LIGHT RHYTHM AS A MEAN OF EMOTIONAL EXPRESSION IN ARCHITECTURE

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ABSTRACT

This article describes the concept of rhythm as the means of architectural expressiveness, its influence on the organization and perception of the surrounding architectural space. It is drawn out, that the use of such means as rhythm and light in architecture is of natural origin. Some results of experiments and researches on the effect of rhythm on the human body are given. The concept of “architectural arrhythmia”, which causes negative sensations when a person perceives architectural objects, as well as the monotonous and trivial organization of architectural forms and spaces is introduced. It is noted that negative sensations are intensified in conditions of lack of light. A historical overview of the development of artificial architectural lighting as a new trend in architecture is given. The conclusions that the use of light rhythm allows to solve many architectural problems, as it is a significant tool for identifying the aesthetics of architectural forms are given.

Key words: rhythm, rhythmic range, “architectural arrhythmia”, means of architectural expressiveness, artificial lighting, architectural lighting, light architecture, light rhythm.

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1. INTRODUCTION

Rhythm as a Tool of Architectural form Making

To communicate in society, we need to have speech skills, know the basics of grammar, only then we will be able to express our ideas and thoughts. The architect who designs and builds, must have a specific language of forms plastics to properly express their creative concepts. The means of the architectural language are the elements, forms, dimensions and rules of their construction. For a distinct implementation of our creative ideas, we must be aware of these means and know their expressiveness.

Rhythm, as a regular alternation of elements in time and space, surrounds you almost everywhere. First of all, nature is imbued with rhythm. We can find its law in the movement of the planets, in the flowing stream of the river, in the circle of seasons, days and nights, in
the sweep of the tides, in the physiology and biorhythms of human (breathing, cardiac contractions, sleep and wakefulness, birth and death, cell growth, etc.).

Architecture very often adopts its means of expressiveness from the life. It can be said that the rhythmic repetition and alternation of proportional elements – one of the laws of living nature – has long and with great success been an important creative tool of the artistic expression of the architecture. Therefore, secondly, the rhythm surrounds us in an artificially created environment, being a universal law of an artistic form construction. The architectural rhythm is consisted in the pursuance of a beautiful and expressive form, shapeliness, orderliness of form and stylistic solidity. Thirdly, we deal with the concept of rhythm in all forms of art without exception. After all, it is impossible to imagine the composition of dance, poetry, theater, decoration of everyday objects, ornaments and decorative ornaments, etc. without rhythm.

We must understand that there is a deep association analysis and creative process between the beauty of the real world forms and the application of its laws in art and in architecture. For the beginning, it was necessary to discover these laws in the surrounding space [1] for the reproduction, imitation and repetition of them.

According to the Soviet architect Moses Yakovlevich Ginzburg: “From the date of its creation to our days, art of building in its formal elements, particular parts and masses composition, is inspired only by the laws of rhythm, which determine the true essence of every piece of architecture. The whole history of the art of building is essentially the history of various demonstrations of these purest dynamic laws. <... > All scientific hypotheses, laws and philosophical worldviews are nothing but the desire to find formulas and definitions expressing the rhythmic beating of the space” [2].

Rhythm, as a supreme regulator, is a source of aesthetic pleasure, understandable to all mankind, beginning with a primitive man who strove to organize the surrounding space with a rhythmic circle of separately standing stones (dolmen) and ending with representatives of the modern age, creating the most elegant works (Fig. 1).

![Cromlech Stonehenge](image1)

![School of medical researches in Australia](image2)

**Figure 1** Rhythmic organization of space in the primitive world and modern age

Rhythm is one of the means of composition, which allows you to achieve harmony, because it has a strong emotional impact.

The architectural and musical rhythms are related. If in music, dance, the sense of rhythm is created by the alternation of elements in time (acoustical rhythm), then in architecture,
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graphics, fine arts, etc., the sense of rhythm is created by the alternation of elements in space. Here time is replaced by length, the alternation in time is replaced by a sequence in space. Each subsequent element merely joins the previous one occupying a certain place in space (visual rhythm), in contrast with music, when the previous element sounds and disappears, remaining only in our consciousness [3].

Scientists conducted a lot of experiments and researches on the effect of acoustical rhythm on the human body. Let us give some conclusions of the researchers:

1) it is proved that a broken, twisted rhythm in music slows down the growth of plants, negatively affects the state of cerebro-spinal fluid of the human, the work of glands regulating the secretion of hormones. As a result, breaking in the heartbeat of the human and the mismatch operation of the nervous system and endocrine glands occur in the body; there is a negative effect on the central nervous system [4].

