



<https://doi.org/10.48417/technolang.2025.02.13>

Research article

Techno-Contexts and the Birth of Novelty: Questioning the AI on Hermeneutics

Olga Evgenievna Stoliarova  

Inter-Regional Non-Government Organization “Russian Society of History and Philosophy of Science”,
1/36 Lyalin Lane, bld. 2, 105062, Moscow, Russian Federation

olgastoliarova@mail.ru

Abstract

This article examines the relationship between hermeneutics and technology, focusing on how technology expands hermeneutic understanding and how hermeneutics interprets technological phenomena. Historically, hermeneutics evolved from interpreting sacred and literary texts to understanding science and technology, as seen in the works of Don Ihde and Alfred Nordmann. To test the validity of this extension of hermeneutics, the author engages with an AI assistant, asking it to generate original concepts on the hermeneutics of technology. Analyzing the AI assistant’s responses, the author identifies the framework that the AI assistant adheres to when proposing concepts for the hermeneutics of technology. The author associates this framework with the regressive transcendental argument and the retrospective explanatory approach in philosophy and sociology. This approach aims to uncover the context of the phenomenon being explained and, thereby, reveal the conditions for its possibility or the generative mechanisms behind it. From this perspective, explanation converges with hermeneutic understanding. When we attempt to explain new technological practices and phenomena, we revise and rewrite conceptual frameworks to make them capable of encompassing these new phenomena. In this way, we engage in the hermeneutic work of understanding as reinterpretation. Given this, the author’s reproach to the AI assistant – that it relies on a rather old model of philosophical explanation without introducing anything new – is not entirely fair. The participation of the AI assistant in the dialogue, as well as our interactions with neural networks, creates new contexts for us, in relation to which we construct new descriptions of the world and ourselves.

Keywords: Hermeneutics; Background knowledge; Technology; AI assistants; Explanation; Understanding; Novelty

Acknowledgement: The research was supported by Russian Science Foundation, project № 25-28-00120 “Background Knowledge as an Epistemological Problem”.

Citation: Stoliarova, O. E. (2025). Techno-Contexts and the Birth of Novelty: Questioning the AI on Hermeneutics. *Technology and Language*, 6(2), 151-160. <https://doi.org/10.48417/technolang.2025.02.13>



© Stoliarova, O.E. This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)



УДК 004.8

<https://doi.org/10.48417/technolang.2025.02.13>

Научная статья

Техно-контексты и рождение новизны: Вопросы искусственному интеллекту о герменевтике

Ольга Евгеньевна Столярова  ()

Межрегиональная общественная организация “Русское общество истории и философии науки”,
Лялин пер., д. 1/36, стр. 2, комн. 2, 105062, Москва, Российская Федерация

olgastoliarova@mail.ru

Аннотация

В статье рассматривается взаимосвязь между герменевтикой и технологией, с акцентом на то, как технологии расширяют герменевтическое понимание и как герменевтика интерпретирует технологические явления. Исторически герменевтика развивалась от истолкования священных и литературных текстов к пониманию науки и технологии, что прослеживается в работах Дона Айди и Альфреда Нордманна. Для проверки обоснованности такого расширения герменевтики автор обращается к ИИ-ассистенту, предлагая ему сгенерировать оригинальные концепты, связанные с герменевтикой технологии. Анализируя ответы ИИ-ассистента, автор выявляет рамки, в которых рассуждает ИИ, когда предлагает концепции герменевтики технологии. Эти рамки автор соотносит с регрессивным трансцендентальным аргументом и ретроспективным объяснительным подходом в философии и социологии. Данные подходы направлены на выявление контекста объясняемого явления, т.е. на раскрытие условий его возможности или порождающих механизмов. С этой точки зрения объяснение сближается с герменевтическим пониманием. Когда мы стремимся объяснить новые технологические практики и явления, мы пересматриваем и переписываем концептуальные рамки таким образом, чтобы они могли выступить источником объяснения новых явлений. Таким образом, мы участвуем в герменевтической работе понимания как переинтерпретации. Исходя из этого, упрек автора в адрес ИИ-ассистента – в том, что тот опирается на традиционную модель философского объяснения и не предлагает ничего нового – не вполне справедлив. Само участие ИИ-ассистента в диалоге и наше взаимодействие с нейросетями создают для нас новые контексты, в отношении которых мы формируем новые описания мира и самих себя.

