliances, simplicity, causality, symmetry, anthropic and others.

Method of the ontological construction: Ontology goes to meet mathematics, and mathematics goes to ontology. Mathematics develops into the Constructive ontology, and Ontology transforms to the Ontological mathematics. Each newly entered mathematical symbol receives the deepest ontological interpretation.

Concretizing concepts, statements and mathematical objects which are clearing up the methodology of creation of basic ideality - "idea of ideas":

- "eidos", "matter" (according to Plato: that from which are born all forms), "ontological space", "absolute (limit, extreme) state of matter", "vector of the absolute state", "bivector", "absolute vector of states", " source-drain", "limiting transition", "increment", "form", "structure", "invariant", "topos", "measure" ("qualitative quantity", "form of forms"), "tention → intention", "attention", "attractor", "catching", "attractor of meanings", "way" - "dao", "primordial structure", "primordial tension", "basic symbol-attractor";
- "**material point**", "point with a vector germ" (E. Cartan) as the center of coincidence of "source" and "drain" of the absolute forms (absolute states) of matter existence;
- **the ontological "celestial triangle**" (Plato) composed of **three bivectors** representing "Logos" ("Law of laws") as measure ("qualitative quantity", "form of forms") of any sensual matter- process. **Three bivectors** represent absolute (limit, extreme) forms of matter existence (absolute states): **absolute rest + absolute movement + absolute becoming**; triangle tops is points of coincidence of maximum and minimum of absolute (limit, extreme) states of matter;
- principle of "coincidentia oppositorum / coincidence of opposites", "coincidence of maximum and minimum" (N. Kuzansky);
- **the primordial structure** ("mother structure", "La structure mère"), that generates all other structures (material and ideal), including all mathematical structures ("les structures mère" N.Bourbaki);
- "Cogito, ergo sum" (R. Descartes) as statement of identity of being and thought, utmost dialectic synthesis of rational and irrational, linear and nonlinear, continuous and discrete, final and infinite, "cogito" and "madness" (absence "I"), qualitative quantum of thinking, increment knowledge;

The symbol ("symbol of symbols") built on the basis of ontological construction – three aligned non-overlapping invariants of ontological "celestial triangle" representing **three absolute states of matter and their ontological ways**. It is the symbol of required "La structure mère" - primordial (absolute, ontological) generating structure, synthetic proto-eidos of ontological basis of the Universum as process of generation of meanings and structures, generation of absolute complexity, the structure of eternally existence ("time prior to the beginning of times", "eternity time"). “La Structure mère” symbol is the “9-top star”, “star of justice”.

The ontological (absolute) space is the existential-extremum of **the absolute forms of existence of matter (absolute, ontological states)**: **linear state (absolute Continuum)** + **vortex state (absolute vortex, Discretuum)** + **wave state (absolute wave, DisContinuum) = the triune (absolute) space of eternal generation of new structures and meanings, triune (absolute) field.** Its geometrical representants: "**cube**" + "**sphere**" + "**cylinder**" **constitute the absolute (natural) system of coordinates of the Universum.** The triune (absolute) space of the pillar process of generation ("time before the beginning of times" - *cyclic time*) has **three ontological measures and nine gnoseological measurements**: three "linear" + three "vortex" + three "wave". Nature speaks to us, and we to Nature in a linear-wave-vortex language.

The primordial generating (maternal) structure leads thinking to a super concept - **ontological (structural, cosmic) memory** - the "soul of matter", measure of the Universum being as the holistic generating process, qualitative quantity of the absolute (limit, extreme) forms of the matter existence (absolute states). Ontological (structural, cosmic) memory is something that generates, keeps, develops, transforms, directs everything, i.e. funds causal, semantic and eidetic definiteness of the Universum being (Greek "entelecheia" + nous"). The

birth of new structure, actual essence, is the birth of "the arrow of time" representing "vertical" (hierarchy) of the Universum being (hierarchical "arrow of time" →past → present → future→).

Thus, the method of ontological construction of the primordial generating structure of the Universum as holistic process brings to uniform ontological (onto- gnoseo- axiological) basis of knowledge: **the ontological framework** (the absolute forms of existence of matter), represented in the "logos", general logic and "laws of nature", **the ontological carcass** (the ontological, absolute system of coordinates of Nature) and **the ontological core - foundation** of being and knowledge - **Ontological (structural, cosmic) memory**.

The primordial (absolute) generating structure is the most fundamental in the Universum, which we observe. John Archibald Wheeler was absolutely right:

Philosophy is too important to be left to the philosophers. [43]

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