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4. Epistemological images of modern science: postmodernism and postmetaphysics

Introduction

In modern academic consciousness, the qualification of modern science as «non-classical» (or even «post-non-classical») is already established. On the other hand, when rethinking in a new context the problems unsolved by the classics, it turns out that this categoricalness is based on only a few «cases» that cover specific scientific discoveries and their ideological interpretation. It is they who provide the basis for determining the characteristic ontological, epistemological and axiological tendencies of modern science, often taken up by philosophy with the prefixes «post-». This is primarily about anti-reductionism in relation to classical idealizations, the multi-level and complex objectivity of the reality studied by modern scientists, the strengthening and diversification of relevant disciplinary interactions up to the search for integrative theories, the revision of the criteria set of scientific rationality and the initial (or final) truth of knowledge.

From our point of view, a convenient way to organize them is to analyze them in the categories of non-classical thinking style, discourse, and values, which allow us to organize the impressive scattering of actual scientific research and their philosophical reflections and extrapolations into a model of the transition from classical to non-classical science, the factors of formation and a kind of qualification of the latter. The methodological complexity that may lie in wait here is the devaluation of the privileged status of philosophical instruments in European culture, for which philosophical (postmodernist) criticism itself increasingly refuses to recognize unity, progressiveness, effectiveness, or at least rationality. Postmodernists proclaim *any* discourse as a «will to power» dressed in linguistic garb, which certain communities possess. However, they reproach philosophy for denying this «fact», which is expressed in the exclusion of philosophy from interpreting its own narratives for any negative (in moral, cognitive, ecological or political aspects) purpose. At the same time, another camp of philosophers, called «postmetaphysicians», considers rationality

as a condicio sine qua non of philosophical reflection with the only amendment that it is no longer based on final absolutes and the centers and hierarchies of significance derived from them.

Refutation of the classics at the general scientific level of knowledge: main ideas

Throughout the 20th century, radical changes in science – from the proclamation of the revolutionary ideas of relativistic theory and quantum mechanics to the formation of new disciplines – so changed the style of general thinking of the era that, in the end, contributed to its paradoxical naming as the «postmodern state», that is, the era that has gone beyond the boundaries of modernity. The first fundamental principle, upheld in physics and cosmology as a result of the philosophical attitude of perceiving the real world exclusively as a «picture», was the relationship of objects of scientific study with the position, conditions and material means of their *observation*. Changing, for example, the observation, measurement or calculation device gives a completely different, even incompatible, «picture» of the scientific object. M. Planck and A. Einstein could still raise the question of the possibility of creating the entire observable world (its boundaries and singularities) to reproduce in a «unified theory» its pre-established harmony [1].

But the leading methodology has come to the necessity of «combining» partial and one-sided descriptions into a common one not through the relation of logical inclusion, but through the methodological relation of «complementarity». In the original version by N. Bohr, the principle of complementarity implies a combination of opposite, logically incompatible descriptions, but its derivative applications often move to another level of generalization: when, for example, they try to «sit on two chairs» of thinking styles, worldviews, referring to neurophysiological arguments of the functional asymmetry of the cortex of the human cerebral hemispheres.

Just as space and time in non-classical science begin to be considered as mutually conditioned parameters (attributes) of matter, in philosophy they are combined into a *chronotope* as an element of narrative. Unlike its art-historical analogue, it has a subjective character, which makes human activity possible as socio-anthropological

dimensions of space and time. Together with discourse, they constitute the scaffolding of a complementary speech agonistic (language game, mode of utterances), which is conducted by heterogeneous and multi-directional subjects. In other words, even scientific *content* that claims to be objective and universal is forced to be born and expressed in certain specific forms of knowledge – historically and practically conditioned. Therefore, its social role cannot prevail and subordinate the values of human life, in which it is always inscribed. On the contrary, it must provide a space for meaningful dialogue, in which free views and expressions mean not the beginning of a confrontation, but a mutual testing of one's own generalizations. Unlike utopian ideologies, always devoid of chronotope and therefore empirically invulnerable, free views are open to change [2].

Among the most general philosophical consequences of this shift is the rethinking of the category of *truth*: from an optimistically conceivable *singular* description of any complex object, which nevertheless turned out to be a model with too narrow macroparameters, to equally substantiated at the theoretical and experimental levels alternative truths that reflect different aspects, discursive and ontological modes of scientific reality. Because of this, the laws of nature sought by classical science as universal nomological statements that provide the fundamental possibility of accurate prediction of the course of events are limited in the range of predictive ability and the scale of coverage of the object system («local unpredictability», «global predictability», etc.). The ideal of «Laplacian determinism» of classical science not only implied a combination of rigid determinism and unlimited predictive power, but also subordinated all other functions of scientific and theoretical knowledge to the latter. So when it was threatened by «wayward» microscopic systems, non-classical physics experienced a general crisis, which was overcome only after mastering the self-organization processes common to micro- and macro-objects. Thus, scientific knowledge begins to be understood as a relative truth, expressed in a set of theories containing elements of objective knowledge, for the ordering of which methodological *principles* are actively used. Unlike the scientific method, such principles have a less rigid structure: they lack the operational and instrumental clarity inherent in the

scientific method, and the softened algorithmic nature. For example, the principle of correspondence orients the scientist to build a new theory in such a way that in the extreme case it could be reduced to the old theory.

