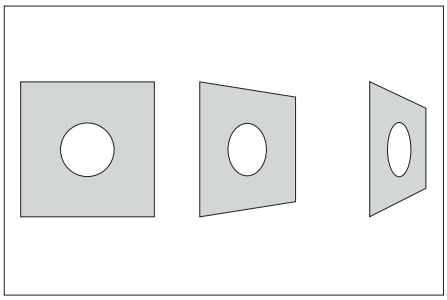
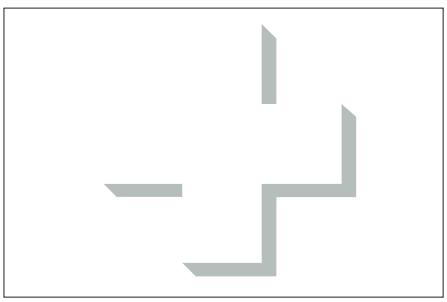
This spherical misrepresentation is accompanied by clear chromatic aberration – light of various wavelengths is refracted to varying degrees, which produces coloured rings around the objects viewed.

The eye is therefore a very inadequate optical instrument. It produces a spatially distorted and non-colour corrected image on the retina. But these defects are not evident in our actual perception of the world around us. This means that they must somehow be eliminated while the image is being processed in the brain.

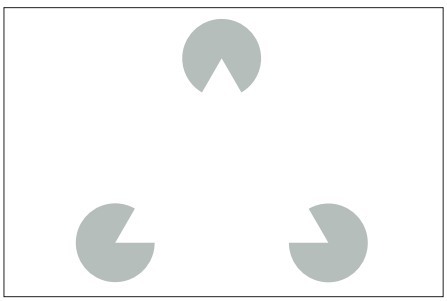
Perceptual constancy: perception of a shape in spite of the fact that the image on the retina is changing with the changing perspective.



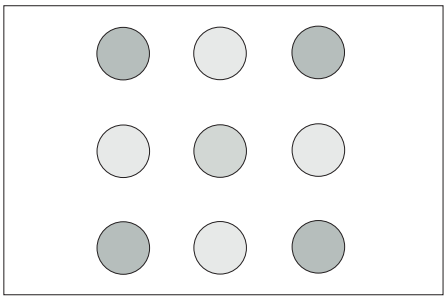
Apart from this corrective process there are a number of other considerable differences between the image on the retina and what we actually perceive. If we perceive objects that are arranged within a space, this gives rise to images on the retina whose perspectives are distorted. A square perceived at an angle, for example, will produce a trapezoidal image on the retina. This image may, however, also have been produced by a trapezoidal surface viewed front on, or by an unlimited number of square shapes arranged at an angle. The only thing that is perceived is one single shape – the square that this image has actually produced. This perception of a square shape remains consistent, even if viewer or object move, although the shape of the image projected on the retina is constantly changing due to the changing perspective. Perception cannot therefore only be purely a matter of rendering the image on the retina available to our conscious mind. It is more a result of the way the image is interpreted.



Perception of a shape based on shadow formation alone when contours are missing.



Recognising an overall shape by revealing essential details.



Matching a colour to the respective pattern perceived. The colour of the central grey point adjusts itself to the black or white colour of the respective perceived pattern of five

2.1.2 Perceptual psychology

Presenting a model of the eye to demonstrate the similarities to the workings of a camera does not provide any explanation as to how the perceived image comes into being – it only transports the object to be perceived from the outside world to the cortex. To truly understand what visual perception is all about, it is not so much the transport of visual information that is of significance, but rather the process involved in the interpretation of this information, the creation of visual impressions.

The next question that arises is whether our ability to perceive the world around us is innate or the result of a learning process, i.e. whether it has to be developed through experience. Another point to be considered is whether sense impressions from outside alone are re-sponsible for the perceived image or whether the brain translates these stimuli into a perceivable image through the application of its own principles of order.

There is no clear answer to this question. Perceptual psychology is divided on this point. There are, in fact, a number of contradictory opinions, each of which can provide evidence of various kinds to prove

their point. But not one of these schools of thought is able to give a plausible explanation for all the phenomena that occur during the visual process.

