Possibilities of Architectural Lighting to Create New Style

V G Chudinova, O R Bokova
Faculty of Architecture, South Ural State University, 76, Lenin Avenue, Chelyabinsk 454080, The Russian Federation

E-mail: chudinovavg@susu.ru

Abstract. The article presents the argumentation of the provision on the style-forming potential of the lighting design the sphere of which is interpreted in a wide range of genres. The area of the intersection of form-building technological and artistic aspects lies in the field of ecology which includes not only energy saving, but also the well-being of the human and the society. The theory and practice of designing the night-time image of architectural ensembles, buildings and landscapes develops much slower than the implementation of light solutions in the advertising industry. In most cases, the possibilities of lighting design are used only in the field of decorative lighting despite their huge aesthetic potential and rapidly improving technologies. The request for innovation and uniqueness usually arises on the basis of image and political ambitions of large corporations or for the positioning of powerful brands. The success of such projects becomes a driver for both creation and promotion of innovative solutions. However, in a broader scientific sense, not only the design of artificial light systems but also the optimization of the daylight usage falls into the sphere lighting design.

The need for the new methods of architectural shaping is dictated by the need to introduce in the building of resource-saving lighting technologies, ecological infrastructure including alternative energy sources. The article gives the examples of different lighting design genres supplemented with illustrations. The conclusions concern the prospective directions and tasks of scientific research in the field of lighting design.

Keywords: illumination design, energy efficiency, architectural style, urban environment, modern architecture.

1. Introduction

The term light design is strongly associated with colorful shows, decorative lighting and festive decoration. In architectural practice, techniques for creating a night image of urban ensembles and identifying the significant space objects have been extensively tested. As a rule, speaking about lighting design, we mean the design of an artificial lighting system. However, in a broader scientific sense, the design of not only artificial light systems, but also the optimization of the use of daylight, falls into the sphere of lighting design. At the same time, economic, ecological, hygienic requirements, as well as safety and artistic expressiveness, must be taken into account. Like the architecture itself, lighting design has two sides - technical and artistic. This is the process, and the result, formed by the interconnection of many factors.

In most cases, architectural lighting is perceived as a complement to the artistic image of objects, as eloquently evidenced by the more common term "illumination". This approach is appropriate when working with historical environments, established ensembles. It really required to emphasize the uniqueness of architecture and landscape there. At the same time, the light image is formed quite...
individually. But, when creating modern buildings, structures, urban structures, not only the external appearance changes, but the design method, the technology of building and operation, the principles of the operation of engineering equipment also change. The criteria of comfort and safety have changed, primarily under the influence of the new social and environmental perceptions. In accordance with the new technologies and requirements in architectural design, approaches to shaping start changing, which also leads to the stylistic changes.

2. Main part

The architectural style is determined by the tectonics of space, the materials used, the constructive methods, the method of shaping, the semantics of the images. All this is to some extent due to the new approaches to the design of the light-color medium. Even if you define the architectural style only by a set of external attributes, then in this case, artificial light can create many new images. The opportunities of light projection equipment and dynamic scenarios unlimitedly expand the range of the visual images of one physical object.

The areas of scientific research in the field of lighting design are divided into two groups: engineering-technological and architectural-artistic. Most publications concern the study of the properties and designs of LED light sources, including their efficiency in terms of energy saving [1,2]. The same group of publications on the technical aspects of artificial lighting include comparative and advertising surveys of lighting products [3]. Interest in the architectural and artistic aspects of lighting design is partly due to the convincing vivid images that are widely used to promote lighting equipment on the market [4].

The second group of the scientific research in the field of form-building, artistic expressiveness of architecture, functional and socio-ecological aspects is represented by a much smaller number of publications [5-7]. Moreover, the issues of ecology, resource-saving, health and safety are presented in both researched groups [8-10].

Speaking about the style-forming potential of the lighting design, we take into account the results of both of these groups and focus on their intersection - in the field of ecology, which includes not only the resource saving, but also the well-being of human and society. The novelty of the approach to the style-forming role of the lighting design is to create a diverse and dynamic environment, using the distribution of not only artificial but also natural light. To the types of its distribution, we include the methods of directional reflection, scattering, focusing, shading, sending through color filters, screening. Interesting images can be created by a reception of dynamic tracking of diurnal and seasonal changes in the light flux, as well as a thoughtful scenario of the shadows' movement from specially designed screens and architectural details. And the dynamics of light-colored spots can be not so much an end in itself, an attraction, but also follow the functional needs, and also proceed from an ecological paradigm.

Figures 1 and 2 shown how the black and white spots in the interior of modern buildings create the main impression of architecture. This technique can work not only in the sunlight, but can also be duplicated by special lamps located in the zone of the upper windows. Unobtrusive change of daylight on artificial is used for lighting of the museum expositions. The game of light in religious buildings has always been a powerful means of influencing people's feelings. It was there that historically formed receptions, which then began to be used in the theater, for entertaining events, and came to the modern entertainment industry. Nowadays festivals of light are held regularly, festive events cannot do without light projection and laser shows, not to mention Christmas and New Year's decorations of the streets.

The evening illumination of buildings differs from festive decoration less and less. Once invented bright images and techniques are replicated and become ordinary. In order to impress and stand out, more and more means are needed [11]. Not a single iconic object is being built today without the development of an evening lighting scenario. The outstanding buildings of past years go through the stage of redesign in order not to drop the image on the background of the new building and meet the increased demands of its owners. For example, in 2015, the famous Norman Foster's building
Hongkong and Shanghai Bank (HSBC) Headquarters received a new night look, corresponding to the level of the world-famous brand [12].