According to the non-classical content of the category of truth, the real world is what mathematical theories tell us, representing it from the side of the integrity that has frozen in the substantial order or is evolving. If in classical science the ideas about physical reality were created at the empirical level, and the mathematical apparatus was already built on top of the ready-made ontological scheme, then in quantum mechanics the formation of mathematical formalism was completed before the ontological scheme and the categorical apparatus of the theory. This epistemological situation turned out to be close to the phenomenological interpretation of cognition by E. Husserl, according to which the question of the reality of the object disappears, since it does not «exist», but «is thought», «self-manifests», «is constituted»... Phenomenology is focused on the way of *revealing* something, investigates the question «how» reality is given, leaving open the question «what»... Similarly, the central idea of quantum mechanical theory, according to which the accuracy of measurement of paired units of an elementary particle, such as coordinates and momentum, is limited by an inversely proportional error, undermined the optimistically conceivable *accuracy* of the description. After all, the results of the experiment, according to the corresponding principle of W. Heisenberg, can now be predicted only with some probability [3].

Thus, non-classical objects of knowledge overturned scientific-rationalistic *objectivism* – the position of an external observer, whose cognitive apparatus had to maintain isomorphism to any modifications of the natural processes under study, and their course, in turn, – to maintain independence from the cognitive procedures used. In relation to one device, a microobject may have a coordinate and not have a momentum, in relation to another the situation may be the other way around. We can say that the specific certainty of the existence of a microobject as a certain fragment of reality is determined by the type of macrodevice, with the help of which the characteristics of the microobject are determined. In relation to different devices, a

microobject has different properties. In turn, the observer does not so much fix the properties of the object «in themselves», as he determines these properties in accordance with a certain situation. The opposite principle of subjectivity requires taking into account the activity of the subject of knowledge with his methodological and value preferences and shifting cognitive tasks to evaluative ones – in situations of methodological or financial planning of scientific research, selection of models derived from fundamental theory, etc.

However, even before material experiments, this idea emerged as a result of the search for a strict singular truth of mathematical knowledge. Initially, the semantic understanding of truth here completely gave way to the formal-logical one: the content of knowledge was subordinated to the apparatus of formal logic, because, for example, compliance with the law of non-contradiction is much easier to detect than the degree of subjective conditionality of a certain knowledge and its qualification as a prerequisite, consequence or contradiction in relation to other knowledge. According to the conventionalism of A. Poincaré, expressed at the II Paris International Congress of Mathematicians (1900), the absolute rigor of mathematical truth is that any knowledge is better to immediately accept as a conditional statement, which contradicts or does not contradict the fundamental. For Euclidean geometry, as D. Gilbert showed, such a foundation is the arithmetic structure of real numbers, the consistency of which makes possible the consistency of the structure of their spatial constructions [4].

However, the subsequent discovery of paradoxes in set theory, which goes deeper than arithmetic, raised doubts about the possibility of thinking about numbers themselves consistently. Therefore, the insurmountable uncertainties in conducting experiments (for example, whether neutrinos have mass or whether a black hole actually exists) showed that the essence of mathematical constructions is not reduced to reflecting physical reality: as creative works of human intelligence, they are only interpreted in quantum mechanical experiments in order to control them. According to the theorems of K. Gödel (1931), an axiomatization cannot be complete and consistent if its propositions are deduced deductively only from themselves by their own means. Therefore, for example, there are true arithmetical judgments that cannot be deduced

from some consistent axiomatic system that would include arithmetic [5].

Philosophical understanding of these conclusions as the collapse of the *absolutist* justification of D. Hilbert's mathematical program finds in their ontological premises the fundamental *uncertainty* of the world of non-classical objects of science, for which rational grounds, if not disappear altogether, then become purely conventional. The mathematical model of the organization of knowledge accustomed classical scientists to a clear hierarchy of basic axiomatic propositions and special and individual statements of deductive knowledge. After a protracted crisis of the logical connections of such a hierarchy in mathematics itself, natural science discovered that its theoretical propositions often achieve universal status only through association with metaphysical doctrines common to science and general culture. This is primarily about determining the attributes of matter – motion, time, space, law, etc., the slightest shifts in the content of which cause crises or advances in the entire corpus of disciplinary knowledge. Thus, it turned out that they can perform the function of axioms, being more flexible and alternative [6].

