doi.org/10.29295/2311-7257-2021-104-2-5-13
УДК 72.01

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THE STAGES OF SUSTAINABLE DEVELOPMENT IN THE STRUCTURE OF ARTIFACTS AND CULTURAL PROCESSES

This article is dedicated to the problem of professional artistic education of architects as a part of the historic and cultural process, which needs, for its efficiency and usefulness, a scientific realization of the essence of artifacts – the results of artistic activity, the methods of researching them and the essence of the laws of their existence and development. The article is an examination of the patterns of artifact construction and of the evolution of certain cultural and esthetic processes using the cluster and system analysis and the system approach. The results presented in the article are of natural-experimental and theoretical researches, which allowed to discover in the structure of artifacts the global principles of preservation and development, which are realized by symmetry, that provides preservation, and dynamic changes, that provide adaptation and development. The article also presents what was received as the result of researches: the certain properties of the organization of the inner structure of artifacts, which turned out to be similar to some of the patterns, which are inherent to living nature, and also a symmetric similarity, in the broad sense, of the time and space structure of the evolution of natural and some culturological processes.
Keywords: professional culture, structure of artifacts, artistic activity, culturological processes.

Introduction. The development of the professional architectural culture is always based on some fundamental, “eternal” elements, which compose the genetic essence of the trade, and naturally reflected in the structure of its products.

That’s why professional education should consist of two components: one of them reflects the most stable patterns in the structure of professional thinking, and the other one reflects the mutational dynamics of the professional improvement of skills. Both of these components complete the base of the professional education.

Justifying the boundaries and contents of the first component, it is necessary to dive into the basic principles of literate architectural thinking, which are fixed in the professional culture, and at the same time to track the diversity of new emerging ideas.

Also it is necessary, while founding the artistic culture into the base of the architectural thinking, to deeply research the principles, on which the artistic education of the architect is based. And this, in its own turn, heavily depends on the width and depth of research of the patterns of art, which is the base of the professional artistic literacy of the architect.

That’s why the research, which is connected to the widely studied principles of the formation of the structure of the architectural shape, the laws of its perception and the dynamics of the development of architectural culture, should be the base of the formation of the architect’s artistic thinking [1].

Because of this, it is nearly impossible to avoid discussing the eternally topical question of the possibility of existing “laws of beauty” in the aesthetic fields, and possible ties of these laws to the patterns of our Universe and human perception [2].

Research objectives. One of the first tasks of the proposed research is the inductive detection of some common patterns in the structures of the continuum of the artifacts of different types of creative activity. The next task should be the detection of some common structural similarities in the historical and cultural process of creative activity. Next goes the task of establishing possible similarities in the structures of the mentioned artifacts and these processes.

The purpose of the study is, as the authors find, is establishing a possible hypothetical semblance of the found earlier patterns to the fundamental laws of nature and human activity.

Materials and Methods. The cognition of reality and the transformation of the world based on the acquired knowledge is happening, as we already know, in two states. The first state suggests the generalization of experience, which leads to the inductive detection of some common

properties in a quantity of different objects, and allows to generalize and formulate naturally predictable qualities of any object which also belongs to this quantity or cluster. These generalized qualities in the process of gradual generalization lead to the creation of theories, which are establishing the qualitative and quantitative characteristics of the causations of the processes, which can be in the objects under research. This method is called the inductive method and it is used in many scientific research processes.

The second state suggests using received reliable generalizations, which lead to theoretical laws, to predict some qualities and results of some processes, for any usage, including practical use. This is called the deductive method. The deductive side of scientific activity is applied in many different spheres of the society's practical being.

Many attempts at researching such a complex and specific object as the creative activity and its results – the artifacts – were made since the ancient times by the greatest minds of antiquity (Heraclitus, Pythagoras, Plato, Archytas, Aristotle and many others).

Inductively generalizing the great artistic practice of the antique architects, artists, musicians, actors, the great minds, having an ingenious intuition, have deductively oriented the creative activity to follow the laws of the Universe, which aren't rejected even nowadays, entering the concepts of Space, Chaos and Harmony, Order, Quiescence and Movement. The development of the antique glance at these fundamental essences was incarnated in the thoughts and works of a great number of philosophers, scientists and artists of all subsequent eras. And nowadays a great number of researchers is trying to set some patterns immediately in the artifacts – the products of the creative activity – as well as the correlation between already received results in this sphere and general, already deemed unshakable, fundamental patterns of the Universe and society.

