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WORLDVIEW PREREQUISITES FOR THE DEVELOPMENT OF ACADEMIC RATIONALITY IN MODERN HISTORY

Besides the traditional for the national philosophy new European worldview due to its interconnections with capitalist economic relations, extensive industrial production and the anti-traditionalistic bourgeois society, this work studies internal links between new philosophy and science. More specifically, a projection of distinctive features of new philosophy onto the formation of classical science, philosophical substantiation of the scientific method in the form of empiricism and rationalism are revealed on the basis of reflections about ontological grounds of reason, its status in the structure of cognitive actions and abilities,. The main historical method of research, which represents the new European academic rationality being interdependently conditioned by the socio-cultural, worldview and scientific contexts, is further supplemented by the analysis of paradigmatic methodologism, comparison of the professional status of scientists, genealogy of scientific programs. Special attention is given to the role of Galileo Galilei in the formation of the classical scientific rationality, which, considering a vast number of sources on the issue, is focused on the reduction of implicit beliefs that were typical of the academic environment of those days to explicit stages of the scientific method, developed by him. Generally speaking, in an effort to reproduce mutual determination of experimental and mathematical natural science as a scientific paradigm and the new European rationality as a form of spirituality, authors of this article reproduce the dynamics of scientific research programs under the conditions of breaking the European academic tradition and indeterminate secularization of its tools. Certain conclusions may initiate further research on history and philosophy of classical science.

Keywords: worldview in Modern History, naturalism, mechanical philosophy, academic rationality, empiricism, rationalism. Galileo Galilei, scientific method, idealizations, classical science.

Works on academic rationality in Modern History, which have long been of interest for the historical, scientific and philosophical thought (works of N.Yu. Beliaev, L.M. Kosarieva, M.K. Petrov, St. Shapin and others), become **topical** again in this day and age of the «fourth global scientific revolution», which in search of a rational basis for the assessment of innovations is reconsidering classical worldview frame and connections of science. While the Renaissance, having kept the traditional goals, opposed the reinstated ancient scientific programs to the clerical means, these means were emancipated in the Modern History, having finally singled out functions of the reason from the mass of expediencies of human view of life. At first sight, this was exactly what caused elimination of all the subjective cognitive determinants as the main advantage of the scholarly Modern History, whose science was the theory of nature, which narrowed down material bodies, phenomena and processes to mathematical means of their advancement. However a major part of the academic environment of those days was known for their eclectic ancient and scholastic ideas, religious and mystical, magical and technical practices, humanist and (counter-) reformation beliefs. And on the contrary, the instinct with criticism reflection on the potential of new science using the means of Modern History philosophy testifies to absolutization of the category of the subject in particular: because instead of the entity and its Creator, reasoning (cogitation) as a baseline givenness became a prerequisite of cognition, the being started being viewed as a subject of cognition, and reason – as cognitive abilities. Consequently there arose an **issue** of inconsistency between the said emancipation of reason in the process of institutionalization of classical science and narrowing down its ontological grounds and practical functions.

After the well-known arguments surrounding the significant works of Edmund Husserl, John Desmond Bernal, and Robert K. Merton about the causes of the golden age of science in the XVII century, the notch of revolutionary vision dropped down: in more recent times a lot of attention was paid

to the cross-cutting conceptual and corporate links of new European academic activities with certain ideas of the Renaissance, Middle Ages and the Classical Antiquity (works of P.P. Gaidenko, V.N. Katasonov, D.V. Nikulin, Robin Collins, Stanley L. Jaki, P.D. Holl.). In this connection, the *objective* of our article is to reproduce mutual determination of experimental and mathematical natural science as a scientific paradigm and new European rationality as a form of spirituality, which is made more specific in the *task* to reproduce the relationship between new philosophy and classical science in the contexts of tradition transformation, institutionalization of professional activities of scientists, revolutionary revision of scientific research programs and formation of a universal method of cognition.