Having accepted this thesis, the leading philosophers of science of the 20th century (T. Kuhn, St. Toulmin, I. Lakatos, etc.) began to include in the models explaining its dynamics, non-rational terms and elements of spontaneity: the transition from classical to non-classical began to be imagined outside the patterns of logical-mathematical deduction. Thus, T. Kuhn's «paradigm» or I. Lakatos' «core of the scientific research program» normalize general provisions and reflexive procedures that are not subject to verification or falsification.

Accordingly, the definition of truth implies not only a certain compromise of arguments, but also a consensus on the *discourse* in which they are produced. At the same time, being guided by the «ideal» *criteria* of articulation of its rules, the effectiveness of its applications, inclusiveness of participants, freedom and truthfulness of speech, equality of initial chances for contributions, absence of coercion, etc. ensures the final truth not only with acceptability, but also with a high probability of choosing from alternatives when necessary. After all, whatever the statements that claim to be true descriptions in this way, their objects are pragmatically considered (Unterstellung)

as part of the objective world common to all [7].

Together with the «creative» understanding of truth in modern science, its methodological reflection comes to the conclusion of the rehabilitation of the role of the psychological characteristics of the subject of knowledge. Thus, according to R.A. Wilson, relativistic relativity and especially «Copenhagen» quantum mechanical uncertainty are a projection of the adaptive mechanisms of the higher nervous processes of the human brain: they constitute the creative potential and the limits of the interpretation of knowledge. Its recognition does not weaken the position of science, but relieves it of dogmatism and intolerance. Strengthening openness in this way transforms the methodological model of a direct and economical «tunnel» of scientific research into a «labyrinth» of constant alternatives. In general, transactional psychology argues that traditional ideas about the psyche's reflection of external reality should have long been replaced by a model of the creative work of consciousness in selecting and combining an excess of psychophysiological signals from this reality. Thus, expectations create a «tunnel» for the reflection of reality, which not only has a subjective-probabilistic nature, but also deprives the «Aristotelian-medieval» concept of a single objective reality of its working meaning. More precisely, the naive postulation of such a reality should acquire a pragmatic dimension of the consequences of its acceptance. Then it will turn out that it is not simply true or false, but gives grounds for greater or lesser chances of predicting the future. Thus, being vicious or virtuous, the neurophysiological features of human psychology cannot but determine the methodological principles of any science generated by it: «every painting always contains the autobiography of the artist» [8, p. 44].

An even more dynamic image of reality and the search for the corresponding truth is provided by the transdisciplinary direction of physical chemistry (in the terminology of the German physicist G. Haken – *synergetics*), which claims to expound the general natural ontology of self-organization, reproduction, maintenance and development of macrostructures ordered in space and time. In particular, a common model of such processes is the dynamics of an open non-equilibrium system that undergoes qualitatively heterogeneous stages: laminar motion, points of divergence of motion

trajectories, turbulent motion, etc. If at some stages the system remains inert to minor external influences, then at others (such as «bifurcation points») its behavior becomes unstable under the influence of the slightest objective (such as heating) or subjective (such as normative expectations) influence. Thus, under the condition of an increase in energy and matter, stable ordered structures are generated from chaotic «fluctuations» that occur in non-equilibrium processes.

Together with the dynamic ontology of «system objects», synergistic innovations also change the epistemological components of modern science, which are denoted by such concepts as nonlinearity, chaos, instability. This is primarily about the de-absolutization of the *substantial* foundations of classical scientific rationality, provided by the structural stability and reproducibility of objective forms of movement. In addition to the already customary discrediting of binary deterministic categories by the philosophy of life, such as «law – chance» or «trajectory - Brownian motion», by indeterministic ones (holistic bifurcation, regular fluctuation, ordered chaos), we are talking about a significant limitation of the principle of superposition, the structure of differential equations, linear predictions, and resonant parameters. Even scientific facts often become the result of the realization of the scientist's value preferences, which determine his selectivity in the perception and regulation of experimental parameters. On the other hand, all these features of scientific knowledge are formulated at the end of long chains of abstractions, which in mass culture can be formed into simplified images of bifurcation labyrinths, in which the predictive ability of synergists is lost.

At the level of philosophical criticism, the idea of synergy itself has found a place in anti-reductionist representations of complex systems, where interacting elements do not lose their own certainty and determination, including moral. In this way, A. Smith's semi-mystical idea of the «invisible hand» of the self-regulating market finally finds justification. After all, in the classical discourse, the general public good excluded the possibility of preserving the selfish, diverse interests of individual participants in market relations, so it remained unclear how persistence in realizing one’s own interests could be combined with helping others or even rewarded [9].

