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THE DEVELOPMENT OF SCIENCE: POST-NON-CLASSICAL, POST-NORMAL SCIENCE OR MODE 2?

Rapid development of information technologies and transportation, spread of communication services and mass education have led to changes in knowledge production, to science in general and its status in society. New period in the development of science has been named by researches in different ways: post-non-classical science, post-normal science and Mode 2. It is necessary to clarify,

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why different terminology is used, what features every concept has and whether one term can replace the others.

Keywords: post-non-classical science, post-normal science, Mode 2, development of science.

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РОЗВИТОК НАУКИ: ПОСТНЕКЛАСИЧНА, ПОСТОРМАЛЬНА НАУКА АБО MODE 2?

Швидкий розвиток інформаційних технологій та транспортної системи, розповсюдження комунікаційних послуг та масовість освіти призвели до змін у засобах виробництва знання, у науці в цілому її статусі у суспільстві. Новий період у розвитку науки був названий різними дослідниками однаково: постнекласичною наукою, пост-нормальною наукою та Mode 2. Доцільним є з'ясувати, чому використовується різноманітна термінологія, якими є основні риси кожної концепції, і чи є вищезазначені терміни взаємозамінними.

Ключові слова: постнекласична наука, пост-нормальна наука, Mode 2, розвиток науки.

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РАЗВИТИЕ НАУКИ: ПОСТНЕКЛАССИЧЕСКАЯ, ПОСТНОРМАЛЬНАЯ НАУКА ИЛИ MODE 2?

Быстрое развитие информационных технологий и транспортной системы, распространение коммуникационных услуг и массовость образования привели к изменениям в методологии производства знаний, в науке в целом и ее статусе в обществе. Новый период в развитии науки был назван по-разному различными исследователями: постнеклассическая наука, пост-нормальная наука и Mode 2. Необходимо прояснить, почему используется различная терминология, каковы основные черты каждой концепции, и являются ли вышеуказанные термины взаимозаменяемыми.

Ключевые слова: постнеклассическая наука, пост-нормальная наука, Mode 2, развитие науки.

In the history of science there are examples when the same phenomenon or law were discovered separately but simultaneously by different researchers from miscellaneous countries. Usually, due to differences in scientific background, these inventions got various names despite their common nature. This can be said about recent research in the field of development of science. Changes taking place in modern science resulted in its new, 21st century stage. If in the countries of Eastern Europe it is called “post-non-classical” science, in the Western countries they call it “Mode 2” or “post-normal” science. In this article we are going to analyze historical background of emergence of these terms, what they have in common and why terminology in philosophy of science is inconsistent.

The concept of post-non-classical science was introduced at the end of the 20th century by V.S.Stepin [1] and was widely accepted in post-soviet countries [2, 3]. The concept refers to the modern period of development of science, to the fourth global scientific revolution. According to Stepin, the first revolution occurred in the 17th century because of the formation of classical science; the second – in the late 18th – early 19th centuries, and was associated with the formation of disciplinary science. The third revolution, which took place in the late 19th and early 20th centuries is associated with the changes that occurred in physics and led to the formation of non-classical science. Nowadays there is a tendency to synthesize knowledge from different disciplines in order to create a unified scientific picture of the world. Theoretical basis for building this picture are principles of universal evolutionism, which embrace ideas of system and evolutionary approaches [1].

Stepin states that post-non-classical science is characterized by an increasing importance of interdisciplinary research; the emergence of comprehensive research programs involving experts from different scientific communities; greater axiological, economic and socio-political orientation; more significant role of the humanities and their methods.

Another name for the modern state of science was given by M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P. Scott and M. Trow in their book “The new production of knowledge: the dynamics of science and research in contemporary societies” [4]. The new way of knowledge production was called “Mode 2”, and was introduced like its analogue in the end of the 20th century. Despite simultaneous appearance of terms “post-non-classical science” and “Mode 2”, the audiences, for which they were targeted, were different. If the latter was intended for post-soviet countries (for example, [5; 6; 7]), then the former was accepted by researchers from the countries of western Europe and English-speaking countries (for instance, [8; 9]).

The Mode 2 knowledge production was introduced as contrast to traditional disciplinary Mode 1, characterized by broader social and economic oriented nature. Its appearance was due to different factors: prevalence of mass education and research, development of communication and information technologies, transportation. As a result, a socially distributed knowledge production system has been established with the following attributes:

1) Knowledge produced in the context of application – means that research is governed by practical needs. Newly produced knowledge must be useful in a particular area: social life, politics, industry, medicine and so forth.

