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**RESEARCH OF DEVELOPMENT TENDENCIES  
OF MODERN UKRAINIAN SOCIETY  
(HISTORICAL - PHILOSOPHICAL AND  
EDUCATIONAL ASPECTS)**

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**Bogatchuk S., Mazylo I., Pikovska T., Makarov Z., Bielkin I.,  
Mangora V., Mangora T.**

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TABLE OF CONTENTS

1.	<b>Bogatchuk S.<sup>1</sup></b>  <b>DEVELOPMENT OF SCIENCE AND EDUCATION IN THE RAILWAY INDUSTRY OF UKRAINE IN THE LATE NINETEENTH CENTURY - IN THE EARLY TWENTIETH CENTURY</b>  <sup>1</sup> Candidate of Historical Sciences, Associate Professor Department History of Ukraine and Philosophy, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	9
1.1	<b>WORLD EXPERIENCE IN THE FORMATION OF RAILWAY NETWORKS</b>	12
1.2	<b>SCIENTIFIC AND TECHNICAL SUPPORT OF THE UKRAINIAN RAILWAY NETWORK</b>	16
1.3	<b>TRAINING FOR UKRAINIAN RAILWAYS</b>	24
1.4	<b>SCHOOLS FOR CHILDREN OF RAILWAY WORKERS</b>	37
2.	<b>Mazylo I.<sup>1</sup></b>  <b>RECONSTRUCTION OF RAILWAY TRANSPORT IN UKRAINE (1943-1948)</b>  <sup>1</sup> Candidate of Historical Sciences, Associate Professor, Department History of Ukraine and Philosophy, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	53
3.	<b>Pikovska T.<sup>1</sup></b>  <b>POLITICAL PROGRAMS OF UKRAINIAN, HUNGARIAN, POLISH AND JEWISH PARTIES IN THE FIRST CZECHOSLOVAK REPUBLIC (1918-1938)</b>  <sup>1</sup> Candidate of Historical Sciences, Associate Professor Department of Law, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	70
3.1	<b>POLITICAL SYSTEM OF THE FIRST CZECHOSLOVAK SOCIALIST REPUBLIC (1918-1938)</b>	70
3.2	<b>THE NATIONAL QUESTION IN THE PROGRAMS OF RUTHENIAN POLITICAL PARTIES IN THE FIRST CZECHOSLOVAKIA</b>	77
3.3	<b>THE NATIONAL QUESTION IN THE PROGRAMS OF HUNGARIAN POLITICAL PARTIES IN THE FIRST CZECHOSLOVAKIA</b>	96
3.4	<b>NATIONAL PROGRAMS OF POLISH POLITICAL PARTIES IN THE FIRST CZECHOSLOVAK REPUBLIC</b>	100
3.5	<b>THE NATIONAL QUESTION IN THE PROGRAMS OF THE JEWISH POLITICAL PARTIES OF INTERWAR CZECHOSLOVAKIA</b>	104

4.	<b>Makarov Z.<sup>1</sup></b>  <b>SCIENTIFIC RATIONALITY AND DETERMINISM: OVERCOMING THE CLASSICS</b>  <sup>1</sup> PhD of Philosophy, Senior Lecturer at Department History of Ukraine and Philosophy, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	109
4.1	<b>INTRODUCTION</b>	109
4.2	<b>ESTABLISHING A CONNECTION BETWEEN CLASSICAL RATIONALITY AND DETERMINISM</b>	113
4.3	<b>TESTING RATIONALITY BY FREEDOM: DETERMINISM IN THE SUBJECT-OBJECT POSITION</b>	116
4.4	<b>DIFFERENTIATION OF CLASSICAL RATIONALITY IN GERMAN IDEALISM</b>	121
4.5	<b>PHILOSOPHICAL PREMISES OF THE PROBABILISTIC STYLE OF THINKING: LEVELS OF DETERMINATION</b>	124
4.6	<b>NON-CLASSICAL SUBJECT, OBJECT AND LANGUAGE OF SCIENTIFIC DESCRIPTION</b>	129
4.7	<b>NON-CLASSICAL CRISIS OF THE CRITERIA APPROACH TO SCIENTIFIC RATIONALITY</b>	134
4.8	<b>TESTS OF SCIENTIFIC RATIONALITY BY PROBABILISTIC TENDENCIES OF POST-LAPLACE DETERMINISM</b>	141
4.9	<b>FORMATION OF POST-NONCLASSICAL RATIONALITY: SYNTHESIS OF NATURAL SCIENCE AND HUMANITIES</b>	145
4.10	<b>POSTMODERN CRITIQUE OF CLASSICAL SCIENTIFIC RATIONALITY</b>	150
4.11	<b>RESOURCE OF SELF-REPRESENTATION IN MODERN SCIENTIFIC RATIONALITY</b>	155
4.12	<b>CONCLUSIONS</b>	157
5.	<b>Bielkin I.<sup>1</sup></b>  <b>PEDAGOGICAL ALGORITHM OF EFFECTIVE USE OF BUSINESS GAMES IN PROFESSIONAL TRAINING OF MANAGERS IN HIGHER EDUCATION INSTITUTIONS</b>  <sup>1</sup> Candidate of Pedagogical Sciences, Doctor of Philosophy, Senior Lecturer at Department History of Ukraine and Philosophy, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	163
5.1	<b>MODERNIZATION OF THE CONTENT OF TRAINING OF FUTURE MANAGERS IN HIGHER EDUCATION INSTITUTIONS, TAKING INTO ACCOUNT THE CURRENT NEEDS OF PROFESSIONAL TRAINING OF MODERN PROFESSIONALS USING GAMING TECHNOLOGIES</b>	163
5.2	<b>IMPLEMENTATION OF COMMUNICATION COMFORT OF STUDENTS IN VOCATIONAL TRAINING IN HIGHER EDUCATION INSTITUTIONS IN THE GAME ENVIRONMENT</b>	171

RESEARCH OF DEVELOPMENT TENDENCIES OF MODERN UKRAINIAN SOCIETY  
(HISTORICAL - PHILOSOPHICAL AND EDUCATIONAL ASPECTS)

5.3	APPLICATION OF BUSINESS GAMES AS A METHOD OF INTERACTIVE LEARNING OF STUDENTS IN REAL INDUSTRIAL COMMUNICATION	181
6.	Mangora V. <sup>1</sup>  PECULIARITIES OF INFORMATION AND LEGAL SUPPORT OF LEGAL EDUCATION AT THE PRESENT STAGE IN UKRAINE  <sup>1</sup> Candidate of Pedagogic Sciences, Associate Professor, Department History of Ukraine and Philosophy, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	193
6.1	INFORMATION AND LEGAL REGULATION OF LEGAL EDUCATION	193
6.2	INFORMATION COMPETENCE OF FUTURE LAWYERS	206
6.3	FEATURES OF DISTANCE LEGAL EDUCATION IN UKRAINE	215
7.	Mangora T. <sup>1</sup>  THE WAY OF LIFE AND THE FORMATION OF A. YAKOVLIV AS A LAWYER AND HISTORIAN OF LAW  <sup>1</sup> Candidate of Law Sciences, Associate Professor Department of Law, Vinnytsia National Agrarian University, Vinnytsia, Ukraine	224
7.1	FORMATION OF LEGAL VIEWS OF A. YAKOVLIV	224
7.2	STATE AND POLITICAL ACTIVITIES OF A. YAKOVLIV DURING THE NATIONAL LIBERATION STRUGGLE OF 1917-1921	228
	REFERENCES	266

#### **4. Scientific rationality and determinism: overcoming the classics**

##### **4.1 Introduction**

Recently, academic communication has invariably revealed the relevance and polemical nature of actually used and conceptually explicated *rationality*. Actually, the problem of rationality is fed by interdisciplinary relativization: «it is known that the essence of the problem of rationality largely lies in the fact that we judge the mind by cognition (and activity). And the tools (rationality) of this cognition are often «fragmented» both by types of cognition, and within these types» [139, p. 194].

However, for all the «immensity» of its principles, concepts and criteria (classifications by P.P. Gaidenko, E.Yu. Leontieva, V.S. Shvyrev, G. Lenk, H. Putnam, K. Huebner, M. Lindgren), which are methodological, axiological, historical and scientific, and other discussions, this category ultimately refers to the divergence of possible types of relationship between a human (from personal to generic) and the world (from transcendent to technospheric). From this point of view, philosophical reflection in science is caused both by the discovery of the most complex objects (like stochastic phenomena) that discredit the classical paradigm in mainstream science, and by the general cultural tendency to revise the *traditional* forms of intellectual worldview (like Eurocentrism) – «the crisis of the foundations of reason».

Many historical and scientific studies show that classical rationality was generated by the secularization of the doctrine of natural revelation as a method and problem of mutual mediation of the structure of the transcendental subject (Intention) *and* the order of its creations (Nature) (works by N.S. Avtonomova, P.P. Gaidenko, V.N. Porus, V.S. Shvyrev and others). Attempts to close the hermeneutic circle between these levels of reflection have given rise to a number of reductionist strategies, the most popular of which, under the auspices of P.S. Laplace formed the attitude of «mind» and its projections on «natural determination». The subsequent overcoming of the hegemony of Laplacian determinism exposed a discouraging multitude of these strategies with their meanings of rationality («closed» and «open», «logical», «empirical»,

«normative», «content-scientific»...). ««...» Formative substratum of rationality, whether it be mind, a special scientific method, or an activity that fully meets its purpose and context, turns out to be an inadequate abstraction, and when you try to make it more concrete and meaningful, the opposition between rational and irrational disappears» [140, p. 128].

Among such abstractions of rationality, the *non-positivist* one does not lose its influence, which reduces the entire range of problems under consideration to the logical-linguistic criteria for organizing the theoretical and empirical, taken as the well-known relation of means and ends by M. Weber [141]. Despite the fact that in the course of the evolution of neopositivism, the simple purification of the empirical basis from non-scientific factors has long grown into the development of the explanatory function of the theory and non-empirical methods of hypothesizing («discovery context»), the derivatives of this strategy remain within a purely epistemological framework. For example, H. Putnam presents rationality as an effective axiomatic of the instrumental representation of reality in terms of simplicity, completeness, coherence [142, p. 103-126], ignoring non-discursive regulatives of empirical meanings as causally unreliable. On the other hand, in the modern paradigm of political emancipation and methodological proliferation, postmodernists tend to deprive explicit apodictic criteria of rationality of empirical significance, assigning them, at best, a probabilistic meaning-orienting role in the spirit of the transcendental ideas of Kant's «practical mind».

Thus, the analysis of the rationality of post-Laplacian determinism reflects the relevance of the reflexive-worldview testing of the particular formal-logical ideal of the scientific mind by the *integrity* of the conditions of its existence, in which the limits of demarcation are steadily expanding, including today, in addition to subject-representative socio-cultural and humanitarian functions of science. In particular, complex self-organizing systems studied in the framework of the theory of dynamic systems, catastrophe theory, synergetics, etc., become exemplary at the post-nonclassical stage of development, raising to the status of a scientific paradigm ideas about levels of complexity, emergent development, non-linear effect, ordered chaos,



ambiguity of regulation, human-dimensional interpretation – everything that problematizes the «natural determination» and the normative rationality of its representation (works by V.V. Afanasyeva, T.I. Bugrova, B.Yu. Dmitriev, E.V. Koveshnikov, I.K. Kudryavtsev, S.A. Lebedev).

In the philosophical and methodological retrospective of historical contexts and logical levels, ideas about classical scientific rationality are subject to several *leitmotifs*, the denial of which determines the content of the current sociological, postpositivist and postmodern criticism of science (the works of T.V. Adorno and M. Horkheimer, Z. Bauman, P. Feyerabend, M. Foucault, P. Kozłowski). Most often, the classical scientific tradition is exposed in the administrative influence of the «*Enlightenment project*», reinforced in equal measure by the order of political structures and the scientific monopoly on truth.

In it, the correct methodical organization of thinking itself seemed to be the highest form of power, in which a person would not only go over the creative abilities of the Absolute to satisfy and develop his needs, but would also gain guarantees of their freedom. «“The death of God” was accompanied by the emergence of a “new” population of people who had lost the ability of mystical union with God, had contempt for everything spontaneously direct, were afraid of hoaxes from the spiritual side, and were enthusiastic about any rational construction» [143, p. 175].

An example of rational tricks for an enlightened civilization was mathematics, which was the first to provide meaningful *theories*, from the elements of which, as from «atoms», any complex knowledge can be formally (uniquely) derived. One or another of their concepts used in a reflexive act is traditionally referred to as «prerequisite knowledge» (*principium ratio*).

Thus, in the Enlightenment project, the cognitive potential of higher religious forms is directed to the practical channel of human freedom – mastering the environment of one’s own existence through the elimination of those elements of the social sphere and material nature that cannot be fully articulated, do not fit into the linear functional nomology of dependent and independent variables and in a scientific perspective, they are qualified as irrational. «The consequence of this was an excessive

trust in any rationality, its deification and, ultimately, doubt that this deification is legitimate, awareness of the limitations of rationality and, as a result, the search for ways to overcome this limitation» [144, p. 198].