The greatest success in their research was achieved by the «Brussels group» of I.

Prigogine, which focused on those chemical reactions where energy dissipation occurs. In non-equilibrium systems, it causes internal contradictions and becomes the most fundamental source of qualitative changes. Thus, a general unifying «principle of instability» was put forward, which governs evolutionary processes of the most diverse nature - from microquantum to socio-cultural processes. Its consistent coordination with other components of the methodology and scientific picture of the world completes the denial of such classical science as the isotropy of time and space, the reversibility of any changes, the priority of substance over accidental motion, stability, etc. [10].

In other words, when combining thermodynamic and evolutionary models of development, the phenomenon of self-organization receives a long-awaited ontological interpretation, in which the level conditioning of the dynamics of the quantities of a self-organized system coincides with the methodological approach of ecology - to consider systems in a cyclical and selective relationship with the environment, which aims to coevolutionarily harmonize the internal alternative adaptive dynamics of the system with the external homeostatic dynamics of nature. However, ecological studies themselves overcome non-classical relativism in a completely different way: they draw attention to the fact that the Cartesian «thinking being» also acts as a subject of ontological relations: successful interaction with nature expands his picture of the world, weakening the subject-object distinction. Thus, he is forced to expand his value orientations to the natural community, giving greater rights to heterogeneous theories and forms of understanding in its scientific knowledge [11].

Thus, synergetics and ecology demonstrate that in the second half of the 20th century the cognitive situation is characterized by the blurring of the line between natural science and humanitarian knowledge. Along with the disciplinary organization of knowledge, which is still preserved, there is an active formation of interdisciplinary knowledge, in which sciences are united in the process of solving a specific problem. In this synthesis, a new relationship between man and nature is established - a relationship of dialogue, characterized by the removal of subject-object dualism. As a result, the «Absolute observer» leaves the scene of science, the subject and the object

are accepted as equals. The humanization of knowledge does not mean the rejection of objectivity, nature, as it were, manifests itself through man. Modern science is characterized by a general ecologization of thinking, a transition from static, structurally oriented thinking to dynamic, process-oriented thinking.

In addition to embedding natural existence in spiritual practices and civilizational progress or separating human existence from the natural order, evolutionists imagine these two sides of existence as separate modes within some third, more general substance. In particular, in the well-known modern concepts of E. Leroy, P. Teilhard de Chardin and V.I. Vernadsky, it is asserted about the noosphere (and later about the anthroposphere and biotechnosphere), in which humanity carries out the mission of self-awareness of the natural evolution of the biosphere, in order to further not only adapt, but also, by the power of reason, curb their joint spontaneous development. The term noosphere was introduced a century ago to denote a special shell of the planet that formed at the end of the Tertiary period of the Earth's geological history in addition to the geographical (lithosphere, hydrosphere, biosphere, atmosphere) through the comparison of human scientific and technical thought with the scale of natural factors of the planet's development and reveals common (genetic, informational, cosmic) patterns of human and natural existence. In the interpretation of V.I. Vernadsky, the noosphere acts as a collective human mind, capable, despite the insignificant human biomass, of fulfilling a geological role and being responsible for the coevolution of planetary civilization and the biosphere in the direction of harmonizing their resources and spontaneous development from the standpoint of a planetary and cosmic scale [12]. In the models of the development of scientific knowledge, there is a shift in philosophical and methodological interest from historical and sociological reconstructions of the origin of generally significant scientific problems and the direction of the growth of scientific knowledge to the postmodern deconstruction of the linguistic dimension of research consciousness. Just as in ontology, here the classical analysis in binary categories is overcome as such, which limit the field of metascientific reflection. And semantic constructions are considered more justified, where the logical subject (S) is not identified with the logical predicate (p), but is

revealed in it. Another material for deconstruction has become narratives of scientific progress, the elimination of the secrets of nature and human delusions, academic traditions, etc. In such a «creative-destructive» way, the foundation of non-Euclidean geometries, non-Boolean algebras, non-Cantorian set theories is imagined… [13].

Epistemological features of modern science: ways of rationalization

Of course, postmodernist deconstruction seems even more justified when applied to the analysis of socio-humanitarian knowledge, primarily historical-stylistic models of philology. It is here that the signs that J.-F. Lyotard so easily calls the «postmodern state (situation)» are most clearly manifested – the stylistic disintegration of works in favor of incessant cross-citations and allusions, transfer and counter-transfer of the author of the work and his characters, textual interpretation of any reality, etc. [14].