The creative activity should be researched in the systems approach paradigm, which implies in this much complex and many-faced object that the basic system elements are detected – the blocks. This will allow to conduct a strict analysis of its essential components. The authors have selected four main elements – the subsystems, the functional aggregate of which allows the phenomena of creative activity to exist and to be researched as a system.

The system of creative activity, which functions in the society space, is a subsystem in it, fractally reflecting similar essential elements and the structure of the society itself. Steadily preserving its structure and constantly partially updating the capacity and essence of the essential elements in the historical process, the creative activity is constantly builds up its multifaceted and diversified capital, which is stored by all its elements.

Each of these elements is creating the system, and removing an element from the common structure makes the existence of the system impossible. The first element is the humanity in its broadest sense, which consists of people, subjects, who are creating the products of creative activity – the artifacts, as well as consuming them. The second element are the artifacts themselves, the material objects which are embodying artistic meanings, ideas and tastes of the society. The third element are the ideal conceptions, criteria, tastes, programs and algorithms of the creative activity, which is the informational management of all the processes in this activity, forming the basics of professional artistic culture. The fourth element are the processes of creating and consuming these artifacts.

Firstly, to solve the assigned problem, it is necessary to concentrate the attention on some of the features of the products of the creative activity – the artifacts, which are discovered as the manifestation of stable structural signs of the systems in different types and genres of the activity.

The empiric materials, which are to be inductively generalized, are: the structure of the color harmony in the artifacts of different ages, nations and genres, researched by V. Kravets; the structure of constructing the light-tone palette of realistic painting, researched by V. Kravets and L. Gorbatenko; the structure of the color palettes of the architectural polychromy and the principles of historical development of the color culture, researched by V. Kravets and N. Ignatyeva; the ratio of the imformativeness in the lines of the silhouettes of the masterpieces of architecture,

researched by V. Kravets, O. Fomenko and K. Aksenov; the structure of synthesis of the space and masses in the masterpieces of architecture, researched by V. Kravets and G. Petukhova; the evolution of the elements of architectural vocabulary in relation to the development of biogenetical types, researched by V. Kravets, A. Mosendz, S. Pykhtin.

Results. V. Kravets discovered strict symmetrical regularities in the structure of the color harmonic palette in the world masterpieces of coloristics (the metric rows in the thresholds of color discrimination in the spectral scale of choice of harmonic spectrums), which informatively saturate the palette with contrasts and at the same time harmonizes it with the steady differences [3].

The research of the structure of color harmony using the works of visual and applied arts, done on an enormous fact material (564 artifacts), and of the coloristic masterpieces of nature, showed that in the color palettes, two basic structural components were present: color spectrums, built on the color elements, making groups of Abel symmetry and responsible for the "mutational" diversity, and (especially in the easel works) a dominant color, which is responsible for the integrity and unity of the palette.

The different proportions of both components enable a possibility of creating infinite variants of contrast and nuance harmonies, which satisfy historical, ethnic, social and individual tastes.

An interesting result was brought up by the research of the structure of light-tone palette in realistic painting on the examples of 100 masterpieces in the museums of Kharkiv, Moscow and St. Petersburg, made by L. Gorbatenko under the leadership of V. Kravets. The research of averaged lightnesses of the main compositional spots of the paintings showed that they were strictly led by metrical and rhythmical regularities. The lightnesses differed either by an equal step in the thresholds of color discrimination, which led to a metric light-tone harmonic structure, or differed like the members of the golden row, which also created a wonderful harmony of color ratios of the elements of composition [4], which proved to be an unambiguous manifestation of a strict structural organization, which obeyed the laws of Fibonacci's row.

The deep quantitative analysis of the ratio of the informativeness in the "mass" and contour perception of the silhouette and the dynamics of said contour, made on the examples of more than 200 samples of masterpieces of world architecture, made by O. Fomenko and V. Kravets, showed a strict following of the informativeness ratios of the characteristics of the perception phases (discovery, differentiation, identification) of these images (the general masses, the silhouettes, the details of the contours) to the ratios of the golden row [5]. More than that, the research of the ratio of the informativeness of the same silhouettes and contour details, made by O. Fomenko and K. Aksenov, confirmed the all-pervading effect of this regularity [6].