The analysis of the specific mechanisms of such *problematization* of the mind, initiated by the New European limitation of its universality within the framework of individual human consciousness with a finite set of cognitive tools, closes on the concepts of the *subject* and *representation*, the conditions for the possibility of which were provided by the enlightening ideal of self-determination, embodied in Laplacian determinism. At the same time, the educational course towards the scientization of rationality has planted a virus of innovation among its criteria, which requires expansive actions from the mind. Hence the permanent *problem* of the contradiction between theory and method, form and content, goal and means, which was reduced by classical idealizations of reality, non-classical instrumentalization of the irrational, and, more recently, by the hypostasis of the stochastic and evolutionary moment of post-Laplace (in) determinism. Today, we often even talk about the «negation of the negation», that is, the abolition of the following classical reductions:

- of the separation of words and things in the representation of reality, which made it possible to conserve the relationship of sign and meaning (cultural value and moral purpose) in deductive conclusions;

- of the transcendence of a heterogeneous individual who followed contextual prescriptions into a cognitive Subject who obeys a priori norms;

- of the pressing of the potential structure of being in the actual scales of the quantified law.

A well-known compromise between the inclinations of scientists to this or that methodological reduction was the rejection of the philosophical introspection of the universal mental structure of the *subject* in favor of analyzing the results of his cognitive activity in the field of real object-practical, social-communicative, sign-symbolic, psychogenetic relations in order to objectify him relevant standards («discourses»). However, the proclamation of a certain probabilist methodology of the communicative scientific community, which masters some complex stochastic reality,

at the modern «turn of development» of scientific self-consciousness, is not always constructive.

In our opinion, this *problem* requires some semblance of empirical justification in the historical reconstruction of the conditions for differentiation of discursive practices and methodological syncretism, especially since the modern idea of the subject of scientific knowledge and its cognitive capabilities in the face of representation is a stage in the long-term emancipation of European thought through the «taming» of the divine *infinity* in pantheism, humanism, enlightenment progressivism and science.

At the same time, it seems justified to focus on the ways of scientific representation of reality (as an operational hypostasis of thinking styles) that are transparent to scientific rationality and determinism, solving the *problems* of methodological development and rational assessment of the demarcation project of non-classics and post-non-classical disciplinary interaction of natural science and socio-humanitarian phenomena and regulatives. The initial dualism of rational reflection, which, in the pursuit of an «intentional» result, discovered its substantive palliative – the actual process of cognitive activity, here receives the ultimate revelation in the dilemma of normative analytical goal-rationality and prescriptive humanistic goal-setting.

An analysis of the methodological «puzzles» of modern science demonstrates that their solution is based on a rational *revision* of the levels of chance and determinism dictated by the probabilistic revolution in natural science. The projection of this historical-scientific genealogy of levels onto the periodization of scientific rationality, often used to comprehend scientific revolutions, opens up the prospect of positively establishing the problematic status of post-non-classical science rationality and outlining the range of its (in)deterministic modifications.

#### **4.2 Establishing a connection between classical rationality and determinism**

The main leitmotif of European rationality, laid down in antiquity, was the appeal of human to the eternity of logos in an effort to overcome the transient random features

of chaotic non-existence inherent in natural elements or subjective arbitrariness. We can find the first evidence in the victorious speech of Pericles, when he, proud of the traditions of the fathers, asserts: «...» by the fact that they raised our state to its present greatness, they owe more to their wisdom than to blind happiness, and more to their moral stamina than to material strength» [145, p. 64]. And after 4 centuries, Virgil will already complain: «...» nothing can ever be adequately expressed, reproduced in its anonymous being, no one will ever be able to convey the babble of the moment being born, that is, we, who were born from chaos, will never be able to come into contact with it, as soon as we look, and order is born under our gaze and form...» [146, p. 441].

As F. Nietzsche summed up about European science, «...» it arose from the aversion of the intellect to chaos» [147, p. 283]. The manifestation of this attitude in various contexts can be traced from the ancient Greek «Noos» and «Logos», which brought order to the original «set», to modern criticism of postmodernity as a mosaic and irrational worldview.

Even during the development of the first picture of the cosmogonic process, designed to naturalize ideas about world harmony, the classical concept of *atomism* was also repelled from the ancient mythology of «necessity» (*causality*) to demonstrate the qualitative certainties of the cosmos, and randomness as pre-cosmic disorder or post-cosmic deviation from order. On one level, she opposed the mythological expediency of personalized interventions, proclaiming internal self-sufficient laws, which were supposed to be objectively learned through the «immediate causes» of mechanical shocks. However, on the other hand, it was concretized in physical accidents to ..., beyond ..., or between ... laws, if you try to reduce these «causes» to the «ultimate foundations» of the hidden nature of things, in which the causal schemes of the qualitative formation of things converge and the speculative explanation of the «first causes» [148].

The search for the Modern era, together with atomism, somewhat repeats the path «from myth to logos», however, they connect the newly liberated determinism with *subjective rationality*. The latter seems to be a cognitive reflection of the quasi-creator,

restoring the original Intention through the methodical questioning of creations based on the law originally established by him [149, p. 303; 150, p. 85-86].

In the deistic desire to close this reflection, its teleological intention was eliminated and the continuity of its cogital space was affirmed, which, in relation to «creations», contributed to the absolutization of the first Democritian level in the face of simple dynamic patterns: all studied properties and connections were considered as «proximate» causes – regardless of their nature, without logical gradation as equally necessary and differing only in intensity. Being consonant with the mechanical task of «completeness of description», it opened up the prospect of direct coordination of the causal relationships of individual atoms with the dynamics of the «great natural laws» of an isolated system as a whole. «It is enough to integrate the system of differential equations that describe the movement of all bodies and particles without exception that make up the Universe in order to obtain an exhaustive knowledge of what is, what was and what will be. Any accident, according to this program, is only the result of our ignorance» [151, p. 254].

Thus, the original thesis «mind thinks being» became a «Procrustean bed» for both sides of the subject-object questioning: the mechanical rationalization of physical theory *and* experimental control of its referent became the tools of the notorious double Laplacian elimination – the «hypothesis» about the divine Creator of the world system as an inexhaustible source external interventions and «chance» as evidence of the internal freedom of Nature. «In fact, we are talking about the rational «transubstantiation» of the core of mythical reality, about rationalization, in the process of which the authentic mythical content of the main provisions of the Christian dogma is leveled. At the same time, the ensemble of ontological axioms itself, which acts as the metaphysical foundation of a new reality (Modern), outside the myth remains a completely arbitrary set of «faith», which could neither be formed randomly, nor be «opened» as a result of purposeful actions» [152, p. 143].

In its ultimate expression, which eliminates the distinction between individual consciousness and reality as a common denominator of means of self-preservation, such a strategy is often viewed as a scheme for hypostasizing power. According to the

authors of the «Dialectic of Enlightenment», its basis is the procedure of mutual generalization of both sides of the questioning, turning off the need for reflection – the individual in the general, the sensual in the abstract-theoretical. Perceiving a thing as a case of one kind or another, «objectifying thinking, just like sick thinking, contains in itself the arbitrariness of the thing itself, completely alien to the subjective goal, it gives oblivion to the thing itself and precisely in this way inflicts on it the violence that is done on her in practice» [153, p. 240].

#### **4.3 Testing Rationality by Freedom: Determinism in the Subject-Object Position**

The revival of atomism and its adaptation to the needs of the analytical methodology of the new natural science contributed to the truncation of the heterogeneous structure of determination and relations between the nature of God and man of the traditional worldview. After the *merger* along this path of the causal schemes of atomism and Aristotelianism, which led to the abolition of the qualitative limitations of nature, experimental Newtonianism could be combined with the idea of a «complete analysis» of rationalism.

Using the theological lineage of «natural revelation», the successes of the new scientific methodology launched the moral reflex of its ultimate extrapolation to the status of «metaphysical philosophy». «In the metaphysical state, which in fact is only a general modification of the theological, supernatural factors are replaced by abstract forces, real entities (personified abstractions), inextricably linked with various things, and capable of themselves producing all observable phenomena, the explanation of which then consists only in search of an appropriate entity» [154, p. 58].

Being legal heirs of the ideas of the divine mind, entities have the properties of substantiality and mutual consistency: on the one hand, they are self-sufficient (they necessarily contain an infinite number of predicates in the concept of the corresponding subject and do not serve as anyone's predicate), and on the other hand, their implementation is actually limited by the expedient structure of universal laws of a general order (Intention).

Thus, in the classics, the Christian mystical *model* of consciousness was continued as a transparent point of pure subjectivity, striving to embrace the Universe in a single formula of all movements and thereby acquire self-identity. Thanks to this model, the liberation of nature from spatio-temporal circumstances, coinciding with the depersonalization of the ability to cognize it, closed the scientific forms to an explanatory procedure relatively independent of empiricism, which, following the model of universal gravitation, is completely reduced to the logic of the *implementation* of the objective essence [155, p. 79].

In the ontological aspect («horizontally»), such a realization occurs in accordance with the principle of causality, and in the epistemological aspect («vertically»), in accordance with the analytical method, the principles of deductive proof and linguistic tautology. At one time, such a simple symmetry of cause-and-effect and send-and-inference relations gave the Thomist doctrine of the Ordo the coordinates for a clear comparison of the «free» initiatives of the human subject and their moral assessment by the divine Subject. Since this variant of theodicy excluded theistic occasionalist guardianship, a human was encouraged or punished indirectly – through an instructive (non)violation of the Ordo. The mastery of the latter, as the mutual distancing of morality and reason, becomes an end in itself, so that justification could be replaced by explanation. ««...» In Holy Scripture, things are sometimes said in our interests that are literally different from absolute truth, while nature, on the contrary, is inexorable and unchanging and never goes beyond the boundaries of its laws, as if taking care that the springs and methods of its actions are understandable to people«...»» [156, p. 217]. Thus, «science brought the identification of the two concepts Ratio and Ordo – «reason» and «order» in the time of Newton and Leibniz were considered as synonyms» [157, p. 152].

In this vein, the logical foundations of thinking and the objective laws of nature are identified, which has found its expression in the principle of *mentalism* (the true order of natural events must initially fit into formal logical schemes), and with it in the figure of the «almighty mind» P.S. Laplace. «A mind that knew for any given moment all the forces that animate nature, and the relative position of all its component parts,

if in addition it turned out to be extensive enough to subject these data to analysis, would embrace in one formula the movements of the greatest bodies of the Universe on a par with movements of the lightest atoms: there would be nothing left that would not be certain, and the future, as well as the past, would appear before his eyes» [158, p. 8-9].

In addition, based on the identity (symmetry) of logical and ontological determinations, the principle of mentalism was balanced by *metaphysical realism*, which represented an object as a more or less isolated bunch of interacting *forces* expressing its inner essence and expressed in logically correct concepts, and therefore subjected to unambiguous analysis, measurement, and combination. As a result, a classical subject-object *opposition* was formed, according to which the active transforming ability of the subject, which was provided by the presence of an internal moral and spiritual plan, singled out and opposed it to the object and, in general, to the rest of nature. But the main thing is that the self-reflection of this internal plan revealed to the subject the infinite transcendent beginning *adequato ad intellectum divinum* with its guarantees of objective and reliable cognition, which were expressed in the fundamental foundations of the knowledge system, constituted the universal structure of their application and set the vector of constructive expedient transformation of the object.

It is characteristic that the scientific disciplines that claim to have a universal coverage of possible experience – «natural philosophy», «natural history», «general grammar» – justify it with a universal structure, as a rule, in the form of a linear order: *natura non facit saltus*. Thus legitimized experience acquires its rationality as a measure of truth in *certainty*, while faith, through the supramental truths of revelation, brings harmonic *integrity* to rational knowledge.

Thus, despite the apparent triumph of the self-sufficiency of the human mind, ««...» the scientific worldview at the time of its formation opposed itself not to a religious view of the world, but to ideas about the world as chaos, a set of random events that are completely incomprehensible to humans. The scientific view of the world not only did not deny the religious one, but, on the contrary, it was based on the



position that the world exists and develops only thanks to Divine control» [159, p. 79]. In confirmation of such a genealogy is the opinion of the emblemator of hard determinism that the human spirit will always remain infinitely far from the ideal of the «almighty mind», in connection with which the development of an analytical *theory of probability* is required.