In epistemological terminology, this state is well described in terms of a style of thinking and ways of representing scientific objects, the novelty of which is due to a sharp decrease (up to «weightlessness») of the empirical component in modern definitions of scientific truth. On the one hand, this process is explained by the integrative impulse of classical scientific disciplines, which brings them closer to the formalization of their own empirical generalizations and the creation of fundamental theories. On the other hand, it is underpinned by the hypertrophy of transdisciplinary «grafting» of nonlinear mathematical tools, which develops on a relatively independent basis of computer modeling. In both cases, there is a predominance of the sign-symbolic construction of «simulacra» that manifest or even replace a certain reality over conceptual-semantic modeling that should represent ontology. In the epistemological aspect, the «game» with signs prevails over the adequacy of meanings and, ultimately, truth, which indicates a certain crisis of the components of the corpus of rationality in the representation of scientific objects. Although, from the point of view of poststructuralism, this state of «absence of extratextual reality in the world», characteristic of modern art, should be normalized for science as well, for example, on the basis of the Sapir-Whorf hypothesis [15].

Just as the artistic traditions of the purpose and mode of functioning of artistic activity of the Modern era since the beginning of the 20th century do not give the desired aesthetic effect in culture (which R. Panwitz at that time qualified as a «postmodern crisis of European culture»), the strict absolutes of classical science regarding the fundamental justification, and therefore the truth, of new knowledge do not contribute to its growth. Especially since both the positivist program of the philosophy of science for the unification of mathematical justification, and the alternative to it, the neopositivist program of the empirical reinterpretation of all scientific knowledge, turned out to be unfeasible and unnecessary for science to fulfill its functions. As A. Einstein's position on this issue (as well as W. Heisenberg, S. Weinberg, etc.) shows, for the multi-stage abstractions of a scientific theory to be recognized within the scientific community, it must have not only external narrow pragmatic and phenomenological premises (empirical justification, predictive power), but also internal *perfection*, which is not reduced to some aesthetic appreciation of the found simplicity or harmony of fundamental equations, but corresponds to large-scale guidelines for research searches, such as, for example, extremely wide groups of symmetries or cosmological acceptability [16].

Thus, the correspondent concept of truth is deepened by the search for contextual *conditions of the possibility* of this true knowledge itself, which include the schemes of the subject-object relationship, material causation, coherence of general and specific knowledge, objectification of the meanings of sign structures through the generalization of their interpretations, etc. This work was also carried out by classical epistemology, which criticized or justified empirical (or «natural» in E. Husserl, or «meaningful» in analytical philosophy) scientific knowledge. By subordinating the sought-after objective «laws of nature» to the processes of meaning formation in the minds of scientists, it ultimately caused a «linguistic turn». However, it retained the Cartesian privileged status of the subject of knowledge, capable of defining or constructing all its objects from transcendental positions. In other words, all direct experience had to be invested in verbal-discursive thinking full of norms and rules.

When non-classical epistemology revealed the rational-communicative dimension of the dynamics of scientific cognition, the position of the External Observer began to differentiate: J. Deleuze drew general attention to the immanent characteristics of the subject of cognition, and J. Lacan, J.-F. Lyotard, M. Foucault, as well as naturalists (K. Lorenz, J. Piaget, U. Maturana, F. Varela) generalized them to the «principle of corporeality». Thus, M. Foucault develops it as an interaction of the ontology of the subject, power, and cognition: as a result of control by social institutions, both the formation and functioning of corporeality have long been subject to predominantly repressive regimes, such as calendar regimes. As is clearly evident from medieval literature or the works of J.O. Lamétrie, they have simultaneously received theoretical justification from the relevant scientific disciplines. Therefore, the restoration of personal corporeality as a primary source of experience and meanings requires a conscious critical attitude to power practices, up to resistance to them (medieval techniques of allegory, the poetry of troubadours and «minnesinger», etc.) [17].

Instead, J. Deleuze demonstrates the reverse influence of corporeality on social relations through its phenomena of desire, temptation and pleasure, which significantly determine cognitive structures, and therefore the content of subjectivity. Moreover, the ontology of the subject completely replaces the conscious Cartesian exercise of thought with the unconscious production of desire (libido), which is at the same time indistinguishable from its object, while the isolation of the subject means the secondary mastery of all phenomena of corporeality. In addition, libido goes beyond the personal subject and forms the «social field» not only of power relations, becoming a metalanguage for ideology, but also of cognitive and value relations, becoming the expression of cosmic Eros. At the same time, the generic person as the primary and natural producer of desire is able to influence socio-cultural and even historical reality. Thus, J. Deleuze, using his own terminology, which blurs the distinctions between human, social and natural, describes the production of the «matter of reality» that is different from industrial production. Carried out by nature, this production also determines social consumption and distribution, with the difference that their economic

analysis is not reduced to weighing the planned goals and the results obtained, but also includes the process itself. Moreover, it is considered as an all-encompassing reality in which nature, man and society carry out production through the mediation of each other [18].

