б характерна відсутність багатьох елементів, що ускладнювало б процес створення і декодування повідомлень у ході функціонування мови.

Отже, необхідно визнати, що хоч у лексиконі відбиваються системні відношення, властиві дійсності, його організація не зумовлюється впливом тільки цих відношень. Визначення характеру організації лексичних одиниць ґрунтується на аналізі як екстралінгвістичних, так і мовних критеріїв системності.

Системна організація є однією із сутнісних характеристик лексикону. Вона випливає як із властивостей його складових одиниць, так і із особливостей їх функціонування. Саме тому дослідження специфіки системної організації лексикону в усіх її проявах є властивим для сучасного стану науки про мову. Виявлення особливостей мікро- та макросистемної структурованості словникового складу англійської мови є важливим в контексті завдань його адекватної лексикографічної репрезентації, у чому ми вбачаємо **перспективи** подальших наукових пошуків.

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SYNERGETICS: EMERGENCE, STATUS AND TASKS

Modern science is characterized by heterogeneity of investigational paradigms, each of which has its own history and is represented by a number of methodological and conceptual mainstreams and schools. Today they all are relevant. However, a need for a new conceptual net to study evolving dynamic complex systems has brought about emergence of synergetics. The article gives a brief outline of a history of synergetics and considers emergence of synergetics as a new stage of General Systems Theory, on the one hand, and as a complement to cybernetics, on the other. Synergetics is understood as a science of complexity, dealing with principles of emergence, self-organisation and self-regulation of complex systems of various ontology – human-made (artificial) or natural (self-organizing). Synergetics focuses on evolving self-organizing complex systems. The notion of 'a complex system' is revealed through a number of characteristic features, including integrity, hierarchy, (in)stability, asymmetry.

The multidimensional character of synergetics is reflected in a wide range of its status and predetermines a number of tasks to be solved. The latter include, among others, the study of a wide variety of states of an open, dynamic, non-linear self-governed system in order to obtain the whole spectrum of possible structures of a given complex system in a non-linear environment; the study and modelling of self-organization processes (phase shifts) of a synergetic system; description of a synergetic system as a unity of co-evolving complex sub-systems. Due to the multidimensional character of synergetics, it is defined differently by various scholars – as a new style of scientific thinking, identified with non-linear thinking; as a theory of evolution and self-organization of complex systems of the world; as a scientific mainstream aiming at uniting natural sciences and humanities on the basis of a common method of generalization. In this article synergetics is seen as a science of complexity, as a specific theoretical and methodological platform, systematizing numerous fragments of knowledge about the outer world obtained by sciences and integrating them into a comprehensive image of the world.

Key words: synergetics, complex systems, interdisciplinarity.

Домброван Т. І. Синергетика: виникнення, статус і завдання. Стаття розглядає появу синергетики як нового етапу у розвитку загальної теорії систем. Синергетика сфокусована на вивченні динамічних самоорганізованих складних систем різноманітної природи. Багатовимірний характер синергетики відбито у неоднозначному розумінні її статусу та широкому спектрі завдань.
Ключові слова: синергетика, складні системи, міждисциплінарність.

Домброван Т. И. Синергетика: рождение, статус и задачи. В статье рассматривается появление синергетики как нового этапа в развитии общей теории систем. Синергетика сфокусирована на изучении динамических самоорганизующихся сложных систем различной природы. Многогранный характер синергетики отражен в неоднозначном понимании ее статуса, а также в широком спектре задач.
Ключевые слова: синергетика, сложные системы, междисциплинарность.

Modern science is characterized by heterogeneity of investigational paradigms, each of which has its own history and is represented by a number of methodological and conceptual mainstreams and schools. Today they all are relevant. However, a need for a new conceptual net to study evolving dynamic complex systems has brought about emergence of synergetics. *The objective of this article* is to give a brief outline of a history of synergetics, to consider its status as it is understood by scholars, and to set main tasks of synergetics, predetermined by its multidimensionality.

Synergetics within a historical retrospective

The early years of the 20th century witnessed a revival of the concept 'system' known since ancient times. It was a great number of scientific discoveries, the rise of new scientific disciplines (such as genetics in biology, thermodynamics and quantum mechanics in physics and others), as well as rapid development of new technologies, that brought about significant changes into our understanding of the system and its ubiquity.