At the same time, the subsequent methodology of rationality unfolds precisely in this space between the «almighty mind» and the human spirit, where the former legitimizes a particular cognitive goal as *universal* and therefore value-neutral, and the latter represents the means of achieving it based on the dogmatic symmetry of the natural order and subjective-cognitive operations. Due to this, the initially ethical concept of reasonableness [145, p. 180] is extrapolated by M. Weber to goal rationality (*Zweckrationalitaet*) as a rational version of the reformation of faith [160, p. 192-193], and the particular scientific version of determinism turns into «*Laplacian determinism*». The linear-functional dependence of the latter becomes a rational model of both truthful comprehension of reality and social progress. «Starting from the Enlightenment, the concepts of rationality and scientificity were almost identified, since there was no doubt that the rational beginning is most fully realized in science, primarily in natural science. In a crystallized form, this position manifested itself in logical positivism, which identified the unscientific and meaningless» [161, p. 24].

Enlightenment ideology justified its intuition of naturalization and universalization with the help of a *total*, «encyclopedic» rational faculty. In the historical retrospective or perspective, this criterion of systemic rationalization meant that the previously privileged methodology would hierarchically structure the human life world, so that all certainties were opposed, and opposites (one / many, good / arbitrariness, necessary / accidental, rational / irrational, etc.) were positioned as positive and negative values. During this period of popularization of the program of mathematical natural science and the epistemology of rationalism, their meaningful opposition to the empirical (sensual) is affirmed, which ultimately leads to the disciplinary specialization of sciences (the program of J. Buffon).

In addition, in contrast to the sensual, the rational for the enlighteners acquires the

meaning of metaphysical freedom – from the final bodily, experimental, traditional-cultural nature. «In the metaphysically natural and therefore unique world, the historicity of human existence turns out to be something, in principle, secondary. History is thrown to the periphery and then comprehended from a certain metaphysical center that removes it, the certainty of culture is weathered and turns into a random, circumstance-conditioned limited form of a common and unified human “nature”» [162, p. 181].

In this regard, a rational being, being abstracted from the sequence of external causes reflected in sensory perception, is able to itself begin causal series, to set intelligible goals: ««...» reason creates for itself the idea of spontaneity, capable of spontaneously starting to act without another preceding cause, which in turn would determine it to act according to the law of causation» [163, p. 478].

At the same time, his reason, oriented towards the «second nature», is doomed to carry the features of this environment of existence, and they will definitely reveal an experienced admixture of knowledge of the «first nature», expressing someone’s will. M. Montaigne noted the first part of this expansive policy of cognitive rationality: «divine truth is revealed to us more with the help of our ignorance than our knowledge. There is nothing surprising in the fact that we are not able to comprehend this supernatural and heavenly knowledge with ours earthly and natural means; therefore, let us treat it with humility and submission, for it is said in Scripture: “I will destroy the wisdom of the wise and I will reject the understanding of the reasonable”» [164, p. 198].

Now we are not talking about the absolute Will, with which the subjective hermeneutics of the Middle Ages conformed: the absolute Will is replaced by a transcendent ontology, while this-worldly ontology is reduced to a mechanical object. Therefore, the issue of freedom is resolved in the epistemological plane: the private-volitional component of the reason can be prevented by the mathematical standardization of any random individual knowledge into a universal necessary theory. Such a theory protects the reason, freed from spontaneous necessities, and from the randomness of particular arbitrariness, incompatible with the idea of cumulative

progress. Thus the individual reason and will become for the German idealists subordinate and extreme expressions of something more general – culture.

#### **4.4 Differentiation of classical rationality in German idealism**

In the light of the analytical reductions of mechanistic natural science, the «free will» of theology symbolized the violation of the prevailing methodological principle «hypotheses non fingo» and called into question the scientific viability of the humanities. «In the Book of Nature, written, according to Galileo, in the language of mathematics, the corresponding chapters on man were to be read in the same language. But the language of mathematical natural science turned out to be powerless when it was resorted to in order to express human spirituality, the ability to think and learn «with mind and heart». Human «existentiality» fell out of the scientific picture of the world» [165, p. 19].

Thanks to I. Kant at the end of the XVIII century. this defect was transformed into the dignity of «practical reason» to orient the subject to go beyond the limits of natural determination and objective being in general, in order to *comprehend the diversity of goals* and requirements for scientific will from the infinite height of divine values. «The highest task of science is “to penetrate into the very depths of nature in accordance with all possible principles of unity, of which the main thing is the unity of goals” <...> the mind builds up to the highest unity – the unity of goals – that which the reason is able to bring only under the unity of the cause – the natural regularity, as it is seen by the mathematical natural science of modern times <...> those regularity that the reason establishes, revealing the causal connection of phenomena, turn out to be a *system of means* for the realization of goals – not the subjective goals of a human or humanity, but objective expediency <...>» [166, p. 22-23].

The recognition of Kant's apriorism contributed to the distancing of the order of reason and the order of being, the diversification of «philosophical» and «scientific» rationality and the subordination of philosophy and science. Proclaiming this relationship at different levels (mind – reason, totality – predicate, noumenon –

phenomenon, etc.), I. Kant, however, uses it only in the most topical areas – where the scientific will by itself comes so far to not enough general and necessary knowledge. Thus, we are talking about reflection on scientific theories – their definition, purpose, construction, structure and epistemological status. In the *perspective* of overcoming accidental in them, a characteristic Kantian apodicticity of knowledge should arise on the basis of «attributing to things only what is necessary follows from what is stated in a priori forms», which for the time being were specified by scientists only in Euclidean mathematics and Newtonian mechanics, which for I. Kant are the paradigm of scientific rationality. There, constitutive scientific reason and regulative philosophical mind practically coincide, compensating for the bodily sinfulness of natural determinism and «vague» forms of its cognition not with semi-transcendental «values», but with refined conventions and idealizations.

«For Kant, everything a priori is necessarily “pure,” that is, it is not characterized by any sensory and material data, by anything random, psychological or physiological, and even more so by nothing social, always containing, according to Kant, this or that element of chance. “Mind” in Kant is necessarily “pure”, be it practical, theoretical or aesthetic» [167, p. 98].

Despite all the extremes of the projects of systematization of the Kantian heritage, the German classics as a whole implement the declaration of the hegemony of philosophy in those aspects of cognition that go beyond the limits of intrascientific goal-oriented rationalization. Now we are talking about internal / external sources of genesis, subjective / objective causes of change, inexperienced interpretation of theoretical concepts, etc. Thus, under the influence of the interdisciplinary achievements of phenomenological natural science («animal» electricity, electrolysis, electromagnetism, oxygen combustion, cellular theory), quality speculative generalizations and extrapolations of «Wissenschaftslehre», «speculative physics», «natural philosophy», «the doctrine of principles» were formed, which actualized the *metaphysics* of telos as a divine Intention, immanent in Nature itself.

Its justification of objective *expediencies*, taken not as Newtonian «hypotheses» or Kantian «values», but as natural philosophical «principles», transferred the hitherto

epistemologically immature «organic» description of «natural history» to the status of a universal dialectic. It consists in the enrichment and relative subordination of natural mechanical *causality* (*causa efficiens*) to the infinite fullness of the spiritual noumenal (*causa finalis*), which, in contrast to the mathematical form of «beginnings», preserves the negative epistemological characteristics of the transcendent (subjective, free) already for itself. «“Speculative physics” should not investigate individual natural objects or subject areas, it deals with the principles according to which nature creates all its forms. Since the forms of nature originate in the Absolute, whose systematic knowledge of itself precedes nature, human knowledge of these forms (or, what is the same, of this knowledge of the Absolute) must precede that knowledge that can be obtained in experience. This speculative, a priori construction of nature precedes empirical science and determines it» [165, p. 31]. Hence the reunion of reason with intuition, the rehabilitation of chance as an objective imbalance in the course of the *actual* (meaningful) realization of the goal, as well as the reduction of the mechanical and mathematical model of determination to the role of an empirical, final, external one.

For example, I.V. Goethe in this strategy, reproduces the Galilean way of mastering randomness by compiling a «continuous» (bounding on conditions, causes and consequences) generic nomenclature of «cases», with the difference that idealization procedures are directed in the spirit of «practical mind» at the synthetic unity of the phenomenon, and their results have a qualitative moral and aesthetic dimension. Obviously, due to such a combination of positive science with the spiritual intuition of the goal-idea-ideal of «primordial phenomena» (substances, forms), the *full* coverage of their «metamorphic individuals» in a universal objective law will remain fraught with chance, and mathematics will only perform the a posteriori function of demonstrative proof locally established sequences of «cases» [168].

G. Hegel also correlates the individual and the genus, but gives this a procedural (historical) form of the joint dynamics of conceptual and categorical structures as the logic of the development of culture. According to V.S. Shvyrev, ««...» if Kant limits the sphere of constructive mental activity to “closed” rationality, then Hegel tried to

make the “open” rationality of developing thought, expanding and deepening its initial premises, its cognitive capabilities and prospects, the subject of his consideration» [169, p. 145.]. Its desired *necessity* («idea») surpasses the general forms and laws of enlightenment thought in that it dialectically combines the rational orientation towards metatheoretical principles (abstract identity, universality, etc.) and «real» accidental.

In the summary gradation of Hegelian categorology, this is *not* the objective accidental that is already known to rationalism and empiricism when they elevate *one* of the areas of actualization of an idea in nature (content) or the human spirit (form) to the category of the necessity of the idea itself. No, we are talking about the *interaction* of content and form, cause and effect, law and phenomenon, in which the magnitude of effective causes of one genus (law) (re-)determines the qualitative measure of effective causes of another genus and vice versa (scientific determinism), submitting on a larger scale to the general teleology of the Absolute Idea (philosophical determinism).

In rational-cognitive terms, the distinction between two determinisms is caused by the *stratification* of the theoretical representation of the systematic and historical moments of the reality under study by formalized reason and «open» mind, respectively. At the same time, in G. Hegel this stratification acquires a «dialectical» character of the brought to the limit of differences between the negatively reasonable scientific and positively reasonable philosophical *stages* within the universality of the self-developing Absolute Spirit of culture [170, p. 86].

#### **4.5 Philosophical premises of the probabilistic style of thinking: levels of determination**

Among the critics of Hegelian determinism, of particular interest are the authors of the philosophical systems of irrationalism, who saw in the strategy of «linearization» individuals (accidents) a relapse of the Aristotelian identification of *being* and thinking that leads him to need.

The fact is that Aristotle was one of the first to consider the category of chance as a logical form of thinking and denoted its objective, although secondary in the «movement» of nature, meaning. It would be more accurate to say «derivative» meaning, since the thesis of the identity of being and thinking assumed the complete exhaustion of being, including random, in logical forms. The latter was presented in the conceptual apparatus of hyleomorphism – along with «matter», «form», «potency», «reality», «causality» – in connection with the desire of Stagirite to give a logically exhaustive explanation of various forms of *change* in essences.

The gap between the material and formal aspects (cause) of a single sensuously perceived entity, causing the movement of its opposite possibilities, is the source of ontological irrationality. However, its recognition in opposites as an accidental «incoming» predicate is already carried out by certifying *logical* procedures, as if it were a whole class of events, a «secondary» entity. «In our sensations, acting as reflections of things that exist independently of consciousness, the world is given to us. However, true knowledge about the reality of sensations cannot be given to us, because in sensations the general, which in reality exists, is not given. That is why the need arises not only for sensual, but also for rational cognition. It is this general that opens the mind in reality. The discovery of the general in the individual is the discovery of the law, the discovery of the connection between essences. It is in the discovery of the law that the rationality of cognition finds its manifestation» [170, p. 69].

The irrationalists of the first wave believe that whatever the merits of the a priori system of thought or, conversely, the flaws of the natural element, reality will be created by spontaneous metaphysical *Will*. However, for all its irrationality, firstly, it negatively mirrors the universal subject of German idealism, and secondly, the image of its objectification is devoid of the category of becoming, and this static character reveals the subordination of the irrational motive to Schopenhauer's philosophy of the general *rational* schema. According to T.N. Dyshkant, the irrationality of A. Schopenhauer is postulative-speculative and is projected onto ontology after the epistemological distinction of disinterested contemplation and interested science [171].

Despite the fact that scientifically organized knowledge is only one of the types of

rational [172, p. 208], the dominant meaning of the term «rationality» covers the articulating and ordering (ratio, mens) abilities of the mind and is associated with the mathematization of Modern science: «here the infinite world is made up of the world of ideal objects as such, and not of isolated, imperfect and randomly given to our cognition, any object is comprehended in its being by itself by a rational, systemic, unified method in the endless process of cognition <...> nature becomes a mathematical variety» [153, p. 41].

Along with a clear demarcation of the field of research and the disontologization of science, the new method ensured the success of the sciences in the XVII-XVIII centuries. «In view of the unsurpassed cognitive effectiveness of science, and also in view of the strict impersonal accuracy of its constructions, religion and philosophy were forced to determine their own position, exclusively in accordance with science, just as in the Middle Ages science and philosophy were forced to conform their positions with religious ideas, which had an immeasurably greater weight in the culture» [173, p. 300].

