14. Foucalt, M. (2003). Arheologiya znannya [The Archeology of knowledge]. Kyiv: Vyd-vo Solomii Pavlychko «Osnovy», 326 s. (in Ukrainian).
15. Hailwood, M. (2023). Rethinking Literacy in Rural England, 1550–1700. *Past & Present. 260* (1), 38–70. https://doi.org/10.1093/pastj/gtac019
16. Jones, R. (2022). Time Warps During the French Revolution. *Past & Present. 254*(1), 87–125. https://doi.org/10.1093/pastj/gtaa048

Received 10.08.2025
Received in revised form 17.09.2025
Accepted 24.09.2025

DOI: 10.15421/272519
УДК 165.194.3(324)

H. G. Starikova

Kharkiv National University of Radio Electronics, Kharkiv, Ukraine

UNCONSCIOUS COMPONENTS AS ACTIVE PARTICIPANTS OF SCIENTIFIC CREATIVITY

E-mail: halyna.starikova@nure.ua
ORCID ID: https://orcid.org/0000–0002–3229–1442

Abstract. Introduction. The article is devoted to the analysis of the role of unconscious components at the stage of discovery of new knowledge as a result of insight. Studies of the process of scientific creativity have proven that the main role in cognitive-heuristic activity at this stage is played by the unconscious sphere of the subject of knowledge. However, researchers have hardly considered the question of what processes occur at the subconscious level during heuristic search, what implicit cognitive components participate in these processes. Therefore, the **purpose** of our work is to analyze the specifics of the functioning of the subconscious at the stage of heuristic search and the role of unconscious factors in this, in particular, tacit knowledge. To achieve this goal, personal accounts, memories and reflections on the process of scientific creativity of prominent scientists of the 20th century were analyzed. The goal also determined the scientific novelty of this work, which consists in studying the participation of specific types of unconscious knowledge in the process of insight formation. **The main part.** At the heuristic stage, the limitations of verbal-conceptual cognition, which works only with rigidly formalized information, become apparent. In contrast, in the unconscious there are no such "rules" and limitations, so at the subconscious level there is always the opportunity to go beyond the known and discover new knowledge. Research has shown that one of the necessary stages for finding a new solution is the creation of a fundamentally new systemic cognitive integrity, which should replace the construction based on a rational basis. To do this, it is often necessary to radically change the conception of fundamental principles that are almost not realized by the subject of cognition. As a result, a new systemic cognitive integrity is formed, which replaces the previous one, which was based exclusively on rational principles. In the creation and effective functioning of this integrity, a significant role is played by implicit, tacit knowledge of various types, for example, such varieties as anti-paradigmatic, contextual, reduced and associative. The main principles of such cognitive integrity are not realized until the completion of the intuitive search and the stage of verbalization of the found knowledge. **The conclusions** are to prove the particularly significant role of unconscious factors at the stage of heuristic search for new knowledge. They can be used in the training of future scientists or in the study of already made discoveries for a better understanding of the process of scientific creativity.

***Key words*:** scientific research, unconscious cognitive processes, unconscious cognitive integrity, intuition, insight, tacit knowledge.