By the end of the XVII century the European civilization was characterized by the establishment of industry instead of crafts, capitalist relations instead of corporate and secularization instead of religious regulation of life, which in general symbolized overriding old traditions in a «new» material and spiritual life. On the level of folk mentality it was accompanied by the establishment of bourgeois values, among which most often emphasis was placed on naturalness as a practical rudiment of spirituality and primacy of immediate experience over book values, individualism as primacy of own valor over corporate goals and class privileges; entrepreneurship as primacy of active exploration over repetition of customary actions with all the decisions being subordinate to the universal impersonal equivalent of money. «Early bourgeois reality removes the “straps” of traditionalism from the man and literally abandons him to the whims of Fate, sending him “under the guardianship” of the harsh, but virtuous Providence. Life and activities of the man in the XV-XVII centuries, having basically become open to the effect of fortuities and “strokes of Fate”, turned into the field of real life-purpose issues, which could only be solved personally – exclusively by trial and error: pure reason was unable to foresee all the reversals of Fortune»[4, p. 59]. Robinson Crusoe became a symbol of such a bourgeois and his survival on a desert island was viewed as a symbol of the Universe, which stopped being home for the man. Through his story the writer Daniel Defoe in 1700 attempted to reconceptualize desertion and hardships as freedom: a separate man is able to break with a hopeless past through self-improvement (with the help of will, guided by reason) and create a new life like that in a real society on his own. Therefore, the loss of traditional guarantees of the truth caused hypertrophy of the subjective sphere, which gave the structure of the man’s reason a moral right to be in possession of universality that is able to duplicate social relations and institutes, as well as entities of various scale.

On the level of conscious philosophy Modern History has two tendencies chasing one another all over the XVII century and becoming a preliminary stage of one another before they came together in the XVIII century of enlightenment. The *first* one was skeptical, which refuses to give the world conservative viable characteristics (*deseccration*), and hence – the ability to preserve the Order or bring clearness to the Disorder. Whereas philosophers in one way or other expressed their own existence in their works, it was undoubtedly affected by the dynasty leapfrog, bourgeois revolutions, crisis of industrial production, numerous consequences of opposition between the Reformation and Counter-Reformation, but breaking the philosophical tradition had the main effect – depreciation of the world straightening skills, which caused the appearance, gave meaning and prospects to a number of habitual provisions, terms and techniques of reflection. For instance, distancing of linguistics and history from the stricken with schism theological beliefs (the principle of canonical conjugacy) resulted in discrepancies in earthly chronology: from 1582 to 1752 Western Europe lived according to different calendars with 10 days of difference. For almost all this time the reflecting people felt the pressure of simultaneous functioning of alternative astronomical systems – the Ptolemean, Keplerian and Copernican. Therefore (like in the context of ancient skepticism), philosophers focused their attention on the gnoseological self-analysis – warnings, rather than on the search of a new ontological «foothold», to make sure the search would not turn out vain, blind or random.

The *second* tendency encouraged optimism and trust to the Human on the condition of raising it to the status of Divine due to the transfer of the traditional hierarchy of cognitive abilities to horizontal dualism of the *supernatural* reason represented by mystical insight and the *natural* reason represented by theoretical reasoning, laid out in the «Book of Revelation» and the «Book of Nature» correspondingly. For instance, for Galileo Galilei mathematical theory deserved more credit on the

issues of foreseeing an event or invention of tools rather than a mere statement: «the truth, the comprehension of which is achieved with the help of mathematical evidence is the same as that inherent to heavenly wisdom; however «...» our method lies in reflections and moving from one conclusion to another, while His method is mere intuition «...»» [12, p. 129]. Having armed ourselves with theoretical thinking, the man could overcome the original sin by correctly directing our sense organs and finding a nontrivial truth using them. Therefore, the traditional gnoseological ratio / sensus dichotomy was replaced with the potential *theoria* / *empeiria* identity. From then on there appeared a great number of Nicolaus Copernicus successors, however earlier his mathematical model of heliocentrism was considered hopelessly contradictory to «something we can see with our own eyes». The fusion of causal schemes of Aristotelianism and Atomism became an ontological counterpart of that methodological innovation, which resulted in the elimination of qualitative restrictions of the nature in favor of homogenous infinity of its Creator. «Mi illumina l'immenso! – “I flood myself with the light of the immense” - was one of the major motifs of metaphysics of Modern History: the man cannot comprehend the infinity, however he can only think in the light and the reflection of it» [6, p. 94]. This reflection of perfection formed the perspective of strict *determinism*, according to which a chance turned out to be a reason of quality changes, which in the mechanistic structure of classical science were only possible as a miracle of transcendent creation or intrusion [1, p. 85-86].