2) music, in which the rhythm and musical pitch are harmonious, contributes to the prevention of childhood neuroses;

3) the effectiveness of metabolic processes of immature infants is improved when listening to Mozart’s musical compositions perfect in terms of rhythm. The learning of new information material is improved among all people, regardless of gender and age, and irrespective of whether they like Mozart's music or not. It is explained by the fact that the rhythm of his musical compositions coincides with the rhythmic vibrations of healthy cell neurons. [5]

Taking into account the fact that the nature of rhythm origin, both acoustical and visual, is essentially one, it can be assumed that there is a direct proportional relation in the influence of the acoustical and visual rhythm on the human state of health. Rhythm, as the element of the psycho-physical nature of the human, serves us for the facilitation of the surrounding space perception. It shows itself in the striving not only for rhythmic division, but also for symmetry in the environment, paired relation of elements, which is connected with binocular vision and features of human state, its primary orienting skills.

Indeed, it is well known that the composition of a number of forms ordered by rhythm facilitates its perception in comparison with an unordered set. Investigating chaotic unordered conglomerations of architectural structures, the observer does not feel any comfort from the realization of harmony, moreover, he is starting to get annoyed. Sometimes the law of motion can be found in some forms with some effort, but the longer we search for the logic of rhythm in an architectural structure, the more energy we spend on understanding it and the less we like it. It is possible to talk about “architectural arrhythmia”, when complex multidimensional formation causes uncomfortable feelings, people always subconsciously try to find system in it, to simplify it.

At the same time, we sympathize with structures with the distinct rhythmic visuals, with distinct laws of motion. Rhythmic elements are perceived as a single whole, and visual entity is one of the most important conditions for harmony (Fig. 2).
The ancient Greeks perfectly felt it. Classic architecture is a vivid example of the use of rhythm in architecture. The classical order, as the set of the rhythmic range of identical columns, is a subconscious and conscious need for rhythmic demonstration of the creative instincts of the architect, resulting in the development of the concept of a column portico or temple (Fig. 3).

**Figure 2** Perception of rhythmic and arrhythmic forms

Greek vase painting. The two-beat rhythm almost does not give a sense of rhythm

Monument of Thrasyllus. Rhythm with an odd number of columns is extremely rare, because the column in the middle prevented the placement of the main entrance in the centre of the temple
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Temple of Nike. The four-beat rhythm has strongly pronounced qualities of dynamic impact

Temple of Concordia in Agrigento. The six-beat rhythm with enough force establishes a rhythmic pattern and, at the same time, does not overdo it in such a way, that the human loses intensity and power of general concept unity

Figure 3 Rhythm of columns in Classic architecture

According to psychologists, in case of a single perception of an object, the human discerns about 7 separate elements within the field of his sight. This fact is related to the human short-term memory span. Therefore, the optimal number of elements of the architectural rhythmic range is 7 (± 2). A smaller number of elements reduces the sense of rhythm, while more elements can disturb a sense of entity, a sense of monotony will appear.

It becomes clear that the ancient architects subconsciously limited the rhythmic range of the colonnade within 6 or 8 columns (avoiding an odd number of 7 columns, otherwise the middle column would be on the symmetry axis of the facade and would prevent the placement of the main entrance). The number of 6 or 8 columns makes the main rhythmic theme of the temple complete and eye-catching.

In addition to “architectural arrhythmia”, the special psychological disfavor of the human is caused by gray, homogeneous urban spaces – long blank walls, house-boxes, uniformly asphalted areas, etc. Such perception objects prevent from our spatial thinking, do not cause interest or associations. Complete simplicity and triviality cause no less annoyance than complex architectural arrhythmia. When we do not spend any effort to perceive the surrounding space, it surrounds us like a blank noise. Therefore, the struggle against similarity, monotony remains one of the serious problems of modern architecture.

2. LIGHT AS A TOOL OF ARCHITECTURAL FORM MAKING

This fact is further exacerbated in conditions of lack of natural light. After all, light is an important element of the people's inhabitable environment, its lack adversely affects the overall comfort of the living environment. The rhythm of nature lighting determines the rhythm of a human life. In addition to the natural desire for rhythmization of the surrounding space in order to simplify perception, the human is implicated with the lighting of the surrounding space, that's why lighting is one of the most important means of architecture. The history of architecture is, in many respects, the history of human interaction with the features of natural lighting in a given area. And if the ancient temples do not lack of light under the southern sky, then in conditions, for example, of the Moscow region, we are trying to save every bit of light. And the inhabitants of the northern regions, perhaps, since ancient times have been restricted in their rights for the bright and contrast light perception of architecture.
After all, the habit to evaluate the architectural and artistic merit of buildings when they were perceived during the daytime was developed after thousands of years of architectural practice.