With the secularization of science and the demarcation of its subject area, the methodological means of formal reflection of cognition acquire a self-sufficient character: the metaposition of the creator as a guarantor of truth is replaced by intrascientific criteria, that is, *goal-setting* rationality is replaced by *expedient* rationality. In theoretically developed disciplines, priority is given not to the description of reality (truth), but to the reflection of the unity of corporate consciousness (scientific character). Any content in it remains only a part, correlated with something larger. «For there are no more separate, independent realities that would exist on their own, and only then enter into relations with other realities; rather, all being as a whole is a relation» [174, p. 102].

Hence the classical understanding of the *irrational* as containing erroneous logical (or scientific conventional) *foundations* or devoid of reflection on them and, as a result, not allowing self-verification. The conscious adherence to the «groundless» position then looks like a capitulation to the scientistic unlimitedness of mathematical expediency: «it was already impossible to stop this “colossus”, which grinds everything



in front of it; one had to flee from it into the shadows of “nature” à la Rousseau, the murky mysticism of sensations, the sugary cloyingness of “irrationalism” cast by it; irrationalism – let us emphasize this – was not an opposition to rationalism, but the desired effect of a purely rationalistic stupefaction, rationalism inside out <...>» [175, p. 50-51].

Although *contemplation* and *attraction* became the subject of the new «shadow» criterion, they did not leave the universal semantic space of reasonable grounds, and their desired «naturalness» was assessed by the ability to call a *generally* valid mind to action. Therefore, within the framework of the opposition to classical rationality, anti-rationalism opposes the absolutist idea of the complete removal of experience by actual theoretical means. There is no place in them for the unique conditions of existence and goal-setting [will], characteristic of a social and humanitarian object. «The consequence of this is the tendency of almost all rationality theorists to be content with a rudimentary understanding of rationality as the capacity for justification, as if the animal rationale could do nothing but justify: for example, think, act, ponder, meditate, solve problems, play, etc.» [176, p. 214]. And vice versa, the addition of special socio-cultural functions to the original features of anti-rationalism and the explication of specific principles of cognition give rise to alternative *types of rationality*. This leads to an extremely broad interpretation of rationality as a form of assimilation of reality, concretized in generalized standards (ideals, norms) of the corresponding activity and its results.

At the same time, the enlightenment cleansing of epistemology from religious-mythological causal schemes turned into ups and downs of the *ontological* registration of the overmind, which by the XX century, along with the rejection of universality and reflexivity, will outgrow the theme of rationality. So the irrationalists continue to distinguish between philosophical and scientific determinisms, considering the first as direct and irrational, and the second as artificial, mediated by the «metaphysical» reduction of chaotic being to identity with necessary thinking. In retrospect, this looks like a combination of Kant’s constitutive activity of the mind with Hegel’s

epistemological progressivism, when the mind *blindly* masters the creative function of the mind.

A similar synthesis of German idealism is carried out by Ch.S. Peirce, however, his indeterminism is less subjective, since the «practical» dignity of artificial determinism is translated by him into «scientific». On the one hand, chance («tyche») is justified on a philosophical level: ««...» although, like the rest of the physicists of his time, he believed that our world is a clock that works according to Newtonian laws «...» Peirce concluded that we are right to assume that there is a certain *imperfection or looseness* in all clocks, and that this opens up the possibility of an *element of chance* in their work [177, p. 503-504].

At the same time, the guarantees of the self-correcting scientific method pragmatically limit its «tychism» to the rational-normative and material conditions of the scientific community into descriptive «laws of probability». In this *reduction* of discouraging contingencies, one can see the *theoretical maturation* of non-mechanistic science, which W. James and D. Dewey still insure with Kant's random *belief* (Unternehmung) and, in general, the classical isolation of the subject of knowledge. Qualifying transcendental grounds as *bringing* certainty into proper scientific empirical laws, they will prepare a revolution in Kant's division of rationalities, which, in combination with Comte's meaninglessness of «primary causes», will constitute (neo)positivist «dogmas» about the dichotomy of analytical and synthetic judgments and about the reducibility of the first to the second [178].

At the same time, the neo-Kantian scheme of scientific determination for idiographic disciplines rehabilitated the *transcendent*, combining at the point of the «first cause» the divine mind and world *connection*, thereby introducing epistemological opacity into the latter: as evidenced by the evolution of the disciplinary *criterion* of demarcation at the end of the XIX it was possible to give it an unconditionally positive meaning only at the cost of probabilistic *addition* of determination levels. In the general scientific perspective, this meant the *equation* of the logical status of «empirical» and «theoretical», the contexts of observation and interpretation, discovery and justification, fraught with a crisis of procedures relating

them as the basis of scientific rationality – the problem of the sufficiency of fundamental axioms, continuity in the rules of inference, independent empiricism, «theoretical load of facts», etc. [179, p. 78].

On the other hand, the neo-Kantian and phenomenological interpretation of the subject-object opposition as sensual «horizons» of subjectivity and the hermeneutic communication of these ontological levels as intersubjective weakened the association of the probabilistic style of thinking with the crisis of scientific rationality, perceived in terms of the subject-object relationship.

#### **4.6 Non-classical subject, object and language of scientific description**

A certain initiative of non-classical norms of scientific rationality at the instrumental level of the *style of thinking* was laid by the probabilistic-statistical means of scientific description of the XVIII-XIX centuries. The probabilistic revolution, which gradually took place in the scientific consciousness, first from criminal and commercial statistics (W. Petty, D. Grount, A. Quetelet), and later from statistical biology and physics, caused a crisis in the basic worldview of mechanism regarding the external-spatial concentration of objective *essence* physical body. The Cartesian principle of cogito placed it in the visual space of the subject, integrating spatial and temporal loci into a rigorous mathematical description.

Now, however, to bring order and meaning to scientific observations, it was necessary to touch on the very nature of the observed object. «The concept of substance was dissolved in assumptions about probabilities and about the “urge to exist”. The connection of particles with each other, which was not of a local nature, ran counter to mechanistic causality. Solid discrete bodies have given way to formal relations and dynamic processes» [173, p. 301].

Therefore, the discovery of these not visual properties-relationships and the statistical structure of objects introduced the problematic nature of their fixation by traditional logical-discursive means into the universal and necessary result of cognition, and with it the problematic idea of the subject as an external

(«Archimedean») observer [142].

Discredited also by the theory of relativity, the privileged frame of reference is replaced by a «surrogate» of instrumentalist, verificationist, metric methods, structural transformation rules, etc. There is no talk yet about the deconstruction of the ideal of an absolutely transcendental subject in the methodological consciousness, but now, through the cognitive tools used, it serves rather as a link (interpreter) between the micro- and macrolevels, the discrete temporary states of the existence of an object.

The self-reflection of the cognizing subject on the subject of possible alternatives endows him with ontological freedom. In other words, in addition to the new European idea of the activity of the subject of cognition in the sense of his methodological enterprise, here are made dependent on the strictly articulated structures of the subject («mind») and the *results* of cognition. So Kant's apology for freedom, which legitimized a certain irrationality of the structure of the human soul, began to spread to the structure of the physical world. This found expression in the fact that mathematical means no longer describe so much events in real space and time as the possible results of *measurements* of the subject, which he can carry out over the system. Being heterogeneous, this integral statistical indicator is divided into probabilistic distributions of possible measurements of a mass, dynamic, complex, and most importantly, ambiguous object. Alternative representations that explain the same phenomena as different objects, and possibly consistent with the principle of complementarity, do not necessarily have to be rejected and linearly replace each other as it was supposed in the classical methodology of cumulativeism and the philosophy of «metaphysical realism».

Thus, the property of objectivity of classical epistemology – in the form of an impersonal cast of an object in knowledge – acquires in non-classical rationality the characteristics of *activity* with an *object*, due to which the latter must either be dispersed in its random properties (accidence), or act in various modes (modes of being) – is the dilemma constituting the crisis of «objectness».

In particular, the corpuscular-wave dualism of quantum theory is caused by the intersection of the Aristotelian (essentialist, substantialist) and instrumentalist

(relationalist, functionalist) methodological approaches regarding the probability of particles to occupy some states. In a certain sense, these approaches revive the ancient philosophical distinction *eisei / fusei* instead of the classical distinction of objective / subjective, which is in crisis.

The context of the finding out of entities was the most relevant for the analytical principle of classical science in connection with the development of predominantly small stationary systems and trust in the transcendental characteristics of the natural mind, or, in a secularized sense, trust in the human dimension of nature. Therefore, essentialism denies the extensiveness of the physical situation (experimental device) any determining [probability] properties, entirely attributing them to the intensity of a fragment of matter – a particle. Even G. Galileo considered it impossible to identify entities both in relation to close elemental substances and distant celestial ones: «it seems to me that I can equally not comprehend the essence of the Earth, like the Moon, elementary clouds and spots on the Sun» [180, p. 77].

Relationalism (from the Latin «*relatio*» – «communications») gives an ontological status to relations that determine the predispositions of the entire physical situation, the usual ignoring of which leads, from this point of view, to interconnected incompleteness of mathematical formalism and incomplete prediction of experimental results [181]. This statement, in fact, is one of the applications of a more general than quantum mechanics, non-classical worldview, which received the first methodological expression, according to K. Popper, in «recent» Anglo-Saxon thought. «Everything we know about the external world can be expressed in terms of the interaction of events that mutually determine the nature of each object. The whole environment is involved in the nature of each event occurring in it. Therefore, the primary form of each event follows from the nature of its natural environment. The laws by which the environment itself is conditioned simply generalize the nature of the objects of which it is composed» [182, p. 432].

Just as the language of Newtonian mechanics ignores «dissipative processes» (relationships of thermal motion, viscosity, friction, diffusion), the essentialist experimental language of quantum theory arbitrarily or forcedly ignores the system-

structural micro-relations that mediate the external influence and response of the object, so that his «behavior» no longer corresponds to the idealizations of analyticism and superposition. As a result, the same initial conditions fixed in the language correspond to a certain set of real initial conditions. However, the corresponding spread of results cannot be calculated in the norm of errors, since the unstable equilibrium of the physical situation leads to a significant increase in deviations, which is fixed in the language as the ambiguity of outcomes or the «free will» of the micro-object. Then fair objections arise about the belonging of the charge, mass, spin and other characteristics, and compromise projects are proposed for preserving the essential principle with another – virtual, transcendental – mode of being [183]. «In the history of science and directly in the history of theoretical physics, an analogue of this situation can be mutual complementarity, equivalence and a kind of constructiveness of the algebraic (group) and geometric approaches» [184, p. 152].

In addition to K. Popper, there are several more editions of relationism concerning quantum mechanical objects, and even more refined ones [185]. «In essence, everything that we know in nature is *relations*, and all our knowledge is ultimately reduced to knowledge of relations. All sorts of “elements” = “objects” that we introduce into the picture of nature, in the end also turn out to be just some “nodes” in relationships and on a network of relationships» [186, p. 452].

However, constructivist experiments with scientific language fix it in the status of a purely instrumental – an autonomous system of signs. And this also means the rejection of the classical idea of the neutrality and transparency of the language of scientific formulations: now it *participates* in the display of the world. linguistic forms of their expression (the language of observation and the language of theory). «For us, this means that we can never simultaneously determine a thing – for example, life – and its price. From now on, we will not be able to fix the real and its sign at the same time, and we will never again dominate both at once» [187, p. 52]. In scientific discourse, this finds expression in irreducible uncertainty, like W. Heisenberg's «uncertainty relation», some universal constants, provoking the relativism of intrascientific methodological reflection.

One of the founders of the new rationalism, G. Bachelard, commenting on the methodological shifts made by the assimilation of the principle of W. Heisenberg in science, speaks of the existence «...» of only secondary qualities, since any quality is inextricably linked with the relation». As applied to non-classical statistical physics, this means that «the properties of the whole must be sought at the level of the class», the belonging of an element to which, in contrast to mechanical laws, constitutes its essence [188, p. 117]. Accordingly, in non-classical (non-Lavoisian) chemistry, the definition of substances also includes the conditions for their recognition (isolation operations), so that «some substance becomes in some way a function of its position in a number of other substances» and «its definition is more functional than realistic» [189, p. 216].

A similar situation can be observed in the logic of the early XX century, in attempts to develop a modal intensional logic in addition to the formal extensional one (C.I. Lewis). Further, Einstein's theory of relativity assumes a space-time world with a curvature that is beyond the scope of three-dimensional perception and «from there» constituting all observable relationships [190]. The same can be said about the unconscious in psychology, ideological in social psychology or nomogenesis in evolutionary theory (L.S. Berg) [191, c. 54]. There is a need for special functions – like «entropy», «wave function», «ideal types», which would indirectly translate contradictory and irregular events of the micro-level of description into terms of nomological structures. Together with them, fideistic and quasi-scientific practices (magic, astrology, alchemy, etc.) based on the *reproductive* combination of qualitative sign-symbolic knowledge and quantitative measurement procedures received methodological justification.

Thus, a feature of non-classical science is the heterogeneity of the sign system representing the corresponding non-classical objects in different epistemological modes or ontological levels. In addition, it combines different (in particular, mechanistic and probabilistic-statistical) methodological approaches to the model representation of the structure of matter: as point-by-element («in the form of an object») and as changes or interactions of the simplest measurable acts of manifestation

of the properties of elementary objects («in the form of events») [193].