Through gnoseologization of the new European worldview, philosophy of this age came close to science, because the main function of the latter is also cognition. This can specifically be seen from the biographies of philosophers of the XVII century: if during the Middle Ages the illuminati combined philosophy with theology, and during the Renaissance – with politics or art, now they became well-known for their theories and inventions in the field of natural science (Francis Bacon – for his study of thermal phenomena, Galileo Galilei – in the fields of astronomy and mechanics. René Decartes – in the field of optics...). Science was attractive to philosophy for its independence of scholastic or rediscovered authorities, who started being seen as constraint within the bustle of their time, while the Nature had a lot of unexplored and efficient. Not so long ago this «unexplored» was less precise and less important than the heavenly or humanist subjects of cognition. But now “natural philosophy”, which gave back its determination to the Nature, received a new partner – industry. This young industry had to introduce powerful mechanisms for massive expansion of production, the invention of which needed a better general knowledge of the Nature, rather than special experiment skills.

By the end of the Thirty Years' War there appeared professional scientists, who, unlike the general public, received training, which was no longer based on the «ancient», but modern authors. Sure enough, they went beyond theorizing, by also conducting observations and experiments, however they had already walked away from the craftsmen in terms of the speed and scale of comprehending laws under which the nature functioned both in the open space and in the “Procrustean bed” of technical equipment. The knowledge of laws in its turn obeyed worldview knowledge in one way or another, and therefore was able to renew and improve it from below. New technical capabilities of science started promoting it to the role of a state institution, which was better able to provide personal welfare and social progress («*scientism*» and «*technocratism*») than religion, politics or art. Moreover, gnoseological narrowness of classical rationality distanced it far away from those spheres of social life, which could not be presented in categories and standards of science. Therefore, the scientified worldview opposed itself to other ones «while the scientific picture of the world is characterized by the fact that through the mediation of knowledge it's possible to foresee events taking place in the world and control them, because any acknowledgment of existence of the unruly and the uncontrollable forces, limiting or grabbing hold of our conscience, is considered to be mythology. Because something that is acknowledged in this way cannot really be an entity» [11, p. 167].

For instance, Francis Bacon wrote a utopian novel «New Atlantis» based on Plato's myth about the submerged island of Atlantis. Both of them depicted an ideal state, which on the outside was expressed through a careful planning of the city-island, and specifically in terms of architecture and irrigation. If in Plato's work its plentiful nature just gave its fruits to the people, in Bacon's work the nature had to be studied and improved. This is exactly why the latter one focused on the description of the scientific and technical center of the island – «Solomon's

House», in which future readers could recognize the Royal Society of London (1660). Among the workers of this house there were both rulers of the entire Atlantis and researchers of all kinds (according to stages of Bacon's «true induction»), who studied «the creatures of God» in their own causes or invented «machines for a happy and creative life». Francis Bacon listed their impressive for the XVII century achievements (from saline water conversion equipment and a perpetual motion machine to synthetic food and the elixir of life), but most importantly all of them were dedicated to an elite corporate work of scientific organization of cognition, manufacturing, infrastructure development and building international ties of the island-state [15].

