

MORPHOLOGIZED CONCEPT BIO- IN THE PROCESSES OF CONCEPTUAL DERIVATION OF THE ENGLISH BIOTECHNOLOGICAL UNITS
МОРФОЛОГІЗОВАНИЙ КОНЦЕПТ БІО- В ПРОЦЕСАХ КОНЦЕПТУАЛЬНОЇ ДЕРИВАЦІЇ АНГЛІЙСЬКИХ БІОТЕХНОЛОГІЧНИХ ОДИНИЦЬ

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Abstract. *The paper explored the English morphological concept of BIO-, which is one of the most active in the processes of conceptual derivation of biotechnological linguistic-mental units. It was used to create a number of lexicalized concepts that are actively used at the verbal level of explication of information, reproducing the importance of naturalness (biology) and the importance of biotechnology or the connection with the biosphere. Formed on the basis of the lexicalized BIOLOGY concept, the morphologized BIO-concept, which means "living organisms", took part in the formation of lexicalized concepts that demonstrate the development of biological technologies. Such lexicalized concepts are a source of replenishment of such thematic categories in the field of biotechnology as biological object, methods and technologies, processes, activity, devices and apparatus, and professions. The creation of new concepts based on existing concepts is ensured through the action of conceptual derivation. Having received linguistic representation, new concepts become an integral part of the conceptual system, creating, in turn, the basis for its further development and maintaining derivational links with the original structures. The morphological concept of BIO- is characterized by high activity in terms of conceptual derivation of English biotechnological units, as evidenced by a significant number of lexicalized concepts represented in the study.*

Key words: *morphological concept BIO-, lexical concept, conceptual derivation, biotechnology sphere.*

Introduction. One of the cardinal problems of modern cognitive linguistics is the study of the processes of conceptual derivation. This issue is very multifaceted and represents a wide field for scientific studies, due to the emergence of new approaches and areas for research. It is promising to study the features of conceptual derivation in new fields of knowledge, which, no doubt, includes biotechnology, occupying one of the leading positions among the leading sciences. The impact of biotechnological innovations on the development of linguistic and mental units of the English language is particularly felt, as biotechnological science is served exclusively in English terminology, although the development of research in biotechnology is not a priority of the Anglo-American community.

Biotechnology is the use of biological processes, organisms, or systems to manufacture products intended to improve the quality of human life [12]. The main purpose of biotechnology is the manipulation

(through genetic engineering) of living organisms or their components to produce useful usually commercial products (such as pest resistant crops, new bacterial strains, or novel pharmaceuticals) [11].

The urgency of the study of the biotechnology language is evidenced by the investigations of A. Gainutdinova and A. Mukhtarova [13], O. Myshak [16], L. Rogach [9], O. Syrotin [10], O. Syrotina [17, 18], who sometimes pay some attention to this problem.

However, despite the significant number of thorough scientific studies in modern terminology, there are no scientific papers that would consider the principles of origin and organization of morphological metaconcepts in biotechnology, establishing their role in the processes of conceptual derivation in English.

The very meaning of the word biotechnology (from the Greek *bíos* – life and *techné* – art and *logos* – doctrine) indicates the creation of biological objects in artifact

space. It is obvious that linguo-mental innovations that nominate the realities related to the biotechnological sphere are formed on a metacognitive affix model using the morphologized concept BIO-, which is one of the most active in the processes of conceptual derivation of biotechnological linguo-mental units. It has created a number of lexicalized concepts that are actively used at the verbal level of explication of information, reproducing both the meaning of naturalness (biology) and the meaning of biotechnology or the connection with the biosphere.

The lack of scientific coverage of the formation of biotechnological linguistic units array through the use of morphological concept BIO- and a significant number of such lexicalized concepts indicate the relevance of our study.