Determining the cognitive and worldview status of these connecting «language of observation» and «language of theory» and, most importantly, their assessment as a set of formal algorithms (abbreviated schemes for describing complex relationships between empirical data) constitutes the problem of rationality in positivism: ««...» if we assert things that are neither analytic statements true by virtue of the rules for symbols, nor empirical statements true by virtue of their referential content, then we are irrational» [194, p. 290]. In order to homogenize sign systems in this regard, following the model of the language of inductive sciences, special logical means were developed to reformulate theoretical terms into terms of the language of observation (methods of F. Ramsey, W. Craig).

In the broader context of the «scientific worldview» of logical positivism, this way of realizing L. Wittgenstein's «ideal language» by its adherence to atomic propositions also ignored the problematization of classical *essentialism*. In this essentialism, the Galilean impulse of objectifying idealizations, described in detail by E. Husserl, which identifies rationality with scientific character and epistemology with *mathematical logic*, has not yet had time to dry up, because in this logic really ««...» ideas about the formal structure of knowledge act directly as specific *substantive* prerequisites for its meaningfulness» [179, p. 17]. Therefore, the formal systems taken by logical positivists as an active transdisciplinary model of the relationship between the theoretical and empirical did not lead to the final demarcation of scientific knowledge expected by O. Neurath and the «encyclopedic integration of scientific knowledge», but to the historical relativism of this significative theory of rationality among postpositivists.

#### **4.7 Non-classical crisis of the criteria approach to scientific rationality**

Meanwhile, the methodological analysis of the «context of discovery» and the development of knowledge, which is marginal for logical positivists [195], demonstrates not only the problem of uncertainty and ambiguity in the construction of



objectivities (modes), but also their non-empirical, transcendental source.

Known for his methodological intuition, A. Einstein, back in the heyday of neopositivism, assumed «...» that the human mind must freely build forms before their actual existence is confirmed. The remarkable work of Kepler's whole life shows especially clearly that knowledge cannot blossom from bare empiricism. Such flourishing is possible only from a comparison of what is invented with what is observed» [196, p. 124]. The main source of such inventions is a set of subjective ideals, which become obvious, internally reliable if they coincide with supra-individual (cultural and professional) ideals and allow the formulation of generalized (more empirically inclusive) *mathematical* laws. The last circumstance is not singled out by A. Einstein, obviously because the pace of mathematization of scientific knowledge at that time already implies the mathematical form of «inventions of the intellect».

As in the tendency to increase the role of the subject when representing the connection of components or states of an object, the non-classical problem of the «context of discovery», apparently, reaches the level of fundamental *philosophical* understanding of the new facets of subject-object relations that are found in science. With the recognition of subjective meanings and meanings as a source of scientific *knowledge*, the latter acquires an uncharacteristic openness until now, fraught with the loss of a direct connection with reality.

Hence, following the example of the traditional metaphysical method, there is a need for *speculative* reflection of the constructed theory on the subject of compliance (*deducibility*) with its foundations and value preferences over other alternative theories [197, p. 135], otherwise, there is a danger of speculation around the «inventions of the intellect» with the subsequent loss of the «species specificity» of science, blurring its boundaries. Here, non-classical epistemology experiences the loss of classical landmarks of rational cognition for a long time and in various ways. The subject of exposure is the apriority of conditions of truth (substantial characteristics, the corresponding structures of thought and research methods), the attainability and singularity of truth in a progressive linear process, the expressibility of «internal mechanisms» («hypotheses of entities») in qualitative visual images, the reducibility

of discrete truths into fundamental laws and complete picture of the world.

According to the neopositivist program for the analysis of science, the cause of such a crisis is seen in the dominance of unscientific and pseudoscientific propositions that should be eliminated by universal logical and mathematical means («analytical rules»). Since this means an extension of the original criterion of «positivity» (for example, through accuracy, consistency, predictive and explanatory scales, simplicity and productivity in the formulation of research problems regarding the foundations of (non)acceptance of the theory) [198], non-classical epistemology focuses on the *criterion function*, which, however, will require no less metaphysical *complexity*, so that the insufficiency in one of the criteria can be compensated for by a more complete compliance with other criteria [199].

The beginning of the current trend of «philosophization» of science can be seen in the Renaissance *autonomization* of the cognitive aesthetic-experimental field of human spiritual life (*Pulchrum*) in the face of humanistic artistry from moral and value (*Bonum*) in the face of the depressing theological doctrine of *Ordo*, the regulatory and criteria support of which was entrusted to science [200, c. 63].

At this time, according to M. Heidegger, the *existent* is established as an object of «re-presentation», which deprives it of its own being in favor of alternative pictures endowed with different values. It is known that their dialectical transition to the reverse stage of «reality» becomes possible only as a result of «historically» organized activity to objectify goals. But then, having become «cultural values», they constantly threaten the consciousness correlating alternative pictures of the world to turn it into an *a priori* subject, whose goal-setting is not the result of a conflict of internal and external motives [202].

At first glance, in an attempt to correctly understand the «value of coins minted by God», only cognitive activity arises in relation to the «picture» of the world, and only in this is the humanistic guarantee of its success. Thus, the value of Mirandolla's man, since he is envied «not only by animals, but also by stars and otherworldly souls» obviously lies precisely in this ability to *compare*. But this is until the orientation to the *transcensum* becomes *a priori*, meaning for the time being only ontological

guarantees of this ability, provided by the absolute Subject, giving and participating at the same time. «Such a position in the subject-object paradigm of science exists only mentally, according to the principle “as if...” – as if a man were outside the bracket of the world. In it, the world appears as subject to knowledge, and not to practical transformation. However, it is quite clear that the next step is implied» [203, p. 204].

By the time of J. Bruno, who had cooled to the fideism of the Florentine Academy, the ability to compare was noticeably ahead of the «values» already accumulated by it, forming the opposition of worldly piety («enthusiasm»): to feel the impulse of the divine in oneself *or* consciously direct the human to the divine [204, p. 52-53]. The first option, characteristic of an undisciplined *spirit*, is more prone to random discrepancies between the values passively reflected by it and the «laws of nature and justice». The second option is looking for *guarantees* for enthusiastic transcensum: «when, oh fate, oh divine unchanging providence, when will I ascend the mountain, that is, I will reach such a height of thought that, having transferred me there, would allow me to touch the high entrances and hiding places, making for me obvious and, as it were, embraced and counted there values, that is, rare beauties?» [204, p. 84].

In the last example, one can guess the future *ideal* of a subject that is universal in its categories, concluding the «value neutrality» of classical science – you just need to reduce the whole variety of moral goals, including transcendental interventions, to the restrictive invariants of their implementation in nature, and those, in turn, lead to a mathematical model, which, according to G. Galileo, is identical in man and God. «This means that the cognitive task is not so much to reproduce the finite randomness of the natural world around him [man], but to penetrate with the help of it into the universal methods of natural creativity» [162, p. 48].

In methodological terms, this transition is one of the aspects of the general duality of the entire Renaissance: when the Holy Book begins to be perceived not so much from the point of view of divine goals, but rather from the point of view of divine *means*, that is, «grammar», it becomes the Book of Nature. Focusing on the methodical *self-control* of the subject over mental operations, which ensures the independent production of new reliable knowledge, science self-sufficiently implements the new

ethical ideal of freedom, pursued by Renaissance thought in place (or in order of down-to-earth specification) of the old ideal of perfection: G. Galileo gave Mirandolla's «movement» as the freedom of self-creation the form of the «law of motion» as a guarantee of this freedom. And if earlier the contradiction to moral axioms and precedents removed any obligation from logically impeccable reasoning, now science is empowered to evaluate conclusions without regard to [moral] content – according to the rational form («correctness») alone [205, p. 42, 341].

Already Leonardo da Vinci, in his manuscripts, reproaches natural philosophers (*vagabundi ingegni*) for adherence to high goals, the foundations of nature and the significance of the *object* of their science, to the detriment of the *validity* of his knowledge [206, p. 13]. And Cornelius Agrippa, correlating magic and mathematics in the same context, sees the advantage of their union in doing various mechanical miracles, like the flying dove of Archytas, «without natural endowments». Analyzing the general fate of the Hermetic tradition in the Renaissance period, F.A. Yeats concludes: «it can be said that a person's dignity has decreased, but power has increased. He has become an intelligent ape of nature, has understood the ways in which she acts, and, having reproduced them, masters her powers» [207, p. 138].

Later, this essentially pragmatic position, provided with the advantage of semi-sacred possession of the «laws» of nature, will for a long time receive justification as *freedom* from ideological prescriptions only due to the explication of the criteria of «internal justification» (of consistency, independence and completeness of axiomatics). It is in this context that the Galilean isomorphization of nature and mind is affirmed, according to which the theoretical certification of an idea meant an increase in its empirical probability up to the famous assertion of Hertz: «the main thing in Maxwell's theory is Maxwell's equations» [208, p. 286].

The search for *truth* is mediated by abstract mathematical hypotheses (idealizations), which reorient it from a semantic reflection of reality to a syntactic self-description: various «forces» (gravity, acceleration, chemical affinity), «fields», «fluids», «elementary currents», «atoms», «electrons» or «ether» are postulated and analyzed as hypotheses at the theoretical level, while empirical studies establish

rational virtues of the *manifestation* of properties, a visual image of these theoretical objects. And since their advancement is associated with a certain alternativeness, competition and improvement, the reflexive arsenal of scientific rationality turned out to be concentrated around the logicist (epistemic) criteria requirements for mathematical elements and operators [209]. With the perspective of their similarity, symmetry and systematic laws, the project of the unity of the human mind is connected – the universal scientific methodology of the pioneers of the philosophy of science (O. Comte, J.S. Mill, W. Whewell). Although it turned out to be impossible to implement it into the desired normative structure, fully explicable in logical-mathematical terms, as K. Gödel proved, the old esoteric image of science here received a new life. As R. Bart showed, in full accordance with the provisions of Gnosticism, non-classical science selects an «equalizing» cipher to the secret unity of nature, which is the opposite of a sign like a safe or a lock to a master key [210].

Thus, the Renaissance epistemologicalization of reality, posited by the humanistic simulation of the absolute Subject, found its full expression only in the XX century, when metaphysics moved on to interpreting being already from the point of view of *finite* human consciousness (E. Husserl, M. Heidegger, J.-P. Sartre), but without abandoning the function of holisticizing reality. In the context of fragmentation of the picture of the world into special languages, and languages into goals («discourses»), this «philosophical» function balances the neopositivist strategy of eliminating disontologized metaphysics, giving rise to L. Wittgenstein's image of an eye that combines the ontological and epistemological aspects of cognition, perception and reflection in an open contradictions [211, p. 183-184].

Developing Wittgenstein's eye metaphor, N.N. Moiseev sees the main consequence of the crisis of axiomatic substantiation in the refutation of the core idea of classical rationalism – the absolute Subject in the role of an External Observer, pulled out in due time by Copernicanism as a mental distraction of an empirical individual from his random point of view in favor of a free position. Occupied with «rational behavior», that is, a permanent search for basic attitudes that determine the choice and dynamics of the rules of cognition, the External Observer now becomes inseparable from the

object of study. This is how the effect of an internal observer arises, consisting in a spontaneous (in natural science) or volitional (in the humanities) change in the boundary and basic parameters of an object. The main way to eliminate this inseparability of objective and subjective determinations (or, more narrowly, micro- and macro-descriptions) is their mathematical averaging, so that stochastics becomes the norm of nomological description [212].

In other words, non-classical stochastics serves as an alternative to classical reductionism in the conditions of complex interference of laws, conditions for their implementation and conceptual and semantic forms, allowing, in relation to non-classical objects, to the same extent to move to a hidden noumenal meaning, to fixing by logical-discursive means of extra-rational reality into a universal and the necessary result of knowledge. «In the context of abstract (nomologically acceptable) worlds, real forms reveal a new perspective on their incompleteness. It is overcome by constructing virtual particles, probabilistic approaches to constructing the image of the Universe, the logic of possible worlds, and so on. This is, first of all, the essence of probabilistic thinking, characteristic of modern science«...»» [213, p. 46].

On the other hand, K. Popper's criticism of the criterion of empirical verification completed the impossibility of closed scientific rationality. Moreover, it turned out that if verifications have a lack of inexhaustibility due to the fact that any theory produces an infinite number of consequences, then falsification has a flaw of relativity in relation to the multitude of its parameters (the ratio of the breadth of the explained and the excluded, experience and logic, the way of generalizing empirical data, the syntactic perfection of postulates, etc.). In the complex and historically changeable body of science, particular concepts and criteria of rationality reveal various degrees of explicitness, completeness, and rigor. This is expressed in the tendency to relativize the category of «rationality», limiting it to «regional» traditions, especially in connection with the revision of the status of quasi-scientific practices.

