Scientific Progress and Interdisciplinarity: a Philosophical-Epistemological Approach

Farid Aflatun Mahmudzade [1]

[1] *Institute of Philosophy and Sociology of National Academy of Sciences of Azerbaijan*
H. Cavid Avenue, 115, Baku City, AZ1073, Azerbaijan

DOI: 10.22178/pos.98-13

LCC Subject Category: B1-5802

Received 26.10.2023
Accepted 28.11.2023
Published online 30.11.2023

Corresponding Author:
fmahmudzade@gmail.com

Abstract. The article analyses the relationship between philosophy and science at the present stage through the prism of interdisciplinarity and scientific progress. Generally, the philosophical meaning of "scientific progress" is considered - the position of T. Sokolova, which caused a comprehensive discussion, is analysed considering the different points of view on this matter.

It is shown that, in general, consideration of this problem from the point of view of interdisciplinary interactions and the formation of interdisciplinary new knowledge has heuristic potential. In particular, the philosophical and epistemological "measurement" of scientific progress becomes relevant at this time.

The discussions confirm that determining an adequate criterion for scientific progress is one of the main problems when considering the problem in the selected context. Various and different proposals and theses appear. This difference in positions is related to the issue's complexity.

Considering the diversity of opinions noted above, the article expresses a unique approach to the problem. In particular, the thesis has been put forward that the philosophical understanding of the concept of "now" can play a significant role in determining the criterion of scientific progress from an interdisciplinary position. The novelty of "now" was studied in synthesising cognitive and practical aspects.

It is shown that in the cognitive aspect if each subsequent stage of the formation of interdisciplinary knowledge can simplify the cognitive situation compared to the previous stage (creating a more precise picture), we can talk about scientific progress.

At the same time, if the practical application of new interdisciplinary knowledge is assessed as innovation, this means scientific progress.

In conclusion, the following thesis is formulated: the criterion of scientific progress can be determined based on a synthesis of the purely cognitive novelty of interdisciplinary knowledge and an assessment of its application in the sociocultural environment as innovative.

An interdisciplinary methodology was used to achieve the scientific goal.

In particular, such methodological principles as nonlinearity, intersubjectivity, formation and synergy were applied.

Complexity simplification and synergistic synthesis were used as a method.

Scientific novelty is associated with the thesis that the synthesis of aspects 1) "now" of scientific progress "translates the cognitive situation from complexity to simplicity as a purely cognitive criterion" and 2) "is innovative as a result of its practical application to society as new interdisciplinary knowledge "can be a criterion of scientific progress at the present stage in general.

Keywords: nonlinearity; intersubjectivity; formation; synergy; new interdisciplinary knowledge; criterion of progress; simplification of complexity; synergetic synthesis.

INTRODUCTION

The modern era of scientific research indicates the rapid development of scientific progress and the consolidation of knowledge in various fields. This phenomenon requires special attention and philosophical and epistemological analysis to understand its essence and influence on our understanding of the world. This article examines the issue of scientific progress and interdisciplinarity using an intellectual and epistemological approach. The emphasis is on the importance of integrating various scientific disciplines and their interaction in the context of the modern scientific picture of the world. This analysis will provide a deeper understanding of the nature of scientific progress and identify new perspectives for further research in the interdisciplinarity and philosophy of science.

The philosophical conceptualisation of the progress of science stands out as one of the pressing problems in philosophical literature. Over the past few years, philosophers and methodologists have widely discussed this topic in the context of interdisciplinary research. Conceptualisations of scientific progress are primarily explored in the context of philosophy of science and epistemology. In this regard, the article by T. Sokolova is of interest [19, p. 23-34].

The philosopher presents the problem as follows. Organising and conducting "successful inter- and transdisciplinary research" can help overcome the problem of disciplinary separation (scientific divisions). If in the 19th-century specialisation was considered a sign of scientific progress, then at the end of the 20th century, the scientific perception of the structuring of sciences is seen as an obstacle to adequate research of "complex and complex objects." Interdisciplinary research is considered a "necessary condition for scientific progress." This automatically presupposes philosophical reflection on this type of research [19, p. 23].