On the other hand, as compared to The Renaissance academies as arbitrary associations that revived means for the reunion of natural and supernatural causes of the world from the ancient times, new scientific institutions as partnerships of officials created means that had to simultaneously ensure both internal communication (method) and external translation (technology). The Copernican world they get used to was too big to be able to fall within a certain tradition or authority, thus state regulation adsorbed all versions of self-expression of microcosms into a method of their impersonal actions: rationality as representation of supernatural goals in the emotions of humans (*humanitas*) changed into solely cognitive representation of invariants of natural means (*naturalis*). This was exactly what became an essential factor of the scientific matter differentiation, which resulted in its productivity upturn. Therefore, natural philosophy, re-oriented from the function of salvation of the man to controlling the nature and inferring practical consequences therefrom, acquired both new criterion of truth, and state financing in it.

Obviously, comprehension of the said ascending impulses was expressed in a series of worldview features, which became a common classical denominator of the new European philosophy and science. Firstly, *naturalism* as an anti-traditionalist intuition that the being loses its transcendence and is brought to integrity a posteriori as an object «set» by human activities, which does not need to be improved in order to actualize an a priori idea in it. In science this intuition was articulated into a negative principle with regard to those material possibilities, which did not come through actual experience and could not be personally verified. Consequently, anything was viewed not depending on the organic environment, which dictated its proper place and ocular properties, but as an analytical conglomerate (similarly to how light, disassembled into the spectrum by Isaac Newton, lost all its symbolic links and meanings).

Secondly, *the mechanical philosophy* as a principle of despiritualizing the Nature, in which excommunication from the Creator is compensated with the worthiness of «machine» structure: components of the same type are put into a closed system of repeatable without development motions, which are transferred between internal parts in a certain amount. For the science it meant the adjustment of matter and experience of its comprehension to the language of mathematical combinatorics of units of length and duration («idealization»).

Thirdly, agency as a capacity of the man to be independent of the transcendental instance, which resulted in transferring universalist powers and responsibilities of the Creator to him. We are talking about the replacement of Christian hierarchy and spirit by dualism of the cleared from the visual properties of the natural object as a determinative reality and the «thrown to its basics» human subject as the superior one – outside the historic and personal context – *reason*. From this perspective the humanist *uomo universale* as a *potential* of all-round self-improvement was replaced by Pascal's *l'homme universel* as an *actual* generic ability to think from all angles. If the Nature has its own potential law and reveals it in stages, the Reason actualizes this law instantly whereby leaving it behind and subjugating it. Theoretical substantiation of this «luciferous» ability lies with philosophy. «The subject-object paradigm – this philosophical paraphrase of the “man is the image and likeness” from the Old Testament – serves as a cultural and metaphysical source, which provides the man of the West with unexhaustable confidence in his unlimited might over the Nature, history and himself, despite any scientific and historical kicks» [8, p. 68]. As opposed to the traditional comprehension as similarization of a creature to the essence of things, the new strategy of mirroring by the person of their Creator through universalization of own reason consisted of two hermeneutic hemispheres: the *empirical* one, which presumed improvability of

hypothetic generalizations of objectively mirrored components of sensory things onto laws of the nature; the *rationalistic* one, which presumed the appearance of more and more new components and things as a result of solely logical transformation of “initial conditions” of these laws.

Philosophy was attractive to science first of all due to its large scale, because all minor inventions eventually revealed a certain common denominator as impartial to the meaning laws of inference, which you then felt eager to move from the end to the beginning of innovative search as a guidance for action. «There remains one hope of salvation, one way to good health: that the entire work of the mind be started over again; and from the very start the mind should not be left to itself, but be constantly controlled; and the business done (if I may put it this way) by machines» [9. p. 28]. So, philosophers used to promise scientists (often in one person) a *universal Method*, which with the initial postulates (general entities or partial phenomena) being true, would guarantee truthfulness of derivative modifications in close contact with any practical branch. «The new reason – listen attentively to this imperative – cannot bear anything it cannot comprehend and stays incomprehensible to it; it is not comprehension it is looking for, but power, and thus it is no longer focused on things alone, but on “*methods*” of treating those things; it is no mere chance that the age starting with «The Discourse on the Method» opens an entire *époque* of “*methodologies*”, which keep the past, present and future under control – all the entirety of spaces and times» [7, p. 202]. Directions and configurations of such *ways* of cognition formed a major contradiction of new philosophy – empiricism and rationalism.

