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## GAMES AND PLAY WITH LIGHT IN ARCHITECTURE

### GRY I ZABAWY ŚWIATŁEM DZIENNYM W ARCHITEKTURZE

#### Abstract

The paper deals with the issue of the influence of daylight on the creation of architecture in the terms of designers' play with light in the architectural space. Using the examples of contemporary realizations of some art museums, the work demonstrates the impact of exploration and experimentation conducted by the creators of visual arts on the design styles and architectural solutions. It also reveals the historical continuity of the use of light manipulation in architecture.

*Keywords: daylight, natural lighting, light manipulation, architectural creation, architecture of contemporary museum, art and architecture*

#### Streszczenie

Artykuł dotyczy problematyki wpływu światła dziennego na kreację architektury poprzez pryzmat gry i zabawy projektantów światłem w przestrzeni architektonicznej. Posługując się przykładami współczesnych realizacji muzeów sztuki, praca wykazuje wpływ poszukiwań i eksperymentów prowadzonych przez twórców sztuki wizualnej na style i rozwiązania architektoniczne. Ukazuje również historyczną ciągłość stosowania manipulacji światłem w architekturze.

*Słowa kluczowe: światło dzienne, oświetlenie naturalne, manipulacje światłem, kreacja architektoniczna, architektura współczesnego muzeum, architektura i sztuka*

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## 1. Introduction

Progress in architecture and arts is implied by scientific discoveries, the development of science, philosophy, and technological advances. In addition to new elements, the attitude to the past significantly influenced the evolution of styles. Very often new trends resulted in a different interpretation of historical elements, inspired a creative play with old forms, appealing to the knowledge and ability of the contemporary audience to interpret. However, some trends, such as the early modernist movement, remained strongly in opposition. A great deal of consideration relating to new concepts of art, work and language of art, were supported by experiments, artistic free play, and exploration of new techniques and materials, including play with light and dark.

Sunlight, which determines the biological existence and the cycle of human life, has always had an impact on architecture. In addition to practical applications, light was used to express beliefs and values that could not be represented in a material form. As early as in ancient times, thanks to astronomy, architects not only used the modulation of light, but could also send it to a desired location at a certain time. The temple of Amon-Ra in Egypt and the Pantheon in Rome are excellent examples of religious architecture where a divine strength is manifested by light.

In Christian culture light is a symbol of the presence of God. Filtered through the stained glass of mediaeval windows, the dim and vibrating “divine” light filled interiors of Gothic cathedrals, creating a mysterious and spiritual space. In the Renaissance, light returned to its rational functions as a discreet and neutral medium. It was used to emphasize the beauty of architecture – to model and reveal geometry and precision of forms. A notable example is the lighting of the Tribune at the Palazzo Uffizi in Florence. In the Baroque and Counter-Reformation periods, light resumed its mystical function of popularization and visualization of religious beliefs. Some elaborate theatrical arrangements of light (chiaroscuro contrast, blinding flashes, hidden light sources, illumination) induced optical illusions blurring the distinction between reality and imagination [5, p. 6–8]. Spectacular lighting deformed space, providing some illusory dimensions, changing the sense of size, imitating its division or the disappearance of partition [6, p. 137]. The baroque churches in Rome by Bernini and Borromini are good examples, but in particular the famous dome of the Church of San Lorenzo in Milan by Guarino Guarinini, which gives the impression of floating upwards as a promise of happiness in heaven.

## 2. Light as a medium of a new modernist philosophy – games and experiments with light in time and space

The fascination with natural light in modernist art was caused by changes in philosophy and worldview. Light varying in time expressed moving away from static absolutism toward liberal reality and relativism. This process was also implied by science, where some substantial changes in the view of light and its properties took place. The dual nature of light, wave and particle, was discovered, and the interest in this was reflected in art.