Of course, the history of approaching philosophy-science relations in the context of scientific progress and interdisciplinary knowledge is extended. Here, T. Sokolova actualises the current problem in a specific direction. Philosophers and methodologists have actively responded to it, and serious discussions are underway. We have expressed our approach to the issue in light of those discussions in this article.

Specifically, we argue that the approach to the problem of the concept of "now-now" in the context of interdisciplinary knowledge in the prism of philosophical and epistemological understanding is helpful in terms of modern scientific criteria.

Interdisciplinary methodology is applied for this. Nonlinearity, intersubjectivity, formation and synergism were chosen as the main methodological principles. The complex application of the methodological tenets has made it possible to philosophically reflect on the dynamic renewal system of the problem and the innovation of knowledge in the integrative aspect.

The article used complexity simplification and synergistic synthesis as methods.

RESULTS AND DISCUSSION

*The epistemological specificity of overcoming the disciplinary limitation: in the prism of a project proposal***.** Against the background of the problem presented above, T. Sokolova puts forward such a thesis: to eliminate the disciplinary separation, it is possible to take advantage of the "French version of historical epistemology" proposed by Gaston Bashlyar. According to G. Bashlyar's historical epistemology, 1) progress is an integral property of scientific cognition; 2) the functional specificity of science it-

self causes scientific progress. To put it concretely, scientific progress stems from the historicity of science. This means that, according to G. Bashlyar's interpretation of historical epistemology, it is necessary to abandon the explanation of scientific truths as timeless, absolute and universal mysteries [2, p. 7-198; 19, p. 23-34].

On this basis, T. Sokolova considers it relevant to examine the issue in three aspects. First, "disciplinary separation is a philosophical problem". Second, there are "approaches to the conceptualisation of scientific progress". Third, "French historical epistemology can be a possible philosophical platform to overcome disciplinary separation" [19, p. 23].

Interestingly, the Russian philosopher tries to explain that there is a specific disciplinary limitation in modern philosophical understanding in the context of interdisciplinary research. Specifically, he shows Federico Rousseau's thesis about English-language philosophy as an example: English-language philosophy is still "characterised by strict disciplinary separation" [18]. In his preface to F. Russo's monograph, M. Boon emphasises that the work is practically an innovation in combining the philosophy of science, technology, and STS [4]. In other words, there is no "scientific bridge" between the highlighted research directions, and F. Russo tries to create it. F. Russo seeks a new epistemology where "human and artificial epistemologies are combined" [4]. Here, "human epistemology" is the subject of scientific activity, and "artificial epistemology" is the "cognitive tools" used by the scientist. Then Rousseau's main idea is this: human and artificial epistemologies create knowledge in synthesis!

Let's explain a concept that is important in terms of the scientific purpose of the article. We mean the STS program. "STS" generally refers to the study of science and technology. In the 90s of the last century, a strong STS program was developed at Virginia Tech University in the USA [23]. In that program, they expressed the scientific goal as follows. Its annotation states that STS is a developing field encompassing all the social and humanities disciplines. The aim here is to examine how science and technology, on the one hand, and society, politics, and culture, on the other hand, mutually shape each other [23].

I. Kasavin presents the Science and Technology Studies (STS) program as "...one of the leading world trends in philosophical-interdisciplinary studies". STS can contribute to science-society interactions in this capacity. One of the main tasks is to examine the interrelationships of philosophy and other disciplines that study science in an interdisciplinary context. At the same time, it is necessary to maintain a balance between the norm of cultural autonomy of scientific research and the existence of science as a social institution. With this, the "technologicalism" inherent in STS can be reduced [7, p. 6].

What is interesting here for researchers is F. Rousseau's appeal to the classical type of French historical epistemology as a possible unification project within the philosophy of science. What is interesting and surprising is the promotion of disciplinary separation within philosophy itself, corresponding to the disciplinary division of natural science within French historical epistemology. Such a situation allows us to imagine that it is more logical that French historical epistemology can propose disciplinary division from natural science to philosophy of science rather than unification in the philosophy of science [19, p. 24-25].

However, it is theoretically possible to approach this situation differently. If interdisciplinary and transdisciplinary research ultimately "...leads to the unique re-separation of disciplines in new areas of scientific understanding, can't this process be seen as a new stage in the development of science as a whole, or at least a certain marker of a new kind of progress?" [19, p. 25].