The outer world began to be seen as a dynamic conglomeration of systems – biological, chemical, physical, social, etc. Researchers were eager to construct a comprehensive scientific view of the world based on laws common for both organic and inorganic nature, or put differently, to create a new complex systems paradigm. New scientific theories were suggested (such as General Systems Theory, Quantum Theory, Irreversible Thermodynamics Theory, Instability Theory, Dynamic Chaos Theory, Catastrophe Theory, Phase-Transition Theory, the theory of bifurcations, the theory of Autowave Processes, the theory of oscillation, to mention but a few) within which new concepts and methods of investigation were developed, which later on provided a foundation for synergetics as a unified approach to various complex systems study.

Cybernetics is also considered a precursor of synergetics. In the words of Norbert Wiener (1894-1964), the founder of this interdisciplinary science, cybernetics is a theory of 'control and communication in the animal and the machine'. The word is of Greek origin meaning 'governance, government'. Cybernetics focused on negative-feedback-based complex systems of causal-chain circularity, i.e. automatic systems capable of restoring their stability within a desired range regardless any disturbances. It is within cybernetics that the notion of ' homeostasis', meaning invariability and balance of states, came to be applied not only to living beings, but also to technological systems. This notion is seen as one of the most important aspect of a system, necessary for maintaining its stability and functioning.

Unlike cybernetics studying relatively balanced, stable, homeostatic systems, synergetics focuses its attention on hysteretic, i.e. evolving, positive-feedback-based complex systems. The notion 'hysteresis' (from Greek "lagging behind') means a delay in the production of an effect by a cause [NWDT 1993, p. 478]. In other words, it's a history dependence of a system. To predict such a system's behaviour, it is necessary to know the 'history' of all external influences upon the given system.

The term '*synergetics'* (from Greek 'coherent action') was coined by the German physicist Hermann Haken in the mid-1970s to name a science of complexity, dealing with principles of emergence, self-organisation and self-regulation of complex systems of various ontology – human-made (artificial) or natural (self-organizing).

But what is understood by 'complex systems'?

A naïve assumption is based on a description of a complex system as having numerous components connected to one another. However, this interpretation is insufficient for research purposes: "A modern definition is based on the concept of algebraic complexity" [Haken 2000, p. 4], i.e. includes a sequence of data describing both the interconnected network and cooperativity of the system's elements and their complex behaviour.

Robert C. Bishop considers it more informative to characterize complex systems phenomenologically and lists the following most important features in these characterizations:

• *Many-body systems*. Some systems exhibit complex behaviour with as few as three constituents, while others require large numbers of constituents.

• *Broken symmetry*. Various kinds of symmetries, such as homogeneous arrangements in space, may exist before some parameter reaches a critical value, but not beyond.

• *Hierarchy*. There are levels or nested structures that may be distinguished, often requiring different descriptions at the different levels (e.g., large-scale motions in fluids vs. small-scale fluctuations).

• *Irreversibility*. Distinguishable hierarchies usually are indicators of or result from irreversible processes (e.g., diffusion, effusion).

• *Relations*. System constituents are coupled to each other via some kinds of relations, so are not mere aggregates like sand grain piles.

• *Situatedness*. The dynamics of the constituents usually depend upon the structures in which they are embedded as well as the environment and history of the system as a whole.

• *Integrity*. Systems display an organic unity of function which is absent if one of the constituents or internal structures is absent or if relations among the structures and constituents is broken.

• *Integration*. Various forms of structural/functional relations, such as feedback loops couple the components contributing crucially to maintaining system integrity.

• *Intricate behaviour*. System behaviour lies somewhere between simple order and total disorder such that it is difficult to describe and does not merely exhibit randomly produced structures.

• *Stability*. The organization and relational unity of the system is preserved under small perturbations and adaptive under moderate changes in its environment.

• *Observer relativity*. The complexity of systems depends on how we observe and describe them. Measures of and judgments about complexity are not independent of the observer and her choice of measurement apparatus [Bishop 2011, p. 111-112]

A complex system manifests its phenomenal richness; consequently, it requires new ways of scientific analysis, as well as a new framework of categories. Synergetics suggests integrity of methods elaborated in various disciplines and variety of models to represent complexity of organic and inorganic systems.