Г. Г. Старікова

Харківський національний університет радіоелектроніки, Харків, Україна

НЕУСВІДОМЛЕНІ КОМПОНЕНТИ ЯК АКТИВНІ УЧАСНИКИ НАУКОВОЇ ТВОРЧОСТІ

Анотація. Вступ. Статтю присвячено аналізу ролі неусвідомлених компонентів на етапі відкриття нового знання в результаті інсайту. Дослідження процесу наукової творчості довели, що головну роль у пізнавально-евристичній діяльності на цьому етапі відіграє неусвідомлена сфера суб'єкта пізнання. Однак дослідники майже не розглядали питання про те, які процеси відбуваються на підсвідомому рівні під час евристичного пошуку, які саме імпліцитні когнітивні компоненти беруть участь у цих процесах. Тому **мета** нашої роботи – аналіз специфіки функціонування підсвідомого на етапі евристичного пошуку та роль у цьому неусвідомлених чинників, зокрема неявних знань. Звертаємо увагу, що в контексті цієї роботи поняття «неусвідомлене», «підсвідоме», «несвідоме» та «неявне» використовуються як тотожні, тільки для того, щоб підкреслити принципово неявний характер досліджуваних феноменів. **Основна частина**. На евристичному етапі стає очевидною обмеженість вербально-понятійного пізнання, яке працює тільки з жорстко формалізованою інформацією. Натомість у неусвідомленому немає подібних «правил» та обмежень, тому на підсвідомому рівні завжди є можливість вийти за межі відомого й відкрити нове знання. Для цього досить часто необхідно докорінно змінити уявлення про фундаментальні принципи, що майже не усвідомлюються суб'єктом пізнання. В результаті формується нова системна когнітивна цілісність, яка замінює попередню, що спиралась винятково на раціональні засади. У створенні й ефективному функціонуванні цієї цілісності значну роль відіграють неявні, імпліцитні знання різних типів. Основні засади такої когнітивної цілісності не усвідомлюються до завершення інтуїтивного пошуку й етапу вербалізації знайденого знання. **Висновки** полягають у доведенні особливо значної ролі неусвідомлених чинників на етапі евристичного пошуку нового знання. Їх можна використовувати при підготовці майбутніх фахівців-науковців або в дослідженнях уже здійснених відкриттів для кращого розуміння процесу наукової творчості.

***Ключові слова*:** наукове дослідження, неусвідомлені когнітивні процеси, неусвідомлена когнітивна цілісність, інтуїція, інсайт, неявне знання.

Introduction. Scientific knowledge is a complex multilevel process, in the implementation of which various elements of the human cognitive system take part. We are used to the fact that the main "actor" of scientific knowledge is abstract-logical thinking, but epistemological and psychological research has long proven that even theoretical knowledge is impossible, for example, without the participation of the sensory sphere of information acquisition. Also an integral part of any cognition, including scientific cognition, are numerous unconscious factors and implicit components of the cognitive sphere. They participate in scientific and cognitive creativity at all its stages, remaining almost unnoticed neither for the scientist himself nor for researchers of his work. But some implicit components have nevertheless become the object of attention of scientist, which made it possible to at least designate these components and identify the stages at which they participate in cognition. All researchers agree, however, that the most significant role of unconscious components is played at the last stage of intuitive search and at the moment of insight. However, the role of implicit elements is more often recognized than implemented in detail. Therefore, further deeper and more meaningful research into the participation of unconscious components in the process of scientific cognition remains topical for modern science, and, in particular, for epistemology. This is precisely their relevance. We propose to approach this problem from a slightly different angle – to analyze how the participation of tacit knowledge in scientific research is perceived by the scientists themselves. It should be noted that in the 20th century, a significant number of scientists were interested in this issue, so we have enough material to analyze what role, according to scientists, tacit knowledge plays at different stages of scientific research.

The Aim and the Subject of the Study. The above considerations allowed us to formulate the **aim** of our research: to analyze the peculiarities of functioning, as well as the role of unconscious cognitive factors, in particular, various types of implicit knowledge, at the heuristic stage of scientific research and in the process of insight formation. One of the main sources on which we relied in our investigation was the materials of self-observation and self-analysis of researchers-scientists who straight participated in scientific and cognitive activity. Accordingly, the **subject of the investigation** were different types of tacit knowledge that take different part in heuristic search and insight preparation. It is necessary to determine which types of tacit knowledge assist in this process and to clarify the specifics of the participation of this tacit knowledge in the formation of new knowledge. It is necessary to pay attention that in the context of this work, the concepts of "unconscious", "subconscious", "implicit" and "tacit" are used interchangeably, only to emphasized the fundamentally implicit nature of the phenomena under study.