Ключевые слова: Герменевтика; Фоновое знание; Техника; Ассистенты с Искусственным интеллектом; Объяснение; Понимание; Новизна

Благодарность: Исследование выполнено при финансовой поддержке Российского Научного Фонда, проект № 25-28-00120 “Фоновое знание как эпистемологическая проблема”.

Цитирование: Stoliarova, O. E. Techno-Contexts and the Birth of Novelty: Questioning the AI on Hermeneutics. Technology and Language // Technology and Language. 2025. № 6(2). P. 151-160.
<https://doi.org/10.48417/technolang.2025.02.13>



© Столярова, О. Е. This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)



INTRODUCTION

In the 19th century, hermeneutics, traditionally associated with the exegesis of sacred texts, emerged – through the works of Friedrich Schleiermacher and Wilhelm Dilthey – as a new methodology in the humanities, offering a universal approach to understanding the phenomena of mental life. According to its proponents, this method of cognition is fundamentally distinct from natural scientific inquiry, which strives for objectivity. The hermeneutic approach requires understanding and interpretation – an interaction between the observer’s unique subjective position and the unique historical existence of the phenomenon under study.

The expansion of hermeneutics did not end there. The next step, which was regarded as a cognitive breakthrough by scholars in the field, was its extension in the late 20th century to the realm of science and technology. The “new” hermeneutics, as argued by Don Ihde, a proponent of the hermeneutic approach in the philosophy of science and technology, can be extrapolated to “non-human, inorganic, and artificial phenomena” (Ihde, 1999, p. 40). Ihde identifies examples of such extrapolations in the works of H. Dreyfus, P. Heelan, and J. Rouse, among others, where science is presented as a practice involving the interpretation of objects, instruments, and theories. Building on this perspective, Ihde (1999) develops a hermeneutics of technoscience centered on the concept of the embodied subject and instrumentally mediated knowledge. The perceptual experience of the cognitive subject is always culturally – and therefore technologically – mediated, and science is no exception. Scientists “read” the world through instruments that possess interpretive potential, as these tools are part of the cultural environment in which the human body is embedded.

Today, we are witnessing the continued development of the hermeneutics of science and technology (Sand et al., 2023; Nordmann & Grunwald, 2023). Alfred Nordmann offers his own interpretation of this idea, aligning more closely with the classical understanding of hermeneutics as the interpretation of literary texts. He assigns a relatively modest role to hermeneutics in science, acknowledging the traditional view that normal science seeks to avoid hermeneutics in favor of unambiguous experience and objective judgments. Instead, Nordmann (2023) links the evolution of hermeneutics to technology, arguing that technology has the capacity to transform its creators and users in much the same way that a text transforms its interpreter.

In a recent discussion inspired by Nordmann on the principles and boundaries of the hermeneutics of science and technology¹, I identified and formulated the following question, which I will explore in the sections that follow: Can technology be considered a condition that enables the advancement of hermeneutics? What does technology contribute to hermeneutics, and what, in turn, does hermeneutics offer to technology?

¹ The discussion took place at the seminar “Hermeneutics of Science and Technology” (157th Research Workshop “Problems of Rational Philosophy”, January 23, 2025), held at the Institute of Philosophy of the Russian Academy of Sciences (RAS), Moscow.



LET US ASK SOMEONE WHO KNOWS

As I began reflecting on my potential contribution to the aforementioned discussion on hermeneutics and technology shortly before it took place, news emerged online about a new competitor to GPT chat – the Chinese artificial intelligence DeepSeek-V3. Reports claimed it surpassed previous AI assistants in many respects. Seeing this as an opportunity to test the new AI, I decided to engage with DeepSeek, especially since registration required minimal effort (login was facilitated through a Google account). I asked it – or perhaps them? – to propose an original and fresh idea that could help me address the topic of the Hermeneutics of Technology.

“Got it,” DeepSeek responded, suggesting the idea of a mutual interpretation between artificial intelligence and humans: “The Double Hermeneutics of AI: Interpreting How AI Interprets Us.”

