

# The Role of Architectural Geonics in Creating an Architectural Space

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**Abstract.** The aim of this work is to formulate the systematic study of the influence the geo-factors on human within the framework of architectural geonics, which assumes the transdisciplinary of the study. The formation of the system-structural approach in the study of a specific architectural space determines the principles and models for constructing a geosynthetic ally specific medium that can positively influence the psycho-emotional and physical state of a person. The concrete, practical orientation of the architectural specific space is aimed at enhancing the functional capabilities of the human body by means of architectural geonics. This article, in essence, is a generalization of theoretical material for the identification of specificity, as a phenomenological feature of architectural space. The published author's works, which are referred to in the course of the presentation material, serve as bifurcation representations, suggesting the further structuring of scientific research with an attempt to articulate the essence the phenomenon of specificity of the architectural space.

## 1. Introduction.

Like any developing branch of science, architectural geonics tries to develop as wide a field of research as possible for its approval. Its boundaries with other industries are blurred, many studies can equally be attributed to architectural acoustics, to building materials science, and to ergonomics, and to medicine, as well as to phenomenology and existential psychology. There is a direct interest in the psychology of the perception of space, including Gestalt psychology. The difficulties of this research are related to the fact that its subject is in the stage of formation and many laws of scientific knowledge are only being outlined and exist in some supposed inclination. Nevertheless, the work on design theory, in which space plays the main role-the construction of artificial systems and the modeling of natural systems within the interaction of inanimate nature and architecture, the formation of the perception of the environment [10], is possible, but it is realized under transdisciplinary [11]. It is as a natural necessity using the potential of a steady trend towards assimilation and interpenetration of various sciences, using the achievements of some to improve the effectiveness of research in others. "By and large, the meaning of the philosophy of transdisciplinary is seen in the coincidence of obtaining an integral result of the joint implementation of a scientific project and the formation of a unique author's position by each of its participants" [12].

Modern trends in transdisciplinary in the theory and practice of architectural geonics, expressed in individual concepts, methods and approaches, are "supported" by the latest knowledge and indicate the



development of the vector of geo-directional architecture. Their local manifestations reflect a comprehensive approach to creating a positive architectural and spatial living environment. This confirms the need for the development of architectural geonics in the framework of theoretical and project experience in the formation of geo-approaches, as well as the development of principles and models of geo-synthetically specific space.

## **2. The scientific significance of the issue with a brief review of literature**

The reduction in a single ontological structure of various theories of space, the development of the concept of "space" in philosophy and the history of architecture is the definition of this category in the basis of research and solving problems of architectural and design synthesis. Representations of space as an open dynamic system, changing along with scientific knowledge of it, are considered in the publication of Panchenko TA. "Evolution of understanding of architectural space" [1]. The current state of the field of study of the structure of architectural space is focused on geometric-spatial characteristics [2] and semiotic principles [3] from the position of spatial connectivity. Within the framework of the fundamental changes in the architectural theory, the phenomenological concepts that "proved to be most effective when trying to explain the irreflexive and non-symbolizable in architecture" become urgent [4]. As an additional idea of architecture as space, the problem of creating an architectural environment that exerts a curative effect on the physical and psycho-emotional state of a person is considered. The analysis of the influence of sound frequencies on the body and human consciousness is examined in the articles "On the transdisciplinary tandem of medicine and architectural geonics" [5] and "The medical aspect of architectural geonics - the effect of sounds on a person" [6].

At present, environmental themes continue their cultivation with a new direction in architecture-architectural geonics [7-8]. The main subject of the study is the formation of the principles for constructing a geo-synthesized space that is capable of such an impact. The primary systematization of the concept of describing a specific architectural space in the categories of the system-structural approach is given in the work "Development of actual problems of the development of geo-orientation in architectural geonics" [9]. The formulation of the problems of cognition of such a space is limited to the means of architectural geonics, the practical and cognitive orientation of which is possible in conditions of transdisciplinary. The development of the vector of geo-directional architecture will allow us to form and develop the concept of architectural-spatial pottery as a geo-synthesized structure.