Analysis of recent researches and publications. Derivation processes have been studied at various levels. The use of a tiered approach when considering derivation as the main mechanism for creating secondary units allowed us to describe the peculiarities of derivation processes at each level. Thus, the features of derivation at the lexical level were actively studied by N. Amosova, V. Gak, M. Nikitin, V. Telia, D. Shmelev, derivational processes at the syntactic level were considered by V. Hrakovsky, E. Starikova and other scientists. Gradually, researchers came to the conclusion that neither the formal nor the semantic aspects of derivational mechanisms make it possible to reveal the nature of secondary phenomena.

The emergence of new approaches to the study of linguistic semantics, according to which increased attention is paid to human cognitive activity, the relationship of structures of consciousness and structures of knowledge, has led to awareness of the need to understand semantic shifts at a deep, conceptual level. This is what cognitive linguistics deals with, the main task of which is "to explain the constant correlations and connections that are manifested between the structures of language and structures of knowledge" [8, p. 9]. There is the mental representation of units at different levels of the language system among the topical issues of cognitive linguistics. In particular, the scientific studies of N. Besedina, M. Boldyrev, E. Kubryakova, O. Magirovska, E. Pozdnyakova and others. The

morphological level includes morphemes of both grammatical and derivational nature.

Linguocognitive study of morphological representation of human knowledge components in English was conducted by N. Besedina [3, 4] exclusively on the basis of grammatical morphemes, but so far there are no works of linguists devoted to word-forming (derivational) units of this language level. A significant contribution to the study of English-language morphological metaconcepts in the processes of conceptual derivation (on the material of language innovations of the late XX - early XXI century) was made by O. Garmash [6,7].

The purpose is to study the conceptual derivation of English-language biotechnological units formed by the metacognitive mechanism of affixation with the morphological concept of BIO.

Materials and methods of research. The material of the study was a sample of lexicographic data recorded in English specialized and explanatory dictionaries. The main method used in our study is the linguocognitive analysis of the conceptual derivation of concepts with the morphological concept of BIO-.

Results of the research. The process of human cognition, which consists in the development of his ability to navigate the world, is the process of forming meanings or concepts about the objects of cognition. The union of concepts is a system of certain human knowledge about the world or conceptual system. Some fragments of the conceptual system, which are the most important knowledge accumulated by mankind, are encoded by linguistic means and stored in language. Thus, using language in everyday life for communication or scientific purposes, we operate with certain concepts presented in our conceptual system.

Representing the world through a system of concepts, language also plays an important role in shaping the conceptual system of man, because it allows manipulating verbal symbols, manipulating the concepts of the system, thus contributing to the creation of new conceptual entities.

The formation of new concepts in the conceptual system "occurs due to processes that are constantly carried out in the system, one of which is the conceptual derivation" [2, p. 54].

In a broad sense, conceptual

derivation, according to N. Boldyrev, appears as a "language model of changing a certain conceptual content in order to form a new meaning" [5, p. 48]. This process is based on the use and interpretation of already verbalized knowledge through its narrowing, expansion, development, restructuring, generalization or, conversely, concretization. The formation of new meaning occurs through certain language mechanisms, and the links between new and original concepts may be different, subject to different cognitive schemes and models: "part – whole", "neutralizing, strengthening or weakening a certain characteristic", "gradation of the degree of sign manifestation", "changing the perspective of the concept representation" [5, p. 48].

L. Babina considers conceptual derivation as a "cognitive process that ensures the emergence of a new structure of knowledge in the conceptual system of man on the basis of existing concepts and conceptual structures" [2, p. 54]. It is assumed that after the concepts that form the human conceptual system have been named, the language has the prerequisites for their further integration into new conceptual structures, resulting in the fixation of independent lexical meanings. [2, p. 54]. Concepts born in the course of cognitive activity, having received linguistic representation, become an integral part of the conceptual system, creating, in turn, the basis for its further development and maintaining derivational links with the original structures.

The conceptual system of man is evolving, modified in the process of its interaction with the outside world. In this case, the internal development of the conceptual system is due to the processes that are constantly carried out in the system, one of which is the conceptual derivation.

