1.5 Colour Vision

Human colour vision is trichromatic. It is based on the L, M and S cone photoreceptors. Figure 17 shows how the outputs from the three cone photoreceptor types are believed to be arranged. The achromatic channel combines inputs from the M- and L-cones only. Its output is related to luminance. The other two channels are opponent channels in that they produce a difference signal. These opponent channels are responsible for the perception of colour. The red-green opponent channel produces the difference between the output of the M-cones and the sum of the outputs of the L- and S-cones. The blue-yellow opponent channel produces the difference between the S-cones and the sum of the M- and L-cones.

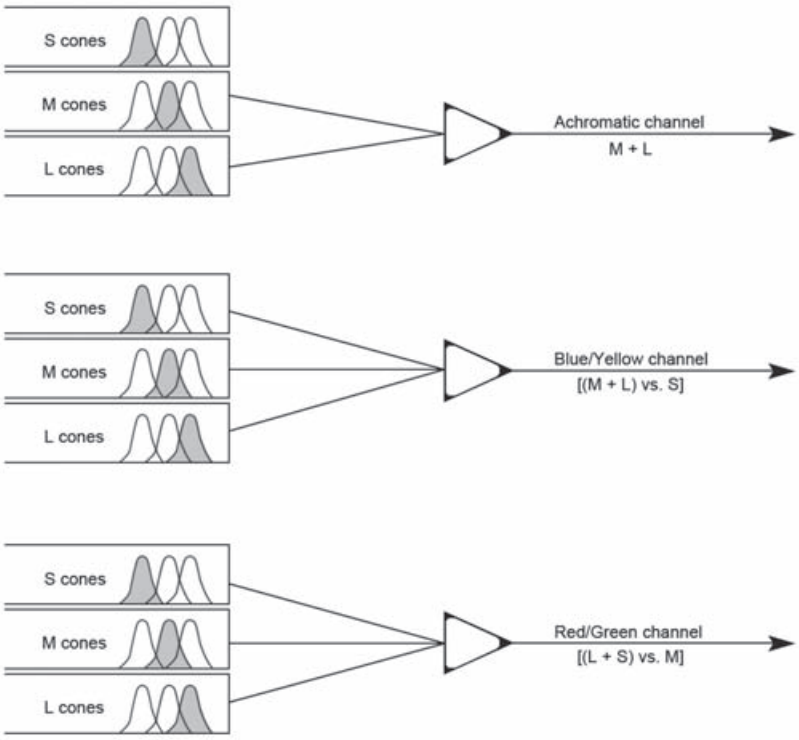

Figure 17
The organisation of the human colour system showing how the three cone photoreceptor types are believed to feed into one achromatic, non-opponent channel and two chromatic, opponent channels.

The ability to discriminate the wavelength content of incident light makes a dramatic difference to the information that can be extracted from a scene. Creatures with only one type of photopigment, i.e. creatures without colour vision, can only discriminate shades of grey, from black to white. Approximately 100 such discriminations can be made. Having three types of photopigment increases the number of discriminations to approximately 1,000,000. Thus, colour vision is a valuable part of the visual system, and not a luxury that adds little to utility.