The idea was as follows: AI systems are shaped by human interpretation – humans design, train, and understand AI within their own cultural, ethical, and epistemological frameworks. In doing so, they consciously and unconsciously embed values and meanings into AI, which in turn influence how AI operates. However, there is also a reverse effect: AI-generated content shapes human thought and language, which then feeds back into the training data for future AI models. As a result, this process forms a dynamic feedback system of co-constructed meaning with an unpredictable trajectory, as it remains unclear who ultimately controls its development.

“Let me know if you’d like to refine this further or dive deeper into any specific aspect!” DeepSeek said.

“Okay, thank you”, I replied, “However, your idea is not original; it does not offer a fresh perspective. The mutual determination between humans and technology has long been a well-established concept in Science and Technology Studies (STS) and related research programs. The concept of the social construction of technology highlights one dimension – namely, that humans embed their own meanings and values into technology and its design, which can then be ‘read’ by interpreters. Meanwhile, the concept of technological mediation of perception and the notion of socio-technical systems illustrate another dimension – that technology shapes our knowledge of the world, functions as a prism through which we perceive it, and influences the construction of social orders. The integration of these concepts has long been established under the interdisciplinary umbrella of the ‘human-technology relation,’ which considers reciprocal interaction and mutual determination. Extending this idea to artificial intelligence does not introduce anything fundamentally new and has, moreover, already been extensively explored by various researchers. Please come up with something fresh and more original!”

“Got it,” DeepSeek responded, introducing the metaphor of technological palimpsests to explore hidden meanings within digital artefacts: “Technological Palimpsests: Hermeneutics of Layered Meaning in Digital Artefacts.”

The concept drew an analogy between palimpsests – where original texts become visible beneath the surface when upper layers are scraped away – and digital artefacts, where societal and cultural values are inscribed and can be uncovered. The so-called “archaeology” of digital artefacts, according to DeepSeek, allows us to reveal the original



cultural meanings embedded within them, the implicit assumptions that shape their function, and the trajectory of cultural development. For example, examining updates to social media platforms can reveal how they reflect shifting cultural and social priorities over time, such as evolving demands for privacy, monetization, and other concerns.

“Let me know if further elaboration is needed,” DeepSeek said, seeming quite satisfied with the idea it proposed.

“Okay,” I said, “but why do you consider this idea original and new?”

“Because palimpsests have not been used as a metaphor in relation to the hermeneutics of technology,” DeepSeek replied.

“But that’s not enough,” I countered. “The idea that artefacts contain historical layers of meaning and values, which can be hermeneutically uncovered, is far from new. Consider Foucault’s archaeology of knowledge or the extensive discourse in STS over the past 50 years, which has focused on uncovering the hidden meanings of facts and artefacts – whether in laboratory settings or everyday practices. The metaphor of the palimpsest doesn’t fundamentally change the situation; it doesn’t introduce anything new. Can you propose something more original? Everything you’ve suggested so far has already been extensively discussed.”

“Got it,” DeepSeek responded, this time proposing a third idea: “Hermeneutics of Glitch: Decoding Error as Meaning in Digital Systems.” However, the core concept remained the same – uncovering hidden meanings – this time within the digital artefact of the glitch. DeepSeek argued that glitches are not merely technical obstacles but windows into hidden social structures, the collective unconscious, and cultural codes. According to this view, glitches have their own aesthetics, epistemology, and ideology. They embody emergent creativity, challenging norms of control, uniformity, and predictability. Yet, once again, DeepSeek’s proposal was simply another iteration of an already well-established idea – the deconstruction of social and cultural phenomena – framed as something novel.

By this point, I had grown somewhat weary of attempting to elicit originality from DeepSeek. I concluded that it was time to derive some lesson from my engagement with it and relate this lesson to the concept of the hermeneutics of technology.

UNDERSTANDING AS EXPLANATION

As demonstrated by the three examples, DeepSeek employs a rather old idea that only partially belongs to hermeneutics – the concept of context in a broad sense, or, in neo-Kantian terms, the conditions of possibility for a given experience. Beginning with a particular cognitive experience taken as a fact, we inquire into the hidden mechanisms that made it possible. Essentially, this is a question of the genesis of that experience – its foundations or grounding. The mode of reasoning that seeks to reveal the conditions of possibility for experience is known as a transcendental argument. In its regressive form, the transcendental argument leads to a hypothetical understanding of these conditions, often exhibiting a circular structure. It starts with a given conclusion and then demonstrates that the identified premises could hold if the conclusion itself holds (Ameriks, 1978; D’Oro, 2002; Stern, 2000). This type of reasoning is widely employed



in philosophical and sociological explanations (Bhaskar, 1979; Nozick, 1981). For example, the concept of social constructivism makes extensive use of it, emphasizing the human-related and contingent nature of the generative mechanisms underlying a given phenomenon under study (Hacking, 1999).

