Our apparent knowledge of distance ratios therefore gives rise to a change in the way we perceive things. As the distances in the drawing are however fictitious, we can say that there is evidence that the brain is able to perform interpretative processes that are not dependent on external stimuli. Perception therefore cannot be attributed to one principle alone, but results from various mechanisms.

2.1.2.1 Constancy

Even if there is not one simple explanation for the way perception works, the question regarding which objective the various mechanisms serve remains an interesting one. Optical illusions provide an opportunity to examine the effects and aims of perception. Optical illusion is not a case of a perceptual faux pas, but can be regarded as the border case of a mechanism that provides essential information under everyday conditions. This indicates that both phenomena described above, both the changing perception of brightness on identical surfaces and the erroneous perception of lines of equal length, can be explained as stemming from one common objective.

One of the most important tasks of perception is to differentiate between constant objects and changes in our surroundings in the continuously changing shapes and distribution of brightness of the image on the retina. Since constant objects also produce retina images of varying shapes, sizes and brightness arising due to changes in lighting, distance or perspective, this indicates that mechanisms must exist to identify these objects and their properties and to perceive them as being constant.

Our misinterpretation of lines of the same length shows that the perceived size of an object does not depend on the size of the retina image alone, but that the distance of the observer from the object is significant. Vice versa, objects of known sizes are used to judge distances or to recognise the size of adjacent objects. Judging from daily experience this mechanism is sufficient to allow us to perceive objects and their size reliably. A person seen a long way away is therefore not perceived as a dwarf and a house on the horizon not as a small box. Only in extreme situations does our perception deceive us: looking out of an aeroplane objects on the ground appear to be tiny; the viewing of objects that are considerably farther away, e.g. the moon, is much more difficult for us to handle.

Just as we have mechanisms that handle the perception of size we have similar mechanisms that balance the perspective distortion of objects. They guarantee that the changing trapezoidal and ellipsoidal forms in the retina image can be perceived as spatial manifestations of constant, rectangular or round objects, while taking into consideration the angle at which the object is viewed.

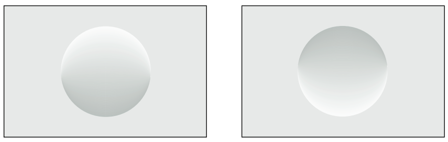
When it comes to lighting design there is a further complex of constancy phenomena that are of significance; those which control the perception of bright-ness. Through the identification of the luminous reflectance of a surface it becomes apparent that a surface reflects light differently depending on the intensity of the surrounding lighting, i.e. the luminance of a surface varies. The illuminated side of a unicoloured object has a higher luminance than the side that receives no direct light; a black object in sunlight shows a considerably higher level of luminance than a white object in an interior space. If perception depended on seen luminance, the luminous reflectance would not be recognised as a constant property of an object.

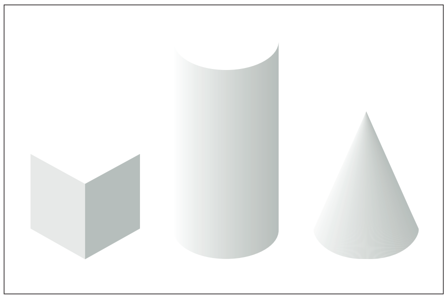
A mechanism is required that determines the luminous reflectance of a surface from the ratio of the luminances of this surface to its surroundings. This means that a white surface is assumed to be white both in light and shade, because in relation to the surrounding sufaces it reflects more light. There is, however, the borderline case, as indicated above, where two surfaces of the same colour are perceived as being of a different brightness under the same lighting due to different surrounding surfaces.

The ability of the perceptual process to recognise the luminous reflectance of objects under different illuminance levels is actually only half the story. There must be additional mechanisms that go beyond the perception of luminous reflectance, while processing varying gradients and sharp differences in luminance.

We are familiar with changing luminance levels on the surfaces around us. They may be the result of the type of lighting: one example of this is the gradual decrease in brightness along the rear wall of a space that is daylit from one side only. Or they may arise from the spatial form of the illuminated object: examples of this are the formation of typical shadows on spatial bodies such as cubes, cylinders or spheres. A third reason for the presence of different luminances may lie in the quality of the surface. Uneven reflectance results in uneven luminance even if the lighting is uniform. The aim of the perceptual process is to decide whether an object is of a single colour, but not lit uniformly, or whether it is spatially formed or a uniformly lit object with an uneven reflection factor.

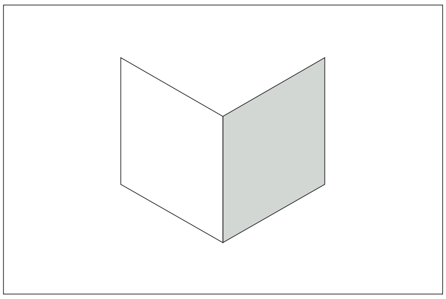
The spatial impression is determined by the unconscious assumption that light comes from above. By inverting the picture the perception of elevation and depth is changed.





The spatial quality of an object can be recognised purely from the gradient of the shadows.