Successful application of concepts and methods of the synergetic approach to the description of biological, physical, historic, social, and even economic phenomena has revealed similarity, if not universality of principles of evolution of complex systems. As a result, synergetics has made it possible to launch a wide variety of interdisciplinary interrelationships, among them mathematical physics, mathematical history, social government, neurosynergetics, meteorology, geodynamics, prognostics, to mention but a few. The new disciplines, in their turn, require specialists with a profound knowledge of complex systems methodology. Otherwise, as Cliff Hooker points out, people whose education does not include relevant competency in complex systems are excluded from science, policy and large scale business or find themselves increasingly dependent on those who have it [Hooker 2011, p. 6].

Nowadays, the necessity of integration of different sciences calls for no argument and most scholars agree that the future of science lies within interdisciplinary research of complex systems [see, e.g. Чернавский 2009, p.235; Князева, Курдюмов 2010, p. 8; Hooker 2011]. In the words of George Malinetsky, the 21st century is bound to become a century of re-establishment of holism and deep understanding of common problems [Малинецкий, Потапов 2011, p. 42]. It is interdisciplinary orientation that helps scientists think globally, i.e. beyond the borders of particular disciplines.

On Status and Tasks of Synergetics

The review of available special theoretical literature on synergetics – articles, essays, and manuscripts – has revealed absence of unanimity among scientists as to the status of synergetics. Some authors speak of synergetics as a *new style of scientific thinking*, identified with non-linear thinking, or even a specific *meta-science* [Котельников 2000]. For others synergetics is a *theory* of evolution and self-organization of complex systems of the world [Князева, Курдюмов 2010]. Still others consider synergetics to be a *scientific mainstream* aiming at uniting natural sciences and humanities on the basis of a common method of generalization [Чернавский, Чернавская 2006, p. 33].

There are many who regard synergetics as *a new scientific paradigm* [Белавин; Князева 2006; Бородкин]. Synergetics is also seen as *"an interdisciplinary approach* founded on intersection of the subject knowledge, mathematical modelling and philosophical reflection" [Малинецкий 2013(a), p. 17] or even as *an interdisciplinary methodology* for explanation of emergence of definite macroscopic phenomena due to non-linear interrelationships among microscopic elements in complex systems [Майнцер 2009, p. 26].

Figure 1 shows a wide diversity of understanding the status of synergetics.

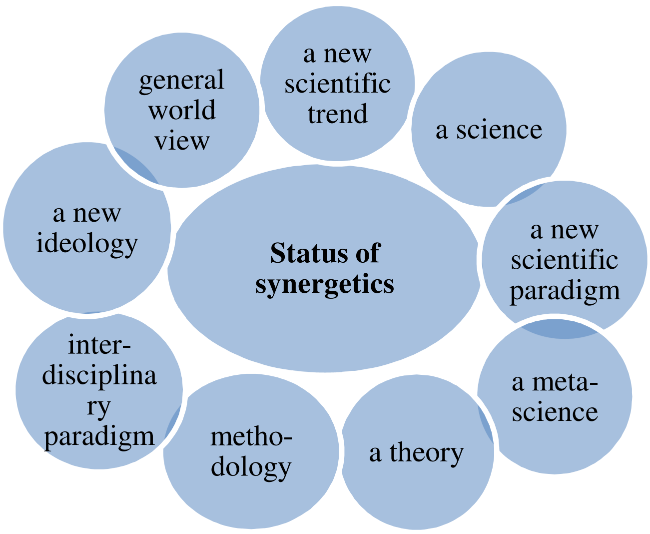

Fig.1 The Status of Synergetics

As seen from Fig. 1, scholars define synergetics differently. Such a situation can be explained by multi-dimensional character of synergetics. Thus, Helena Knyazeva in [Князева, Курдюмов 2011, p. 70-71] speaks of the following dimensions of synergetics:

- *A scientific dimension.* Synergetics is defined as a peculiar mainstream of scientific investigations focusing on the study of complexity, non-linearity and chaos, on outlining and mathematical modelling of the so-called blow-up stages described by the hyperbolic law.
- *A philosophical dimension.* Here the focus is shifted to explanatory possibilities and an interdisciplinary character of synergetics. The author warns against reducing synergetics to particular disciplines, such as physics or chemistry within which it emerged. On the contrary, synergetics studies universal principles of self-organisation, as well as emergence and co-evolution of complex systems.