Literature review. Sources and research methods. In our investigation, we relied on two types of sources. The first type are disquisitions devoted to the study of the phenomenon of tacit knowledge as such. The second type of sources is the reasoning of the researchers themselves about the participation of unconscious components in their own cognitive creativity.

Scientific analysis of tacit knowledge as a certain fragment of the human cognitive system has been carried out for several decades, but at the same time tacit knowledge is considered from one, separate, specific side – from the point of view of its participation in one or another type of human activity. This may be a question of certain practical and effective skills (riding a bicycle, etc.); works related to pedagogy are quite widely represented – in the learning process in general and in learning a foreign language in particular; in management or advertising and in other applied aspects. For example, A. Furman in his works analyzed in detail and creatively the role of tacit knowledge in the pedagogical process, developed a whole concept of the so-called "osvitologyi", which is based on the possibility of using tacit knowledge in the learning process, and proposed his own classification of tacit knowledge[1].

In scientific knowledge, implicit knowledge can be considered as a component of the prerequisite components of scientific knowledge. Interest in the prerequisites of scientific knowledge in twentieth century was activated, on the one hand, in connection with the development of psychoanalysis and its studies of the unconscious. On the other hand, attention to implicit prerequisites was the result of a critical review of the neo-positivist research program, which led to their study as an independent component in the general structure of science. K. Popper, and after him A. Musgrave, J. Watkins and others consider prior knowledge as "unproblematic" knowledge, as the third component of scientific knowledge, along with data and hypothesis[2] c. 215]. In the scientific literature, two approaches to prior knowledge have been formulated – logical-historical (temporal) and heuristic, but both of them face significant logical difficulties. There are other interpretations of prior knowledge: as a competing theory (I. Lakatos); a theory that imposes ontology (W. Quien); additional hidden information (J. Watkins), etc. For methodologists – followers of K. Popper, a functional understanding of prior knowledge as generally accepted, undoubted knowledge, the third component of the cognitive process, the nature of which relates to scientific knowledge requires special research[3].

It should be noted that the content and structure of the precondition knowledge itself are either not clearly differentiated or are reduced to the content and structure of special knowledge. The question of including philosophical and worldview, regulatory and methodological components in the precondition knowledge is essentially not raised at all. This is also confirmed by the fact that the modern discussion of the role of ontological preconditions in

[1] Фурман А. В. Методологічне обґрунтування багаторівневості і парадигмальних досліджень у соціальній психології. *Психологія і суспільство*. № 4. 2012. С. 78–125.

[2] Karl Raimund Popper. Conjectures and Refutations: The Growth of Scientific Knowledge. Psychology Press, 2002. P. 215.

[3] Ibid. P. 198–201.

the development of scientific theory is almost not connected with the problem of precondition knowledge.

At the turn of the millennium researches became more pragmatic. Now scientists and philosophers were more interested in the question of how exactly tacit knowledge affects a particular form of human activity, for example, what role it plays in the process of learning a foreign language or simply in pedagogy, or in economics and management, etc. More theoretical can be considered the works of M. Davis, in which he tried to connect the functioning of tacit knowledge with other mental processes[4], in particular, he used the concept of tacit knowledge in researching the characteristics of the basic elements of N. Chomsky's generative grammar. But even in these works, tacit knowledge appears more as an additional research tool than as a separate subject of consideration. Ukrainian researchers of the early 21st century paid attention to both these practical aspects and proposed more theoretical approaches to the study of this cognitive component. This applies, in particular, to the works of M. Melnychuk, in which he attempted to consider implicit knowledge as a post-non-classical phenomenon. But his approach is based on a specific vision of the problem and the author's own terminology, so his approach has not yet become generally accepted in the scientific community[5]. Also we relied on the works of H. Starikova, devoted to the typology of tacit knowledge and the role of implicit cognitive components in the process of scientific investigation[6][7].