A completely unresearched problem of the ratio of "masses" and spaces in architecture was researched by V. Kravets and G. Petukhova on the base of more than 200 masterpieces of architecture from more than 2000 years of architectural history. The conducted analysis showed a surprisingly strict following of the regularities of Fibonacci's row in the ratios of inner spaces and their ratios in the common penetration zones [7].

Quite unexpectedly an interesting regularity was discovered by A. Mosendz and V. Kravets using the quantitative cluster analysis of the evolutional changes in the development of architectural vocabulary, details and archetypes during all of the history of architecture until the end of XX century: the stable quantitative ratio of parameter characteristics, reflecting the doses of the "homeostatic", stable, and the "mutational", changeable, which correlates with the data of Ludwig Von Bertalanffy, who studied the processes of development in biogenetic species [8]. However, in the end of XX century and in the beginning of XXI century "catastrophic" (math.) violations of the discovered ratios have been observed, and this reflected the chaotic state of the architectural process – the loss of "species" isomorphic characteristics. The only conclusion which was possible to be made from the analysis of the researched objects of architectural vocabulary on the mark of the XX and XXI centuries, was the absence of any general conclusion.

And even the quantitative ratios in the Fibonacci rows are analogous to the biological regularities of heredity, as every member of the Fibonacci row includes a "hereditary" dose of the former one, as well as a "mutational" added dose, confirming the necessity of the existence of rather strict ratios of "homeostasis", stableness and the mutational and dynamic, as the components of harmony, the unity in diversity.

The research conducted by V. Kravets and S. Pykhtin was the connecting link between the results received by V. Kravets and A. Mosendz in the research of the evolution of the elements of architectural vocabulary, and the theory of Ludwig Von Bertalanffy about the development of the biogenetical species, which revealed the ratios of basic genetic and mutational features. Analyzing the floristic motives in the masterpieces of architecture, the authors discovered a stable correlation of the aforementioned ratios in the structure of those masterpieces and similar ratios of the dispersion of parameters in the isomorphic elements of live nature. For example, the standard deviations of different parameters in flowers, leaves, the structure of tree trunks etc. were having the biggest spread of differences in the parameters from the idealized averaged isomorphic shape to 20 percent, as in the theory of Ludwig Von Bertalanffy [9].

Considering the continuum of researched artifacts not as the end results of creative activity of separate authors (though it is so), but as elements of the system of creative activity, developing in time, suddenly it is possible to come to a conclusion that the time and space structure of this process correlates with the revealed before structure of separate artifacts and, more than that, with some of the regularities of the process of development of different cultural and even natural processes, demonstrating fractality, connecting these objects of research. An example of this phenomenon can be the structure of the process of development of the color culture in the space and time system of the artistic culture in the Ecumene, revealed by V. Kravets and N. Ignatyeva. Researching the color palettes in the history of world architecture, the authors confirmed the revealed symmetric structure of their build. As a manifestation of visual and material mastering of the world around, the color cultures, researched by the authors, began their development, on probation, from some united center of possible emergence and development of the Human and the humanity. The resettlement of the future humanity began in the directions of different ecological niches of the Ecumene. While forming the harmony of the ethno-landscape balance (by L. Gumilyov [10]) in the process of adapting to the different conditions of these niches completely different coloristic preferences were formed in the color cultures of different regions. But it turned out to be that the palettes of these preferences and their combinations are based on the strict following of the symmetry of color elements, also forming the rigid structure of Abel's symmetry groups, each of them, while positioned in Newton's circle, fractally repeats the graph of spatial development of the whole process [11]. That's how it became possible to go to the analysis of the process of the time and space development of the color culture as a system existing in time. The idealization of the principal scheme of development of the color cultures, no matter what the differences were in time and space, cultural, geographic "distances", was received by comparing the main elements of the structure of this artistic and cultural system from the isomorphic point of view.

The common idealized scheme of development of the color culture in the historical process in the Ecumene is a symmetrical process, equally developing in the two-dimensional space and in time from the center to the periphery. The center can be the unity of different centers of emerging primary elements of the color culture.

The continuation of the development of regional and national color cultures in the process of constant historical reformatting of the ethnic and social systems led to more and more intersection, crossing and mixing of the directions of the development vectors, especially in the modern age of growing connections between all of the elements of the cultural society. The chaotic (because of unevenness) mixing of the cultural color norms led to the fact that nowadays we have a colorful and uneven picture, similar to the picture received in the research by V. Kravets and

A. Mosendz. Cybernetists call similar situations in the informational space “the white noise zone”, where it is hard to perceive structured and meaningful information and any hint of the organization – and that means, the harmony.