By no means, methods had existed before, in a mental form, and of universal character. For example, the Byzantine collection of Aristotle’s works on logic was called the *Organon* (Instrument / Tool) in the Middle Ages due to its detailed layout. However, in the perception of the intellectual elite of Modern History, those were lacking heuristicity: they either were too committed to didactic objectives – to proving and duplication of the already known, or in pursuit of novelty indiscriminately put true false and the truth together. That is why it was planned to build on a “consistent” ability to discover the new through gnoseological combination of the idea and the thing, the heavenly and the earthly, the transcendent and the immanent on the basis of reputable old knowledge. The most recent attempts of such combination were observed in the art of the Renaissance, when an exemplary sculptor would imagine that he was chopping off all he did not need from a block of marble, and a painter would add a new matter to the canvas [14]. The contemporaries of the XVII century experienced these two strategies as the above-mentioned gnoseological optimism and pessimism, envisaging firstly *criticism* of the tradition in each study, whether it did not shade the naturalness, and only after – the *practice* of consistent combination of mental and perceptual principles as such. Considering that mechanical philosophy also reflected itself on gnoseology, worldview discrepancies there could be represented as those arising with regard to the “power plant” (the source of cognition), «transmission mechanism» (methods to bring the reason and senses into compliance) and the «working tool» (discovery verity criteria).

On the verge of the Renaissance and the Modern History Francis Bacon’s *empiricism* and Pierre Gassendi and Marin Mersenne’s *rationalism* were formed independently of one another. The first one as absolutization of experiment skills for all types of cognition was a reaction to the hypertrophied syntactic approach in the philosophy of universities, where Aristotelian scholasticism was predominant long after the Middle Ages. The second one as a priority of the skeptical mind was a reaction to the schism of the XVI century that required some generally valid methodical palliative (means) for the dogmatic faith (values). Obviously, under the new conditions of joint dissociation from the tradition both had to rely on their own reason, although for empiricists it was the reason, reflecting regularities of the created nature (mind), while the rationalists attempted to imitate the immanent spiritual reason of the *Creator* (intellect). But both directions needed experience of using the chosen tool and testing the received results, however in one case it was a *multilevel* inductive «analysis», and in the other case - a *one-level* deductive «synthesis». Their further opposition was not caused by those discrepancies, but by encroachments of their standard and ontological rationality respectively on the general scientific status [5].

As a result, the philosophical thought had come to the epochal contradiction: on scientific requirement to improve the reason and senses of one another, thence from then on they became the theoretical and the empirical respectively, with one of them still having to be chosen as the initial condition of cognition. If their verity due to immediate obviousness, full comprehensiveness

and resistance to error can be proved by philosophers in principle - as a substance for all cases at once – scientists would only have to adhere to a series of impersonal rules of the chosen method.

Unlike humanists, the Method seekers did not trust the human nature, including it into the traditional list of prejudices (*offendicula, casus, idola*) while gaining the objective experience and using it make their way to the higher agency. For example, the founder of the classical theoretical mechanics Galileo Galilei in his work «The Assayer» (1623) believed only a few concepts of objects (form, size, state of motion) to be objective; the majority of other ones, dictated by human sense organs (hot or cold, sweet or salty, colored or black-and white...) – to be inherent only to human consciousness («only names»). To be more exact, objective properties of things can be perceived by the human consciousness as such («real accidents»), which in turn are derivatives from the combination and movement of borderline material components of things – «atoms» (for example, the sense of temperature of an object is caused by the degree of objective mobility of atoms of the thing). Therefore following the Renaissance doctors and together with the new «epicureans» (G. Vandeputte, Pierre Gassendi, Thomas Hariott, William Charlton, Robert Boyle) Galileo Galilei revives the ancient study of atomism (Democritus, Epicurus, Lucretius) in these views, having introduced the terminology of scholastics («primary» and «secondary» qualities) into it: the properties of invisible and hence mentally visible atoms are the same as «primary» objective properties of things, but «secondary» subjective properties are qualitatively different from the other ones, *not* complying eventually with the nature of things.

