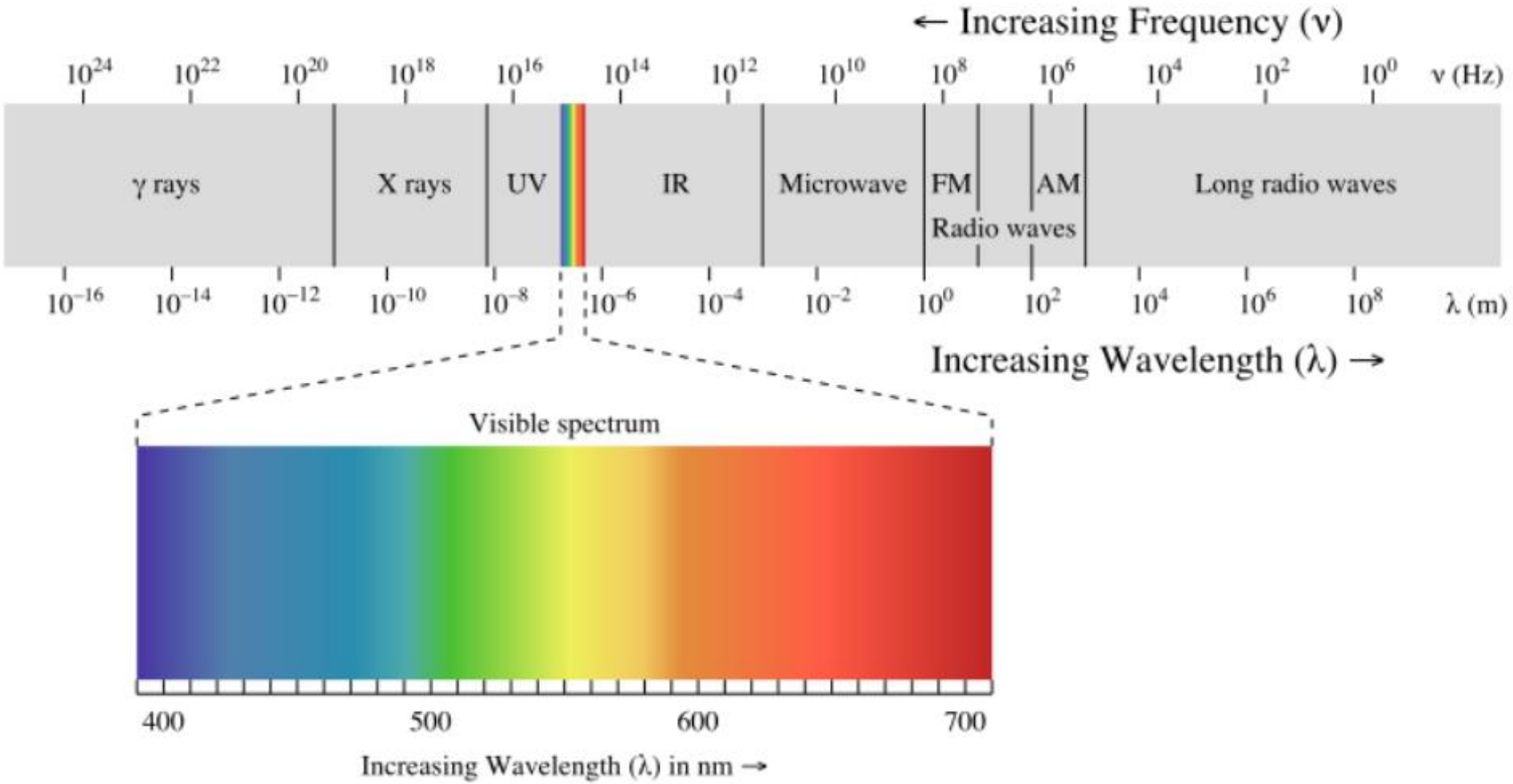
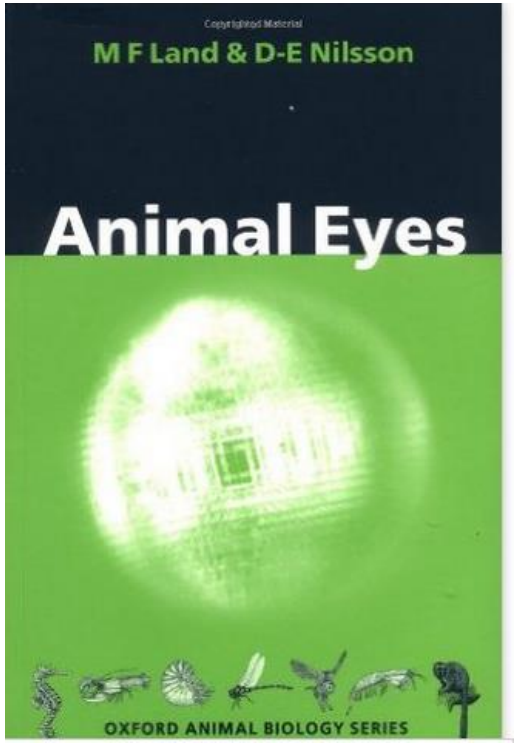
Vision