Impressionists initiated a new trend in painting, which was then continued by neo-impressionists and some representatives of post-impressionism looking for ways of visualizing the effects of light by means of painting. Modernist artists, derived from the Bauhaus school,



began to use light as a creative medium. Experiments and fun related to the presence of light in space and its interaction with materials. László Moholy-Nagy, one of the creators of kinetic sculpture, created a kind of “light fresco” by projecting the movement of light and shadow on the wall surface using his “Light-Space Machine” and space-modulators – three-dimensional compositions modulating light [5, p. 9]. Gyorgy Kepes studied the relationship between the phenomenon of light, organic forms and new technology. As a result of his interests in the social impact of art and his efforts to connect art with the latest advances in science, numerous works referring to light and architecture were created, e.g.: the first programmed “wall of light” on the facade of Radio Shack in Boston (1949), and the kinetic “walls of light” in KLM headquarters (1959), New York Times Square and Harvard Square subway station in Cambridge. [1]

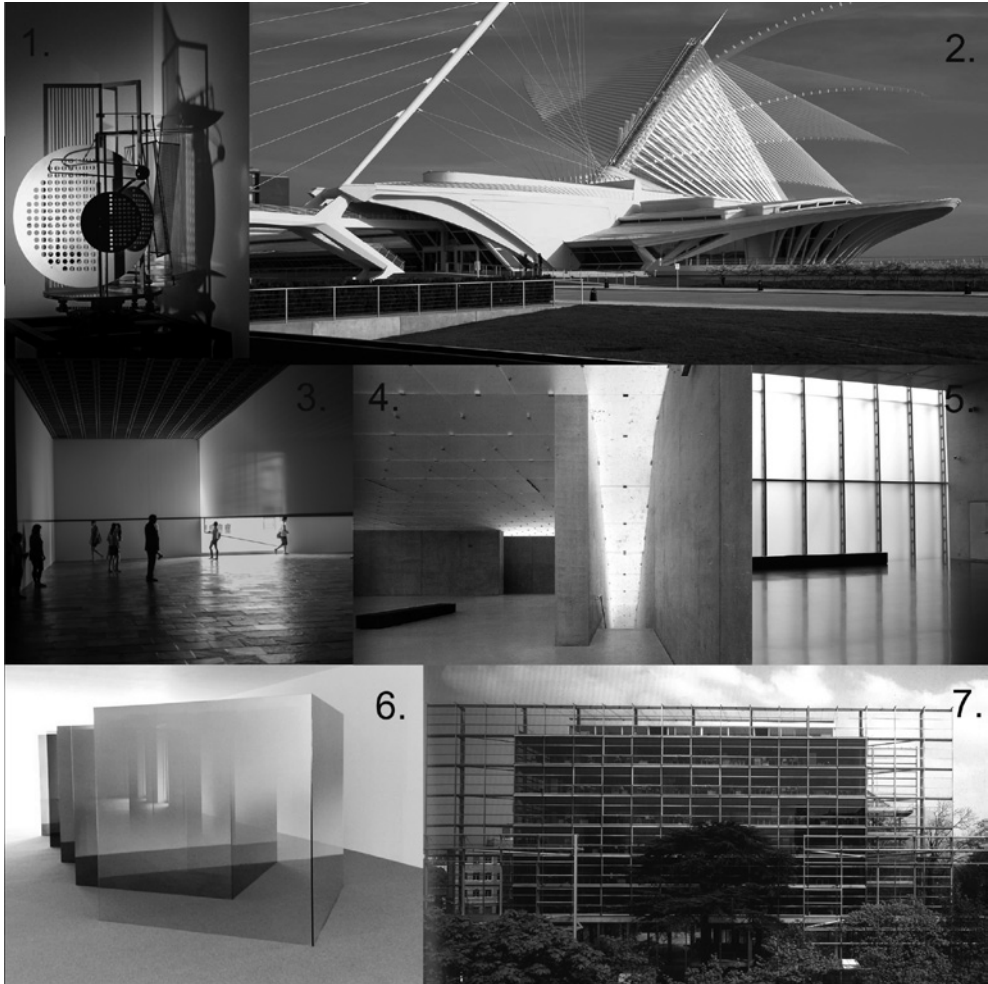
Since the 60s, a group of Californian artists, the movement “Light and Space” (Robert Irwin, James Turrell, Larry Bell and others) has been conducting some creative exploration concerning the effect of light on space, both indoors and outdoors. In contrast to kinetic performances they look for peace, contemplation, fleeting effects of light, and shadow games. Robert Irwin creates large installations and contemplates light in large spaces and in the open air. Similarly, James Turrell, exploring the issues of light perception, creates unusual works made up of space and light only, drawing attention to the physical presence of light as an object, not only as a source of lighting. Larry Bell arranges sculptural compositions of glass. He is interested in the mutual relationships between art objects, and their interaction with the environment of art. His installations include sequences of simple systems, based on the cube, with panes of transparent, stained and reflective glass, placed in light-filled interiors.

