Summary of Section 3

- Psychophysics is the study of elementary psychological sensations which observers report in response to physical sensory inputs.
- An absolute sensory threshold is defined as the intensity of a stimulus at which it is reported as being present on 50 per cent of presentations. Psychophysical thresholds have been reinterpreted as requiring the detection of a signal (stimulus) from background neural activity, a theory known as signal detection theory.
- According to Weber's Law, a constant proportion has to be added to a stimulus for detection of a just noticeable difference (JND).
- The gestalt psychologists proposed that stimuli are perceived as organized figures as a result of grouping principles such as proximity, similarity, closure and continuation, all of which operate to produce perceptions of good figures against background; that is, the distinction between figure and ground.

4 Basic perceptual processes

The theories and research discussed in Section 3 were concerned with aspects of the environment which influence people's perceptual *experiences*. People can report their perceptions of individual tones and lights and of overall patterns as figures. The next step is to explain how these experiences are derived from the sensory inputs of light to the eye. The physiological studies reported in Section 2 indicated that information about patterns of light falling on the retina is transmitted to the brain. Psychologists studying visual perception are interested in the *perceptual processes* which interpret these sensory inputs to the visual system.

One influential approach to perception, which first emerged in the 1950s and 1960s, is to consider the perceptual processes by which information can be extracted from the light falling on the retina to provide sensory cues about the environment. The question is often posed in terms of the **retinal image**, referring to the pattern of light falling on a specific area of the retina. Each object is thought of as *projecting* an image on the retina by stimulating light receptors. As Figure 10.2 showed, light rays enter through the lens in the front of the eye and are focused on a particular area of the retina at the back of the eye. How can the brain interpret the light image on the retina in order to arrive at an accurate perception of the external environment?

The research of psychologists working on this problem is well described in Gregory (1972). One particular concern was to explain how perceivers see objects as a constant size even when they are at quite a distance away from us. It may seem so obvious that objects normally remain the same size that you may be wondering why there is anything here that needs explaining. But remember that all the visual system has to go on is the patterns of light falling on the retinal image.

4.1 Size constancy

As Figure 10.13 shows, the rays of light reflected off a tennis ball when it is near to the eye stimulate a relatively large area of the retina. The light rays reflected off a more distant ball stimulate a much smaller area of the retina. The situation is that the very same ball projects *different size* retinal images depending on how far it is away.

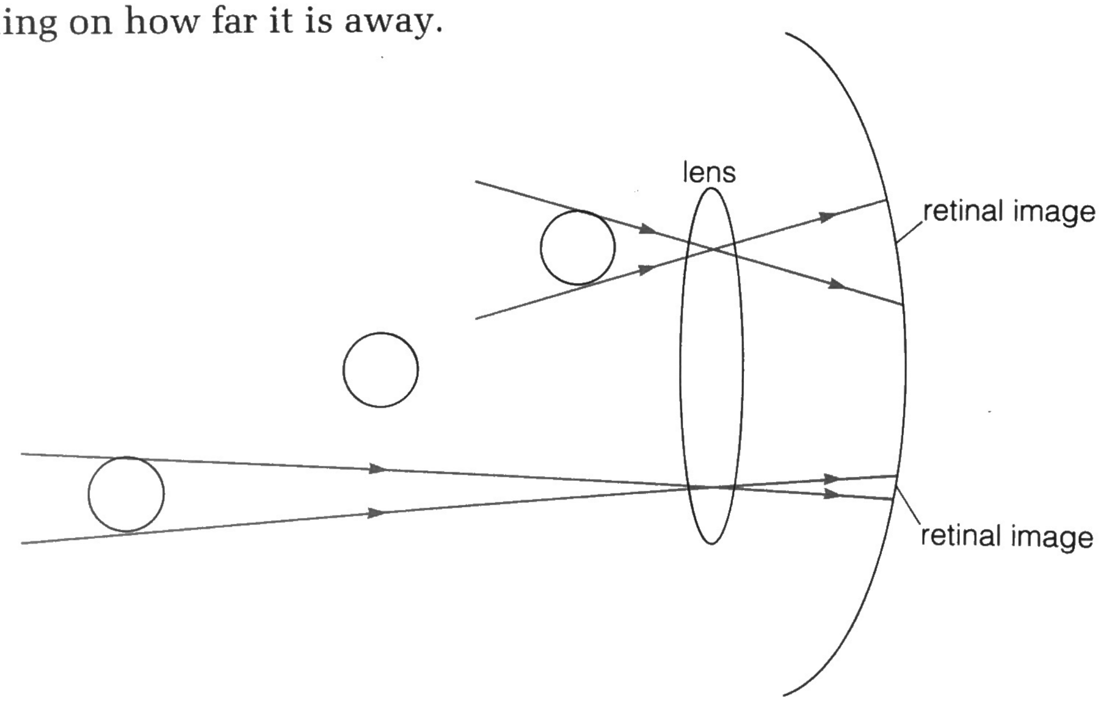

Figure 10.13 A schematic diagram to show the different sizes of retinal images projected by the same-sized object at different distances

SAQ 6 On Figure 10.13, draw in the light rays from the tennis ball at the middle distance from the eye. What is the relative size of this retinal image compared with those of the ball at the nearest and furthest distances?

The question which struck psychologists was this, 'how can the human visual system cope with all this ambiguous information about the "real" size of the ball?' When we see a tennis ball hurtling towards us, it does not appear to get larger and larger as it approaches. Yet Figure 10.13 shows that its *retinal image* is getting larger and larger. If an actual tennis ball 'grew' as large as its retinal image would indicate, you might be tempted to opt out of the game and run for cover. So it is rather convenient that the visual system perceives the ball as remaining a *constant* size, despite its changing retinal size.

Gregory (1972) suggests an easy way of demonstrating that objects project different-sized retinal images. Hold your left hand out at arms length and your right hand at half the distance away. You will find that both hands look roughly the same size. But, if you move your right hand over to overlap the left hand, you should find to your amazement that the right hand not only overlaps the left hand but is large enough to swamp it completely. The point of this demonstration is to show that your two hands were actually stimulating *different-sized* images on the retina, the image for the more distant left hand being smaller than the image for the nearer right hand. Nevertheless, to start with, both hands were perceived as being roughly the same size, despite the disparity in their retinal sizes. How can **perceived size** be explained in relation to such large differences in **retinal size**? The name for this phenomenon is **size constancy**, referring to the fact that objects are perceived as a *constant* size despite alterations in the size of the retinal image.

Figure 10.14