#### **4.8 Tests of Scientific Rationality by Probabilistic Tendencies of Post-Laplace Determinism**

With the attraction of *qualitative* areas and parameters of being to the atomistic paradigm, many classical idealizations regarding the causes and effects that are taken into account, and with them the *guarantees* of rationality, have sharply weakened. The fact is that objects that can only be described qualitatively turned out to be outside the rational description. From the moment when their properties were no longer reduced by the then means of formalization, the philosophical prerequisites opposite (to the classics) – phenomenology, personalism, modernism, pragmatism, voluntarism – were actualized in the scientific consciousness.

Moreover, this is not so much about providing science with new tools, as it might seem from the textbook study of Kierkegaard's motives for the complementarity principle of N. Bohr [214, c.77]. By analogy with apophatic irrationalism, which denies theology the essential attributes of God, there is a noticeable shift both at the anthropological level of Consciousness and at the epistemological level of Truth–Scientific–Rationality: ««...» different perspectives of the system vision are not reduced to one single perspective; irremovable plurality, a polylogue of views on one and the same reality means the impossibility of a divine view of all reality» [216, p. 736]. In other words, non-classical philosophy came to the conclusion that the desired metaconsciousness is qualitatively delimited for individual consciousness from scientific, linearly reproducible forms of reality representation. In this vein, Bergson's critique of the intellect sounds, which can be reduced to the fact that thinking reproduces «not reality, but only an imitation of a real, or rather, a symbolic image; the essence of things eludes us and will always elude us; we move among relations, the absolute is inaccessible to us, we must stop before the Unknowable» [217, p. 146].

At the same time, in the philosophy of Marxism and Freudism, attempts were made to justify the non-self-sufficiency of consciousness: being an element of a dynamic world totality, consciousness is determined, in particular, by the class structure and history of society or the ontogeny of sexuality, it does not include the conditions of its

possibility in mental experience. This takes away from the subject the possibility of rationally controlled (continuous and endless) reproduction of the object, the ability to identify consciousness and being [218].

Thus, contrary to the results and achievements of the history of philosophy in the nineteenth and twentieth centuries, there is a gradual extinction of philosophical rationalism: «its place is taken by a pluralistic (worse version of dualism) empiricism of two main types: 1) sensualistic, which nourished and nourishes both the Marxist «diamat» and various schools of positivism, and 2) intuitionistic, based on irrationalism» [219, p. 23]. Increasing the accuracy of measurements in electrodynamics, thermodynamics, biology did not provide analyticity, integrativity, combinatoriality of empirical quantities in order to move from them to mathematically articulated *nomology*. Since that, despite all the influence of Newtonianism, was perceived in a certain transcendental relation to unified bodies, the first interpretation of the crisis was metaphysical *indeterminism* consonant with philosophical *irrationalism*. And, accordingly, the first reaction to it was the “positive” inductive methodology (J. St. Mill, W. Wavell, W. James, and others).

Ignoring the empirical-analytical gap of phenomena, positivism, following the methodological model of D. Hume, distinguished them only by the magnitude of the «immediate» causes, therefore, irregular and contradictory consequences produced in visual mechanical schemes were justified in a skeptical «narrative manner» [220, p. 207] and were subject to addition and mass evaluation in alternative nomological descriptions. The freedom to manipulate their variables, based on a multitude of atomic propositions, in the classical view of the progress of science, must mature into a scientific explanation that promised mastery of the subject.

However, the search for a unified theory of fundamental interactions, on the one hand, and “hidden closest parameters” of a self-identical ontology, on the other hand, undertaken to falsify theoretical alternatives, only gave rise to the non-classical problem of redundancy of rationality criteria. If this forced philosophical rationality to look for the norms of cognition at a more general level of non-logical analysis, then scientific-positivist rationality focused on the intersubjective potential of instrumental



methods of representation («synthetic forms», «mathematical hypotheses», «propositional statements»). «As is known, the emphasis on “description” in comparison with “explanation” in science seems to have been first made by Kirchhoff, who discovered (together with Bunsen) spectral analysis; this opinion, as is known, was supported and developed by E. Mach, Poincaré, Duhem and other scientists who made the greatest contribution to the philosophical understanding of the exact sciences <...> we are talking about the most complete and most concise description, i.e. usually expressed in mathematical form» [221, p. 266].

Realizing the anti-metaphysical program of positivism, these «descriptions» transferred cognitive priorities from the object to the method, from the explanatory function of the theory to the predictive one, from cause-and-effect determinism to the probabilistic ersatz of causality - an integral area of possible values. « Absolute precision, completely rigorous, unambiguous definiteness of the consequences of any assumption exists in natural science (as in geometry) not in sensory reality, but only in theory. The development of science aims to better and better adapt theory to reality» [222, p. 431]. Thus, external force «causal» determination began to be opposed to «*non-causal*» internal connection of states (L. Boltzmann), logical relation – functional correlation (J. Cuvier), study of adaptations – the law of growth correlation (C. Darwin), monism of theoretical explanation – pluralism of empirical descriptions (W. Wavell), speculative consistency of categories – the reliability of predictions (E. Mach).

According to W. Heisenberg, who, using the example of physics, identified scientific revolutions with changes in the structure of thinking, their general condition is the desire to «raise other questions and use visual images other than before» [223, p. 195]. Thus, in contrast to Laplace's extrapolation of deterministic epistemology to ontology, the instrumental-pragmatic approach to the objects of non-mechanistic natural science transferred a qualitatively new determination from physical representation to mathematical formalism. Thus, natural-science methods of representation, in particular, the probabilistic language of science, received general methodological recognition: «I am sure, – W. Pauli stated, – that the statistical nature

of the  $\psi$ -function (and thus the laws of nature)  $\langle \dots \rangle$  will determine the style of laws for at least several centuries» [224, p. 266].

For a figurative understanding of probability, natural science assimilated the image of the levels of heterogeneous factors of determination from philosophical irrationalism and neo-Kantianism, reflected by N. Bohr as model *ersatz* for the analytical *explanation* of scientific theory. «Today, clarity is created not by simplifications that reduce all phenomena to a single visual model, but by an exhaustive overlap of various descriptions, including concepts that clearly contradict each other» [215, p. 103]. In the ontological aspect, this meant referring the non-causal factor to the internal *spontaneous* properties of objects-atoms, now really independent, but coordinated in the actualization of their capabilities by the general conditions of the system («dispositional field»).

At first, this *tendency*, described by K. Popper as «the transformation of all clocks into clouds», manifested itself in the extrapolation of the spiritual or vitalistic layers of being (forms of the movement of matter) with their characteristic «expediency of the irrational» on the problematic characteristics of non-classical objects (L. Oken, A. Bergson, W. Ostwald, etc.). Then, thanks to cosmology and quantum mechanics, it was transferred to the category of methodological principles that regulate the non-classical relationship between the theoretical and the empirical as ontologically heterogeneous. «For the interpretation of quantum theory, it is very important that its concepts are basically divided into two classes: the first (initial, primary) class consists of the so-called «directly observable» quantities considered in theory as typically random; the second class is formed by quantum numbers (proper quantum concepts, such as spin)  $\langle \dots \rangle$  The former express more external characteristics of micro-objects, the latter express deeper, internal characteristics. The former allow one to individualize quantum processes, the latter are of a generalized nature. The former are constantly and chaotically changing, the latter are more stable. Naturally, the completeness of the theoretical expression of quantum processes is achieved by using the concepts of both classes related to different logical levels» [225, p. 162]. Non-classical rationality here acts as an arbiter of the descriptive and explanatory functions of scientific models

through the expansion of the initial criterion of «positivity», which is now forced to take into account the *indirect* correspondence of the language levels of the theoretical and empirical, when the specific meanings of one act as an exponent of the structure of possible *changes* in the other.

If the crisis of the classics caused a weakening of the cognitive norm of scientific explanation, then in the vicissitudes of non-classics, behind the criteria of metatheoretical choice from model alternatives, the value instance of the paradigm is visible, which, due to its fundamental nature, does not simply mediate the content of models with sociocultural samples and linguistic norms, as is typical of the «ultimate foundations» of classical and non-classical values, respectively [226]. Comparing models as expedient means in terms of the set and specific weight of «side» results that are subject to theoretical idealization and experimental elimination, it selectively qualifies the same «immediate» causes as necessary essential *or* accidental introduced ones. Thus, the normative function of *scientific* rationality reveals the half-heartedness of its cognitions in the general hermeneutic circle of *philosophical* rationality, which in fact also performs a prescriptive function, invisible to the former.

#### **4.9 Formation of post-nonclassical rationality: synthesis of natural science and humanities**

Since the awareness of values in many respects requires going beyond the framework of cognitive experience and is not subject to such logical verification as their goal rational *implementation* with the help of a certain configuration of means, enlightening connotations most often elevate them to a universal homogeneous subject, justified by the perspective of the «almighty mind» P.S. Laplace. After the Kantian establishment of «collective unity for the purpose of rational actions», it coincides with the ultimate goals of human existence and the universal rational grounds on which any *scientific argument* is closed: «instead of the personal interests of an individual, it makes values that have universal and necessary value» [227, p. 43]. Thus, the rational-philosophical principles of the subject-subject relationship and onto-teleological

determinism are identified with cognitive values, the manifestation of which in science turns out to be only a generalization of their means – a transition from subject idealizations to methodological norms.

For example, the (counter-)reformist revision of the mystery of transubstantiation, eventually reflected by philosophers as «the rupture of the thing and the symbol», pulled the ground out from under the «sympathetic canons» of magic and left it to the «theoretical assumptions» of natural science. The latter laid the meaning of relative truth as a progress in the correspondence of knowledge to *nature*, when the metrical and experimental refinement of experience removes from its spontaneity the limitations united by the common name *causa formalis*. Thus, the formation of classical science took place under the auspices of the new European value of freedom (*causa sui*), the combination of which with the ancient value of perfection (ἐπιζτήμη) allowed G. Galileo to introduce mathematical idealizations of motion into the corpus of mechanics, and R. Descartes to introduce the logical foundations of experience.

With the loss of socio-cultural monopoly by the church institution and the emancipation of scientific rationality from the philosophical rationality Aesopian language of «theoretical assumptions» natural scientists began to perceive «positively», taking instrumental and mathematical idealizations for nature itself. «In fact, before them is not even an illusion of reality, but only an instrumental concept, technically useful techniques that allow establishing a correspondence between the logical apparatus and the facts of experience, and this concept is constantly improving, evolving (namely, an instrumental concept, and not “types of rationality”). Experience by its very nature presupposes sensory practice. This is what ultimately was designated by rationalism, i.e. what is historical was originally opposed to it» [219, p. 23]. Later attempts to return to it a sociocultural dimension, for example, in the context of humanitarization or in the strategic role of understanding that sets the conditions for possible meanings for scientific explanation [228, p. 331], turn out to be that the latter are also taken out of axiology and ascertain in the impersonal operational discourse of scientific representation as a context of discovery or application.

The incorporeal type of the object of non-classical natural science, abstracted

from phenomenal accidents only in «additional languages of instrument readings», strengthens the value-based mediation of reality, aggravates the reflexive part of the methodology and makes «questioning nature» not only a symbolic, but also ontologically active activity. «...» If, nevertheless, we try to determine the appearance of the reality that has become the object of our scientific knowledge, it turns out that its main properties are constituted by the most general principles of scientific rationality and are obtained as a result of hypostasizing those methodological principles that are considered rationally legitimate. What could be called the “metaphysics of science” is the doctrine of a regularly arranged space-time universe in which the “lower” (elementary) hierarchical levels are “responsible” for the states of the higher levels (and explain them accordingly), and the change in one’s own whose states in time can be fully described by fundamental dependencies «...» are nothing more than an explication of the basic methods of scientific rationality» [152, p. 66].

Since the substitution and deduction of signs are not necessarily symmetrical to the aspects and levels of the original signification of reality, scientific knowledge takes on the form of a *symbol* that surpasses its exact semantics and is involved in several connotative systems of elements and operators at once, between which information relations are established (parallelism, interference, displacement, etc.). If the neo-positivist project pursued the *reduction* of subject-methodological alternatives through a refining reflection of their linguistic foundations, then the post-positivist one forces us to reconsider the very constitutive opposition of scientific representation – formalization / reference – and finally move from the inductivist ideal of the structural simplicity of *theoretical abstraction* to the epistemological norm of complexity. «...» There is nothing at all insignificant – the presumption of meaningfulness of each element and the presumption of universal interdependence: even “the cat looks at the king”, even the most “pure” theory is influenced by the structure of everyday experience and the structure of language; there is nothing “pure” – all products of culture and thinking are mediated by activity and bear its imprints, among which, in particular, are the prerequisites for future activity «...» [170, p. 58].