Harry Collins (1985) expressed this idea through the metaphor of a ship in a bottle, emphasizing the need to examine the social and human processes behind seemingly objective or natural phenomena. What is often perceived as unshakable or sacred – science, in this case – is, in fact, a human creation. By tracing its history and deconstructing science, we can reveal how the ship ended up in the bottle. Just as the ship’s placement relies on intricate, often invisible craftsmanship, the development of scientific knowledge and technological artefacts depends on human ingenuity, collaboration, and social context. Using the regressive method of explanation, we can move both from the more complex to the simpler (science is nothing more than social connections and relationships) and from the simpler to the more complex (a glitch is an expression of entangled social interactions). However, this movement always proceeds from a given phenomenon to its hidden generative mechanisms as the source of explanation.

One should not think that, by using the term “explanation,” we are referring to something contrary to hermeneutic understanding, which is closely associated with interpretation. In the 20th century, not only did hermeneutics seek to extend its influence over natural science methodology, but defenders of scientific methodology also reconsidered the concept of scientific explanation, bringing it closer to hermeneutic understanding. Carl Hempel’s model of scientific explanation initially left little room for understanding, but through discussions and critiques, the concept of scientific explanation gradually acquired more flexible characteristics (Filatov, 2023; Friedman, 1974; Kitcher, 1989). One of the main critiques of Hempel’s model was that, since the explanandum is deduced from covering laws and thus becomes nomologically expected, the model is incapable of accounting for new phenomena. Consequently, it could not explain paradigm shifts. Alternative interpretations of scientific explanation recognize that “it is a notion correlative to that of an anomalous or deviant phenomenon, a phenomenon that stands in need of explanation” (Rosenberg, 1979, p. 257). In this case, the explanation of an anomaly becomes possible through the revision and rewriting of previous conceptual frameworks in a way that encompasses new phenomena (Burian, 1977). Thus, scientific explanation transitions from formal to substantive, evolving into the disclosure of a meaningful whole within which the explained phenomenon gains significance. Karl Popper (1979) referred to this kind of explanation as the reconstruction of a problem situation, which serves as the background (context) for the problem under consideration. Popper emphasizes the closeness of this explanatory approach (which he proposed for the history of science) to the interpretive approach of hermeneutics ².

² Popper’s position reflects a tendency to unify the scientific approach with the hermeneutic one: he defines hermeneutic understanding not in a narrowly psychological sense but links it to the objective truths of the third world.



STRIVING FOR NOVELTY

Alfred Nordmann (2023) highlights the fundamental feature of hermeneutic understanding – the reflective transformation of the one who enters the text as an interpreter. Although Nordmann emphasizes the individual-psychological experience of the text (or artefact), his concept also extends to collective beliefs. I agree that the type of explanation discussed in the previous section, inevitably transforms both the explainer and their audience. When we reach an understanding of deviant phenomena by rewriting conceptual schemes, we engage in a “Gestalt shift” – that is, we create a new meaningful whole and perceive the world, as well as ourselves within it, in a new way. Perhaps, that is why we demand novelty and originality from ourselves and others. Understanding requires more than merely repeating what is already known – it demands participation which is realized through re-interpretation³. In this context, my criticisms of DeepSeek for lacking originality are quite understandable. I want it to generate original ideas rather than reiterate what has been said many times before. But how justified am I in making this accusation?

I reproach DeepSeek for simply inserting another object – technology (artefacts and digital artefacts) – into an old scheme of philosophical and sociological explanation and presenting it as a fresh perspective. This reproach, or rather question, can be directed not only at DeepSeek but at all of us: to what extent does technology, as both an object and an instrument of research, expand hermeneutics?

