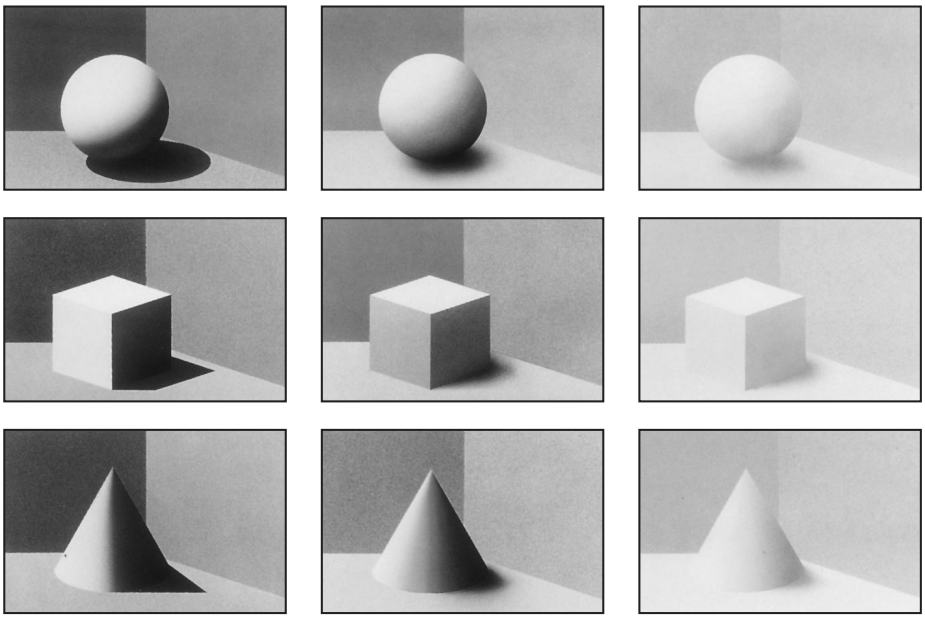
that he has at his disposal. Whereas the light emitted by diffuse or exposed light sources always has an effect on the entire space, in the case of tightly controlled light, the effect of the light relates directly to the position of the luminaire.

Here lies one of the most progressive aspects of lighting technology. Whereas in the era of the candle and the oil lamp the light was bound to the immediate vicinity of the luminaire, it is now possible to use light in other parts of the space at any distance from where the light source is located. It is possible to use lighting effects at specific illuminance levels on exactly defined areas from practically any location within a space. This means that a space can be purposefully lit and the lighting modulated. The relative local illuminance level can be adjusted to suit the significance of a particular part of a space and the perceptual information it contains.



Perception of three-dimensional forms and surface structures under different lighting conditions.
Directed light produces pronounced shadows and strong shaping effects. Forms and surface structures are accentuated, while details can be concealed by the shadows.

Lighting that consists of both diffuse and directed lighting produces soft shadows. Forms and surface structures can be recognised clearly. There are no disturbing shadows.

Diffuse lighting produces negligible shadowing. Shapes and surface structures are poorly recognisable.

2.5.2.1 Modelling

Another basic feature of the world around us, and one that we take absolutely for granted, is its three-dimensional quality. One essential objective regarding visual perception must therefore be to provide information about this aspect of our environment. Three-dimensionality comprises a number of individual areas, from the extension of the space around us to the location and orientation of objects within the space, down to their spatial form and surface structure.

Perception of the three-dimensional character of our environment involves processes that relate to our physiology and perceptual psychology. The shaping of our environment through light and shade is of prime importance for our perception of spatial forms and surface structures. Modelling is primarily effected using directed light. This has been referred to, but the significance for human perception must be analysed.

If we view a sphere under completely diffuse light we cannot perceive its spatial form. It appears to be no more than a circular area. Only when directed light falls on the sphere – i.e. when shadows are created, can we recognise its spatial quality. The same applies to the way we perceive surface structures. These are difficult to recognise under diffuse light. The texture of a surface only stands out when light is directed onto the surface at an angle and produces shadows.

Only through directed light are we able to gain information about the three-dimensional character of objects. Just as it is impossible for us to retrieve this information when there is no directed light at all, too much shaping can conceal information. This happens when intensely

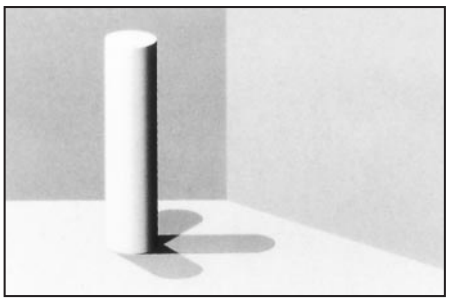
directed light casts such stark shadows that parts of an object are concealed by the darkness.

