Museum lighting

If you compare the museum as a medium to the cinema, theatre, or television, exhibition design can be regarded as its means of expression.

Every exhibition comprises a synergy of three crucial aspects:(see Davallon, 1999):

⇛ firstly, that of content, i.e. the creation of an appropriate setting, irrespective of the theme of the exhibition: paintings, ethnological exhibition, etc. This setting represents the semantics of the exhibition.

⇛ secondly, the spatial dimension i.e. the contents of the exhibition are transported into the space, and the various exhibits arranged in an appropriate order. This might be referred to as the syntax of the exhibition.

⇛ finally, the communicative aspect. This cannot be separated from the first two, since it is this aspect that creates exhibition design out of museum design. This aspect of communication is best addressed by applying the rules relating to sensory ergonomics. It represents the pragmatic aspect.In the case of museums, a further dimension should be added: the material conservation of the exhibits. We should therefore no longer refer to "exhibition design", but to "museum design " (see Ezrati, 1996). As with the communicative aspect, this is also part of the pragmatic aspect of the exhibition.

"Museum design" means the creation of a setting combining various elements, such as the arrangement of the exhibits, the partitions, the furnishings, the plinths, all the items that lend the space a structure, the forms and the colours, and naturally the light in which the entire ensemble is bathed. The latter is the material we lighting designers work with.

Light is also used as a medium for presentation in the theatre, of course, where it has enjoyed its crucial role as part of the set for many years: lighting effects, accent lighting, and dynamic light, whereby the three dimensions that apply to exhibitions (semantic, syntactic and pragmatic) are addressed. In the field of museum lighting, we still have a long way to go.

If lighting is not included as a crucial element of the overall design at an early stage in the project, there is a danger that the contents of the exhibition may be misconstrued, that visual comfort and the conservation of the exhibits neglected, and the visitors sorely disappointed.

Museum lighting can therefore be defined as the application of light to create an expressive setting, the aim being to communicate, and guarantee the material integrity of the exhibits.

In the field of museum lighting light is

⇛ a means of expression

⇛ an ergonomic element

⇛ but also, unfortunately, a medium that causes deterioration.

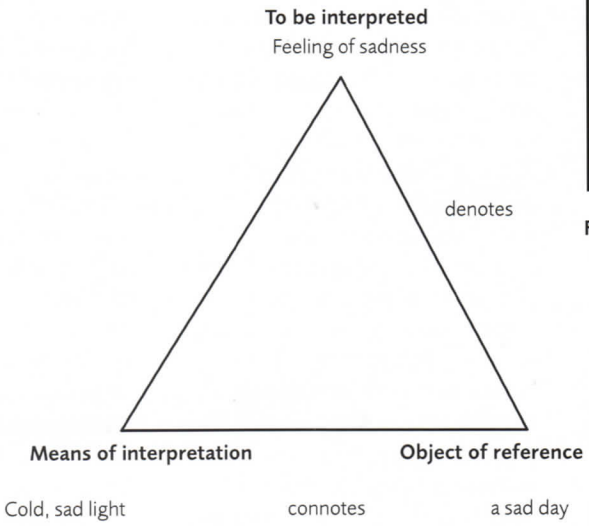
Exhibition of sculptures in a space designed for an exhibition of paintings. Artificial lighting has been added to the diffuse daylight that penetrates the glass ceiling: one single spotlight per sculpture, like one single ray of sunshine (PAR 38 lamp).

MUSEUM LIGHTING
Text: Jean-Jacques Ezrati

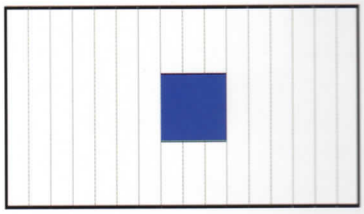
Lighting for a space with changing exhibitions: in this case, the Palais Galliera in Paris where the technical infrastructure allows the space to be transformed into an atelier or a theatrical setting: adjustable gantry structure, adjustable spotlights, computer-controlled programming, etc.

Lighting as a means of expression

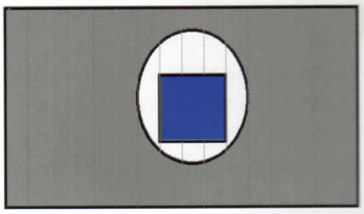
Reviewing the statements made above, it can now be maintained that the lighting in a museum is the language with which the museum design expresses itself, its means of expression in other words, and, like the other elements, it fulfils the criteria of a semiotic system. This involves a whole series of light-related variables (luminous colour, luminous intensity, direction, beam spread, etc.), which together form significant units (let us refer to them as "photorems"). A good example might be the creation of a gloomy, sad atmosphere through the application of cold, weak light, like a winter's day:



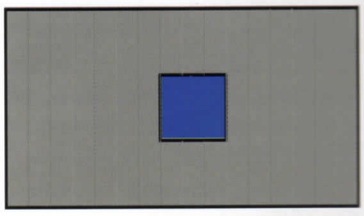
Or another example, in the case of the localised lighting of a two-dimensional object:



Directed light



Focussed light



Framed or dramatised light

Example of irreversible photochemical damage to a bird's feather exposed to daylight for a number of weeks (photo: ICCROM).