The peculiarities and specifics of scientific creativity have attracted the attention of many modern researchers. Thus, in the monograph «Psychology of scientific activity»[8] the authors consider various psychological aspects of the creative activity of a scientist, such as the general characteristics of the creative process, individual psychological characteristics of the creative personality, motivation of the creative process, etc., but the special role of unconscious components does not attract the attention of researchers. In the other hand, N. Karpenko in your work proposed a periodization of this process, and we will partially rely on this periodization in our further work. But the author also did not carry out a thorough study of the role of various unconscious components in scientific cognition, this role remained at the level of stating the well-known fact that "the act of scientific creativity"[9]. We believe that an in-depth study of this cognitive phenomenon is quite relevant for modern cognitive theory.

In accordance with the goal, we turned directly to the works of scientists – predecessors and contemporaries of M. Polanyi, who paid attention to or even tried to analyze the place and participation of tacit knowledge in their scientific and professional activities. Of particular importance, in our opinion, are the reflections on this topic of A. Poincaré, who, just like I. Kant at one time, was interested in the question of how scientists discovers something new, how researchers arrive at unexpected answers, how the process of scientific creativity generally takes place. He not only pondered these question on his own, he corresponded on this topic with many prominent contemporaries, representatives of science of that time – A. Einstein[10], P. Dirac, M. Planck and others.

[4] Davies M. & Stone T. Mental simulation, tacit theory, and the threat of collapse. *Philosophical Topics*, 29. 2001. P. 127–73.

[5] Мельничук М. Неявне знання як аналог апріорізму в некласичній парадигмі епістемології. *Науковий вісник Чернівецького університету. Філософія*. 2012. Вип. 602–603. С. 36–40.

[6] Старікова Г. Г. Сучасні підходи до розробки типології неявних знань. *Дослідження з історії і філософії науки і техніки.* 2023. Т. 32, № 1. С. 19–27/

[7] Старікова Г. Г., Тіхонова Л. А. Розуміння як етап наукового пізнання та роль неявних знань на цьому етапі. *Актуальні проблеми філософії та соціології.* 2024. № 49. С. 138–143.

[8] Волянюк Н. Ю. Психологія наукової діяльності: [Монографія] / Н. Ю. Волянюк, Г. В. Ложкін, А. Б. Колосов, Б. В. Андрійцев. Київ: КПІ ім. Ігоря Сікорського; Центр ДЗК, 2020. 352 с.

[9] Карпенко Н. А. Психологія творчості. Львів: ЛьвДУВС, 2016. С. 33.

[10] Einstein A. The Evolution of Physics: The Growth of Ideas from Early Concepts to Relativity and Quanta. Cambridge University Press. 1938. 218 p.

The results of these reflections found their embodiment in several articles and essays by Poincaré[11]. An important contribution to the development of this issue was also made by the work of the outstanding scientists of those times, J. Hadamard[12], who rather meticulously analyzed the process of scientific activity, in particular, its creative component. Therefore, his work provided a lot of material for conclusions about the role of unconscious components at different stages of scientific research. Of some interest are also individual statements on this subject by such prominent scientists as A. Einstein, P. Feyerabend, T. Kuhn, who, one way or another, drew attention to the process of one's own cognition and, in particular, to the participation of unconscious components in it.

Basic material and results. The insight stage clearly demonstrates the shortcomings and limitations of conceptual, abstract-logical cognition. For rational cognition, there is only that knowledge that has a verbal, conceptual form or in other, mathematical, physical, chemical, ect. symbols. If knowledge is not formalized, it does not exist for the conceptual level, it is absent in the semantic field, in the lexical composition of language, natural or purely scientific. That is why it is impossible to discover something fundamentally new within the limits established by rational cognition, and that is why at the last stage of scientific research there is a forced transition, a movement of the "epicenter" of the cognitive process to the unconscious level. The subconscious does not have such strict restrictions and informational prohibitions, which allows cognition to go beyond the known.