Vision: Light (electromagnetic radiation). The physical input

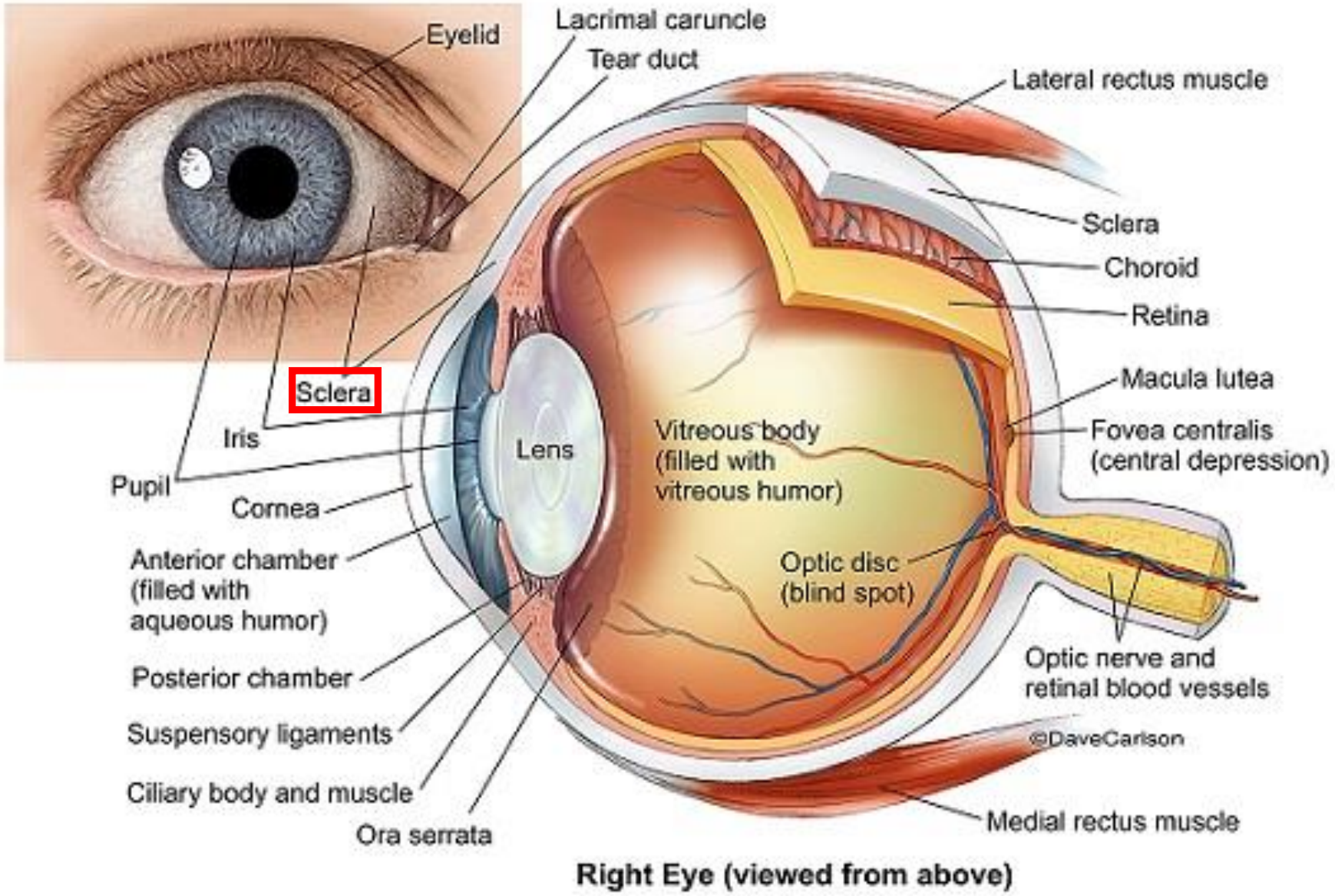


Seeing is ecologically important

