

# Daylight, Definition, Interpretation and Application Today

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## Abstract

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Light is a universal medium that illuminates our world. It is the key to discovering the mysteries of the universe, of the spiritual and physical dimensions of the human past, present and future. The history of light and its impact on our world is almost infinite, and through it we search for the origin of life and civilization. It is a story that starts with the beginning of the world and goes on all the way to the development of quantum physics. It unifies and intertwines the art, science, architecture, religion, and philosophy in time and space.

## Introduction

Daylight is the beginning...

The Evolution of people is based on the conditions of natural light. The Sun as a source of day light, has been respected by many religions as a home of Gods or as a Deity. In the course of history, architects-built objects for the Sun. They did it in order to enable god respect of Sun, as well as to trace the route to heaven. There was a belief that the lit objects could prevent various illnesses. [Imhotep]

The treatment of lighting, as well as its cultural and symbolic meaning, from the aspect of rational and emotional approach, were often changed being pro and against. Light is the unique immaterial and invisible element having the same treatment as building material, an element which has an impact on the choice of a home/shelter, as well as while defining the wall masses of the closed volume.

Day light is a base for the existence of floral world, but the effect of daylight on certain organic functions of animals and men is also important, as well

as for the metabolism and hormone regulation. Light is elixir giving life. It is essential to provide day light for maintaining the psychic health which urges thinking, brings joy and makes us feel grateful for our own experience.

Day light as one of the segments in the process of drawing the plans and exploiting of objects is the basic element which directly influences health condition of people living in that space. According to Christopher Alexander et al. [1], people by their nature are phototropic. They move depending on light and when static, they orientate themselves towards light. The maximum use of daylight, on which the biological rhythm of human organism depends, as well as the health and the working ability of the users, it penetrates into the space, through light openings and contributes to the visual enlargement of the interior and connection with the exterior surroundings.

Through the openings, it is made possible for the exterior dynamics of the surrounding to penetrate into the closed within the space. Unlike the artificial light, which can be sent towards any point in the interior, and its intensity to be controlled depending on the wishes of the users, the use of daylight is characterized by quite different approach because of

its specifics and characteristics. Its variability has an impact on the expression of each architectural and artistic work.

The rhythm of day, the cycle of light and dark during the year as well as the inconsistency, and changeability of weather and sky conditions, have total influence on our perception. Light and materials are mutually dependent one on the other. The materials are essential to understand light in architecture because they directly influence the quality and the quantity of light.

Peter Zumtor [2], describes the irreplaceable sense of the presence of day light in his book "Atmosphere" in the chapter "The light on Things": "When I think about daylight and artificial light, I must admit that daylight i.e., the light of the things is so excitable so that I feel its spiritual quality. In the morning, when the Sun rises – what I consider wonderful, absolutely fascinating because of the manner it rises every morning – and aims its rays on things, it does not look as it belongs to this world. I do not understand light. It gives me the sense that there is something above me, something beyond every understanding. And I am very glad and very grateful that such thing exists.", (Figure 1).

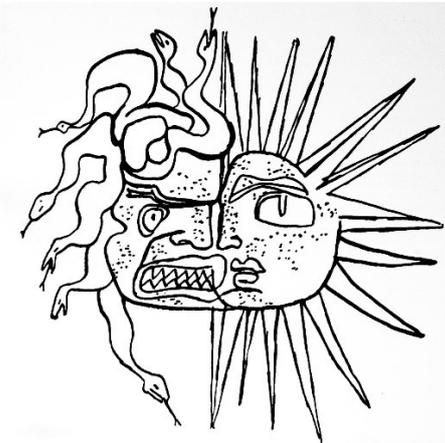


Figure 1: Le Corbusier, drawing of Apollo/medusa dialogic balance between two contrasted powers

Light and warmth are two essential items of daylight, which directly influence the quality of space. Nowadays these two components are considered as basic prerequisites while drawing up the plans for objects. The energetic crisis as natural condition and the characteristics of the time during our life are constants of contemporary time, which directly relate to the ecological and economic crisis and are in a dynamic and interactive connection. According to research carried out in Europe, the energy used in buildings takes up 40-50% of the total consumers' energy. The greatest part is used for warming and cooling the objects, so the percentage regarding the energy used for lighting the objects is not less. Such condition impose natural quantities having priority over the choice of materials

and the way of the building of objects.

## Light And Position

With its typical colorful dance, day light has a leading role in creating the character of the place itself. It is most probably the unique medium, which provides the two senses for the position and time. Architects should find the specific nature of light thus adapting the object to characteristics of terrain as for the condition of daily light, but not only the aim to increase our sensual feeling, but also to make the saving of energy possible. It is also evident that in architecture daily light cannot be looked upon separately, it is always necessary to have reciprocity between the climate and topography of the place, as well as the local history and everyday habits of local population.

## Light And Space

If it is necessary to define the basic criteria of the aim of bringing daily light into the space, then it can be considered separately as criteria of performances of lighting and its influence on the character of the space and the people staying in that space. The initial step in thinking over the lighting of a certain space is to define the aims and specifications of the space as well as the necessary quantity of light to realize the effects that should be achieved. It is essential the aim of lighting to be in harmony with the general architectural achievements thus putting on accent on the basic idea and the concept of the space. Even in 1933 Le Corbusier [3], in The Athens Charter emphasized that bringing the Sun in the space should be imperative task for architects.

James Turrell, an artist dealing with light in space wrote about the "importance of light" and its influence upon the character of space: "In essence I create spaces which captivate light and keep it so that you can feel it physically. It is a realization your eyes can "touch", see and feel. And when eyes are open you give space to this sensation, the touch comes out of the eyes in the form of sense.", [4].