In modern linguistics, there are two concepts that attempt to understand and describe the interaction of cognitive elements, which are objectified by the addition of linguistic meanings: "cognitive derivation" and "conceptual derivation". "Cognitive derivation, marked by morpheme combinations, primarily combinations of root and affix morphemes, becomes an arena of interaction of different types of cognitive units (concepts, propositions and frames) and the principles of their integration" [7, p. 46]. "Conceptual derivation" is a redistribution of meanings, in

which "new concepts are formed taking into account the original, existing ones" [2, p. 54].

Following N. Boldyrev, we understand the conceptual derivation "the formation of new meaning as a result of a certain way of interpreting the original verbalized knowledge" [5, p. 47].

Formed on the basis of the lexicalized BIOLOGY concept, the morphologized BIO concept is as part of the derived concepts of new fields of knowledge indicates their "biological direction". The relevance of biocentric concepts in our time is exceptional, so along with technocentric concepts, they share a central place in the conceptual system of the English language as part of the modern anthropocentric mental continuum [7, p.47].

The urgency of the development of the biological industry and the widespread introduction of biological concepts that highlight the achievements of mankind, evidenced by the emergence of such scientific fields as bioinformatics, bioengineering, biotechnology, biotribology, biometrics, bionics, biosemiotics, biospeleology, biophysics, biochemistry, biogeochimics the concept of BIO- is used.

With the help of the morphological concept of BIO - through conceptual derivation a number of lexicalized concepts of biotechnology were formed: *bio-accumulation, bio-assay, biochip, biocontrol, bioconversion, biodegradation, biodesulphurization, bio-enrichment, biofuel, biogas, biolistics, bioleaching, biometry, biopiracy, bioprocess, biopesticides, bioreactor, bioremediation, biosensor, biosorbents, biosynthesis, biotin, biotoxin, biotransformation, biotope.*

Thus, the morphological concept of BIO-, which means "living organisms", took part in the formation of lexicalized concepts that demonstrate the development of biological technologies. Such lexicalized concepts are a source of replenishment of the following thematic categories in the biotechnology field: biological object, biotechnological product, technology, processes and apparatus, science and industry; agent.

The biological object used for technological manipulations is represented by such lexicalized concepts formed by the metacognitive mechanism of affixation with the morphological concept of BIO-: *biologics, biomass, biosorbents, biotoxin.*

Biologics – agents, such as vaccines, that give immunity to diseases or harmful biotic stresses [15, p. 8]. *Biomass*. 1. The cell mass produced by a population of living organisms. 2. The organic matter that can be used either as a source of energy or for its chemical components. 3. All the organic matter that derives from the photosynthetic conversion of solar energy [14, p. 30]. *Biosorbents* are micro-organisms which, either by themselves or in conjunction with a substrate are able to extract and / or concentrate a desired molecule by means of its selective retention [14, p. 31]. *Biotoxin* is a naturally produced compound which shows pronounced biological activity, toxic to some or many organisms [14, p. 32].

The nominations of the biotechnological product are represented by a number of such lexicalized concepts with the morphological concept of BIO: *bioproduction*, *biofuel*, *biogas*, *biopesticide*, *biopolymer*, *biosilk*, *biotin*.

Bioproduction is the production of biologics-based therapeutic drugs including protein-based therapeutics, vaccines, gene therapies as well as cell therapies; drugs so complex they can only be made in living systems or indeed are a living system (cell therapies) [14, p. 33]. *Biofuel* is a gaseous, liquid or solid fuel derived from a biological source, e.g. ethanol, rapeseed oil or fish liver oil [14, p. 32]. *Biogas* is a mixture of methane and carbon dioxide resulting from the anaerobic decomposition of waste such as domestic, industrial and agricultural sewage [14, p. 32]. *Biopesticide* is a compound that kills organisms by virtue of specific biological effects rather than as a broader chemical poison. Differ from biocontrol agents in being passive agents, whereas biocontrol agents actively seek the pest. The rationale behind replacing conventional pesticides with biopesticides is that the latter are more likely to be selective and biodegradable [14, p. 32]. *Biopolymer* is any large polymer (protein, nucleic acid, polysaccharide) produced by a living organism. Includes some materials (such as polyhydroxybutyrate) suitable for use as plastics [14, p. 32]. *Biosilk* is a biomimetic fibre produced by the expression of the relevant orb-weaving spider genes in yeast or bacteria, followed by the spinning of the expressed protein into a fibre [14, p. 32]. *Biotin* is a vitamin of the B complex, it acts as a co-enzyme for various enzymes that catalyse the incorporation of carbon dioxide