There is an indication that the spatial aspect of perception is innate. If you place new-born animals (or six-month-old babies) on a glass panel that overlaps a step, they will avoid moving onto the area beyond the step. This indicates that the innate visual recognition of depth and its inherent dangers have priority over information relayed via the sense of touch, which tells the animal, or baby, that they are on a safe, flat surface.

On the other hand, it can be demonstrated that perception is also dependent on previous experience. Known shapes are more easily recognised than unknown ones. Once interpretations of complex visual shapes have been gained, they remain, and serve as a source of reference for future perception.

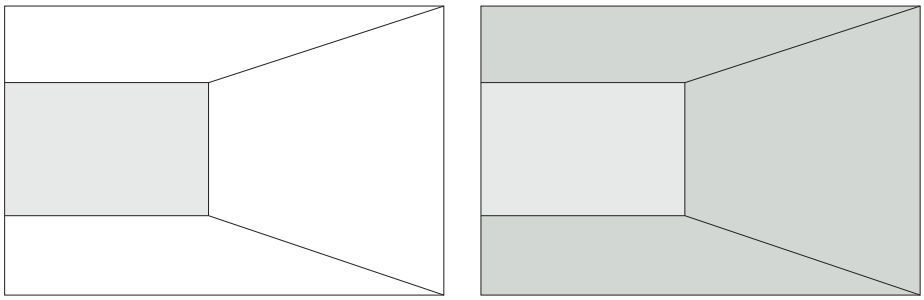
In this case experience, and the expectations linked with it, may be so strong that missing elements of a shape are perceived as complete or individual details amended to enable the object to meet our expectations.

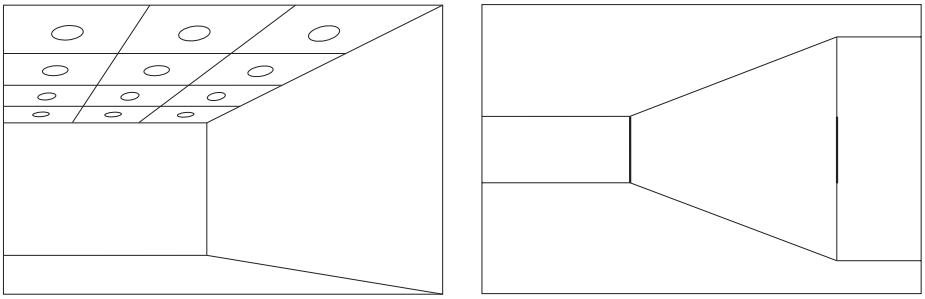
When it comes to perception, therefore, both innate mechanisms and experience have a part to play. It may be presumed that the innate component is responsible for organising or structuring the information perceived, whereas on a higher level of processing experience helps us to interpret complex shapes and structures.

As for the issue of whether impressions received via the senses alone determine perception or whether the information also has to be structured on a psychical level, again there is evidence to prove both these concepts. The fact that a grey area will appear light grey if it is edged in black, or dark grey if it is edged in white can be explained by the fact that the stimuli perceived are processed directly – brightness is perceived as a result of the lightness contrast between the grey area and the immediate surroundings. What we are considering here is a visual impression that is based exclusively on sensory input which is not influenced by any criteria of order linked with our intellectual processing of this information.

On the other hand, the fact that vertical lines in a perspective drawing appear to be considerably larger further back in the drawing than in the foreground, can be explained by the fact that the drawing is interpreted spatially. A line that is further away, i.e. in the background, must be longer than a line in the foreground in order to produce an equivalently large retina image – in the depth of the space a line of effectively the same length will therefore be interpreted and perceived as being longer.

The perception of the lightness of the grey surface depends on its immediate surroundings. If the surrounding field is light an identical shade of grey will appear to be darker than when the surrounding field is dark.





Constancy with regard to perception of size. Due to the perspective interpretation of this illustration the luminaires are all perceived as being the same size in spite of the variations in size of the retina images.

In this case the perspective interpretation leads to an optical illusion. The vertical line to the rear appears to be longer than a line of identical length in the foreground due to the perspective interpretation of the picture.

The continuous luminance gradient across the surface of the walls is interpreted as a property of the lighting of the wall. The wall reflectance factor is assumed to be constant. The grey of the sharply framed picture is interpreted as a property of the material, although the luminance is identical to the luminance of the corner of the room.