Another thing is that the very necessity of such additional searches for non-classical epistemology can be assessed by the public consciousness, accustomed to extreme scientism and rationalism, in a skeptical and even anti-intellectual spirit. Instead, all the prestige is taken over by pseudo-, quasi-, anti-scientific forms of knowledge, which are attractive because, unlike science, they do not so much raise problems as loudly remove them. At the same time, an interesting paradox noticed by R. Descartes is reproduced: the polemical mood of this extra-scientific knowledge regarding science and the absolute uncriticalness of one's own ideas and their grounds. Instead, a scientist, by definition, must impartially doubt any positive knowledge: any expedient exceptions deprive it of rationality. History teaches that the testing of axioms for consistency, conducted by B. Riemann, J. Boyai, M.I. Lobachevsky, was perceived by the public of that time in anti-scientific colors – as a conscious departure from reality and rationality. However, being, in fact, scientific, at least in terms of the methodology of dealing with axioms, they led to significant progress in geometry, and also added to the sphere of scientific reflection a new meta-level of distinction between objective and subjective, basic and deduced, real and symbolic. As evidenced, for example, by the correspondence of Z. Freud and A. Einstein, scientific theories can perform the psychological functions of myth (adaptation to the present, reassurance from exhaustive explanation, harmonization of relations, ordering of worldview). However, their reassurance or irrationality appears as such only in contrast to their own obsolete forms and components: scientific adaptation is anticipatory, reassurance is prospective, harmonization is structural, ordering is dynamic. In contrast, all kinds of myths under the surface of transformation and revolution are always based on ready-made analogies, therefore stable and final. Therefore, they do not contain a mechanism (criterion) for the growth and renewal of one's own knowledge, which at the level of postmodern reflection is expressed in the *denial* of progress. Due to the lack of

distinction between traditions and innovations and irony regarding canons and absolutes, everything «new» is viewed only as a recombination of the «old»: «modernity has exhausted itself» [19]. Moreover, this recombination is denied any (both scientific and practical) systematization, normalizing not only epistemological («anything goes»), but also ontological eclecticism as the result of the deconstruction of «forced» binary oppositions (such as both subject – object and subject - subject) in the conditions of the possibility of true knowledge.

It should be noted that the postmodern pathos of anti-scientism, anti-demarcationism and de-absolutization, which grew out of the crisis of the methodological and epistemological canons of classical scientific knowledge, despite the well-known intra-scientific examples of resolving this crisis, focuses all attention on the practical and socio-cultural significance of modern science. In particular, paradoxical parallels are drawn between scientific rationality, legal humanism and the genocides of the 20th century, contrasting them with Eastern pessimism, mysticism or passive contemplation as a worldview that leads to more balanced and humane consequences in a non-rational way. In contrast, the consequences traced by postmodernism largely coincide with the post-industrial critique of society and culture: we are talking about the internal contradiction of the bourgeois guidelines of the Enlightenment, which theoretically call for progressive social-group «common sense», but in practice lead to arbitrary individualism. Therefore, if in the youth movements of the 1960s if the non-classical irrational will manifested itself as a collective subject in socially significant rebellion, then after decades it reached an individualistic scale, when the immediate thoughts and impulses of the individual are equalized and opposed to socio-cultural ones. Since in most guidelines, such as party or class, this means nonsense, it turns out that their content from the beginning excluded individual self-determination [20].

In postmodernist terms, this idea demonstrates disbelief in the values of Modernity through the emasculation of any original thought – from scientific truth to artistic beauty. When science cannot guarantee impeccable foundations for its own knowledge, then instead of waiting for their improvement, it is easier to declare this

state of affairs final and equate it in rights with any other knowledge that is «conditional», «indefinite» and «imperfect» in its foundations.

However, similar «kickbacks» have happened before: take at least the example of the popularity of quasi-scientific modernism and spiritualism of the late 19th and early 20th centuries as the antithesis of natural positivism. Therefore, *post-metaphysicians*, starting with J. Habermas, continue to search for grounds that would enable scientific and theoretical knowledge and the critical function of philosophy in relation to it. Of course, in this case, one cannot find the metaphysical place of the External Observer, who directly contemplates the substance and therefore can reflect it in an impartial form in the ideal language of theory... Postmetaphysics has received a certain immunity from the «grand narratives» of the Laplacian demon criticized by postmodernists, which, together with the comprehension of the only truth, frees humanity from dependence on nature. The corresponding subject of scientific knowledge is the learned society, which in many generations, creative inventions and linguistic discourses accumulates and reconstructs the knowledge that someone once expressed in a monological discourse. If it turns out to be deductively consistent and relevant to experience, the illusion of an empirical reflection by a single subject of all possible experience may arise. And only a failure in its effective application to pressing cognitive or practical problems forces the restoration of its entire genealogy, which cannot do without philosophical categorical distinctions [21].