### **3. Light as a medium of architectural idea in contemporary temples of art**

Awareness of the needs and opportunities for widespread use of daylight in buildings increased radically in the era of industrialization and technological progress of the nineteenth and twentieth centuries. The technological revolution brought about absolute freedom of expressing the ideas of light, which led to countless experiences associated with it. Frank Lloyd Wright, Le Corbusier, Alvar Aalto and Louis Kahn – they were the first to draw attention to the aspects of light as energy trapped in space and noticed its metaphysical significance.

The museum is a place where special attention is paid to the quality of light whose functions are numerous: from lighting the exhibition by creating ambient light which builds, organizes and prioritises the space and also creates the atmosphere of the exposure to symbolic functions. Light as the leading topic of museum architecture was introduced by Louis Kahn. When designing the setting for The Kimbells’ fine art collection, Kahn wanted to create a space with metaphysical meaning, reflecting the absolute reality in which the art existed. The vision of silence as depicted by light was a theme developed in the design process in each element of the project. The main entrance was arranged as a sequence of experiences helping to leave behind the ordinal light (“profane”) and enter the “holy light” of the museum. Kahn achieved his purpose realising the unity of matter, space and light in the structure of the building. The use of traditional forms was combined with a precisely developed lighting technology – daylight enters through the linear skylight and falls onto a precisely calculated curvature of a reflector, and is further transmitted to the shell of vaults. M.S. Millet called the effect achieved by Kahn “holy light”, which suggested space eternity and immortality [4, p. 160–161].





- III.1. László Moholy-Nagy, *Light Space Modulator* 1922– 1930 (MoMa, New York, Workshops for Modernity)
- III. 2. Santiago Calatrava, Milwaukee Art Museum
- III. 3. Robert Irwin, *Scrim veil/Black rectangle/Natural light* 1977 (Whitney Museum of American Art, New York, installation Light and Space)
- III. 4. 5. Peter Zumthor: Kunsthau Bregenz
- III. 6. Larry Bell: *6 x 6 An Improvisation* (Chinati Foundation 2014)
- III. 7. Jean Nouvel: the Fondation Cartier pour l'art contemporain Paris

Introducing light and landscape to the interior, the glass wall has become a favourite element of contemporary architecture. The properties of glass enabled the architects to create architectural concept not by building a geometric solid but by a play of light. This led to the ethereality in architecture, producing effects of dematerialization and elusiveness through



creative manipulations and the effect of illusion, mirror images, blurring of contours, weakening of contrasts, filtering and modelling light, the penetration of space. As a result, the facades of buildings are difficult to define and isolate from the environment. The master of dematerialization, Jean Nouvel, is the author of a spectacular example of “ephemeral architecture” – the Cartier Foundation for Contemporary Art in Paris, whose facade is composed of many layers of transparent glass walls. The impressions created by the building resemble the impressions about the exhibitions of the glass installation by Larry Bell.