into various compounds, and is essential for the metabolism of fats. Adequate amounts are normally produced by the intestinal bacteria in animals. Significant as a molecular biology reagent due to its high affinity with avidin and streptavidin [14, p. 32].

Lexical concepts of methods and technologies such as *bio-assay*, *biolistics*, *biometry*, *bio-accumulation*, *bio-augmentation*, *biodegrade*, *bioleaching*, *bioprocess*, *bioremediation*, *biotransformation*, *biosynthesis* are created with the participation of a morphologized concept BIO-.

Bio-assay. 1. The assessment of a substance's activity on living cells or on organisms. Animals have been used extensively in drug research in bio-assays in the pharmaceutical and cosmetics industries. Current trends are to develop bio-assays using bacteria or animal or plant cells, as these are easier to handle than whole animals or plants, are cheaper to make and keep, and avoid the ethical problems associated with testing of animals. 2. An indirect method to detect sub-measurable amounts of a specific substance by observing a sample's influence on the growth of live material [14, p. 32]. *Biolistics* is a technique to generate transgenic cells, in which DNA-coated small metal particles (tungsten or gold) are propelled by various means fast enough to puncture target cells. Provided that the cell is not irretrievably damaged, the DNA is frequently taken up by the cell. The technique has been successfully used to transform animal, plant and fungal cells, and even mitochondria inside cells [13, p. 32]. *Biometry* is the application of statistical methods to the analysis of continuous variation in biological systems [14, p. 32].

With the help of a morphologized concept of BIO - by conceptual derivation numerous lexical concepts of biological processes were formed, for example: *bio-accumulation*, *bio-augmentation*, *biodegrade*, *bioleaching*, *bioprocess*.

Bio-accumulation is a problem that can arise when a stable chemical such as a heavy metal or DDT is introduced into a natural environment. Where there are no agents present able to biodegrade it, its concentration can increase as it passes up the food chain and higher organisms may suffer toxic effects [14, p. 32]. *Bio-augmentation* is increasing the activity of bacteria that decompose pollutants; a

technique used in bioremediation [14, p. 32]. *Bioconversion* is conversion of one chemical into another by living organisms, as opposed to their conversion by isolated enzymes or fixed cells, or by chemical processes. Particularly useful for introducing chemical changes at specific points in large and complex molecules [14, p. 32]. *Biodegrade* is the breakdown by micro-organisms of a compound to simpler chemicals. Materials that are easily biodegraded are colloquially termed biodegradable. *Bioleaching* is the recovery of metals from their ores, using the action of micro-organisms, rather than chemical or physical treatment. For example, *Thiobacillus ferroxidans* has been used to extract gold from refractory ores [14, p. 32]. *Bioprocess* is any process that uses complete living cells or their components (e.g. enzymes, chloroplasts) to effect desired physical or chemical changes [14, p. 32]. *Bioremediation* is a process that uses living organisms to remove contaminants, pollutants or unwanted substances from soil or water [14, p. 32]. *Biotransformation* is the conversion of one chemical or material into another using a biological *catalyst*: a near synonym is biocatalysis, and hence the catalyst used is called a biocatalyst. Usually the catalyst is an enzyme, or a fixed whole, dead micro-organism that contains an enzyme or several enzymes [14, p. 32]. *Biosynthesis* is synthesis of compounds by living cells, which is the essential feature of anabolism [14, p. 32]. *Biocontrol* the reduction in numbers or elimination of pest organisms by interference with their ecology (as by the introduction of parasites or diseases) [14, p. 32].