Philosophers conclude from these that it is a particular paradox. For example, I. Kasavin looks at that problem through the prism of the interaction between the "metaphysics of progress" and the "disciplinary structure of science" and puts forward the opinion that T. Sokolova talks about two paradoxes. This paradox originates from the intention to resolve the disciplinary divisions of scientific knowledge based on a theoretical comparison (or explanation, description) of the differentiation and integration of scientific knowledge. I. Kasavin considers this critical for understanding modern science [6, p. 35].

At the same time, I. Kasavin disagrees with the solution approach proposed by T. Sokolova. He justifies this position because it is not entirely

correct to put the issue in the context that modern science has a disciplinary suture, and the research object does not correspond to this disciplinary division. Because "that contradiction disappears when we add the third characteristic of progress that is actually observed". It is "the integration of knowledge, interactions of several interdisciplinary fields in the form of disciplinary institutionalisation". For example, the cognitive sciences presented by T. Sokolova as differentiation mean the integration of more sciences. From this point of view, we can talk about the institutionalisation of psychology, physiology, linguistics, sociology, philosophy and computer sciences against the background of researching cognitive technologies with long-term cross-disciplinary effects. These disciplines found a common language by creating an "exchange zone" [6, p. 36].

This point occupies a separate place in the discussion of the problem. However, despite the paradox highlighted in light of the diversity of approaches, researchers are united in the fact that the philosophical-scientific meaning of the concept of "progress" is the main line of discussion. T. Sokolova writes, "The central concept of this discussion is progress (more precisely, its constantly repeated meaning both in science and philosophy)".

Therefore, T. Sokolova considers it relevant for him to accept historical epistemology as a "possible theoretical platform" to overcome and re-understand the philosophical reflection of scientific progress, as well as the disciplinary separation of interdisciplinarity [19, p. 26]. Let us emphasise that the Russian philosopher uses the term "transdisciplinarity" here, which in the considered context does not differ from interdisciplinarity or is a part of it [21].

The meanings of scientific progress and scientific rationality: an epistemology of interrelationships. Philosophers and methodologists of science actively reacted to the above statement of the issue and turned it into an object of broad discussion. Let's dwell on some of them in the context of the topic we are looking at. First, look at the general meaning of "scientific progress". The researchers point to the definition in the Oxford Dictionary as the primary content of the concept of "scientific progress". It says that the word "progress" means 1) development towards a better or more advanced state and 2) moving forward or ascending to a specified place [14].

The concept of "scientific progress" is explained in the literature on this basis. Here, the main point for us is that "scientific progress" means "innovation" or "unprecedented signs" when certain conditions are met. However, in the philosophical aspect, the main issue is related to explaining "innovation". Researchers agree that scientific progress is innovation, but there is a difference of opinion in determining the philosophical, epistemological and scientific criteria (signs, parameters) of this "innovation". The same thing happens during the epistemological meaning of scientific progress.

Therefore, discussions and debates of philosophers and methodologists about scientific progress are not related to this phenomenon's existence or lack thereof but to an adequate philosophical-scientific explanation. For example, several researchers believe that the first definition of progress is descriptive (specific quality change regardless of direction), and the second is normative (analytical) [19, p. 26]. Other researchers, while emphasising that the concept of "scientific progress" has a dual nature (descriptive and normative), claim that the Oxford Dictionary does not give a descriptive but a normative definition because they write that the phrase "to improve" already emphasises the direction [22, p. 65]. This feature again shows that clarifying what is "new" plays a fundamental role in the philosophical understanding of the concept of "scientific progress".

For the philosophical understanding of innovation in the context of scientific progress, philosophers consider it essential to compare "science" and "non-science". This side of the issue was included in the discussions. I. Niiniluoto believes that science differs from other fields of human activity precisely because it has a "progressive character". Art, religion, philosophy, morality, and politics are different. In addition, there are clear, precise standards or "normative criteria" to clarify scientific achievements [12].

An interesting conclusion was reached in the discussions. From the above position, it is challenging and perhaps impossible to see scientific progress as a particular case of the general progress of humanity. This forms different views on science and human activity in the human-humanity, society-nature interaction.