Deconstructivist building, which takes the form of a contemporary sculpture and becomes the means of expression, was readily used in the architecture of museums. Architects used the play of light to deepen the impression of deconstruction and dematerialization, making use in an intelligent way of the relationship between the building and the environment. The “dancing” building facades by Frank Gehry, which are covered with glossy metal sheets, “ripped” with glazing and often surrounded by water, sparkle in the sunshine. The countless and various reflections create the impression of an unreal image (Art Museum in Minneapolis, Guggenheim Museum in Bilbao and others). Daniel Libeskind emphasizes the communication role of architecture as a sign of the place. He creates sculptural buildings as dynamic systems of solids, consisting of shiny surfaces intersected irregularly by narrow strips of glass. The leading role of light is particularly evident in his method of arranging the interior as a sequence of dynamic designed images. The author engages the principle of light perception in their narrative – he uses light negatives, light contrast, chiaroscuro and the phenomenon of phototropism in order to achieve extraordinary visual effects and a strong impact on the viewer (Jewish Museum in Berlin, Imperial War Museum in Manchester). The artists of the “Light and Space” movement, such as James Turrell, use similar effects in their work. They are also characteristic of the baroque interior.

The Kunsthaus Bregenz by Peter Zumthor is a manifesto of the idea of minimalism in architecture. The form and unconventional structure of the building is subordinated to the concept of natural lighting of a three-storey gallery by “soft”, diffuse daylight flowing through the glass ceilings. The outer form of the building in the character of a translucent cube (called the “tower of light”, “piece of ice” or “immaterial ghost,”) catches the light with its entire surface, then filters it by multiple reflections from the ceiling and wall, and spreads to the interior. The raw interior of the gallery is filled with some extraordinary ambience, created by the award-filtered “special light” that creates the climate of an “underwater world”[2].

The Bellevue Arts Museum by Steven Holl is dedicated to the idea of triad, derived from the unity of art, science and technology, as well as to the philosophy of connecting the experiences of “watching, studying and creating” pieces of art. This idea is expressed by natural lighting of individual galleries. The lighting carries a symbolic meaning. Three different lighting conditions symbolize different concepts of time. Linear time is represented by the uniformity of northern light, cyclical time is expressed by southern light from the upper-side arc glazing, and gnostic time is reflected by light flowing from skylights [3, p. 200–204]. The symbolism of light and its precise handling refer both to the ancient Egyptian temples and the latest discoveries in science and technology.

The game of chiaroscuro, which stands in contrast to the white surfaces, emphasizes the rhythm of dynamic forms of structural elements designed by Santiago Calatrava. The louvred movable roof, inspired by the wings of a bird, in the Milwaukee Art Museum is the huge shading device referring to the “Shadow Machine” (kinetic sculpture designed by the architect for the exhibition in MoMA in New York). It is the most striking element of the museum’s structure and also a symbol associated with light. The vivid movement of

chiaroscuro, introduced to the interior of the building, brings associations with projections of light and shadow by using the “Light-Space Machine” or light modulators.

#### 4. Summary and conclusions

The examples of museums presented in the article show that playing with light may be a creative tool in the process of making architectural conceptions. With the use of daylight, the architect introduces the viewer into a new illusory reality, in which the matter seems to lose its volume and weight, and the space is deformed and lacking in dimensions. This game is based on the imagination, the play on senses, it appeals to dreams.

Some similarities and correspondence in the ways of playing with natural light are visible in both architecture and the visual arts. This is due to the interest in light as a medium in the modernist movement of the Bauhaus school. The interaction of light and materials becomes the theme of study they both share – playing with light and glass and experimenting with new materials. Both architects and visual artists have been asking the question of whether light is both the means of visualizing reality and an independent element in space and are trying to find the answer. Artistic effects – the quality of lighting, illusions – can be compared with the best historical realizations, because games and the manipulation of natural light have been known since ancient times.

The artistic experiments carried out by the “Light and Space” movement also concerned artificial lighting. Currently, the area of exploration has been extended to new inventions in lighting technology, information technology, multimedia technology and intelligent glazing systems, adapting to changing environmental conditions. Modern buildings are designed in the context of their day and nighttime appearance. Their facades take over the functions of interactive connectors for receiving and processing external and internal stimuli.

It seems, however, that the part of creativity associated with natural light remains invariably important in architecture and art because it proves to be everlasting, friendly and close to nature and humankind.

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