The participation and role of implicit cognition at different stages of scientific research were analyzed in the article "Modern approaches to developing a typology of the tacit knowledge"[13]. and "Роль неявного знання на евристичному етапі наукового дослідження"[14]. It is obvious that the participation of unconscious components in cognition does not end with their functioning at the initial stage, when they ensure the course of a conscious rational process, for example, the choice of initial research hypotheses, the analysis and interpretation of empirical data, or even an unconscious change in cognitive dominance at the stage of creative search. Having performed certain function in "serving" the rational component, implicit cognition continues to process information at its own, subconscious level. It should be emphasized that, unlike the analogous conscious analysis of information, which is strictly limited by the principles, rules of science, etc. accepted by consciousness, at the implicit level there are no such restrictions, information can be compared with any other information fragments that are present in the subconscious. And there are an infinite number of such fragments, orders of magnitude more than information in the semantic field, on which rational thinking is based. In our opinion, it is precisely these unlimited possibilities of searching and arbitrary comparison of any information with any that provide the unconscious with the opportunity to combine various fragments into a new cognitive concept, which remains implicit for the time being. It is within the framework of this new concept that the answer to the question, the solution to the problem, that is, the achievement of the goal of scientific research, is ultimately found. These considerations explain why a person is not able to control the process of heuristic search for an answer to the desired extent and, in particular, to initiate the emergence of insight. The main activity at this stage is the activity of implicit cognition, which is not subject to the desires, rules and requirements of consciousness. The answer is found when the unconscious processing of information is completed; a person is not yet able to influence this process.

Thus, one of the necessary steps for finding a fundamentally new solution, new knowledge is to go beyond the usual, stable, formed systemic integrity in understanding the problem we are investigating. There is a generally accepted point of view, theory or concept from which a scientist usually begins his work. But in order to discover something new, most often it is

[11] Poincare H. Science et Method. Paris Ernest Flammarion, Edteur 26, rue Racine. 1920. 196 p.

[12] Hadamard J. An Essay on the Psychology of Invention in the Mathematical Field. Hadamard Press. 2008. 164 p.

[13] Старікова Г. Г. Сучасні підходи...

[14] Старікова Г. Г., Тіхонова Л. А. Розуміння як…

necessary to radically revise the basic, fundamental ideas and the entire holistic construction in its unity and, accordingly, to form a new, alternative vision and a fundamentally new integrity. This is exactly what happens at the final stages of scientific research. It is known that many researchers of the cognitive process have especially emphasized the importance of forming a new holistic idea of reality in the process of creativity, as opposed to a fragmentary-analytical, verbal-conceptual understanding of reality as a certain type of "sum" of individual semantic elements and their combination. Researchers have found that by the moment of insight, the general "integrity index" of the process increases, the very culminating moment of the birth of innovation can be characterized as holistic, that is, indivisible into separate meanings, it cannot be imagined as a set of such meanings, and therefor they cannot be realized and, accordingly, subjected to reflexive description. This innovative integrity is different in that it is based on a rethinking of all rational meanings, which cannot be described by analyzing the content of these meanings and the relationships between them. We can say that a new integrity is created by restructuring the usual meanings and their relationships.

The primacy of this new holistic structure, its importance and even necessity is confirmed, one way or another, by many modern studies of the psychology of creativity. They cite the results off self-observation, self-reports of test subjects, and recollections of prominent scientists about their own creative process. Thus, according to the theory of Gestalt psychology, ""the whole" can be included in the composition of structured Gestalts (which are not reduced to the sum of their components) before its individual "parts"; due to this, the holistic problem structure seems to independently direct the process of thinking in a certain direction; restructuring, reorientation of knowledge are more important for discovery than a simple increase in actual knowledge"[15]. The famous American researcher G. Raudsepp also emphasized the essential dependence of the creative process on the formation of an "intuitive sense of the whole". It is necessary to emphasize that this integrity as a necessary element of insight is directly related to the phenomenon of implicit knowledge. They, due to their unconsciousness, om the one hand, and relative proximity to the conscious level (since a certain part of implicit knowledge can be realized under certain conditions), on the other, can provide a close connection between the discrete and the continuous, unity and multiplicity, fragmentation and integrity in the process of scientific discovery. We have already seen that at the moment preceding insight, simultaneously with the cessation of logical-conceptual search, the possibilities of discrete components of cognition are exhausted, and the center of the creative process moves to the unconscious sphere. Accordingly, implicit knowledge as an important element of unconscious cognition begins to function according to the rules of a new integrity. At this stage, those of implicit knowledge that are usually not realized, since they do not coincide with the basic concepts fixed in consciousness, become active; moreover, some of them, for example, anti-paradigmatic, may even contradict the basic attitudes of consciousness. Such implicit knowledge can also include contextual, systemic, associative and subconscious types. But it is precisely thanks to this unconsciousness that the restrictions on the use of knowledge that is unacceptable from the point of view of consciousness disappears, which provides the opportunity to find a fundamentally new solution and discover fundamentally new knowledge.