## **3. Formulation of the problem**

The proposed hypothesis consists in confirming the influence of geo-factors on the formation of an architectural specific space. By geo-factors we mean a number of natural phenomena that affect human perceptivity, including natural sounds - acoustics. As an acoustic material, it is proposed to use sounds obtained as a result of passage of air streams through strings (Fig. 1) or pipes of various diameters, installed as elements of the architectural structure (Fig. 2). Depending on the volume-spatial formation of the structure, on the geometric characteristics of the pipes, such as the length of the tube, the diameter of the inner cavity, the presence of cutoff of the ends of the tube; depending on the material of the pipes, which affects the sound reflectance; influence of the wall thickness of the tube; the use of methods for creating wind musical instruments to extract sound harmonic oscillations - all in the conditions of spontaneity of wind force and direction. As a result, the pipes, as the basic translators of sound, will be able to synthesize a very large range of audio frequencies. In this case, the sounds will have some philharmonic complexity.



**Figure 1.** "Aeolian harp". Strait of Agate Pass between Bainbridge Island and the mainland of the Kitsap Peninsula, USA. Arch. Ron Konzak, Ed Hazhmann.



**Figure 2.** Chimecco Bridge, Aarhus, Denmark.

Revealing the "right" frequencies will affect the spatial and spatial formation of the structure: the geometric characteristics of the pipes, such as the length of the tube, the diameter of the inner cavity, the presence of a cutoff of the ends of the tube; dependence on the material of pipes affecting the sound reflectance; influence of the wall thickness of the tube; the use of methods for creating wind musical instruments to extract sound harmonic vibrations - all in the conditions of spontaneity of wind force and direction. As a result, pipes or strings, as the basic translators of sound, will be able to synthesize only that range of audio frequencies, which has only a positive effect. In this case, the sounds will have some philharmonic complexity.

Based on this, one can assert the legitimacy of creating an alternative to natural spontaneity, by calculating and selecting the above characteristics, when the sound background can be controlled and directed.

In parallel with the confirmation of the psycho-physiological fact of the impact of the architectural acoustic environment, the task is to create an alternative to natural spontaneity, through calculations and a selection of the above characteristics, when the sound background can be controlled and directed.

#### **4. Formation of the system-structural approach in the study of a specific architectural space.**

The current situation introduces into the formation of the environment such a component as specificity, which is a new determinant in the formation of the architectural space. The substantiation of the status of a specific architectural space is the psycho-physiological phenomenon in the categorical field of the philosophy of architecture. The study of the positive influence of geo-factors on humans, in the methodological plan, consists in the development and development of ideas on the topic of specificity of space, on the specifics of its content. The designation of the problem of the structural approach in the studies of a specific architectural space [13] is accompanied by the formulation of the

structural properties of specificity and the enumeration of the tools for creating the geo-specificity of space. Thus, one of the main tasks of the theory of architectural geology is to study the structure of a specific space.

The ways of creating a specific space differ in essence, and in effect, and allow you to feel and understand the essence of space in a different way. Systematization of the study of the geofactors influence on humans will serve as a justification for the status of a specific architectural space as a psycho-physiological phenomenon.

The specific environment of architectural geognics is a kind of environment design in architecture [14]. Comparison of some characteristics, limited by the framework of the psychology of the environment, explains the mechanisms of interaction between man and the environment and treats them as a single system. It is the understanding of the perception process that is the unifying factor of environmental design with the design of a specific space. Theoretically, this factor should be considered against the background of environmental psychology, such as the use of knowledge of the process of perception. And the difference is in the construction of a fixed space with the help of geofactors, in the cause-and-effect determination of the environment and the person. An important role in the descriptive specifics of the psycho-emotional impact of the geo-specificity of space is played by the concepts of the psychology of perception of spatially-environmental forms at the level of sensory sensations.

Environment approach to research of psychic phenomena considers a person in constant interaction with the surrounding living space. Explains how a holistic impression of the stimulus environment arises if our senses give us signals from receptors in different modalities. In other words, how different in quality images - visual, auditory, kinesthetic, tactile and olfactory form a single reaction of the organism.