This *mechanistic* way of describing the matter contributed to the advancement of classical philosophy and science so much that it eventually became universally accepted (with some differences in the list of «primary qualities»), having also revealed moral potential of the extremely clear improving ability of the man and his surroundings according to example of technical inventions, because they, unlike natural things, by no means can be suspected of having any secondary qualities: they are maximally open for comprehension, expedient in terms of their effect and controllable in terms of their consequences. Soon the entire world assumed the similitude of the most precise mechanical invention – the clock, and its Creator turned into the clockmaker. And only discrediting of divine expediency as a «secondary quality» in the world order by the mechanical philosophy, as well as the faith as its cognitive counterpart, would cause attempts of the mysticism to take revenge in the XVIII century, at least on the territory of supplements of the mechanical philosophy. For instance, within the framework of James Berkeley's idealism «secondary qualities» were given back their property of being «primary ideas» (not only human), and alternatively «primary qualities» are reinterpreted as instrumentals abstractions of natural reason, which is derived from the faith («secondary ideas») [10].

The «new old» concepts of the matter were opposed to the scholastic *Aristotelianism* predominant in those days, according to which the matter was hardly every viewed separately from specific things that in turn were determined by their own substantial «forms». For example, a separate leaf was viewed as an inseparable embodiment of the species «having leaves» in the universal amorphous matter, which in response gave the leaf some accidental («superimposed») features, which were the ones to help distinguish the given leaf from the rest. According to atomism all species or individual properties of things are determined through the configuration of borderline material components and are described as «primary qualities», and hence «forms» (together with all their internal «mental» connotations) become unnecessary. While Aristotle viewed them as a bridge to rational patterns, structurally congruent in the nature and thinking, criticism of concepts of the matter brought Galileo Galilei to a new organization of reason, dictated by the analytical and mathematical *method*.

At first sight, the structure of this method does not reflect empirical or rationalist preferences of the author, who was more of a scientist than a philosopher, as much as it reflects his developments in astronomy. In order to prove the Nicolaus Copernicus' «mathematical hypothesis» he first did not like, Galileo Galilei had to judge from the substantial integrity of the world, and hence extrapolate both earthly methods (transformation of sensuous experience into geometrical values) to divine events, and vice versa – certain algebraic proofs to material phenomena. However, from the point of view of humanists, this is how the long-awaited elimination of discrepancies between the Aristotelians and

Platonism or the antiquity and modernity would look like. Galileo Galilei himself treated it as a sequence of the «extensive» stage, when *natural* material phenomena were observed and analyzed in the multitude of their properties, and the «intensive» stage, when the disassembled properties are assembled again, but in accordance with *rational* mathematical rules. Invariable regularities of «assembling» (*compositio*) for both reason and the nature were sought for and tested with the help of corresponding experiments – mental heuristic and measured test experiments. Different both in their meaning and actions stages were combined in the discovered by Galileo Galilei «idealization» of properties, i.e. by sifting of their «secondary qualities» into the “primary” ones, which were used in mathematics exclusively.

As a result Galileo’s method as compared to the tradition, established through trial and error, reduces any quality variety of substantial forms (given in both primary and secondary qualities) to a standard series of properties. On the other hand, unlike the *Late Renaissance strategy* of collecting all natural accidents, being aimed solely at the correct scientific meaning of these natural phenomena in their idealized reconstruction, it reduced their nomenclature to a calculated expedient invariant of their relations – universal functional «formulas». For instance, in the law of motion $S = a/2t^2$ multiplication of products of increasing acceleration (*a*) by time (*t*) equals multiplication of segments of increasing length (*S*) for any mechanical bodies, while in the free-fall law $S = 1/2gt^2$ multiplication of accelerations is replaced with the constant of free fall (*g*). Systems of identities and implications of such laws in the structure of theoretical knowledge superseded the outdated genus and species classifications, marking the transition from the Platonic-Aristotelian sample of rationality to the Euclidean. «Philosophy is written in the great book (I mean the Universe), which is constantly open to our eye, but only the one who can first understand the language and interpret signs with which it is written can understand it. It is written in the language of mathematics, and its signs are triangles, circles and other geometric shapes, without which the man would not be able to understand a single word in it» [13, p.232].