The most astonishing fact is that the physical mixing (as in the color beams) of the palettes of different color cultures leads to getting the “white color”, similar to the “white noise”.

Conclusions. Discovered by V. Kravets and N. Ignatyeva, the unity of the structures of the diverse and unique palettes of regional coloristic environmental formations allows to make such a conclusion: formed during many centuries, the ethnic and landscape balance in the sphere of coloristics demonstrates the development of the principle of harmony in the geosphere, biosphere, noosphere (discovered by V. Vernadsky [12]), and the system of all discovered palettes of the subject-spatial environment forms at he stage of ethnic environmental forming (in the ideal view, taking into account the features of the historical stage, but not the chronology) an ordered mass of colors, which form isomorphic Abel’s groups in the isotropic space. These groups tend to have inner symmetry. Chronologically, This ideal model is being violated, because different regions have passed the same stages of historical development at different historical times.

Offered in the research by V. Kravets and N. Ignatyeva, a model of the most common interregional principles of forming of the coloristics of the subject-spatial environment allows to look with a fresh glance at the problems of local and regional coloristic environment, giving scientifically approved methods of management for these processes, and also it is a means of confirming the centrally symmetrical nature of the process of development of color palettes (see Fig. 1).

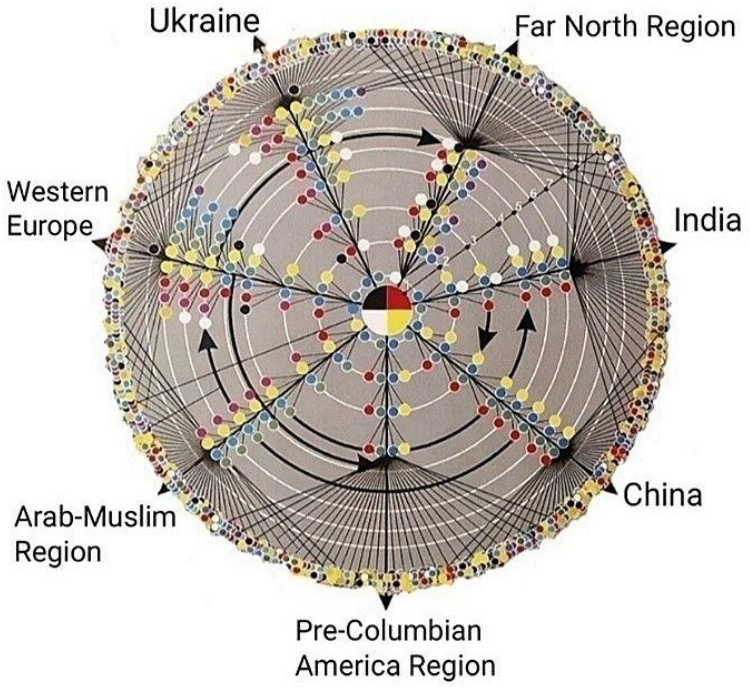

Fig. 1. The model of interregional principles of forming of the coloristics of the subject-spatial environment.

So, to generalize the conducted research of the structures of the products of creative activity – artifacts, it can be said, that nearly in all of its types and genres the diverse variants of the fundamental laws of symmetry are manifested.

Summing up the natural research of the different elements of the artistic vocabulary and some of the nature's samples, it is possible to say that the inner structure of all researched samples obeys the common fundamental laws of harmony, based on the unity, which is achievable by the all-pervading power of symmetry, and the variety of elements, also permeated by it. We are talking about the dynamic symmetry, which is seen not only in the products of creative activity, but also in the historic timeline.

By its symmetrical organization, the model of the organisms development mostly correlates with the model of the coloristics development of the subject-spatial environment, suggested by V. Kravets and N. Ignatyeva – from a common center the "branches" are diverging, getting more complicated, symbolizing new species of animals and plants, emerging in the process of evolution. There is a hypothesis that the development of language systems might be similar. The linguists, who compare the typological signs of languages to the biological signs, are building classifications and models of language development, which are similar to the ones that are in biology. By the hypothesis of the great linguist, the academic N. Marr, all of the world languages came from one root [13], and, leaning on the well-known linguistic theory of development and spreading of the languages, it is possible to suggest with some level of accuracy that languages, as a whole quantity or system, have evolved in space and time in a similar way, as the authors stated in the principal scheme of development of the color cultures.