• *A methodological dimension.* It consists in drastic changes taking place in the conceptual network of man: "There appears a new synergetic view of the world – evolutionary, non-linear and holistic. The old paradigm is being broken by a conceptual shift from 'being' to 'becoming', from stability and equilibrium to instability and non-linear phase transitions, from order to chaos serving as a basis for innovative changes in complex systems".

• *An epistemic dimension* of synergetics is seen in application of models in the study of cognitive and creative processes.

• *A social dimension* of synergetics is perceived in application of synergetic models in social studies, including prognoses of social processes development. Such models are believed to serve as foundation for further scientific research of the so-called non-linear methods of social government.

• *A prognostic dimension* of synergetics. It is claimed that synergetics can become a novel methodology in the study of the future (prognostication).

I think that synergetics has one more dimension, let's call it *humanitarian*. It concerns application of the synergetic methodology to the study of human language as a complex system. This dimension is close to the epistemic one, but unlike the latter dealing with man's cognitive *activity*, the former focuses on complex systems as a *result* of such activity and studies further behaviour and development of constructed complex systems.

All above mentioned proves that synergetics as a unified theory of complex systems is multi-dimensional, which on the one hand, makes it hard to strictly define its status, but, on the other hand, outlines main tasks of this theory. They are connected with:

• the study of a wide variety of states of an open, dynamic, non-linear self-governed system in order to obtain the whole spectrum of possible structures of a given complex system in a non-linear environment;

• the study and modelling of self-organization processes (phase shifts) of a synergetic system. This presupposes analysis of existing attractors of the system;

• singling out and description of the system's 'life' stages within a non-linear environment – emergence, functioning, and decay;

• reanalysis of concepts 'chaos', 'order', 'chance' in the light of synergetic methodology. This will enable a scientist to predict possible alternatives in the development of a complex system;

• description of a synergetic system as a unity of co-evolving complex sub-systems of various 'age' [see works by H. Knyazeva and S. Kurdyumov]. A synergetic system is heterogeneous not only because it consists of various subsystems and elements of different types: it may include (and it usually does!) components of various stages of development. A wide-known example is the human body: on the one hand, it contains a coccyx – a rudimentary tail which is of little use in the life of a body; and on the other hand, the cerebral cortex which has no analogy in the organic world.

Scientists strongly believe that application of principles of complex systems co-evolution, as well as principles of non-linear development of open dissipative environments, will result in formation of a new efficient approach to solution of global problems of mankind and contemporary science [Белавин].

Needless to say, the common feature of all synergetic systems is their uniqueness: the Universe, our life on the planet Earth, languages and cultures of peoples of the world, ecosystems and so on are unprecedented and one-off. Consequently, man's responsibility for his actions (most of which are irreversible) is increasing. I can't but agree with George Malinetsky who says: "We must think, foresee and plan our actions in this only world where we live and in this only life at our disposal. It is a challenge to many sciences" [Малинецкий 2013, p. 21].

Conclusion. Future of science lies within interdisciplinary research of complex systems. Synergetic systems can be defined as multi-component systems characterized by complex behavior of their parts and sub-systems. Since human language is also a complex system, it can be studied with the help of the universal principles of the complex system's behavior revealed within the theory of synergetics. All things considered, synergetics is to help us understand the principles of complex systems, predetermining our present day and our tomorrow. Synergetics is seen as a specific theoretical and methodological platform, systematizing numerous fragments of knowledge about the outer world obtained by sciences and integrating them into a comprehensive image of the world.

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ФЕНОМЕН ФРАКТАЛОВ В ФИЛОЛОГИЧЕСКИХ ИССЛЕДОВАНИЯХ

В статье исследуется фрактальная природа языковых и текстовых структур. Обоснована синергетическая роль фрактальных явлений при построении текста в плане самоорганизации его структуры, а также в плане самоорганизации смысла текстового сообщения. Изучена важная роль оператора связи (генератора фрактала), порождающего текст-фрактал. В зависимости от вида оператора связи показаны порожденные им фигуры текстовых фракталов, классифицировано многообразие их структур. Приведены краткие характеристики признаков фрактальности в различных типах текстов.

Поставлено перспективное задание: на основании этого многообразия создать своеобразную «геометрию текстов» и построить соответствующие концепты.

Ключевые слова: фрактал, самоподобие, бифуркация, оператор связи (генератор фрактала).