We are talking about «heteromorphic rational reconstructions», not only

reflecting the ideal causal scheme from the positions of inductivism, conventionalism, falsificationism, etc., but also dictating to scientists the appropriate rules of behavior. Rejecting the ideal of the correspondence of the order of reason to the order of being, methodological analysis goes beyond intertheoretical relations, involving cultural contexts (P. Feyerabend), sociological criteria (T. Kuhn) and the historical dimension (I. Lakatos) into scientific rationality, which stratify the «almighty mind», desacralizing his position as an external observer. «*Instead of one mind, many types of rationality* arose. Thus, the universality and necessity of scientific knowledge was called into question. Skepticism and relativism, so characteristic of historicism in philosophy, have now spread to natural science» [166, p. 13].

Post-non-classical interpretation of scientific objects through the principles of nonlinearity, multistability and teleonomy in the behavior of complex systems leads to a series of failures and compromises of classics and non-classics. «In particular, the principle of superposition is not fulfilled in non-linear systems, resonances change qualitatively, special non-linear effects of dynamics appear, which are absent in linear systems. This leads to the fact that the behavior of nonlinear systems is not described by polar categories, and therefore it becomes necessary to introduce synthetic concepts that unite the sides of the dichotomy: deterministic chaos (ordered disorder; necessary, regular randomness); self-organization (random order); fractality (discrete continuity, integral partiality), etc. «...» Today it is well known that development is generally non-linear, and its trajectories are non-closed curves or even fractal sets that have no classical geometric analogues and require revolutionary topological images, such as a strange attractor, for their description» [229, p. 31].

In operational-mathematical terms, such a graded description of ontology means overcoming the formality of probability distributions of non-classical statistics in «stochastic dynamics», in which not only physicists have recently experienced analytical interest. ««...» This is connected both with the emergence of a large number of specific problems in various fields, and with the emerging opportunity to advance in the fundamental problem of the relationship between the dynamic and statistical laws of physics, which were previously opposed to each other» [230, p. 228].

On the one hand, the «removal» of alternative idealizations (spatial and temporal, discrete and continual, horizontal and vertical, static and dynamic, material-bodily and spiritual) means a course towards real value *neutrality*, on the other hand, it realizes the phenomenological *value* of the fullness of being and its representation. In experiments with open nonlinear systems, it is supported by ontological activity and the semantic load of *phenomena* that now express the previous stages and related links of the system's existence, including the communicative and applied context of the subject of cognition. The representation of the symbolic connotations of this «indirect» context (subtext) not just as non-classical conditions of cognition, but as an explanance connects it with the mental prerequisites of socio-humanitarian «understanding», but subordinates the value alternatives of the latter to the task of increasing the empirical sensitivity, critical breadth and predictive power of description languages, common with the original cognitive context. «Science, with all the diversity of its components, is a single system. And the general direction of its subdivisions is on the whole one and the same – identifying the realm of the “possible”. Only if natural science determines the *possibilities* hidden in the *surrounding world itself*, then humanitarian knowledge contributes to understanding the *possibilities of human action*. In particular, those that still remain unrealized» [231, p. 33].

Thus, «included» scientific reflection presupposes the organization of «analytical data» from both sides of questioning into the general diachronic meaning of the innovative probabilistic perspective of post-Laplace determinism, ascending from the desired universal order of the cognizing mind to the initial diversity and variability of its regulators – the rational order of social actions. For the scientist, this means additional mediation of an «intentional» subject-content representation: he compensates for the shaken absolutes of criterion-normative validity with *intersubjective ersatz* of transcendent rationality, which, at their levels of representation, assimilate real possibilities in communicative forms of expression and interaction with reality, forming in a coherent whole «internal stories», «virtual worlds» and other analogues of the «third world» by K. Popper.

#### **4.10 Postmodern critique of classical scientific rationality**

The loss of structural stability by natural objects, which served as a source of objective meanings and absolute foundations of universal rationality [232, p. 103], reinforces postmodern ideas about such a radical mediation of reality by cultural layers that questioning turns out to be one of the functional acts (along with evaluation, interpretation or criticism) of a purely linguistic game of giving meaning to signs. ««...» A new determinism is at work in the linguistic world of postmodernism. Linear development here has given way to non-linear branching of alternatives (rhizome). Instead of an equilibrium and structural system, a non-equilibrium and amorphous environment is presented, the creative potential of which expresses a multitude of random events. The abundance of inputs and outputs of the labyrinth environment devalues the division into external and internal. Here there is no certainty of dynamic laws (such as the laws of mechanics) and everything new arises statistically and with a certain degree of probability» [233, p. 563].

Both the studied phenomena and the scientists who study them are deprived of the «depths and volumes» of their own definition, turning into «superficial» aesthetic symbols for the random (anonymous and autonomous) events of this game. «Outside of fixed reference points, all acceptable means are equally good, and in a pragmatic light, reason itself turns out to be nothing more than one of the means of action. The way it is used replaces the lost essence of rationality, turning rationality into a predicate of activity» [152, c. 175].

In this regard, the explanance of theoretical explanation turns into a *narrative* similar to Kant's «ideas of practical mind», which, instead of subordinating the elements of scientific description to the goal-rational order of a rigid paradigm, includes them in a laminar history of current teleological meanings. The primary task of philosophical reflection is then transferred from the post-positivist «genesis» to the postmodern «deconstruction» of classical categories, such as «cosmos» / «chaos», «foundation» / «consequence», «subject» / «object», «author» / «work», etc., as discourse-forming oppositions that administer the space of scientific research and give



private values and prejudices the appearance of scientific descriptions and explanations.

The paradoxical result of this process was cultural self-awareness, which affirms the ontological and intellectual finiteness of man, and with it the inability of the scientific mind to objective (non-historical, non-social) truth. However, the postmodern image of the subject, crucified on communications with virtual value systems and incommensurable goals, should not be demonized. According to the prominent French sociologist A. Touraine, it is justified rather intellectually – as a *reaction* to too radical criticism of the traditionalist Ratio by the ideology of instrumental-pragmatic rationalism of modernity (Enlightenment) against the backdrop of anti-evolutionist, -progressive, -communitarian, -metasocial *consequences* of technical and economic modernization that discredited the industrial sociology of K. Marx, M. Weber and E. Durkheim [234, p. 46, 194, 219].

With all the *anti-systematic* outrageousness of postmodernism [235], the intermediate link in understanding its situation was *structuralism*, which, according to the generalizations of the concepts of psychoanalysis, linguistics, ethnology, etc., was the first to transfer the determining model of the truth of scientific knowledge to the unconscious beginning of a human. At the same time, since it is determined by the model of the language system relationally - by relations with all other elements of social life - structuralism is positively oriented (as opposed to, for example, existentialism or personalism) to the classical tradition, although it points to objective variability and hence the well-known uncertainty of the prerequisites of scientific rationality.

Today, methodological invectives like Feyerabend's «anything goes» are more and more commonly perceived, expressing the historical assessment of science as a very unreliable filter for separating «human nature» and «the nature of things». At least, the scientific community no longer requires a detailed argumentation of the thesis about the pragmatic and environmental burden of «pure» fundamental research, as at the end of the XX century [236]. Before a scientist who loses his original goals («first causes»), a similarity of the late Renaissance dilemma of piety arises: to engage in the

deconstruction of disciplinary standards or to look for guarantees of scientific production in new rational foundations of scientific methodology.

M. Foucault and other postmodernists demonstrate that in the process of «decentration» of the absolute Subject, which served as the basis for the subject-object dichotomy of scientific and cognitive activity, the content of its aspects changes: the general substratum-spatial order («essentialism») gives way to local coordination of time and meaning («eventualism»), and the conscious teleological motivation of scientists – is a random configuration of warring «forces». In both cases, the new basis is a simulated reality, in which «words and things» are fatally mixed. In other words, as the very idea of the subject «decentrates», the alienated goals that constituted the cumulative image of the absolute Subject begin to form its monstrous likeness, shuffling in their objective and target areas. According to M. Foucault, after the rejection of the absolute Subject, which claimed and authorized the subject to measure the earthly order, the method of earthly (reproduction) of substance lost its personal guarantees and at first found refuge in the competence of the elite collective Subject and was fixed there in scientific criteria, standards.

M. Foucault also exposes this temporal measure as one that claims to delineate in one fell swoop the realm of the real from infinite possibilities, but at the same time proclaim it to be the sphere of *all possible* experience. Moreover, the basis and means for such an identification is a set of rules, norms of rationality, developed within the framework of the same historical reality, in the structure of which (th, th) the subject of cognition is dissolved, more precisely, the («method of subjectivation») is set. The study of these «discourses» («structures of experience», «historical a priori»), derived from the sociocultural determinants of «cumulative historical situations», opens up universal sources («forces») of the constitution of knowledge [237].

In the eventualization program of M. Foucault, in connection with the general setting of poststructuralism, to show the «wrong side of the structure» and to withdraw the semantic content from the linguistic dictates of the discourse of representation, they are interpreted as a random correlation of certain genealogical forces. But it sets only the modus of the structure of ideas, and their substantive meaning («being of order»)

is organized by the semantic space of discursive practice [238]. It is its goals that drive the subject in his desire to master the «chaos» of individual cases of experience (eventus) and to fix the desired order in the subject-object scheme of representation and its rational foundations: «by all conceivable and unthinkable means, the subject breaks through to reality, to the level of “being of desires” » [239, p. 245].

Despite the novelty and relevance of the eventualization program, this is not the only example of deviation from essentialism. There is, for example, a whole metaphysical tradition of the biblical perception of reality without an emphasis on the inner essence of things – as structures of behavior of exclusively external causes. «The whole structure of Jewish thought is connected with realities that are different from the concepts of being, essence, object, predication, proof, etc. Although it is possible to find appropriate expressions for translating the above concepts into Hebrew, however, they often have to be translated descriptively» [183, p. 122].

One way or another, in postmodernism, anti-essentialism is translated into the aspect of power relations, taken in the generalized sense of «conditions of possibility», forcing the subordination of transformative practice to linguistic or, more broadly, to communicative practice. We are talking about a spontaneous interweaving of discursive practices (relations, rules, epistemes, dispositives), which generates a random subject and mediates power and language (knowledge). It is they who form the anonymous goal-setting, which is then realized in an expedient, but *methodological activity* alienated from the original goals.

Then it turns out, for example, that in classical European philosophy the chaotic element was allowed only in one aspect of rationality – goals by the right of absolute «free will» of the subject-creator. However, the earthly mediation of its transcendence brought forward other elements of rationality – means, conditions, sequence of events, an epistemological corpus, and, even more so, methodological rationality – that allowed contingency only as an anomaly, an imperfection of «necessity», tending to be forced out as rationality was mastered. Even on the political plane, any significant accident immediately turned into a necessary element of eschatological history or civil progress. Therefore, many creators of the *classical* scientific paradigm (F. Bacon, G.

Galileo, T. Hobbes, I. Newton, etc.) in their anti-scholastic motivation were guided not only by cognitive values: they quite consciously used the *analogy* of natural laws and social values when they put forward the program of «releasing the possibilities of Nature through the development of its reality». Thus, according to T. Hobbes, ««...» *science* is the knowledge of connections and dependencies of facts. Thanks to this knowledge, based on what we can do at the moment, we know how to do something different from this or similar to this at another time, if that is our desire» [240, p. 35].

Modern study of the genealogy of natural science reveals more and more clearly the scientific goal of the *reverse* application of the scientific virtues of «law» to the social process, the first of which is the calculation of social behavior.

In the state of Postmodernity, the formulation of not only laws, but also any cognitive foundations is perceived as an attempt to naturalize or transcend them and, thereby, to bring them beyond the rational. Therefore, the most rational construction of *meanings* in complete forms and their syntactic relations is regarded as a *logocentric* position, which presupposes predetermined invariant characteristics of the referent outside the acts of his communication. Thus, the human dimension of these meanings is ignored as the inclusion of the referent in a specific language system, cultural context, which cannot be stable both in historical and textual terms: each cultural connotation brings alternative hidden and contradictory meanings, which ultimately cast doubt on the existence of immanent qualities of the referent [241].

Abstraction in cognitive grounds from these premises, instead of representing the absolute completeness of the original meaning, leads to the elimination of real rational motives from the field of consciousness and tendentious ideological selection and interpretation of facts.

Then «each category makes a phase transition, in which its essence is liquefied in the solution of the system to homeopathic, and then to microscopic doses up to complete disappearance, leaving only an elusive trace „as if on the surface of water”» [242, p. 15]. But now it is no less senseless to restore its orientation to the original goal-setting and comparison of «pictures of the world» than to completely simulate it: both of them are subjectless. If in the natural science context this post-modern problem is

so far leveled by the innovative ideal, then in the socio-humanitarian context it questions its very essence.