The core difference of color and language systems lies in the fact that the forming of the color culture happened under a great influence of the factor of the color environment in the conditions of ethnic and landscape balance (by L. Gumilev [10]), which is difficult to suggest for the world language system. Other factors have influenced this process, which caused the mutation of primary language forms. But the branching of language forms in the development of related ones is influenced by them, which leads to the mixing of the languages similar to the mixing of color cultures, discovered by the authors.

The symmetrical essence of the structure of different genres of artifacts and many elements of nature, eternally admired by the human, is a special case (as we think) of a global law of development of self-governing (in the case of nature) or human-made (in art) systems, which suggest the development of the system from a certain center in different directions from the center, equally distributed in some space and time, in the case of its homogeneity (see Fig. 2).

When the space is non-homogenous, the development in different directions loses its uniformity and the symmetry of the process is being interrupted because of this informal reason. The generalization of a large enough for correct conclusion number of variations of schemes of the development of the process with the interruption of symmetry, but still having the main structure elements, which allow to preserve the isomorphism, leads to a possibility of creating an idealized model of the process, where the symmetrical structure is fully preserved. Having an unlimited space for the system development, the multiple branching of the development vectors leads to the growth of the symmetry order. But if the environment, where the system is developed, is limited, the lack of free space leads to multiple intercrossing of the new branches of the development vector.

Hermann Weyl said: "A question can emerge, does the aesthetic meaning of symmetry depend on its meaning in life. In other words, is the artist discovering symmetry in the nature – the symmetry, with which the creations of nature are gifted because of some its inner laws – and then just copies and perfects whatever nature gave in an imperfect state; or the aesthetic meaning of symmetry has an independent source? Together with Plato I tend to think that in both cases the common source is the mathematical idea: the mathematics laws, which rule the nature, are

the source of symmetry in nature, and the intuitive realization of this idea in the creative spirit of the artist is the source of symmetry in art…" [14].