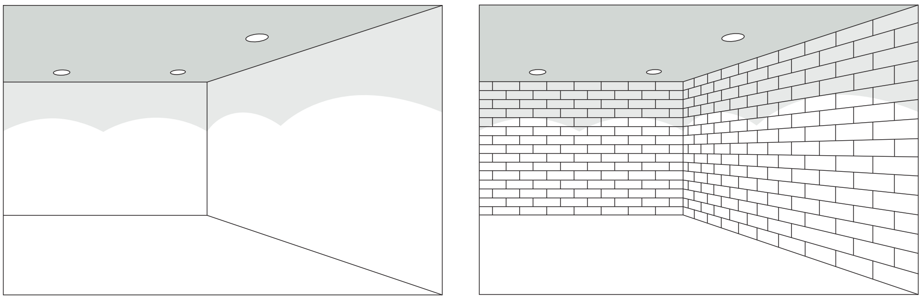
Change of perception from light/dark to black/white if the spatial interpretation of the figure changes.

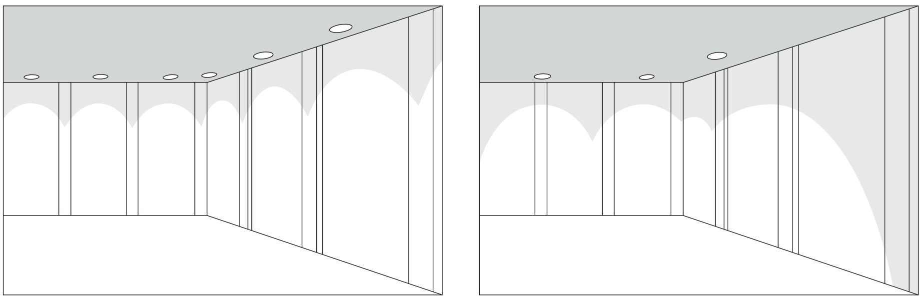


The example shown here serves to explain this process. As a rule the folded card is perceived as if it is being viewed from the outside (fold to the front). In this case it appears to be uniformly white but lit from one side. If the card is seen as being viewed from inside (fold to the rear), it is perceived as being uniformly lit but with one half coloured black. The luminance pattern of the retina image is therefore interpreted differently: in one case it is attributed to a characteristic black/white coloration of the perceived object; in the other case perception does not cover the different luminance in the perception of the apparently uniformly white card; it is taken to be a feature of the lighting situation.

One characteristic feature of perception is, therefore, the preference for simple and easily comprehensible interpretations. Differences in luminance are effectively eliminated from the perceived images to a large extent or especially emphasized depending on whether they are interpreted as a characteristic feature of the object or as a feature of the surroundings – in this case, of the lighting.

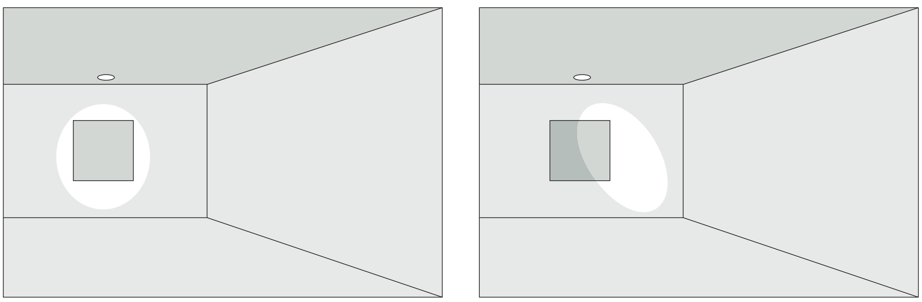
The lighting distribution on an unstructured wall becomes a dominant feature, whereas the same lighting distribution on a structured wall is interpreted as background and not perceived.





Light distribution that is not aligned with the architectural structure of the space is perceived as disturbing patterns that do not relate to the space.

The position of the luminous beam determines whether it is perceived as background or as a disturbing shape.



These mechanisms should be taken into consideration when designing the lighting for a space. The first conclusion that can be drawn is that the impression of uniform brightness does not depend on totally uniform lighting, but that it can be achieved by means of luminance gradients that run uniformly.

On the other hand irregular or uneven luminances can lead to confusing lighting situations. This is evident, for example, when luminous patterns created on the walls bear no relation to the architecture. The observer's attention is drawn to a luminance pattern that cannot be explained through the properties of the wall, nor as an important feature of the lighting. If luminance patterns are irregular they should, therefore, always be in accordance with the architecture.

The perception of colour, similar to the perception of brightness, is dependent on surrounding colours and the quality of the lighting. The necessity to interpret colours is based on the fact that colour appearances around us are constantly changing.

A colour is therefore perceived as being constant both when viewed in the bluish light of an overcast sky or in warmer direct sunlight – colour photographs taken under the same conditions, however, show the colour shifts we expect under the particular lighting.

Perception is therefore able to adjust to the respective colour properties of the lighting, thereby providing constant colour perception under changing conditions. This only applies, however, when