## Lighting Of Space

Lighting of a space contributes to evaluating the quality of the object. The treatment of light as a component in the architectural creativity is an additional aspect making it possible to raise the aesthetic and functional value of the object. The

process of transformation and the control of day light is an effect which is always actual and is a substantial architectural problem, but is also an opportunity for the making the psychophysical, architectural, and urban quality of staying and living in a certain space better and more valuable. One of the more modern approaches towards solving the problem of high-quality lighting in the objects is a so-called Holistic approach by which the local conditions in the process of urban and architectural planning are taken into consideration. Objects in their energetic balance should be looked at as independent systems, which optimally use the surrounding forms of energy to satisfy their own various kinds of needs. They should be constant systems with possibilities to satisfy various needs on a larger period of time (Figure 2).

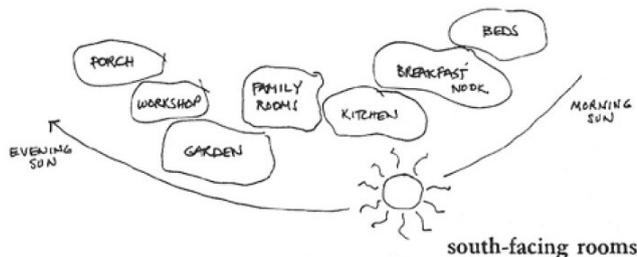


Figure 2: Christopher Alexander, #128 indoor sunlight, A Pattern Language

Each object should be looked at individually, which functions independently at the same time perceiving its exterior surroundings. The choice of disposition of the object and the interior functional organization should be subordinated to natural laws. This kind of approach facilitates the use of contemporary technological achievements, which can be used in positive sense without disturbing the biological balance of man.

## Light Openings as Primary Visual and Aesthetic Elements

The metaphor “Windows are the eyes of the house” express the wisdom of the saying because at the same time it defines dual role looking outside and admitting light, as well as the ambiguous function of simultaneous dividing and connecting of interior and exterior. The word “window” also means that it is not only an opening for light, but also for weather conditions. Therefore, it is a border crossing for atmospheric phenomena, which have an influence upon the users in pleasant and unpleasant ways equally. The definition of the dimension, the proportion and location of the elements creating the appearance of the object, can be explained by Le Corbusier’s thought expressing the connection of window to aesthetic.

“In the history of architecture through centuries, the history of window was a constant fight

between the wishes for light and the laws of aesthetics.”

The light openings in this context of performance and influence are subordinated highly as a cause and consequence of the other functions of the contemporary systems. The correct defining of dimension and character is the primary task, which contributes to qualitative lighting and energetic balance of the object. The analysis and defining the forms through proportional analysis of the light openings depending on the depth of space is an additional factor, which contributes to the quality of lighting. The right relation between the height and depth of the space is a good starting position when defining the dimension of the light openings (Figure 3), [5].



Figure 3: Rob Krier, Elements of Architecture

By correct treatment and materialization and the proper constructive solution based on scientific and technical level, the light openings can create an ambient satisfying the following factors:

- The factor of convenience in regard of satisfying the need for qualitative lighting and optimal thermal characteristics which establish balance of man in his activities
- The factor of visual connection of the surroundings and the psychic balance of men
- The factor of safety and security of people from exterior conditions
- The factor of economy based on energetic balance

Defining the transparency of objects is mainly focused on satisfying the following contradictory demands:

### **Lighting – Warming – Protection - Cooling**

Besides satisfying the social and physical demands of man as final user of a certain space, daily light determined by light openings has an impact with its aesthetic character on forming the shape,

expression and appearance of each architectural item. Yet, we should not neglect the other functions of light such as: the protection from noise which nowadays becomes a great problem to which we should pay attention, airing out and protection from atmospheric influences.

Such multifunction of light openings imposes their significance as elements, which should have an adequate place when beginning the process of shaping and not be the result of already defined volumes and building elements.

### ***Protection From Excessive Lighting***

Besides all the positive benefits of bringing inside sun light and warmth, there are some negative and unpleasant appearances such as flash, excessive warming, too much sunlight and usual uneasiness. Because of all the above-mentioned negative effects, we can conclude that sometimes some appropriate elements protecting the final user of space should be used.

The use of brisolei (systems for protection from excessive solar radiation) is actualized once more, but with noticeably changed and transformed function. Solar shaders on objects are used again as first-rate functional decoration. The contemporary double coverings, which more and more replace the classical facades, contribute to maximum use of natural laws applied in the function of objects (the circulation of air through the double coverings in natural way avoiding the connectional systems for cooling and warming). When using double coverings, the shaders are integrated in the function and façade of the object itself, [6].

Nowadays the number of objects in which the shaders besides their primary aim for shelter have also the function of collector with photo cells giving low electrical energy for domestic use, is not small.

These positive characteristics contribute to greater use of shaders in all kinds of objects with an individual approach as for the choice of materials and the way of installing.

By this, the above-mentioned items can be taken into consideration and used as initial element in the process of drawing up the plans and enabling the primary, recognizing the possible performances of day light, its influence on space and possibility for adequate choice of dimension of the openings. In favor of this, we take into consideration the fast technological development and modern materials, which are in correlation with the quantity and quality of lighting. The development of modern materials for glassing and shading enables flexibility, which is in context with the dimension of the light openings to that rate that the quality of light is dependent on the wishes on the man.

Thus because of that, the problem of bringing in daily light should be constituent part in the process of integral development of architectural form and its operation in the context of defining the elements and relations defining the character of the object.

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