That is, "Is there no interaction between scientific progress and other types of human activity?" the search for an answer comes to the fore. Against the background of this idea, the question of whether science is historical becomes relevant. If science is historical, it has a past. When his past exists, his attitude to the sociocultural environment of that period is fascinating. Because historical stages differ from each other, at the same time, scientific paradigms also differ from each other. Is there no connection between science and different types of human activity? In this regard, imagining progress as a transition from knowing less to knowing more is interesting. Because then progress is necessarily based on the historicity of science. Therefore, to determine scientific progress, there must be such decisive points (factors, parameters, etc.) in the past that "relative progress is recorded" [19, p. 27]. In particular, T. Nikles writes that in the "cumulative approach to progress", it is possible to talk about the historicity of science, that "progress can be defined as the quantitative increase of knowledge and facts about the world" [11].

T. Sokolova talks about the possibility of an adequate philosophical understanding of scientific progress within the French historical epistemology in the light of such ideas. In this regard, it is based on J-F. Braunstein's thesis is that French epistemology is a scientific reflection and a "critical reflection of history". At the same time, it expresses a thesis that is important for us: the critical reflection of the history of science is also a reflection of the history of rationality [3, p. 923]. There is no strict distinction between epistemology, philosophy of science and technology.

Interestingly, this point causes misunderstanding in English-speaking scientific circles and requires further explanation. In this regard, T. Sokolova shows the ideas of B. Boer as an example [5, p. 171].

The following conclusion can be drawn from them: in the modern philosophical sense, progress can be determined according to some factor, parameter, or sign, which indicates that progress is related to the direction. That is, the conversation here should not be descriptive but normative. Progress can be understood philosophically within an analytical approach. If not more specific, scientific progress is a normative term relative to a particular goal. Here, "norm" and "goal" express the essence of the philosophical-epistemological meaning of progress. Even several philosophers perceive progress as an "exceptionally normative" phenomenon [22, p. 67]. Its epistemological and scientific meaning should also be related to this point.

At the same time, the issue of philosophical understanding of the mutual relations between progress and scientific rationality automatically becomes relevant here. If science is historical, scientific rationality is also historical and changes from stage to stage. In this regard, what about the epistemology of the connections between scientific progress and the multidimensionality of scientific rationality?

This point also took a severe place in the discussions. V. Porus analysed the interesting philosophical points of the issue. The philosopher analyses what contribution interdisciplinary and transdisciplinary methodology can make to determine scientific progress and scientific rationality [16, p. 58–64]. According to V. Porus, "construction of large-scale concepts" occupies a special place in sociocultural epistemology. There are "complex and 'multidimensional' approaches" to such creation of understandings. The practical application of these theoretically constructed concepts is carried out with the same logic. It turns out that methodological, psychological, social, etc. "theoretical-methodological measurements" cannot form a universal idea about those concepts. However, it can play a guiding role in using those concepts in epistemology and philosophy of science. It should also be taken into account that the progress of science within the framework of "multidimensional rationality" can be considered progress in one assessment and regression in another. Taking all this into account, V. Porus concludes that the philosophy of science, on the one hand, "should avoid dogmatic universalisation of the criteria of rationality, and on the other hand, the extremism of relativism" [16, p. 58].

In the highlighted context, the following questions are also relevant for us. So, can the transition of scientific research to interdisciplinarity be called a "new type" of scientific rationality? If so, how do the criteria for scientific progress change? [16, p. 58]. V. Porus does not object to calling the transition to interdisciplinary research "new rationality" in principle. That is,

there is such a point of view that the rationality used in interdisciplinarity can be accepted as "new". This point of view is justified when approaching scientific rationality through the prism of "multidimensionality" [15, p. 5–16; 17, p. 416–432].

But again, firstly, the question depends on which rationality prism to look at scientific progress. Secondly, it is related to defining progress according to what factors and based on what criteria. For example, let's look at the mutual relations between philosophers and scientists in the context of the concept of "progress" within the framework of interdisciplinary rationality. The need for philosophy to be interdisciplinary, similar to natural science, emerges. This means that, for example, the philosophy of physics, the philosophy of biology, the philosophy of culture, the philosophy of mathematics, and others should interact within the framework of interdisciplinarity in natural science, corresponding to physics, mathematics, biology, and others. In that context, expressions such as "autonomous epistemology" and "plastic epistemology" used by several researchers can also be considered. But in all cases, in the epistemological aspect, the issue comes down to the specific scientific criteria of "measuring" progress, where one of the main questions is "how to determine scientific innovation?".