In environmental psychology, the main directions of research have been formed, specifically scientific concepts of which can be used to form a systematic study of the influence of geo-factors on the creation of a specific space and, as a consequence, on man. It is the study of information-emotional relations between a person and the environment, including spatial cognition, perception, interpretation and evaluation of both individual components and integral fragments of the environment. And it is the definition of the nature of the effects of individual environmental factors on human behavior and psyche, including the impact of suboptimal spatial organization and environmentally unfavorable physical environment [15]. The unification of the natural-science and humanitarian approaches presupposes the use of specific environmental properties and instrumentally fixed reactions of the users of the environment to them. An adequate methodology in this case is the use of the principles and concepts of psychosemiotics. Psychosemiotics studies the mechanisms of the interaction of sensory elements of the image with sign structures of various levels of complexity. Under the sign structures, in this case, signs of the specificity of the architectural space should be considered. The use of the psychosemiotic approach in the creation of the environment by means of architectural geognics was touched upon in the author's article "On the use of the achievements of environmental psychology in architectural geognics" [16], where the denotative and connotative values of the sign of a specific space were considered.

## **5. Practical significance, proposals and results of implementation, the results of experimental studies.**

The scientific substantiation of a specific architectural space is extremely necessary. Space can have a curative effect. "Structured space does not only hold the person, but also manages it" [17]. We need experiments and their "decoding". Based on the "decryption" need to create a database of techniques, methods, tools, etc. to determine the methodology for manipulating impressions and physiological changes in the stimulus environment. And create the definition of the nature of the effects of individual environmental factors on the behavior and psyche of man. And in the end, to describe the system of forming a single reaction of the organism by the projected quality of images - visual, auditory, kinesthetic, tactile and olfactory.

The architectural and design possibilities for creating surfaces of structures capable of synthesizing the acoustic capabilities of the geo-media in the conditions of spontaneity of wind force and direction are considered in the work "Design model of the structure for creating a specific acoustic environment" [18]. It illuminates the practical result of obtaining a specific acoustic space, the natural background of which is the low frequency of sound vibrations. The application of this data in the research, innovation and creative work of the architect will serve as the beginning of solving the problem of creating an architectural environment that exerts a therapeutic effect on the person's physical and psycho-emotional state.

When creating a specific space, environmental factors are identified that exert a dominant influence on the whole body response. New knowledge of the psycho-physiological basis of perception, the construction of eidetic models in perception, the recognition of images and the formation of memory engrams, will help overcome the difficulties of space understanding. Then the specific space will be the result of the transmutation of the environmental approach. This philosophy is based on the philosophy of transdisciplinarity - the inclusion of classical models in some exceeding their state, the transition to which is accompanied by a qualitatively revolutionary transformation, the interruption of gradualness and the creation of a new emergent state, which, however, does not lose its links with its classical origins [11]. We need our own research work of architects in the border area between psychology and design. The factor of contact with a specific medium is extremely important, since the quality of such a medium (space, smells, shape, sound, light) in this case determines the predictability of human exposure. System studies are needed that determine the choice of approaches to studying the possibilities of creating a specific architectural space that can positively affect the physical and psycho-emotional state of a person. These possibilities are legitimate and hypotheses can be considered as potentially promising.

## 6. Main findings of the study.

According to A.G. Rappoport's [19] «synthetic schema of understanding space and time», the development of an understanding of the architectural geospatial space concretizes the idea of space and, perhaps, the combination of "space configuration" will be interpreted not only as a "topographical configuration". Temporal correspondence to this problematic status of space is memory, emotional memory. Reflection in the architectural and spatial continuum implies any manifestation of the properties that characterize the singularity, the self, the specificity of this very space, and hence the specific space can be considered as a means of spatial reflection.

Thus, the fundamental subject of architectural geonics, primarily determining its content, is space, as a system object of the act of perception, taking into account the mechanism of the formation of a figurative system in the subject's psyche. The development of geo-orientation of architectural geonics suggests a comprehensive approach to the development and development of ideas about the theme of a specific architectural space, and also to the final formulation of the structural properties of specificity. The transdisciplinary focus of the scientific search for paradigmatic models of a specific space is due to the fact that spatiality as a semantic denotation remains a weak, undeveloped link.

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