#### **4.11 Resource of self-representation in modern scientific rationality**

At the same time, the postmodern analysis of the «discourse of power» seems to be an aftertaste of (neo)positivist objectivization («alienation», «externalization» [243]) of the mind and the objects of its cognition by instrumental methods of representation and in general, modern enlightenment of the sinfulness of «created nature», which is still destined for a reverse movement of methodological preferences towards the hyleomorphic strategy of imitation of «creative nature». «*An activity is rational if the mechanism of internal improvement and external harmonization is built into its structure <...> The level of balance in the relationship of activity with other human abilities and the surrounding world is the same criterion for the rationality of activity as its internal improvement <...>* In a certain sense, this is a combination of the principles of formal goal rationality and value rationality, formulated by M. Weber» [244, p. 1035].

Replacing the «almighty mind» with *immanent* conditions for the possibility of empirical and theoretical unity, scientific rationality supplements the *negative* freedom of logical control of the translation of cultural experience («stating rational consciousness») with a *positive* procedural correlation of the sides of questioning, depriving chance of the privilege of being a criterion for differences between text and reality, goals and results, value and meaning. Just as the historiographic load of historical events overcomes the dilemma of their regularity/randomness, the hermeneutic communication of the order of being (causes and effects), on the one hand, and the order of actions (means and ends), on the other, can express the organic ability of post-nonclassical rationality to *project* cognitive possibilities, assimilating the discrepancies between external causal schemes and the internal logic of research, and thus removing them from the asymptotic perspective of scientific and cognitive mastery.

Then the handling of means presupposes not only the proliferation of theories and the rationalization of scientific (meta)language in order to refine the criteria and principles of their purposeful rational selection or linguistic complementarity, but also the hermeneutic *restoration* of the cognizing subject, his original goals and cultural meanings in general. According to J. Habermas, such a methodological orientation can overcome the existing crisis of motivations, promote mutual understanding of the subjects of communication and organize the «social action» of the direct, undistorted implementation of rationality [245]. The latter “dilutes” the natural-science samples of scientific representation (whether it be mechanistic ways of explaining or probabilistic-statistical ways of describing) with contextual methods of description and non-demonstrative forms of substantiation of socio-humanitarian studies (with experience, intuition, typology, case study, participant observation, etc.), the classical non-rationality of which was expressed in the weakening of idealizations and was paid for by the growth of uncertainty and unpredictability.

Moving from the status of «context of discovery» to «context of substantiation» in postnonclassics, socio-humanitarian methods of scientific representation make it possible to test scientific knowledge in addition to logical and linguistic normative criteria by pragmatic rootedness in its origin, functioning and communication: everything that determines the formal structure of the subject of cognition requires a separate representation (“self-representation”) and endows axiological (in)acceptability with the same gradual evolutionary dimension that is mastered in the outside world. «If the classical image of science focused on the construction of a unified generalized theory, and the non-classical image of science - on the complementarity of various methods and languages for describing quantum mechanical phenomena, then post-non-classical science defends the idea of a fundamental plurality of descriptions and explanations, insisting only on the clarity and methodological transparency of the initial principles and premises, on the consistency and argumentation of scientific discourse, carried out in dialogue and criticism of other principles and ways of reasoning <...> Scientific knowledge appears as a multi-level network of interconnected symbolic conceptualizations, and its nodes as semantic

concepts that exist in acts of scientific communication, including, and above all, in acts of verbal communication» [246, p. 473, 619]. Then the extrapolation of means that successfully reproduce similar goals becomes truly rational, and does not justify its arbitrariness by statistical approximations, approximations, fraught with the substitution of the result, or, as Aristotle would say, «in vain» (μάτην) [247, p. 95].

#### 4.12 Conclusions

Classical scientific rationality can be represented as an institutionalized mode of rationality in the context of normative scientific research. The ultimate expansion of normativity into rationality comes from the pragmatic ideology of the Modern time, which requires methodological and epistemological guarantees of cognitive activity, which eventually form a corpus of scientific foundations, and with them the self-consciousness of scientific rationality. At the turn of its formation, it acquires a mathematical way of describing phenomena, as opposed to the metaphysical-substantialist interpretation of forces – syllogistic in the Middle Ages and figuratively aesthetic in the Renaissance.

The changes that took place in this way are now qualified by philosophers of science as the formation of a paradigm of rational *nomological explanation*, that is, explanation by means of the laws of nature.

For scientists of the time, this meant that «general laws are hidden in all particular cases, where they are complicated by so many extraneous circumstances that it often takes the greatest skill to discover them <...>» [248, p. 302] or «<...> reduce the theory of mechanics and the art of solving problems related to it to general formulas, the simple specification of which gives all the equations necessary for solving any problem» [249, p. 9]. This or that fragment of reality became an object of study to the extent that it was included in the area (structure) of a certain set or to the extent that it met the requirement of equality of predicates. This made it possible to quite fully establish the set of conditions under which one or another scientific statement is true.

With the obvious new European progress of scientific determinism, its rational dimension, which goes back to the creationist-cognitive reflection of the objectively universal, reveals a repressive effect aimed at cleansing all corners of the world from the «dogmatic *prejudices*» of value forms of consciousness (myth, religion, tradition). «In the philosophy of the Enlightenment, oriented towards the experimental and mathematical natural science that arose in the XVII century, being is identified mainly with nature, as it appears in mechanics – as an environment where mechanical causality reigns and there is no more room for the concept of purpose, expediency» [166, p. 494]. As a result, conceptual awareness, general significance, systematicity and other criteria of purely scientific rationality are elevated to the rank of generally reasonable (and even meta-reasonable), which in turn hobbles the subjective and representative prerequisites for the further development of scientific determinism.

As a result of the enlightening combination of the mechanistic reductionism of Newtonianism with the quasi-religious rationalist idea of «full analysis», the particular scientific version of determinism crystallizes into a «Laplacian» model of a true description of reality, which reinterprets sacred mystery into modern problematicity and provides miracles with rational certainty in the formula «we can only know what did it themselves». «Mechanism finally said goodbye to the image of nature, which comes from the archaic-mythological consciousness, as a field of action of certain “living forces” that have their own aspirations, intentions, will, pursuing their goals (teleologism) and presented it in a homogeneous space in which objects devoid of internal energy and self-movement move according to strict uniform laws. Knowing these regularities, a human is able, in principle, to completely master nature, remove any halo of mystery from it, disenchant it, according to the well-known expression of M. Weber, and turn it into the material of his activity, which involves a rigid unambiguous determinism of controlled causal influences and the consequences they cause» [169, p. 110].

At the same time, this quintessence of classical scientific *reasonableness*, representing natural *determinism*, was subordinated by I. Kant to the value-teleological



principle of «practical mind», designed to bring the empirical alternatives of the first to the original Intention of the second.

The invariants of its a priori forms, which make up the «pure» (homogeneous) transcendental consciousness, will become the personification of the non-classical meta-rational attitude not so much towards subject properties, connections and structures, but rather towards the *prerequisites* for their cognition.

The consistent immanentization of the transcendental subject in German idealism has transferred empirical alternatives to scientific rationality into the status of extrema on the scale of natural determinism, where they constitute contradictory means of hyleomorphic communication of the Idea and reality as subordinate to the philosophical and scientific levels of determination, respectively. The discrepancy between the Idea and reality in G. Hegel takes the form of an expedient evolution of the mind, in which the enlightening stage only «clears the ground» for subsequent synthesis, which, in the body of scientific determinism, will manifest itself in the «real chance» that accompanies not only the variability of the individual, but also his whole «law of nature». At the same time, Hegelianism, like Laplacian mechanistic determinism, presupposes an exhaustive rationalization of reality, excluding cognitive alternatives and extra-cognitive foundations of human activity.

If the German idealists, overcoming enlightenment rational reductionism, but not abolishing faith in *mind*, hypostatized the latter, then the authors of the philosophical teachings of irrationalism abstract its intuitive moment from the dynamic integrity of thinking, resorting to a similar distinction between *philosophical* and *scientific* determinisms. The irrational immediacy of the first will lose its connection with universal cognizability and will find justification in the *microcosm* beyond the limits of everyday life, while the instrumentality of the second will find its justification in its quantum regularity. On this path, the empirical dignity of the causal schemes of «artificial» determinism turns into pragmatic «laws of probability», and the constructivist potential of the formal norms of the scientific community – into non-classical criteria of scientific rationality.

Testifying to the emerging distance between empirical reality and the human mind, the instrumental-pragmatic approach to the study of non-mechanistic types of determination provoked a phenomenological apology for the intuitive unity of thought and the world, empirical and theoretical. In general, this contributed to the general methodological acceptance of a *probabilistic* style of thinking, implying the post-Laplace norm that in the «unified formula of movement» the proportion of «forces that animate nature» is different and changeable, and the scientific mind expresses the collective (heterogeneous) nature of cognition.

Historical and philosophical analysis of the main stages of scientific determinism allows us to present them in the methodological culture of modern science as a «semantic grid» of alternatives to scientific rationality. In particular, the implementation of the program of mechanism in the Laplacian ideals of «omnipotent mind», «unified formula of movement» and «completeness of description» provided a goal-oriented strategy for testing and incrementing scientific experience, and then establishing its structure in the form of a relationship of description languages. At the non-classical stage of methodological reflection, the *opacity* of these languages as a means of scientific research was realized, which limits their controlling ability in alternative descriptions and side effects.

Scientific rationality in its non-classical models contains an excessive set of characteristics and therefore is identified not so much by elementary criteria (explicitness, accuracy, completeness, logical validity, consistency, methodicalness, verifiability, falsifiability), but by structural ones (preservation, correspondence, invariance, symmetry, consistency) – and, first of all, the *integrity* (coherence, completeness, matureness) of the activities carried out in its cognitive, practical and reflective aspects [250, c. 41, p. 144-145]. But the synchronization (coordination) of the set of methodological criteria and the non-scientific (metaphysical, religious, political, historical, psychological) context of their preference is very situational, and the task of the philosophy of science of the XX century consisted in the logical explication and *standardization* of these «internal logic» and «external history».

In this perspective, the normative nature of scientific rationality became more and

more noticeable, since with the establishment of the paradigm of non-classical physics, the representation of reality is increasingly merging with sophisticated mathematical abstractions, less and less based on experience or visual models: «here, thinking reproduces an object as included in human activity and builds images object, correlating them with ideas about the historically established means of its development» [251, p. 166]. Using the connections of deterministic categories with the main scientific programs and «categorical matrices», it is possible to reconstruct the transition from the metaphysical to the dialectical *or* postmodern perception of these categories in philosophy, which equally constitute the philosophical and methodological support of the probabilistic style of thinking of modern science.

On the one hand, the model of an evolving object postulated by this style provokes the *deconstruction* of classical categories in the form of new concepts of «chaosmos», «death of the subject», etc., which negatively qualify rational needs in science as signs of narratives. Here, the efforts of *postmodern* consciousness to follow the actual priority of chaos, virtuality and permanent becoming are noticeable. However, this «marginalization» of ontology is not simple relativism: it occurs to the extent of historical, methodological and interdisciplinary *detection* of the context of the goals and means of socially determining processes that dictate the actual meaning of «naturalness» and the corresponding cognitive means (abstraction, categorization, idealization, extrapolation). With this approach, their deconstruction in various sciences reveals an *intense* «movement» of the content of these narratives and establishes existing contradictions and continuity in them.

On the other hand, the incompleteness of the scientific representation of post-nonclassical natural objects, comparable with the immanent context of a humanitarian object, allows us to generalize scientific and cognitive activity to a co-evolutionary ability of self-generation, in which the sides of the original subject-object questioning are open to mutual positive correction of chances according to the hermeneutic scheme, smoothing the spatial (levels), temporal (stages), etc. categorical polarization of rationality.

With the transfer of cognitive goals in this way to the variable order of sociocultural conditions and means, the criteria of scientific rationality are perceived as variable cognitive values, and the rational regulation of the new subject-subject interrogative, instead of a theoretical representation of the ideal causal scheme or the imposition of descriptions of varying degrees of generality, takes the form of a sensory-volitional *understanding* of dynamic communication their model interpretations.

The general conclusion drawn from this by the post-non-classicists is the need to distinguish between complexes of means from the ideal (and value-ambivalent) canon of rationality in relation to the types of objects, problems and tasks of scientific research, as well as the historical and scientific context [252, p. 122; 253; 254].

However, the question of the permanent *bifurcation* of the theoretical description of reality remains: does it mean a fundamental reduction in the rigidity of the determinism of modern rational cognition, or does it represent local and temporary violations of expediency in this activity? «...» Models can coexist at the same time, consisting of the same elements, but «working» differently due to the fact that these elements have different functions in them. One model emphasizes the prevailing importance of the consistency of the structures of scientific knowledge, the other model brings to the fore the fundamental «openness» of these structures, the richness and alternativeness of explanatory procedures, heuristics, etc. Thus, like the whole system of normative rationality, that and its subsystems as models are changeable, dynamic, adaptable to the development of scientific knowledge. «...» Thus, we should not talk about the criteria of rationality, by which one could judge the rationality of models of scientific rationality (the path to regression!), but about the degree of adequacy of the image of science and scientific activity, which dominates at this historical stage the picture of the general cultural process» [114, p. 96, 99].

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