2) Transdisciplinarity – involving experts from different disciplines implies creating distinctly new piece of knowledge which is the result of theoretical consensus of the experts. Moreover, it contributes to easier and more efficient spread of knowledge, production of which is based on theoretical and empirical components.

3) Heterogeneity and organisational diversity – knowledge is created through interaction of different institutions, which include not only universities and colleges, but also multinational firms and research centers, think-tanks, government agencies, consultancies and industrial laboratories, national and international research programmes. Usually, temporary groups are created to solve particular tasks. After new knowledge have been produced and the task have been solved group dissolves or transforms into a new group, which involves new participants.

4) Social accountability and reflexivity – a research is sensible to its impact, meaning that it is influenced by values and preferences of people not involved in the production of knowledge. For example, impact of a research on environment, health and privacy has become of great importance. Self-reflection implies involving experts from social sciences into the process of knowledge production.

5) Quality control – implies not only the peer review process, which meets intellectual needs of disciplines, but also social, economic and political expectations.

In other words, Mode 2 is a goal-oriented system, where knowledge is produced on the border of various disciplines or between them through interaction of participants from different institutions and organizations. The features of Mode 2 are flexibility, communication with short response time and self-reflexivity, guided by social expectations concerned, for example, with environment, liberty and health.

Another concept introduced in theorizing about knowledge production in the modern world is “post-normal science”, which tends to be “an extension of traditional problem-solving strategies” [10, p. 648]. “Normality” of science is traced back to “normal science” of T. Kuhn, and J.R. Ravetz, the coauthor of the concept “post-normal science” (along with S. Funtowicz), states that routine puzzle-solving activity doesn’t provide “... an adequate knowledge base for policy decision” [10, p. 648]. He explains his point of view using the example of environmental studies, where decisions with high impact are made in difficult conditions: uncertainty, limited time, ambiguous value system. In this case such ideals as truth or factual knowledge are substituted with quality of the process of research and its results.

Quality is controlled by “extended peer community” – different stakeholders regardless their education and institutional accreditation.

In the frame of post-normal science qualitative, trusted knowledge is produced not only by scientists in traditional understanding. In this process people without education, certificates and degrees can be involved – anyone who is creative enough to find a practical way towards improvement [10, p. 652].

Another feature of post-normal science is negative nature of emerging problems. If, traditionally, basis for a new discovery or invention was its possibility (positive case), then in “post-normal science” first comes suspicion that something is wrong (negative case). In most cases this suspicion comes from non-scientists, and institutions deny existence of the issue, focusing on the problems that are easily comprehended, bringing benefits, privileges and ranks. This explains, why there is a need in “extended peer community”, where anyone concerned with the issue (or might be affected by it) can control the quality of the process of the research and its results [11, p. 277].

Comparison of three concepts that were introduced to name the new period in the development of science reveals their common traits. Producers of Mode 2 and post-normal science notice that new type of knowledge production coexists with the old one (Mode 1 or “normal”) in case when investigated problems are not of great impact on public opinion. Another common trait of all three concepts is interdisciplinarity – meaning that there are more and more issues on the border of existing disciplines which require participation of experts from different branches of science. However, Ravetz expanded the circle of participants, proposing to involve into quality control experts along with people without specific knowledge or skills.

Another common thing of post-non-classical, post-normal science and Mode 2 is their greater axiological, economic and socio-political orientation. Science depends on funds, and economic or political goals influence scientific research either directly (for example, by making laws or equipping laboratories) or indirectly (for instance, through education). Public opinion acquired more significant role in the development of science: the more issue is discussed in society – the more it is studied in scientific community. Public opinion and impact of science on people led to increase of significance of axiological component of research, which, in turn, increased an interest to humanities and their methods.

All three concepts (post-non-classical science, post-normal science and Mode 2) were conceived at the same time, in 1980 – 1990s. This followed from the comprehension of the fact that changes in life of society have led to changes in science, since the former and the latter are interrelated. From unbiased activity of production of objective and accurate knowledge, science has transformed into instrument of political and social influence, while scientists have turned from adherents of the truth to subjective subordinates of their institutions. Comparison of the concepts reveals similarity or even overlap of “post-non-classical science” and “Mode 2”, however, post-normal science stands aside due to its specialization on risky and uncertain issues.

As it was stated, the audiences, for which the concepts were targeted, were different. “Post-non-classical science” was introduced and accepted by scientific community of post-soviet countries, while “post-normal science” and “Mode 2” originated in western countries. This is the reason of terminological inconsistency – overlapping concepts coexist because of communication barrier between scientific communities of western and eastern countries, which is a characteristic of modern science as well.

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