But today, lighting architecture is not only the mastery of the skills of interacting with daylight. The modern way of life requires the continuation of life activity when darkness falls, and even at night the life of the city and the settlement does not stop, and sometimes becomes more intense. And the technological progress of the last decades makes it possible to use the light not only as a means which provide road-traffic safety, but also as a significant tool for revealing the aesthetics of architectural forms.

The ancient philosophers Pythagoras, Euclid, Plato, Aristotle, and others for the first time began to research the concept of “light”, later the light theory appeared in the metaphysical theories of the Middle Ages (Augustine, Saint Thomas Aquinas and others). This issue was addressed by sages, humanists and artists of the Renaissance (Leonardo da Vinci, L.-B. Alberti, M. Ficino and others). The ideas about the nature of light gain scientific and experimental traction in the works of J. Locke (1632–1704) in the Age of Enlightenment [6]. Theoretical concepts of light as an architectural and artistic method gain traction in the studies of Roger de Piles, J. W. Goethe and Schelling by the middle of the eighteenth century.

The problem of architectural light became the subject of active research in the early 21st century of the French scientist Roger Narboni, who began to study the role of artificial and natural light in the perception of different urban landscapes [7]. Later, the issues of the artistic image and urban aesthetics became the subject of scientific researches by a large number of scientists around the world. For the first time in the native architectural practice, the concept of a night light panorama was introduced in the works of N. M. Gusev and V. G. Makarevich, where it is stated that the artistic quality and imagery of a night light panorama are determined by a system of architectural ensembles and dominants accentuated by artificial light [8].

The architectural and artistic possibilities of artificial light attract more attention of modern architects to the night architectural illumination [6]. Christa van Santen [9], Ulrike Brandi and Christoph Geissmar-Brandi research lighting design and artistic concepts of light for cities [10].

The topic is really broad and have many aspects. After all, architectural illumination allows, first of all, to focus attention on the merits of the object, placing emphasis of the visual perception, sometimes even enriching the daytime image of architecture; secondly, to create visual complexes from objects of different styles, and, thirdly, to shift from unnecessary details or even hide fails and gaps.

Urbanization processes, intensive development of modern lighting technologies make it possible to create light panoramic compositions of the city, a “virtual” vivid expression of urbanized areas for more outstanding interaction of residents with urban spaces.

Despite all this, at the moment the lighting architecture is just gaining popularity, the methods and ways for its design are being developed.

But a huge number of examples that persuade us of the importance of using this means of architecture have been already created in the world practice (Fig. 4) [11].

Thus, it can be said that with the advent of artificial lighting, the ancient architectural problem of light and illumination manifested itself in a different form, confirming its inexhaustibility, aesthetics and eternity.
3. LIGHT RHYTHM IN ARCHITECTURE

The possibility of the interrelation between the two most important natural tools of architectural form making for human nature – rhythm and light – is seen as a significant tool of a modern architect. A huge mass of uncovered planes and spaces, deprived of any visually pleasing division, massive monotonous forms, houses-“boxes” that abound in urban areas is an endless field for architectural activity with the use of light rhythm.

In the evening and on a gloomy day when the negative sensations of perceived monotony are further exacerbated, the rhythmic lighting makes it possible to depict visually pleasing rhythmic relations on the surface, imitating the temporal play of architectural forces in homogeneous interiors. (Fig. 5).

The level of modern technologies development made the use of architectural lighting affordable. At the same time, there are various architectural and artistic solutions, for example, spotlighting, band lighting or uniform illumination of the surface. The light rhythm in architecture can be static (metric), when it represents a repetition of an element without changing its sizes and the intervals between them; as well as dynamic (rhythmic), when there are processes of increase or decrease in the sizes, shapes, intervals between elements. The world practice is already rich in interesting examples of creating a light rhythm (Figures 6, 7).
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Figure 5 Rhythmic lighting of homogeneous corridor walls

Figure 6 Examples of rhythmic lighting of country house area and facade
Figure 7 Strengthening the rhythm of the architectural form by illumination

4. INFERENCED

Thus, the use of the concept of “light rhythm”, based on the fundamental knowledge of the human perception of the architectural space, as well as on modern technologies for artificial lighting, will help architects to solve many issues of improving the well-being of the environment.

REFERENCES


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