Birdwatching

More Details

How does colour perception work with our eyes?

Specialised visual cells in the eyes, the so-called cones, are responsible for colour perception.

Humans have three different types of cones, the S-type ("blue receptor"), M-type ("green receptor") and L-type ("red receptor"). The colour impressions are created by calculating the signals of these three receptor types in the brain. The colour impression "white" results from the simultaneous stimulation of all three cone types with approximately the same intensity.

The spectral absorption curves describe the stimulus response of the three receptor types as a function of the wavelength of the light stimulus (Fig. 1).

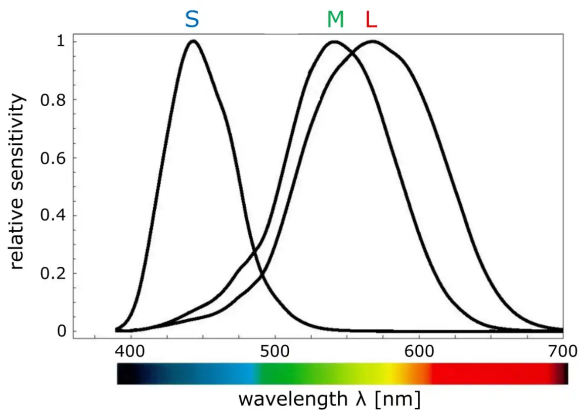

Fig.1: Spectral absorption curves of the three receptor types.

Three different types of cones

- **S cone** (short wavelength receptor): these receptors cover the blue range of the visible colour spectrum. The absorption maximum is at a wavelength of about 420 nm (blue-violet).
- **M cone** (medium wavelength receptor): the absorption maximum of the green receptors is at about 534 nm. They cover the range between the blue and orange spectral range.
- **L cone** (long wavelength receptor): its absorption maximum is at approximately 563 nm (yellow-green) Despite this colour value, it is also called red receptor, as it is mainly responsible for the perception of the red range. The perception of the "rods", which are used for vision at low brightness, is shown as a dashed line.

Why does a cyan bird appear in the cage after we have looked at the red bird for a long time?

When we look at the red bird, the receptor types for the red range (L) are stimulated for a long time and "adapt". This means that they report the same colour impression with less intensity than before (Fig. 2).

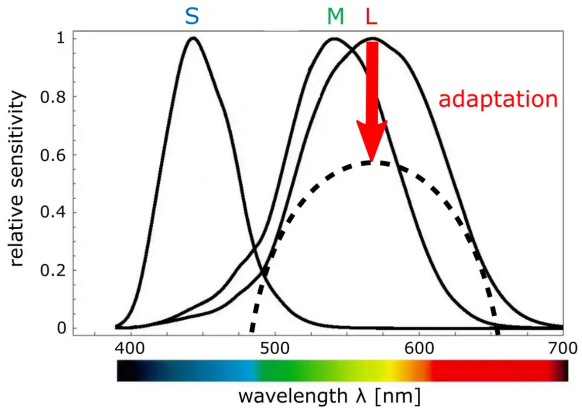

Fig. 2: Adaptation of the L cone.

If we then look at the white surface in the cage, all cone types report the perception in their respective spectral range. Since the L-receptors (red range) are still adapted after the strong red impression from before, they perceive their spectral range with lower sensitivity. As a result, the signal of the two other receptor types S and M predominates: the impression cyan (blue-green) is created! This is called a "negative afterimage". It is the expression of an adaptation of the cone types to a previous, intensive colour perception.