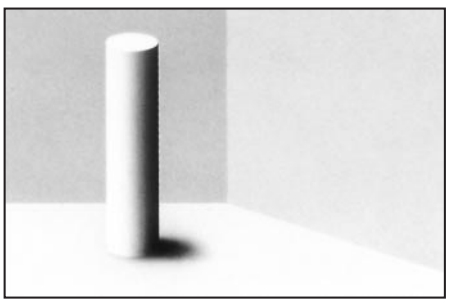
The task of lighting design is therefore to create a suitable ratio of diffuse light to directed light to meet the requirements of each individual situation. Specific visual tasks, where the spatial quality or the surface structure is of prime importance, require lighting that emphasises shapes and forms. Only in situations where spatial quality and surface structure are of no importance, or if they are disturbing factors, can completely diffuse lighting be used.

As a rule suitable proportions of diffuse light and directed light are required. Well balanced portions provide good overall visibility of the environment and simultaneously allow spatial appreciation and vivid perception of the objects.

In some standards for workplace lighting there is a criterion for the modelling effect of a lighting installation. It is referred to as the modelling factor, which is defined as the ratio of cylindrical illuminance to horizontal illuminance.

When planning the application of directed and diffuse light it is advisable to rely on our fundamental experience of daylight with regard to the direction and colour of the light. Direct sunlight either comes from above or from the side, but never from below. The colour of sunlight is clearly warmer than that of diffuse sky light. Consequently, lighting that comprises directed light falling diagonally from above with a lower colour temperature than the diffuse general lighting will be felt to be natural. It is, of course, possible to apply light from other directions and with other colour temperature combinations, but this will lead to effects that are especially striking or strange.





It is possible to create uniform lighting in a space by using several point light sources. Due to the fact that each light beam is directed, objects within the space will cast multiple shadows.

In the case of uniform lighting with diffuse light the shadows are softer and far less distinct.

2.5.2.2 Brilliance

Another feature of directed light alongside its modelling effect is brilliance. Brilliance is produced by compact, point light sources and is most effective when applied with an extremely low proportion of diffuse light. The light source itself will be seen as a brilliant point of light. A good example of this is the effect of a candlelight in evening light. Objects that refract this light are perceived as specular, e.g. illuminated glass, polished gems or crystal chandeliers. Brilliance is also produced when light falls on highly glossy surfaces, such as porcelain, glass, paint or varnish, polished metal or wet materials.

Since sparkling effects are produced by reflections or refraction, they are not primarily dependent on the amount of light applied, but mostly on the luminous intensity of the light source. A very compact light source (e.g. a low-voltage halogen lamp) can create reflections of far greater brilliance than a less compact lamp of greater luminous power.

Brilliance can be a means of attracting attention to the light source, lending a space an interesting, lively character. When applied to the lighting of objects brilliance accentuates their spatial quality and surface structure – similar to modelling – because sparkling effects are mainly evident along edges and around the curves on shiny objects.

Accentuating form and surface structure using brilliance enhances the quality of the illuminated objects and their surroundings. Sparkling effects are in fact generally used in practice to make objects or spaces more interesting and prestigious. If an environment – a festival hall, a church or a lobby – is to appear especially festive, this can be achieved by using sparkling light sources: candlelight or low-voltage halogen lamps.

Directed light can also be applied with sparkling effect for the presentation of specific objects – making them appear more precious. This applies above all for the presentation of refractive or shiny materials, i.e. glass, ceramics, paint or metal. Brilliance is effective because it attracts our attention with the promise of information content. The information we receive may only be that there is a sparkling light source. But it may also be information regarding the type and quality of a surface, through the geometry and symmetry of the reflections.
The question still has to be raised, however, whether the information our attention has been drawn to is really of interest in the particular situation. If this is the case, we will accept the sparkling light as pleasant and interesting. It will create the feeling that the object of perception, or the overall environment, is exclusive.

If the brilliance possesses no informative value, then it is found to be disturbing. Disturbing brilliance is referred to as glare. This applies in particular when it arrises as reflected glare. In offices, reflections on clear plastic sleeves, computer monitors or glossy paper are not interpreted as information (brilliance), but as disturbing glare, disturbing as it is felt that the information we require is being concealed behind the reflections.