The existence of solution within a broader context is not accidental; it plays an important role in the subsequent processes that will occur immediately after the insight. In particular, it is the presence of this context that makes possible the further verbalization of the solution found, since it provides a fairly large selection of necessary formulations. On the other hand, the same context takes part in the implementation of the memory mechanism at an unconscious level. It is clear that the value of the newly found solution lies not only in the answer to a specific question, but also in the possibility of using this solution in the future, when faced with similar cognitive tasks. Thus, one of the necessary steps for finding a fundamentally new solution, new knowledge is to go beyond the usual, stable, formed systemic integrity in understanding the problem under study. There is a generally accepted

[15] Яланська С. П. Психологія творчості. Полтава: ПНПУ ім. В. Г. Короленка, 2014. С. 56.

point of view, theory or concept from which a scientist usually begins his work. But in order to discover something new, most often it is necessary to radically revise the basic, fundamental ideas and the entire holistic construction in its unity and, accordingly, to form a new, alternative vision and a fundamentally new integrity. This is exactly what happens at the final stages of scientific research. It is known that many researchers of the cognitive process have particularly emphasized the importance of forming a new holistic idea of reality in the process of creativity, as opposed to a fragmentary-analytical, verbal-conceptual understanding of reality as a certain type of "sum" of individual semantic elements and their combination. Researchers have found that by the moment of insight, the general "integrity index" of the process increases, the very culminating moment of the birth of innovation can be characterized as holistic, that is, indivisible into separate meanings, it cannot be imagined as a set of such meanings, and therefore they cannot be realized and, accordingly, subjected to reflexive description. This innovative integrity is different in that it is based on a rethinking of all rational meanings, which cannot be described by analyzing the content of these meanings and the relationships between them. We can say that a new integrity is created by restructuring the usual meanings and their relationships. It is the existence of a broader context that ensures such a transfer of new knowledge and methods of action to other situations. The process of such a transfer is greatly facilitated by the positive emotional reinforcement that occurs in the case of a successful solution to the task. In other words, the new implicit integrity is fixed both on the substantive and on the emotional-sensory level.

It is within this new integrity that the search for a new solution takes place. It is likely that the result of such a search is not one, desired answer, but several solution options at once. These options can be both similar to each other and significantly different; in addition, the observation of scientists themselves prove that not all of these options are fruitful and subsequently gain access to consciousness for further analysis. Here is what Poincaré wrote about this: "Barren combinations do not even occur to the inventor. Only truly useful combinations appear within his consciousness, as well as, along with them, several others that he will later reject, but which have, in a certain sense, the character of useful combinations"[16]. In addition, there are cases when some of the intuitive solutions found are marked by a rather strong negative personal attitude. This personal unacceptability of the solution may be stronger than its subjective cognitive value. As a result, this option will be rejected at an unconscious level, regardless of how close it turned out to be to the answer or solution that the researcher was looking for. The significance of the personal attitude may outweigh both the tension of the cognitive attitude and even the pressure of the "stagnant" cognitive dominant. The role of the personal factor, which is no longer restrained by conscious-logical limitations, is especially increasing at the stage of intuitive search, as well as at the stage of verbalization of the solution found. One could even say that at a certain point personal passion becomes the only criterion for selecting among different solution options. However, sooner or later the selection is made on a subconscious level. The "acceptance" of such a choice is subjectively experienced by the researcher as the highest point of the intuitive-creative process – the moment of enlightenment.