According to Aristotelianism mathematics did not have methodological value, since it was concerned with the superficial («accidental») quantitative modifications of the essential form of the cognizable thing. On the other hand, during the Renaissance, hermetic and neo-Pythagorean teachings became popular, which gave mathematics the status of the key to the world code, however practically without any quantitative measurements and transformations («philosophical geometry»). Obviously, Galileo Galilei combined these two approaches, having found precedents for it in the recently revived Archimedes' works on hydrostatics and confirmation in the works of Nicolaus Copernicus on astronomy, and added scholastic calculation of motion (future differential calculus) to them hoping that correct measurement and calculation of «primary qualities» would coordinate the rest of the reasoning about natural substances - first and foremost, metaphysical, for example, with regard to qualitative (non-) homogeneity of a full variety of atoms, and therefore the (im-) possibility of universal units of measurement. On this basis major versions of classical science - Cartesianism, Newtonianism, and Leibnizialism would be built [3].

However, as Galileo Galilei notes in one of his early treatises («On Motion», 1592), the use of mathematics required its empirical reflection in measurements, which not always were applicable to genuine *nature* (phenomena), full of «accidental obstacles» due to the Fall of the man. The experiment used for idealization of its conditions became a special stage of the Method, in which stabilization of natural objects in time, intensity and composition was carried out in the same combinatorial way as in “real nature” (entity) with its configurations and motions of the constituent atoms. Thus, the experiment turned out to be a bridge between the vertical of theoretical language, which provided measurements using relevant units, and the horizontal of material conditions, which provided measurements with variations for finding, adaptation or verification of mathematical laws. The latter, in turn, allowed going beyond the existing status quo, having expanded enormously the inductive set of experiential cases. According to P.P. Gaidenko, the reason of new science was formed in the bonding of the mathematical and physical objects. «This new type of rationality, first of all, removes the distinction between physics as a science that explains causes of motion, and mathematics as a science that only allows describing this motion, that is to formulate its law. Secondly, it eliminates the fundamental difference

between mathematics and physics as sciences, on the one hand, and mechanics as art, on the other. Thirdly, this type of rationality disables the old concept of mathematics as a science of constant entities, and thus initiates the appearance of a new type of mathematics, which is able to describe motion and variation, make laws of variation. And, finally, it leads to the conclusion that it is more important for a physicist to make a law describing the process of phenomena variation, rather than look for comprehensible reasons of the latter» [2, p. 241].

Despite all the successes of the method, the philosophers did not hurry to leave the gnoseological niche, reserving the lion's share of their reasoning on any topical issues to *metaphysics* - analytical theoretical weighting of all the pros and cons in order to find out «what to do» before new world-view goals settle down, even if they turn out to be false or mutually exclusive. According to this approach, rational criticism of the tradition as an autopoietic culture quickly made its immanent goals *arbitrary*: from then on they did not serve to supplement the a priori whole, but became the beginning, to which the rest of the world had to adapt («Zweckrationalität»). Therefore, the scholastic preparation of perfection of creation in the hierarchy of specific *objectives* was replaced by the freedom of mastering all possible *means* of it (instrumentalism), hoping that their infinite testing, having removed everything accidental from the natural creatures, would reveal the intention of their Creator [16, p. 249].

Thus, the ancient classical dialectics of being (λόγος) and thinking (νοῦς) was mediated by the «thinking – action» identity. «Human knowledge and human power come to the same thing, because ignorance of cause frustrates effect. For Nature is conquered only by obedience; and that which in thought is a cause, is like a rule in practice» [9, p. 33]. If science hypostasized modes of activity, which were invariant for theory and empirism (method) in a new respectable sense of «naturalness», then metaphysics internalized those methods into a mental plan as an a priori symmetry of semantic and syntactic relations of knowledge, imitating the universal creative initiative (agency).