K. Popper points out the compatibility of rationality and the collective scale of the subject of knowledge: an individual is prone to errors, but through joint efforts it is quite possible to approach the truth. This model of spirituality in science can be adopted by broad collective cooperation, which also requires objectivity [22].

If we approach the dispute between postmodernists and postpositivists historically and pragmatically, we will have to admit that it was classical science, which most changed both the external life of Western civilization and its cultural awareness, that was based on absolute mathematical foundations that equalize the cognitive capabilities of the immanent and transcendent mind. Behind it stands the human desire to master the eccentric diversity of things into a holistic picture of the world, to reduce

the chaotic vectors of their movement to linear changes that can be described by means of linear differential equations. When those from Newtonian physics were transferred to politics, economics, and social history, enlightened scientists, such as J. Condorcet, using the famous metaphor of K. Popper, turned «clouds into clocks» [23]. For example, in economics this meant the exclusion of socio-cultural factors of development in favor of exchange factors, in public policy it could manifest itself in the subordination of unique experience and conflicting interests to the general development program, etc.

It is possible to argue to what extent they abstract from all the complexity, alternativeity of the movement of a certain type of systems, however, the successes of classical science were based on rigid categorical oppositions that provided quantitative mathematical reductionism. In addition, the spiritual maturation of humanity, when its existence contributes to the mass awareness of an individual as a holistic personality, presupposes the affirmation of the value of scientific knowledge and a positive attitude towards it.

Thus, the successful liberation of a person from the pressure of external circumstances correlates with the growth of the socio-cultural status of scientific rationality. However, despite the «universal doubt» of this rationality instilled by R. Descartes in the 20th century, it has outlived its time and competence, especially outside the boundaries of scientific knowledge [24]. But has the idea of rational *grounds* that provide a discursive coverage of a certain sphere of knowledge, a mental toolbox of initiative activity, and a corresponding explicit, generally significant result, if we add to them the basis of self-criticism, actually exhausted itself?

If we assume that the renewal of foundations should be synchronous with the development of new types of scientific objects, the problem of refuting their absoluteness corresponds to the vicissitudes of a number of discoveries in quantum mechanics (which undermined the idea of the stability of matter at its microlevel), the theory of relativity and cosmology (which introduced the dimension of irreversibility into the ontology of the universe), non-classical thermodynamics (which established a mediator between order and chaos in the person of non-equilibrium structures), etc. In

the latter case, for example, we are talking about the essential instability of the trajectories of motion, which makes their quantitative prediction limited in time and space, thereby denying the heuristic value of Laplace's demon and the category of the determined world itself. Therefore, the diversification of methods of scientific description up to the involvement of extra-scientific forms in them according to the skeptical (postmodernist) principle of *isonomy* is only the first reaction to this crisis. That is why, according to P. Feyerabend, the slightest preferences for science immediately turn into its usurpation of power through fusion with the state and dogmatization in absolutist criteria of rationality [25].

Instead, the epistemological contours of the new scientific rationality are viewed in a nonlinear style of thinking, which involves preserving the entire breadth, complexity and dynamics of connections and factors of influence in the objects of knowledge. By analyzing opposite alternatives of development directions and qualitative irreversible changes, they are qualified as unique, and their representation (construction) by means of nonlinear equations is based on the methodological *principles* of systematicity, historicism, invariance and complementarity. On the one hand, nonlinear thinking can expound unique systems that, due to openness, are capable of self-regulation and development, and on the other hand, its categorical apparatus is designed to reproduce any whole if it is presented as a hierarchy of orders. In a visual form, these two aspects of representation appear as a series of cross-movement, where straight sections correspond to one-sided order and local prediction, and intersections – to catastrophic consequences from minor deviations or errors.

Thus, the implementation of the explanation of the behavior of the system at a certain segment of its dynamics does not necessarily coincide with the function of prediction, which is inherent in any mathematized theory so far. Supporters of synergetics associate the adoption of this style of thinking with a new level of self-criticism, which requires the inclusion of historical, socio-cultural and communicative components in the internal foundations of rational reflection, simultaneously with the enrichment of scientific theory with these components [26].