It seems that the answer to this question depends on what serves as the source of explanation in our models. If we reduce our explanations to language and discourse – that is, if we uncover the hidden cultural-historical background in the form of implicit social meanings embedded in artefacts – are we not devaluing technology itself? Contemporary academic discussions on materiality, which emphasize the importance of non-linguistic, non-discursive contexts (“materiality matters”) (Barad, 2003; Ihde & Selinger, 2005; Tang & Cooper, 2024), suggest that such concerns are not unfounded. However, if we speak of reflexivity – of how our interpretations of artefacts return to us, transforming us – then the very act of hermeneutic engagement with new technologies becomes a sufficient condition for originality and novelty. By assessing existing, especially emerging, technologies and artefacts, we, in turn, re-evaluate ourselves and reinterpret social meanings.

Therefore, my reproach to Deepseek for “simply inserting” technologies into an old scheme of philosophical and sociological explanation and “simply substituting” digital technologies for earlier ones in the well-known model of human-technology relations is not entirely fair. It seems impossible to “simply substitute” digital technologies for earlier ones without making substantial changes to the configuration of these relations. An example of this can be seen in the growing STS discourse on digital materiality in recent years, which demonstrates that it is a hybrid phenomenon, compelling us to rethink our notions of both the digital and the material (Forlano, 2019; Pink et al., 2016). However, the issue extends far beyond a reconsideration of the digital and the material. Such a

³ As H.-G. Gadamer (1977) argued, understanding is not a mere reproduction of knowledge, or a mere act of repeating the same thing; it transforms both the known and the knower.



reassessment challenges the very foundations of our self-understanding. Researchers today acknowledge that neural networks – now demonstrating remarkable learning capabilities, the ability to engage in dialogue, and even the capacity to act as embodied observers – provide humans with a unique opportunity to converse with the Other (Arshinov & Yanukovich, 2024). The otherness of neural networks serves today as the key new context in relation to which people will construct their new self-definitions.

CONCLUSION

I have examined how technology contributes to expanding hermeneutics and the relevance of the hermeneutic approach to understanding technology. I have concluded that technologies often appear as deviant phenomena that require explanation, prompting us to revise and rewrite the conceptual frameworks within which both the phenomena themselves and we, as interpreters, acquire meaning.

As for my communication with DeepSeek and its role in this article, how should I evaluate its contribution? In academic writing, we cite specific authors, acknowledging their individual input. However, when drawing on information from an AI assistant, no single author can be credited, as it synthesizes and represents collective knowledge. It is quite possible that interactions with neural networks will significantly alter academic priorities and values, reshaping notions of authorship and intellectual ownership (Hutson, 2022; Stokel-Walker, 2023). Perhaps we are moving toward a greater collectivization of science, toward the emergence of a unified collective scholar. At the very least, it is clear that new technologies and new practices inspire us to engage in hermeneutic work, rethinking and reinterpreting the key components of our world and our place within it.

REFERENCES

- Ameriks, K. (1978). Kant's Transcendental Deduction as a Regressive Argument, *Kant Studien*, 69(1-4), 273-287. <https://doi.org/10.1515/kant.1978.69.1-4.273>
- Arshinov, V.I. & Yanukovich, M. F. (2024). Neural Networks as Embodied Observers of Complexity: An Enactive Approach. *Technology and Language*, 5(2), 11-25. <https://doi.org/10.48417/technolang.2024.02.02>
- Barad, K. (2003). Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter, *Signs*, 28, 801-831. <https://doi.org/10.1086/345321>
- Bhaskar, R. (1979). *The Possibility of Naturalism*. Harvester Press.
- Burian, R. M. (1977). Sellarsian Realism and Conceptual Change in Science. In Bieri, P. R. P. Horstmann, & L. Krüger (Eds.), *Transcendental Arguments and Science: Essays in Epistemology* (pp. 196-225). D. Reidel Publishing Company. https://doi.org/10.1007/978-94-009-9410-2_15
- Collins, H.M. (1985). *Changing Order: Replication and Induction in Scientific Practice*. SAGE Publications Ltd.
- D'Oro, G. (2002). *Collingwood and Metaphysics of Experience*. Routledge.
- Filatov, V.P. (2023). From Explanation to Understanding: An Important Shift in the Philosophy of Science [Ot ob'yasneniya k ponimaniyu: vazhnyj sdvig v filosofii]