Conclusion. Under the conditions of abandoning historical memory and the traditional ideal of contemplative truth in favor of logical sample of expansive lifestyle and thinking, knowledge stops being a goal in itself, having acquired pragmatic and exoteric connotations, translated into scientificity in Modern History. Hence, the typical of the Renaissance universalization of the man narrowed down to cognitive universality of the agent, having brought philosophy and science closer together and bequeathed the main topic of gnoseology for them, which had become independent of the essential structure of nature.

Having switched from the imitation of intellectual or volitional features of God to his creative means, which are tested on the nature's creatures, the new European rationality excludes goals from the structure of cognition on the level of philosophy, and generalizes experiential, rational, intuitive and mystical sources of cognition on the level of science into the universal method as a structure of practical activities in corresponding spheres. According to the artistic tradition of the Renaissance, the structure of method presumes two major parts - the *negative*, which is aimed at the elimination of extra obstacles and errors (delusions), dictated by the human nature and tradition, and the *positive*, which regulates the expediency and sequence of cognitive actions of the universal agent. If the first part developed into metaphysics, which soon became a goal in itself for philosophy, the other part developed into instrumental methodology of science, represented by Galileo Galilei.

Revision of properties of the matter and methods of studying it brought Galileo Galilei to programmatic for classical science identification of mathematical relations with experimental possibilities instead of dualism of logical relations of reason and experiential generalizations of nature. Contrary to empiricism and rationalism taken individually, the new rationality presumed experiential origin of scientific knowledge alongside with its extra-experiential structuring (idealized reconstructions) pursuant to methodically tested rules of theoretical inference.

Whereas natural science together with all its constituent parts based on experiment and mathematics not only gained the place of scientific paradigm further on, but also that of a higher level new European rationality as compared to traditional forms of spirituality, the accomplished work can lay a foundation for a more balanced as compared to internalist or externalist approach to the reproduction of intellectual phenomena of Modern History.

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Зоріслав Макарів Тетяна Радзіняк

Світоглядні передумови становлення академічної раціональності нового часу

У даній роботі на додаток до традиційного у вітчизняній філософії науки вивчення новоевропейського світогляду через його взаємозв'язки з капіталістичними економічними відносинами, розширеним промисловим виробництвом і антитрадиціоналістським буржуазним суспільством досліджується внутрішній зв'язок нової філософії з наукою. Зокрема, на матеріалі рефлексії онтологічних підстав розуму, його статусу в структурі пізнавальних дій та здатностей виявляється проекція прикметних рис нової філософії на формування класичної науки, філософське обґрунтування наукового методу в особі емпіризму і раціоналізму. Основний історичний метод дослідження, що представляє новоевропейську академічну раціональність в процесі її взаємного обумовлення соціокультурним, світоглядним та науковим контекстами, доповнюється аналізом причин хрестоматійного надалі методологізму, порівнянням професійного статусу вчених, генеалогією наукових програм. Окрему увагу приділено ролі Г. Галілея у становленні класичної наукової раціональності, що, з огляду на безмежну джерельну базу цього питання, зосереджується на редуції імпліцитних світоглядних настанов, що панували в тодішньому академічному середовищі, до експліцитних етапів випрацьованого ним наукового методу. В цілому, маючи на меті відтворити взаємну детермінацію експериментально-математичного природознавства як наукової парадигми і новоевропейської раціональності як форми духовності, автори статті відтворюють динаміку науково-дослідницьких програм за умов зламу європейської академічної традиції та неоднозначної секуляризації її засобів. Окремі висновки можуть ініціювати подальші дослідження з історії і філософії класичної науки.

Ключові слова: світогляд Нового часу, натуралізм, механіцизм, академічна раціональність, емпіризм, раціоналізм, Г. Галілей, науковий метод, ідеалізація, класична наука.

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