

Spectral sensitivity of the human eye

Spectral sensitivity is the relative efficiency of detection of light or other signal, as a function of the frequency or wavelength of the signal. There are two types of **retinal photo-receptors** exist - cones and rods. Spectral sensitivity of eye is influenced by light intensity. Sensitivity to individual colors, in other words, wavelengths of the light spectrum, is explained by the RGB (red-green-blue) theory.

Retinal photo-receptors

Cones cell

- Cone-like shape at one end where a pigment filters incoming light
- These cells concentrated in the center of the retina
- Responding to bright-light condition (Photopic vision)
- Responsible for perception of color

There are 3 cone types.

- Long-wavelengths sensitive (L) - pigment erythrolabe. maximum sensitivity for red (max 564 nm)
- Mid-wavelengths sensitive (M) - pigment chlorolabe. maximum sensitivity for green (max 533 nm)
- Short-wavelengths sensitive (S) - pigment cyanolabe. maximum sensitivity for blue (max 437 nm)

Rod cell

- Narrower, characteristic shape
- Sensitive enough to respond to a single photon of light (about 100 times more sensitive to a single photon than cones)
- Responding to low-intensity light condition (Scotopic vision)

Visible spectrum

- Visible spectrum means sensitivity of cones & rods. It varies with the wavelength.
- Wavelength ranges between 380 nm and 800 nm.

Spectral sensitivity of eye

Spectral sensitivity of eye is influenced by light intensity. And the light intensity determines the level of activity of cones cell and rod cell. And it can be determine the main characteristic of human vision.

Sensitivity to individual colors, in other words, wavelengths of the light spectrum, is explained by the **RGB (red-green-blue) theory**. This theory assumed that there are three kinds of cones. It's selectively sensitive to red (700-630 nm), green (560-500 nm), and blue (490-450 nm) light. And their mutual interaction allow to perceive all colors of the spectrum.

Sensitivity of human eye

- Sensitivity of human eyes to light increase with the decrease in light intensity.
- In day-light condition, the cones cell is responding to this condition. And the eye is most sensitive at 555 nm.
- In darkness condition, the rod cell is responding to this condition. And the eye is most sensitive at 507 nm.

As light intensity decreases, cone function changes more effective way. And when decrease the light intensity, it prompt to accumulation of rhodopsin. Furthermore, in activates rods, it allow to respond to stimuli of light in much lower intensity.

Links

Related articles

External links

Bibliography

Gigahertz-optic : <http://www.light-measurement.com/spectral-sensitivity-of-eye/>

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