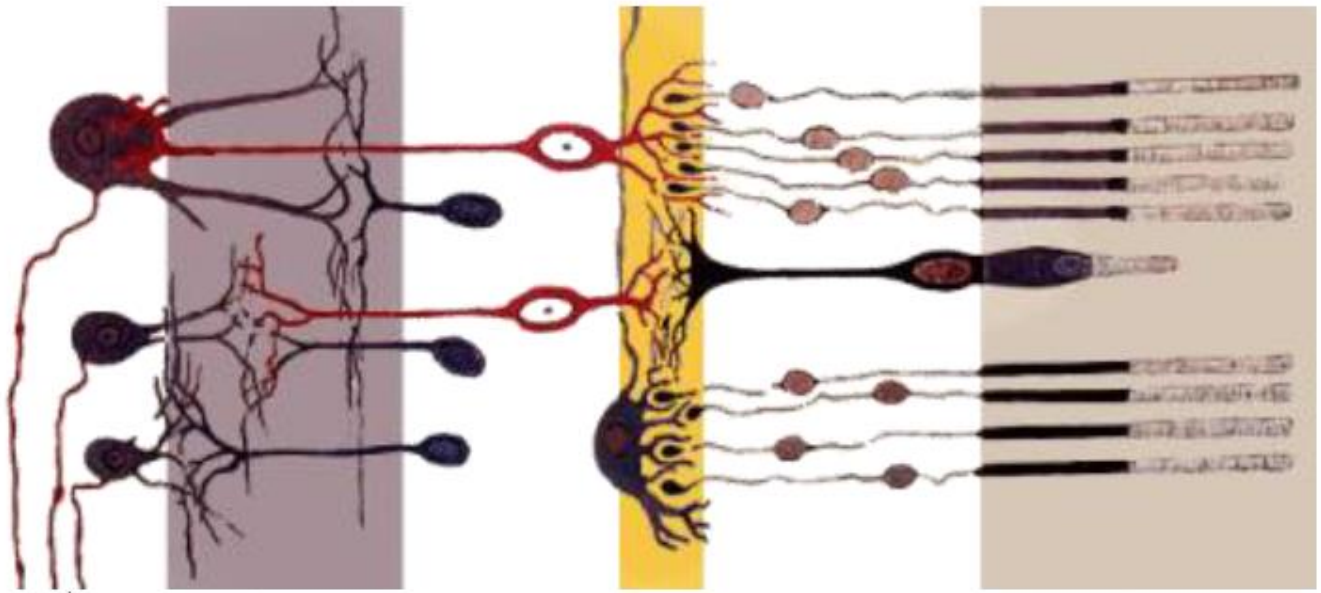
- More of our brain is dedicated to it than any other sensory modality (e.g., hearing, smell)
- Most species (~97%) have eyes