In the highlighted context, V. Porus puts forward the issue of the unity of the result obtained in application with the theoretical-inventive aspect of progress [16, p. 62-63]. In the true sense of the word, scientific progress should give positive results in the direction of "service to humanity" in addition to purely cognitive innovation. The unity of these two aspects can allow us to talk about scientific progress. At this time, V. Porus also mentions that it is not right to blame the damage of scientific innovation on humanity, only on politics and morality. Let us emphasise that the same position was expressed by H. Kissinger, D. Hattenlocker and E. Schmidt in their last work [8].

The study of scientific progress in the context of interdisciplinarity raises many epistemological and methodological questions. Summarising them, we can identify several main points.

First, scientific progress is a concept with complex content and meaning, and its philosophical understanding requires a separate approach.

Secondly, scientific progress can be defined relative to "scientific innovation" in all cases. At this time, the philosophical-epistemological meaning of "innovation" in science is essential. This point has a special meaning and relevance in an interdisciplinary approach.

Third, the understanding of scientific progress is closely related to rationality. Rationality in that context should be considered as a "multidimensional complex". The fact that rationality is multidimensional gives reason to imagine scientific progress as a "multidimensional concept". In this regard, interdisciplinarity can contribute to the philosophical reflection of scientific progress as a new rationality.

If we compare these results, we will see that the philosophical understanding of the concepts of "scientific innovation", "new knowledge", and, in general, "now" is relevant for the intellectual reflection of scientific progress in an interdisciplinary context.

Philosophical reflection of the concept of "now" in the prism of an interdisciplinary approach. Let's look at the synergetic explanation of the issue in light of the provisions we have highlighted above. There may be different approaches to the philosophical and epistemological definition of innovation in science. Here, we take as a starting point a thesis of E. Moore. The French philosopher and methodologist tried to bring philosophy and science to a single theoretical-methodological level using complexity [10; 1, p. 64; 9, p. 4-18]. Of course, other philosophers could have taken the same position. But E. Moren's approach is essential for us in an interdisciplinary and synergistic context. Here, the proposed method to ensure the unity of philosophy and science is interesting, and we believe that it gives grounds for drawing specific conclusions based on the discussions presented above.

This is the logic of this approach. According to E. Moore, each cognitive situation is a "loop of consciousness" that interacts with complexity and simplification when passing from one stage to another. The human mind tries to simplify every complex cognitive situation in its way. These transitions transition the mental process from one loop of consciousness to another Hestalt (not fragmentary, but holistic, whole). At the last stage of the process of understanding, a "loop of universal consciousness" is created, which includes the previous stages.

According to V. Frobel and C. Timashev, the cognitive process understood in Moren's sense results from the fractality of consciousness (self-similarity with certain intervals). That is, according to this approach, time is fractal. At each new stage, cognition returns to the situation of perception at the previous stage ("reentry"), and the cognitive process as a whole continues in that order [20]. Then, at each stage of understanding, the content of the concept of "now" becomes relevant to the philosophical epistemological problem we are looking at. In general, by determining the relationship between the content of "now" and a specific scientific innovation ("scientific now"), we can answer the question "What is scientific innovation?" it is possible to find an answer to the question.

Against the background of the fractality of time, in the synergetic (interdisciplinary) sense of the issue, every "scientific-now" takes the content of the temporal (in the sense that each cognitive situation has its content and rhythm of progress) discourse of the problem of intersubjective communication of consciousness. Against this background, we can discuss a specific criterion for evaluating scientific progress as new knowledge.

The temporality of scientific knowledge acquisition can be considered as an intersubjective temporal discourse, in addition to determining that knowledge has its content within each fractal dimension and the transition from one fractal dimension (the limit of self-similarity) to another (in the sense of the transition from a specific rhythm of self-similarity to another). At this time, any change considered as "new scientific knowledge" (invention, discovery, innovation, information, etc.) ensures the transition of the cognitive situation from complexity to a simpler one (in the sense that the overall cognitive picture becomes more apparent against the background of new knowledge), then it is scientific in the mental aspect can be considered as progress. In the sense of E. Moore, understanding manifests itself as simplifying a complex cognitive situation at a new stage.