In the first case, *directed* light links the object (a commercial poster, a painting by Klein, a mediaeval painting.) with the background against which it is set (a white wall, a redbrick wall, a wooden panel). The influence of the nature of the background, when viewed in context with the object, is important.

The second case is equally significant, although it bears a different significance. Here we are dealing with *focussed* light. The object is accentuated, the background loses in significance and has little influence on the overall presentation of the exhibit.

In the third case, where *framed or dramatised* light is applied, the area surrounding the object is fully negated. The light separates the work of art from the surrounding space. The background appears to be missing, which accentuates the illuminated object even more. This effect is further enhanced by the stark contrast between the object of attention and the surrounding negated space. This stark contrast allows the luminous intensity to be reduced considerably, which is often necessary to meet curatorial requirements.

Light as an ergonomic element

Light and lighting are there, or applied , to help us to see, and to see better with the minimum of visual fatigue. The lighting must be functional, but it must also fulfil the intention of the lighting designer's design. Luminous intensity, the quality of the colour spectrum and a reduction of disturbing side effects (glare, reflections, stray light) form the basis for good lighting. These principles also apply to museum lighting.

The lux levels recommended for light-sensitive objects are often not sufficient to allow textual information on dark backgrounds or colours to be recognised properly (50 lux in comparison to the 1500 lux recommended for viewing colours, or in the catering busi-ness). Visual acuity worsens with age: 60-year-olds need twice as much light to see by as 20-year-olds. If we do not take this into account, we undermine the interest of a great many visitors to museums.

High-quality lighting is therefore required. Human vision is designed to be stimulated by daylight, i.e. by a balanced and complete colour spectrum. The light sources available have spectrums that comprise a number of different rays, which together produce white light. These are the "high-performance" or compact fluorescent lamps on the market, and tend to be used everywhere. This light can be used effectively to supplement daylight, but is bad, if not dangerous, when used to substitute natural light. Since our visual system is designed to continuously balance the colour spectrum, the result can only be increased visual fatigue. Certain lamps also give rise to physiological problems: two different, but very similar colours appear to be practically the same under one light source and different under a light source with a different spectral composition.

Disturbing luminance occurs when the visitor's attention is drawn towards an overlit surface which is not relevant to the specific visual task. The next stage of disturbance incorporates glare. The smaller the light source, and the greater the contrast to its surroundings, the greater the glare factor.

Nothing is more disturbing than a patch of bright light on a painting, or on a work of art displayed under glass or in a showcase. Visitors have to perform a number of contortions to view the work properly.

Light as an element that causes deterioration

Light is energy and energy is the result of interactive atoms in motion. The interactive motion of oxygen, hydrogen, chlorine and nitrogen atoms, which are to be found in organic substances such as textiles, paper, leather and skin, are comparable to the energy produced through visible radiation and the inherent UV radiation. It is therefore easy to understand that light can have a subsequent detrimental effect on these substances through various chemical processes (yellowing, disintegration due to a break in the carbon chain, etc.) (s. Brill, 1980). The damage does not only

Protecting a Chinese silk painting from daylight using an electric. It is unfortunate that the curators went for white and such a plain design. They certainly paid attention to preserving the precious material, but it does little for the exhibition design.

depend on the kind of material, therefore, but also on the spectral composition of the light. Daylight comprises the full spectrum of shortwave radiation, for example, and is far more detrimental that incandescent light, which produces practically no UV radiation and has only a limited shortwave component. Since this produces heat, the detrimental effect is not of a photochemical, but rather of a thermal nature.

The effect of this radiation on materials is cumulative, i.e. the degree of damage depends on the duration of exposure, and on the illuminance. The results are the same for an object subjected to 50 lux for a period of 30 000 hours (10 years' exposure to light) as for a comparable object subjected to 500 lux for a period of 3000 hours (one year's exposure to light). The following recommendations should therefore be adhered to: (Thomson, 1986, Bergeron, 1994, CIE 3-22).

Insensitive materials (stone, metal, ceramics)	---
Sensitive materials (wood, ivory, paint):	600 000 Lxh/a
Very sensitive materials (etchings, b/w photos):	150 000 Lxh/a
Extremely sensitive materials (textiles, paper):	15 000 Lxh/a

Basic principles:
⇛ UV radiation should be eliminated
⇛ visible radiation should be controlled
⇛ IR radiation should be reduced

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An international museum guide is shortly to be published entitled "Guide to Museum Lighting and Protection against Radiation Damage", compiled by CIE technical committee 3-22, chaired by Professor Eliyaou Neéman (Technion -. Israel) with the active support of the members of the Conservation Committee of the International Council of Museums(ICOM-CC) together with members of professional lighting associations: P.Gabriel (IALD), Prof. Dr. H. Kramer (ELDA), J. Oksanen (ELDA), and JJ Ezrati (ACE).

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