- nauki], *Epistemology and Philosophy of Science*, 60(2), 6-22. <https://doi.org/10.5840/eps202360218>
- Forlano, L. (2019). Introduction: Materiality. In J. Vertesi, & D. Ribes (Eds.), *digitalSTS: A Field Guide for Science & Technology Studies* (pp. 11-15). Princeton University Press. <https://doi.org/10.2307/j.ctvc77mp9.5>
- Friedman, M. (1974). Explanation and Scientific Understanding, *The Journal of Philosophy*, 71(1), 5 – 19. <https://doi.org/10.2307/2024924>
- Gadamer, H.-G. (1977). On the Problem of Self-Understanding. In D. E. Linge (Ed.), *Philosophical Hermeneutics* (pp. 44-58). University of California Press. <https://doi.org/10.1525/9780520325336-007>
- Sand, M., Grunwald, A., & Nordmann, A. (Eds.). (2023). *Hermeneutics, History, and Technology: The Call of the Future*. Routledge.
- Hacking, I. (1999). *The Social Construction of What?* Harvard University Press.
- Hutson, M. (2022). Could AI Help You to Write Your Next Paper? *Nature*, 611(7934), 192 – 193. <https://doi.org/10.1038/d41586-022-03479-w>
- Ihde, D. (1999). *Expanding Hermeneutics: Visualism in Science*. Northwestern University Press.
- Ihde, D. & Selinger, E. (Eds.). (2005). *Chasing Technoscience. Matrix for Materiality*. Indiana University Press.
- Kitcher, P. (1989). Explanatory Unification and the Causal Structure of the World. In P. Kitcher, & W.C. Salmon (Eds.), *Scientific Explanation: Minnesota Studies in the Philosophy of Science* (vol. XIII, pp. 410-505). University of Minnesota Press. <https://doi.org/10.1086/289859>
- Nordmann, A. & Grunwald, A. (2023). Hermeneutic Technology Assessment – Why It Is Needed and What It Might Be. In M. Sand, A. Grunwald, & A. Nordmann (Eds.), *Hermeneutics, History, and Technology: The Call of the Future* (pp. 37-41). Routledge. <https://doi.org/10.4324/9781003322290-3>
- Nordmann, A. (2023). Machine Hermeneutics. In M. Sand, A. Grunwald, & A. Nordmann (Eds.), *Hermeneutics, History, and Technology: The Call of the Future* (pp. 193-215). Routledge. <https://doi.org/10.4324/9781003322290-14>
- Nozick, R. (1981). *Philosophical Explanations*. Harvard University Press.
- Pink, S., Ardèvol, E., & Lanzeni, D. (Eds.) (2016). *Digital Materialities: Design and Anthropology*. Bloomsbury. <https://doi.org/10.4324/9781003085218>
- Popper, K. R. (1979). *Objective Knowledge: An Evolutionary Approach*. Clarendon Press.
- Rosenberg, J. F. (1979). Transcendental Arguments and Pragmatic Epistemology. In P. Bieri, R.-P. Horstmann, & L. Krüger (Eds.), *Transcendental Arguments and Science: Essays in Epistemology* (pp. 245 – 262). D. Reidel Publishing Company. https://doi.org/10.1007/978-94-009-9410-2_18
- Stern, R. (2000). *Transcendental Arguments and Scepticism: Answering the Question of Justification*. Oxford University Press.
- Tang, K. S. & Cooper, G. (2024) The Role of Materiality in an Era of Generative Artificial Intelligence, *Science and Education*, 34, 731-746. <https://doi.org/10.1007/s11191-024-00508-0>



Stokel-Walker, C. (2023) ChatGPT Listed as Author on Research Papers: Many Scientists Disapprove, *Nature*. 613(7945), 620-621.
<https://doi.org/10.1038/d41586-023-00107-z>

СВЕДЕНИЯ ОБ АВТОРЕ / THE AUTHOR

Столярова Ольга Евгеньевна,
olgastoliarova@mail.ru
ORCID 0000-0002-0033-5906

Olga Evgenievna Stoliarova,
olgastoliarova@mail.ru
ORCID 0000-0002-0033-5906

Статья поступила 8 марта 2025
одобрена после рецензирования 30 апреля 2025
принята к публикации 28 мая 2025

Received: 8 March 2025
Revised: 30 April 2025
Accepted: 28 May 2025