In other words, here we are talking about new scientific meanings (concrete; we can also say "scientific truths" within the framework of rationality). From here, the importance of talking about the projection of scientific progress into the "intersubjective cognitive zone" (interdisciplinary cognitive field) at the modern stage automatically emerges. So, we can talk about scientific progress in the interdisciplinary cognitive field, where new scientific meanings emerge. At this time, the ability of new knowledge to transfer the overall cognitive situation from a complex picture to a more precise (in the sense of simplicity) situation can act as a cognitive criterion of the progress of science. If new knowledge can make the cognitive situation (or picture) more transparent and more straightforward than the previous stage, we can talk about scientific progress in the mental aspect.

However, the problem in the interdisciplinary context is not limited to this. Here, a second factor (or parameter) is necessary. Specifically, new knowledge in the cognitive aspect should also be evaluated as an innovation due to its practical application because modern societies are "scientific societies", "information societies", and "knowledge societies" to a large extent. This means that now social-cultural, moral-cultural values are "scientific". Therefore, it is necessary to accept the scientific activity and the scientific knowledge that is its direct result in the synthesis of cognitive and sociocultural aspects.

Thus, scientific progress in the context of interdisciplinary knowledge at the modern stage can be defined in the cognitive and practical-applied innovative unity of new knowledge. Here, as a cognitive criterion, new knowledge can change the overall cognitive situation from the existing complex picture to a simpler, clearer one. Here, an essential condition is considering scientific progress in the interrelationship of all previous and subsequent stages. That is, here, scientific progress can be imagined as the fact of theoretical evaluation of science at a later stage compared to the previous stage.

At the same time, scientific progress is closely related to evaluating new knowledge as innovation due to its practical application in the context of interdisciplinary learning. If the cognitive (in the sense of simplification of the mental situation compared to the previous stage) sign (parameter, criterion) of scientific progress and its sociocultural criterion (perceived as innovation as a result of practical application) are united, then it is possible to talk about scientific progress as a whole.

CONCLUSIONS

Philosophical reflection of scientific progress in philosophy-science relations at the modern stage is complex. When the issue is approached from an interdisciplinary (interdisciplinary) position, the need for philosophical and epistemological "measurement" of scientific progress arises. Discussions conducted by philosophers and methodologists in that direction show that the main issue is determining scientific progress's adequate criterion (parameter, sign). Here are various suggestions.

We put forward the thesis that the philosophical understanding of "now" can play a significant role in determining the criterion of scientific progress in an interdisciplinary prism. We state that two aspects are vital in this concept's philosophical and epistemological meaning in multidisciplinary knowledge. First, the purely cognitive criterion of "now". Second, confirmation of the innovativeness of "now" as a result of its practical application to society as a new interdisciplinary knowledge.

In the unity of these two aspects, we can talk about the criterion of scientific progress in an interdisciplinary context.

Taking these into account, we can express the conclusion as follows: the philosophical-epistemological criterion of scientific progress in an interdisciplinary context is innovative as a result of its practical application, with the peculiarity that knowledge can further simplify the complexity compared to the previous stage (in the sense of creating a clearer picture of the object within the scientific criteria of the time) can be determined based on the unity of determining its capabilities. At this time, as an essential condition, it is possible to accept the synthesis of interdisciplinary knowledge and its application to the sociocultural environment as innovation.