Analyzing the process of creative search, Poincaré also comes to the conclusion that "the unconscious solves not only the complex task of creating different ideas, but also the essential and delicate task of choosing combinations that satisfy the problem being solved"[17]. The state of sudden enlightenment, in his opinion, is the result of long-term unconscious work, and the role of this unconscious work in scientific and, in particular, mathematical creativity is very significant. On the other hand, Hadamard, relying on observations of his own creative process, came to a similar conclusion that individual considerations and their complexes "wait, so tj speak, in the living room of consciousness, in the marginal consciousness, to be introduced only at the beginning of the final stage of the cognitive process"[18]. At the same

[16] Poincare H. Science et Method… P. 10

[17] Ibid. P. 34.

[18] Яланська С. П. Психологія… С. 77.

time, Poincaré notes not only the fact of unconscious reasoning, which leads to a certain conclusion, but also that this unconscious reasoning is an unconditional and important source of the scientist's confidence in the content and composition of the future result[19].

Finally, the solution has been found, but this is not enough, since it is still within the unconscious sphere. As Poincaré emphasizes, the unconscious never gives us the result in a complete and finishes form. It is necessary to make it available to consciousness, for logical verification, justification and further use in the rational process. In other words, new knowledge requires sing-symbolic representation. This is the beginning of the next stage of the cognitive and creative process – the stage of verbalization and formalization of the solution found. Subjectively, this moment is felt as a state of "foreknowledge", "foreunderstanding". Researchers believe that the awareness of the fact of the solution occurs completely suddenly, unexpectedly, it arises due to the fact that the need that has reached the highest tension at the moment is satisfied. At the same time, at the beginning, not the result itself is realized, but the fact of satisfying the need is realized, and only then – the fact of solving the problem. It should also be noted that the search tension in this situation does not disappear, but, on the contrary, may even increase, and its focus shifts towards the search for specific means of expressing and formalizing the solution found.

The problem is that the found answer not only refers, it is an integral part of a holistic, indivisible unity. Therefore, it is necessary to carry out the reverse process of dividing this integrity into fragments. Such fragmentation begins at the moment when the subject has a need for a symbolic design of the found solution. An active search for means of expression begins, which sharply stimulates the structuring and division of the new integrity into component fragments. Thus, even at the level of the unconscious, the necessary fragment is isolated, which includes the solution itself as such, and further operations are carried out directly with its content.

Conclusions. We see that in the human cognitive system, knowledge about any object of reality is an integral part of a more general holistic concept about the fragment of reality to which the object under study belongs. Such a generalized holistic idea is formed at the first stage of scientific investigation, during the search and formulation of the research hypothesis. At subsequent stage, it is this basic concept that becomes the bottom for choosing a methodology, conducting empirical research, their description and interpretation. It should be emphasized that the structure of such cognitive integrity contains both explicit, conscious elements (knowledge, scientific concepts and principles, ect.), and implicit, unconscious, in particular, tacit knowledge. One of the important results of the functioning of this integrity is also the formation of such mostly unconscious components as cognitive dominant and cognitive attitude. Even at the beginning of the empirical stage of the search for new knowledge, this cognitive unity remains the basis of the cognitive process. But with the transition to the stage of intuitive search, when cognitive activity moves to the subconscious, there is a need to revise and transform the old concept, which significantly limits the heuristic possibilities at this stage and makes it impossible to find a fundamentally new solution. Therefore, at the unconscious level, a new cognitive integrity is formed and becomes dominant, the basic principles of which are not realized and cannot be realized until the end of the intuitive search. Only at the last stage, in the process of conceptualization and proof of intuitively revealed knowledge, does the possibility and necessity of gradual awareness, verbalization and formalization of the principles of this new cognitive integrity appear. In certain cases, the formulation of these new principles becomes no less significant for science and occupies the same important place in scientific knowledge as the actual formulation of a new law, new concrete knowledge, etc.