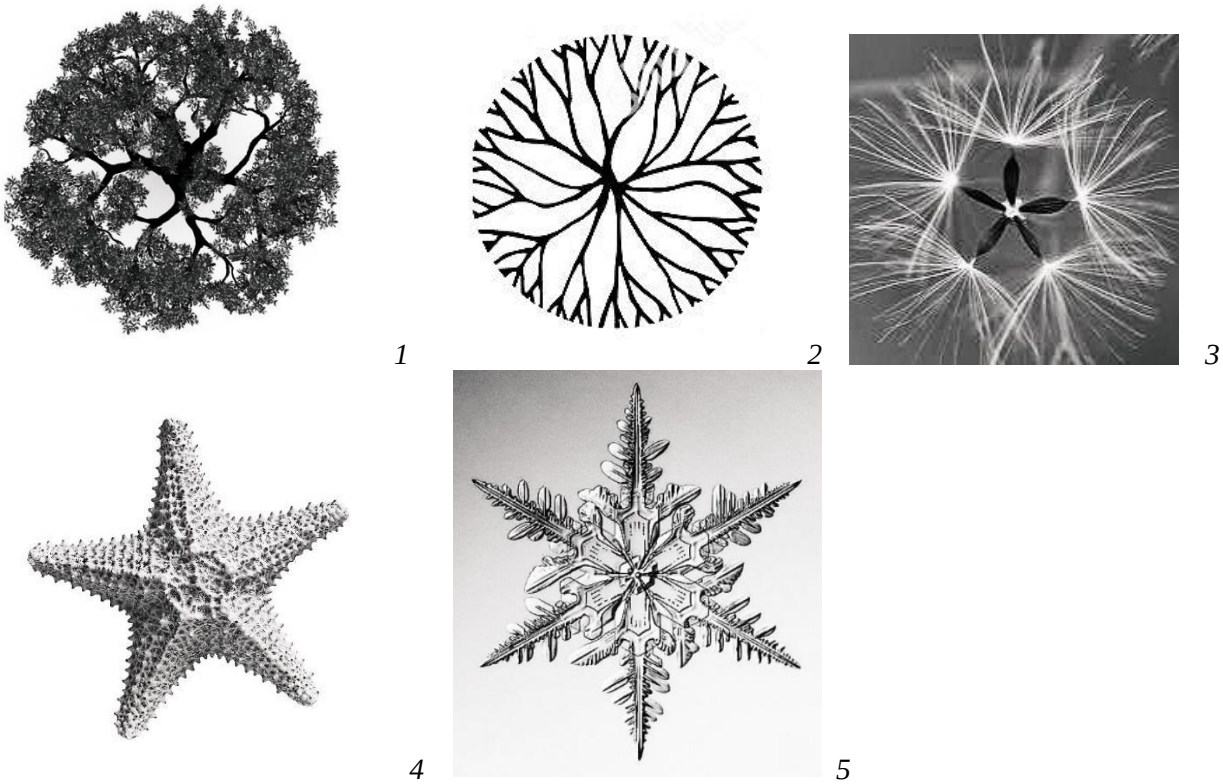

Fig. 2. The examples of symmetric mastering of the space by natural forms.

The authors take the liberty to generalize the results of the aforementioned researches and known theoretical conception, and to hypothesize that the development of self-governing systems in the isotropic space created in the idealized forms some systems, which have structures, which happen to be Abel's groups of symmetry, and, researching every "vector" of development, there is a Fibonacci's row. More than that, in the structure of the end "product" of creative activity, which is also developing in the form of these symmetric systems, there are as Abel's groups "at work", as Fibonacci's golden row.

The revealed facts of following the pattern of the golden row in pieces of art open up, as we see, an amazing quality of this great fundamental pattern, in which many patterns of life and development of biological systems fit in as well. This quality unfolds in the possibility of containing the former member in each new member of the continuance, as a keeper of constancy, stableness, the golden genetic heritage, and also the next one, in which the development of the movement and perfection is concluded and inseparably connected to the former one.

Symmetry is the manifestation of the general fundamental principle of the interaction of two principal alternatives – stillness and movement, embodied in the principles of preserving and changing, which are realized by continuance, moving forward, repeating in time and space. In nature and in art it is shown in the perfect examples in certain ratios of these essential alternatives. These ratios are searched by the nature and the art in homeostatic and mutable doses in genetics and harmony in artifacts.

The violating of the principles of symmetry happens because of morphological mutations, conditioned by informal factors of the influence of the inhomogenous environment (space) and time.

The research of all aforementioned artifacts proved the legitimacy of the definition, established in the theory of architecture – the dynamic symmetry, as a manifestation of correlation of the regularities of structures in nature and art.

Therefore, it is possible to conclude, that in the process of development and in the structure of some natural and in all living and social self-governed systems, the common principles of preserving and developing are manifested, realized by the symmetry, which provides the preservation, and the dynamic changes, which provide adaptation and development.

On the base of received results of these perennial researches, it is possible to confidently make the conclusion that the professional education, as a part of the historical and cultural process, should include both components, which can become the base of the architects' artistic education, including the best traditions of the professional academic art schools and the brave experiments with the figurative and expressive elements of the language of creative avant-garde [15]. All of this, together with the scientific awareness of the essence of artifacts and the historical process of their creation, is the process of upbringing the future architect.

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Кравець В.Й., Ігнатьєва Н.В., Тимофєєва Н.В. ЕТАПИ СТАЛОГО РОЗВИТКУ В СТРУКТУРІ АРТЕФАКТІВ І КУЛЬТУРОЛОГІЧНИХ ПРОЦЕСІВ. Статтю присвячено проблемі професійної художньої освіти архітекторів як частини історико-культурного процесу, для ефективності та повноцінності якого необхідно наукове усвідомлення сутності артефактів - результатів художньої діяльності, методів їх дослідження та сутності законів їх існування і розвитку. У статті розглянуті закономірності побудови артефактів і еволюції певних культурно-естетичних процесів з використанням кластерного і системного аналізу і системного підходу. Представлені результати натурно-експериментальних і теоретичних досліджень, які дозволили виявити в структурі артефактів загальні принципи збереження і розвитку, що реалізуються симетрією, що забезпечує збереження, і динамічними змінами, що забезпечують адаптацію і розвиток. У статті також представлені отримані в результаті досліджень певні властивості організації внутрішньої структури артефактів, які виявилися подібними деяким закономірностям, властивим живій природі, а також симетрична подоба, в широкому сенсі, просторово-часової структури еволюції природних і деяких культурологічних процесів.
Ключові слова: професійна культура, структура артефактів, художня діяльність, культурологічні процеси.