REFERENCES

1. Arshinov, V. (2011). Refleksivno-aktivnye sredy innovacionnogo razvitija v kontekste sinergetiki slozhnosti [Reflexive-active environments of innovative development in the context of the synergetics of complexity]. In *Mezhdisciplinarnye problemy sredovogo podhoda k innovacionnomu razvitiju* [Interdisciplinary problems of the environmental approach to innovative development]. Moscow: Kogito (in Russian).
2. Bashljar, G. (2000). Prikladnoj racionalizm [Applied rationalism]. In *Bashljar G., Izbrannoe* (Vol. 1, pp. 7–198). Moscow: Universitetskaja kniga.
3. Braunstein, J.-F. (2002). Bachelard, Canguilhem, Foucault. Le ‘style français’ en épistémologie. In *Les philosophes et la science* (pp. 920–963). Paris: Gallimard (in French).
4. Boon, M. (2022). *Preface to Federica Russo’s monograph Techno-Scientific Practices – An Informational Approach*. Retrieved from https://www.researchgate.net/publication/370527331
5. De Boer, B. (2019). Gaston Bachelard's Philosophy of Science: Between Project and Practice. *Parrhesia,* 31, 54–173.
6. Kasavin, I. T. (2023). Metaphysics of Progress and the Disciplinary Structure of Science. *Epistemology & Philosophy of Science, 60*(2), 35–41. doi: 10.5840/eps202360220
7. Kasavin, I. T. (2014). STS: Operezhajushhaja naturalizacija ili dogonjajushhaja modernizacija? [Advanced naturalisation or catch-up modernisation?]. *Epistemologija i filosofija nauki,* 39(1), 3-17. doi: 10.5840/eps20143911
8. Kissinger, G., Shmidt, E., & Hattenloker, D. (2022). Iskusstvennyj razum i novaja jera chelovechestva [Artificial intelligence and a new era of humanity]. Moscow: Alpina Digital (in Russian).
9. Montuori, A. (2013). *Complex thought. An Overview of Edgar Morin’s Intellectual Journey*. Retrieved from https://www.researchgate.net/publication/260603130_Edgar_Morin_and_Complex_Thought
10. Morin, E. (2005). *Metod. Priroda Prirody* [Method. Nature of Nature]. Moscow: Progress-Tradicija (in Russian).

11. Nickles, T. (2017, June 14). Historicist Theories of Scientific Rationality. Retrieved from https://plato.stanford.edu/entries/rationality-historicist/

12. Niiniluoto, I. (2002, October 1). *Scientific Progress*. Retrieved from https://plato.stanford.edu/Entries/scientific-progress/

13. Nowotny, H. (2005). The Increase of Complexity and its Reduction. *Theory, Culture & Society, 22*(5), 15–31. doi: 10.1177/0263276405057189

14. Oxford Advanced Learner's Dictionary. (2023). *Progress*. Retrieved from https://www.oxfordlearnersdictionaries.com/definition/english/progress_1

15. Porus, V. (2010). Mnogomernost' racional'nosti [Multidimensionality of rationality]. *Jepistemologija i filosofija nauki,* 1, 5–16 (in Russian).

16. Porus, V. N. (2023). On the Multidimensionality of Scientific Rationality and Scientific Progress. *Epistemology & Philosophy of Science, 60*(2), 58–64. doi: 10.5840/eps202360223

17. Porus, V. (2015). Ot mezhdisciplinarnosti k transdisciplinarnosti: mosty mezhdu filosofiej nauki i filosofiej kul'tury [Perspektivy From interdisciplinarity to transdisciplinarity: bridges between the philosophy of science and the philosophy of culture]. In *Transdisciplinarity in philosophy and science. Approaches. Problems. Prospects* (pp. 416–432). Moscow: Navigator (in Russian).

18. Russo, F. (2022). Techno-Scientific Practices. An Informational Approach. London: Rowman & Littlefield.

19. Sokolova, T. D. (2023). Conceptualizing Scientific Progress. *Epistemology & Philosophy of Science, 60*(2), 23–34. doi: 10.5840/eps202360219

20. Timashev, S. F. (2000). A new dialogue with nature. *AIP Conference Proceedings*. doi: 10.1063/1.1302392

21. Bazhanova, V., & Scholz, R. (Eds.). (2015). *Transdisciplinarnost' v filosofii i nauke: podhody, problemy, perspektivy* [Transdisciplinarity in philosophy and science: approaches, problems, prospects]. Moscow: Navigator (in Russian).

22. Tsurkan, E. G. (2023). Scientific Progress, Rationality and Interdisciplinarity. *Epistemology & Philosophy of Science, 60*(2), 65–71. doi: 10.5840/eps202360224

23. College of Liberal Arts and Human Sciences. (2023). *About*. Retrieved from https://liberalarts.vt.edu/departments-and-schools/department-of-science-technology-and-society.html