From the first Russian objects, a complete project of dynamic illumination in 2012 was prepared by Philips and "LightService" for 19 buildings in the center of Moscow [13], among which buildings on the street New Arbat (Kalininsky prospect, 1968). For all the scale of the problem, the color scale and scenario of such projects are rather monotonous. The contrasting violet and green colors dominate, and the dynamic is more restless than cheerful. By 2016, the situation has changed significantly for the better thanks to the thoughtful project of the festival "Christmas light." The installations developed for Moscow by experts from Italy, France, and Russia have been exquisite luxury for the last two years (Fig. 3). And this is achieved by the predominance of white and warm light in contrast to the bright acid colors of mass advertising products and plots.

With all the richness of the opportunities of lighting design, it's unfortunate to see monotonous techniques that neutralize the images of not only architecture but also fashionable events. As they themselves are already very effective and labor-intensive, the show organizers pay more attention to technical issues, rather than the development of artistic techniques. Despite the uniqueness of light projection shows on the facades of large buildings, the scenarios do not differ in variety. And they often present a picture of virtual collapse of the facade (Fig. 4). The destructive effect of the projected picture on the architectural composition takes place even without a special scenario move (Fig. 5). This is due to the fact that the architecture as a physical object is not necessary for a light show. The projection can be broadcast on water splashes, fog, clouds, smoke. As for architecture, due to 3D-

![Figure 1. Kuokkala Church, Finland, Lassila Hirvilammi Architects (the photo from https://sumally.com/p/476797).](image1)

![Figure 2. Nine Bridges Golf Club, Shigeru Ban Architects (the photo from http://www.archdaily.com/search/all?q=Shigeru%20Ban).](image2)
mapping technologies, it is created by other compositional principles and media facades have a completely different tectonics.

![Figure 3](https://img-fotki.yandex.ru/get/9514/50138619.138/0_b054c_10fd0fa3_XL)

**Figure 3.** Festival Christmas light. Moscow Nikolskaya street (photo from https://img-fotki.yandex.ru/get/9514/50138619.138/0_b054c_10fd0fa3_XL).

Evening lighting for historical objects should create a light picture, accentuating the compositional features and revealing the uniqueness of the building, without distorting its recognizable architectonics and minimizing intrusion into the original designs. According to professor Shchepetkova, baroque will turn into "light baroque", empire - in "light empire" [14]. But here you need a fine and precise work in determining the locations of installation and the choice of types of lighting equipment. It is necessary

![Figure 4](http://fotografersha.livejournal.com/167213.html)

**Figure 4.** Moscow, Red Square Festival «Circle of light» 2011. (the photo from http://fotografersha.livejournal.com/167213.html).

![Figure 5](http://archi.ru/tech/news.php?id=44016)

**Figure 5.** Manezh. Circle of Light Moscow international festival (the photo from http://archi.ru/tech/news.php?id=44016).
to take into account their security, physical effects of radiation on materials, provide fire safety and comfort of people.

The need for new methods of architectural shaping is dictated by the need to introduce resource-saving engineering networks, ecological infrastructure, including alternative energy sources into buildings. Wind turbines, solar panels and collectors, sunscreens give a significant burden on the structure and have impressive dimensions. In addition, outdoor equipment will require protection from adverse climate effects. Changes in design methods are required not only for equipping buildings with the new types of equipment, including lighting, but also for integrating devices that allow daylight to penetrate into rooms without windows and zones remote from the outer contour. The new morphology of architectural objects in turn affects their stylistic qualities. As Professor N. Schepetkov claims, the question of the style in the lighting design, delivered in 2006 is not developed [8]. Meanwhile, this is one of the fundamental categories of the emerging theory of lighting design as a new field of scientific, creative and practical activity [14].

So, before talking about style, it should be noted that in the art and technology of lighting design, certain genres have been already formed. Among them, the above-mentioned genre of festive lighting develops most actively, which in addition to lighting and decorating buildings, plays on existing and creates new objects of the urban environment, including independent installations. The next, rather new genre in architecture is light projection [15]. Usual for the modern event-industry laser shows in this case use 2D and 3D-mapping with a plot that takes into account the architectural features of buildings. The genre of media facades is visually close to 2D video projection, but it is still fundamentally different, if not simply a surface-mounted screen, but organically grows out of the structure itself. In this case it is already possible to talk about the style-forming significance of the lighting design, where the style of architecture is determined not only by the appearance and decor, but also by internal tectonics, design patterns [16, 17].

The next, already fourth genre, distinguished in our study, is probably the most pure from the point of view of the formation of a daylight and artificial light based on interaction. This genre has a full range of style attributes and it is easier to refer it to a visual example, than to describe it verbally. An example is the New Council of the European Union Brussels. It is not surprising that its image was wittily described in the title of the article as "Luminaire in a cube" [18].

The gradation of genres can be continued, but it is important to note among the main differences, not only the work with artificial lighting systems, but also with the organization of streams of daylight. These can be hollow fibers that reach significant dimensions [19, 20], mirror systems that repeatedly reflect the light, and new translucent materials and structures.

3. Conclusion
Predicting the further development of scientific research on lighting design, we should note the growing need for studying the medical and biological effects of the new sources of artificial light [22], the ecological properties of lighting systems and techniques. There is also a need to study the socio-psychological impact of a dynamically changing image of reality. With respect to the architectural design, it is necessary to concentrate efforts on the new methods of shaping, taking into account the new opportunities of lighting equipment, the requirements for its installation and maintenance. And the light equipment should include systems that ensure maximum use of natural daylight, which corresponds to the physical well-being of the person and also meets the requirements of the ecology on the whole. Now there is organizational, financial and project division of the issues of street, architectural and advertising lighting, improvement and reconstruction takes place, because of which the creative attempts of even qualified lighting designers come across irresistible bureaucratic barriers, and not the most successful solutions appear.

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