Thus, the analysis once again proved the important role of unconscious cognition in scientific and cognitive creativity. The subconscious receives special importance at the last stage of intuitive enlightenment and insight. It is necessary to emphasize that the unconscious components do not function separately, each by itself, but within the framework of a new

[19] Hadamard J. An Essay… P. 121.

cognitive integrity, which begins to form at the heuristic stage and reaches its highest activity at the moment of insight. The conclusion about the emergence of a new unconscious cognitive system in the creative process is of great importance for the analysis of the process of scientific and creative search, since such integrity can become a source of new hypotheses in subsequent scientific research or even initiate a new scientific direction. The results of the research can be used to work on some sustainable development goals, primarily on the problem of developing higher education, improving the level and quality of training of future scientists. In addition, they can be useful in scientific developments in the field of industry and innovation, scientific research on climate change, environmental problems and the specifics of the marine and aquatic environment, and other scientific developments necessary to achieve these goals.

REFERENCES

1. Davies, M., Stone, T. (2001). Mental simulation, tacit theory, and the threat of collapse. *Philosophical Topics*, *29*, 127–73.
2. Einstein, A. (1938). The Evolution of Physics: The Growth of Ideas from Early Concepts to Relativity and Quanta. Cambridge University Press, 218 p.
3. Furman, A. V. (2012). Metodologichne obhruntuvannya bagatorivnevosty i paradygmalnyh doslidgzen y sozial'niy psyhologiy [Methodological justification of multilevel and paradigmatic research in social psychology]. *Psyhologiya i suspilstv,* (4), 78–125 (in Ukrainian).
4. Hadamard, J. (2008). An Essay on the Psychology of Invention in the Mathematical Field. Hadamard Press, 164 p.
5. Karpenko, N.A. (2016). Psychologiya tvorchosty [Psychology of crativity]. Lviv, LDUVS, 156 s. (in Ukrainian).
6. Melnychuk, M. I. (2012) Neyavne znannya yak analog aprioryzmu v neklasychniy paradygmi epistemologiyi. [Implicit knowledge as an analogue of apriorism in the non-classical paradigm of epistemology]. *Naukoviy visnyk Chernivezkogo universitetu. Filosofiya*, (602–603), 36–40 (in Ukrainian).
7. Poincare, H. (1920) Science et Method. Paris Ernest Flammarion, Edteur 26, rue Racine, 196 p.
8. Popper, K. R. (2002). Conjectures and Refutations: The Growth of Scientific Knowledge. Psychology Press, 582 p.
9. Starikova, H. G. (2023) Suchasni pidhody do rosrobky typologiyi neyavnyh znan [Modern approaches to developing a typology of tacit knowledge]. *Doslidjennya z istoriyi i filosofiyi nauky i tehniky, 32*(1), 10–27. doi: 10.15421/272302. (in Ukrainian).
10. Starikova, H. G., Tyhonova, L. A. (2024). Rozuminnya yak etap naukovogo piznannya ta rol' neyavnyh znan' na cyomu etapy [Understanding as a stage of scientific cognition and the role of implicit knowledge at this stage]. *Aktual'ny problemy filosofiyi ta sociologiyi,* (49), 138–143 (in Ukrainian).
11. Volyanuk, N.U. (2020). Psychologiya naukovoyi diyalnosty [Psychology of scientific activity]. Kyiv, KPI, 352 p. (in Ukrainian).
12. Yalans'ka, S. P. (2014) Psyhologiya tvorchosty [Psychology of crativity]. Poltava, PNPU, 180 p. (in Ukrainian).

Received 18.08.2025
Received in revised form 12.10.2025
Accepted 14.10.2025