Given that synergetics is often considered as a combination of nonlinear mathematical methods of description with the ontology of non-classical thermodynamics and cybernetic structures of levels of self-organization, the external components of reflection look like expenses of interpretative models of nonlinear dynamics, which are compiled on socio-humanitarian material. However, synergetics themselves take an anti-physicalist methodological position and emphasize the universal status of the external, which appears when representing qualitative transitions (jumps) in the irreversible evolution of sufficiently complex systems. In cybernetics, the parameters of the complexity of the system were determined by the number of its elements and the ways of their combination, as well as the feedback mechanism, when some part of the energy (information) spent by the system returns to its input to correct errors and ensure the stability (internal self-organization) of the system. In synergetics, it is believed that these external factors diversify and significantly strengthen the feedback of the system.

The inclusion of these «subjective» components in the structure of scientific explanation changes the natural standard of theory, in which the role of axioms can be performed by socio-humanitarian provisions regarding order and activity in the most diverse spheres of culture. Being inextricably linked to personal understanding and practical embodiment, they complement the epistemological dimension of scientific knowledge with an existential dimension, which in turn raises the methodological resources of humanitarian discourse to paradigmatic status. Together with them, the cognitive model of the subject-object relationship drifts towards the communicative subject-subject as more complex and general, in which *nonlinearity* is determined by the subordination of the absolute subject to the relative; abstract scientific description to moral, artistic and practical prescriptions; binary categories to procedural; homogeneity to heterogeneity; additivity to emergentness; logical sequence to Gestalt switching; monodisciplinarity to the complexity of research. At the same time, the relativity of the subject of scientific knowledge carries within itself the contextual contations of the «agent», which is in the irreducible conditions of sensuality, corporeality, and imagery: «<…> incarnationality among them reveals the dependence

of the content and form of cognition on the structure of the agent, its functional features, and even its spatio-temporal location» [27].

Conclusions

As a result of the assimilation of a new type of objects into the methodology and worldview, non-classical science has come to establish at the general scientific level the knowledge of such new *ideas* as complementarity, uncertainty, instability, which have entered the thesaurus of modern philosophy. Their ideological justification is developed by representatives of postmodernism in view of the disparity in modern science of empirical and theoretical knowledge and the inexhaustibility of methods for solving and selecting scientific problems by purely theoretical means, such as modeling in a computer experiment. In popular form, these conclusions have gained publicity as the «blurring» of correspondent truth by the contextual conditions of its sign-symbolic articulation.

Just as in the culture of the 20th century the diversification of symbolic and expressive forms ultimately led to the relativization of their content in the spirit of multiculturalism, in scientific activity the ultimate generalization of the principle of complementarity must tolerate the coexistence of properly scientific cognitive forms with non-scientific ones as additional sources and criteria of objective knowledge (P. Feyerabend's «principle of tolerance»). The signs of this anti-demarcationism phenomenologically coincide with cultural and political multiculturalism, as well as the dependence of science on its own technical equipment. Since technique and technology are always expedient, the fusion of science with them makes it less and less neutral. Modern technoscience is so intertwined with economic interests that it takes on the features of a kind of business project: instead of the principle «what is produced is consumed», scientific knowledge is subordinated to the principle «what is consumed must be produced». Thus, if classical science served as a model for the formation of industrial technologies, then modern technoscience itself imitates them: the technogenic environment of science ceases to be its application.

At the same time, the epistemological requirement of demarcation at all levels of knowledge and stages of research remains in force for technoscience, which is aimed at preventing and eliminating subjectivism in the production and application of knowledge. Even the proposal of a practically significant problem, in order to become the subject of attention from scientists, must undergo a special intra-scientific procedure of formulation and justification with a final assessment – «rational», «scientific», «relevant» or «current». From this moment on, all derivatives of this problem fit into the system of scientific knowledge and sooner or later receive a solution through the replenishment of experience despite possible further shifts in its content, meaning, context. Conversely, the absence of a scientific status in a problem indicates the absence of cognitive contradiction or rational certainty in knowledge.

In addition to blurring the boundaries of objective knowledge and the sequences of its acquisition, postmodern reflection sees in modern science such epistemological *features* as the rejection of a rigid hierarchical system of values (as the allocation of logical or historical absolutes) in favor of freedom (including academic freedom), the apology of pluralism and the methodological relativism associated with it, epistemological discreteness, and the playful eclecticism of allusions; rethinking the nature of scientific knowledge from «epresentation» to «construction» reality as a quasi-scientific product.

On the other hand, the crisis of scientific rationality, in which these features are summarized, can be regarded as a «growth disease» of its classical type, which is extrapolated to the entire culture and civilization in accordance with the recent social authority of science. Therefore, revolutionary shifts in the natural scientific picture of the world, associated with the discoveries of non-classical thermodynamics, ecology and field theory, have the prospect of normalizing the corresponding nonlinear methods of description and style of thinking as scaffolding for a new type of scientific rationality – positive, concentric and dynamic.

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