The category of devices and apparatus is also supplemented by lexicalized concepts formed with the participation of the morphological concept of BIO-, for example: *bioreactor*, *biosensor*.

Bioreactor is a tank in which cells, cell extracts or enzymes carry out a biological reaction. Often refers to a fermentation vessel for cells or micro-organisms [14, p. 32].

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Biosensor is a device that uses an immobilized biologically-related agent (such as an enzyme, antibiotic, organelle or whole cell) to detect or measure a chemical compound. Reactions between the immobilized agent and the molecule being analysed are converted into an electric signal [15, p. 36].

The close interaction of biological theories with other scientific spheres provoked a number of industries (*bio-energetics*, *bio-informatics*, *bio-engineering*, *biopharming*, *bio-ethics*) and professions related to biotechnology, such as *biotechnologist*, *bioengineer*, *biochemist*, *bioproduction*, *biotechnician*.

Bio-energetics is the study of the flow and the transformation of energy that occur in living organisms [14, p. 32]. *Bio-engineering* is the use of artificial tissues, organs and organ components to replace parts of the body that are damaged, lost or malfunctioning [14, p. 32]. *Bio-ethic* is the branch of ethics that deals with the life sciences and their potential impact on society [14, p. 32]. *Bio-informatics* is the use and organization of information of biological interest. In particular, concerned with organizing bio-molecular databases (particularly DNA sequences), utilizing computers for analysing this information, and integrating information from disparate biological sources [14, p. 34]. *Biopharming* is the use of genetically transformed crop plants and livestock animals to produce valuable compounds, especially pharmaceuticals [14, p 45].

Conclusions. Thus, the analysis of factual material allows us to conclude that the creation of new concepts based on existing concepts is ensured by the action of conceptual derivation, which is a cognitive process. It provides the emergence of a new knowledge structure in the conceptual system of a person on the basis of existing concepts and conceptual structures.

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Анотація. У роботі досліджено англійський морфологізований концепт *BIO-*, який є одним з найактивніших у процесах концептуальні деривації біотехнологічних лінгво-ментальних одиниць. За його допомогою було утворено чисельну низку лексикалізованих концептів, які активно використовуються на вербальному рівні експлікації інформації, відтворюючи як значення натуральності (біологічності), так і значення біотехнологічності або зв'язки із біосферою. Утворений на основі лексикалізованого концепту *BIOLOGY* морфологізований концепт *BIO-*, який має значення "living organisms", взяв участь у формуванні лексикалізованих концептів, що демонструють розвиток біологічних технологій. Такі лексикалізовані концепти являються джерелом поповнення таких тематичних категорій сфери біотехнології, як біологічний об'єкт, методи і технології, процеси, діяльність, прилади і апарати та професії, пов'язані з біотехнологією. Значна кількість лексикалізованих концептів, репрезентованих у дослідженні, свідчить про високу активність морфологізованого концепту *BIO-* у плані концептуальної деривації англomовних біотехнологічних одиниць. Сформований на основі лексикалізованої концепції *БИОЛОГИЯ* морфологізований *BIO-*концепт, що означає «живі організми», брав участь у формуванні лексикалізованих понять, що демонструють розвиток біологічних технологій. Такі лексикалізовані поняття є джерелом поповнення таких тематичних категорій у галузі біотехнології, як біологічний об'єкт, методи та технології, діяльність, прилади й апарати та професії. Створення нових концептів на основі існуючих концептів забезпечується шляхом дії концептуальної деривації. Отримавши мовну репрезентацію, нові поняття стають невід'ємною частиною концептуальної системи, створюючи, у свою чергу, основу для її подальшого розвитку і підтримуючи дериваційні зв'язки з вихідними структурами. Морфологічний концепт *BIO-* характеризується високою активністю у плані концептуальної деривації англійських біотехнологічних одиниць, про що свідчить значна кількість лексикалізованих понять, представлених у дослідженні.

Ключові слова: морфологізований концепт *BIO-*, лексикалізований концепт, концептуальна деривація, сфера біотехнології.