Structure of eye



Structure of the Retina



Axons to optic nerve

Ganglion Cells

Bipolar Cells

Rods and Cones

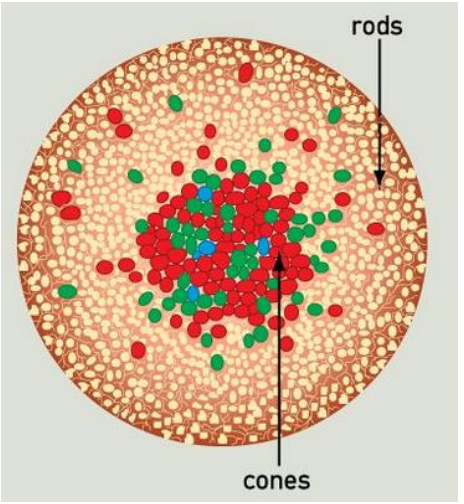
Rods and Cones

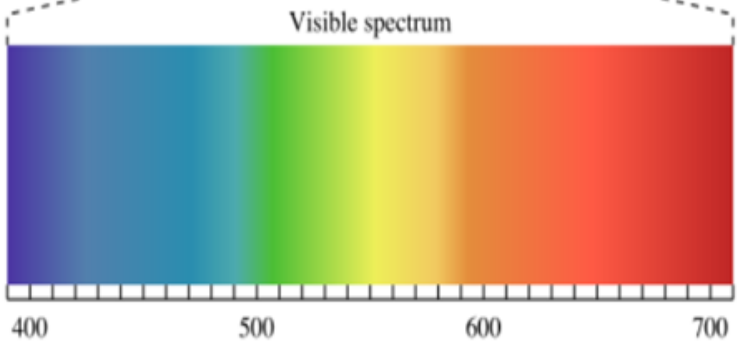
Cones

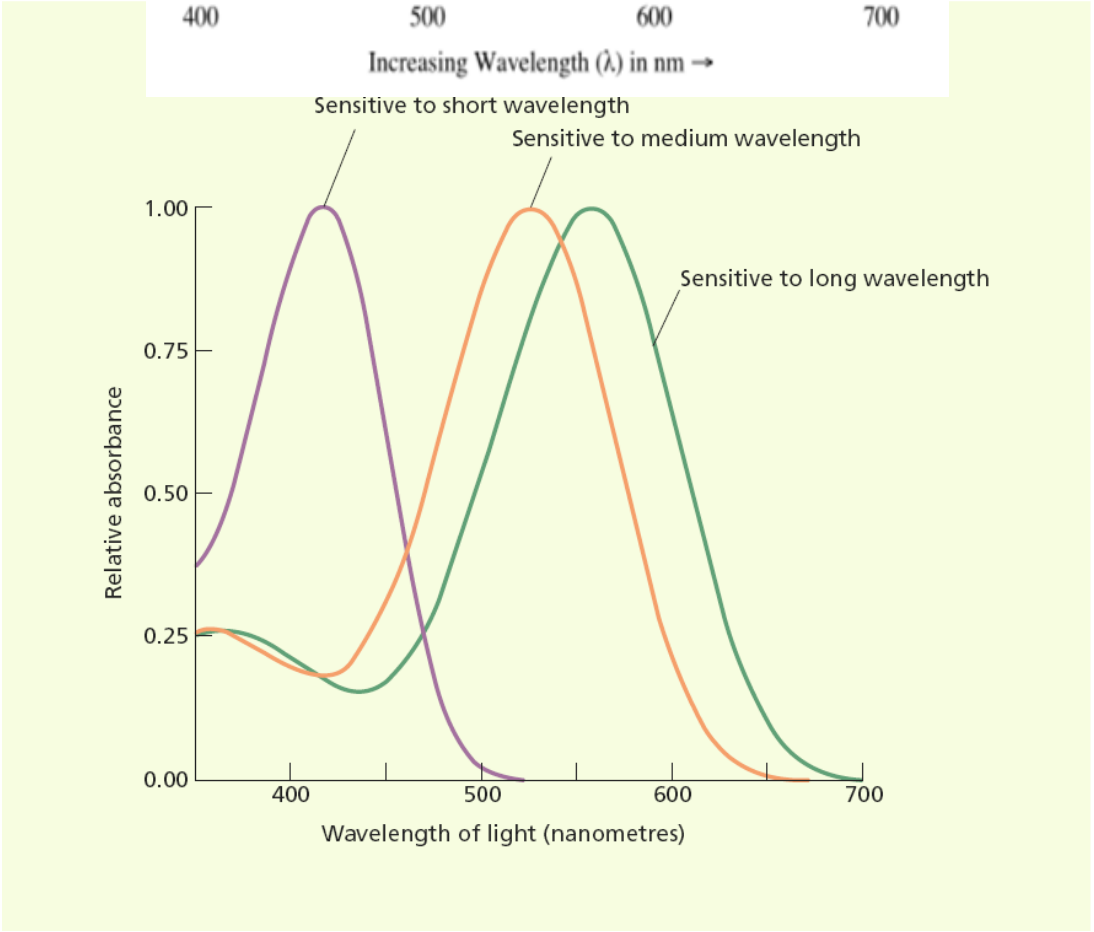
- Concentrated in the center of the retina (especially fovea)
- Sensitive to colour and fine detail (high resolution)

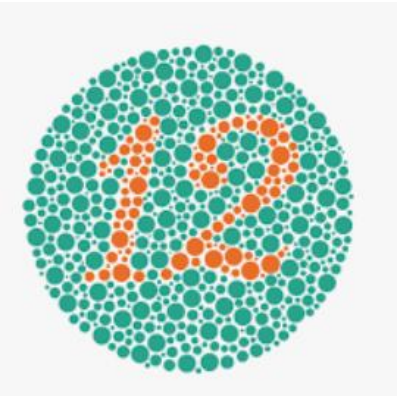
Rods

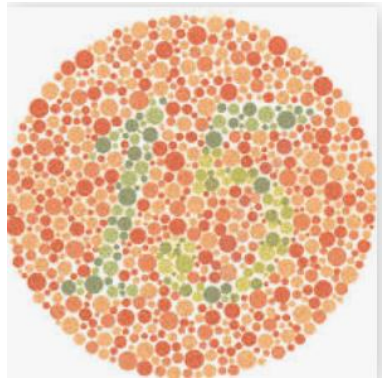
- Predominate in the periphery of the eye
- Sensitive to motion
- Coarse detail and no colour information











The three types of receptor have a pigment in them that is bleached by light, with the different cones sensitive to different wavelengths. This can produce an action potential.

Colour Perception: Psychological Dimensions

Hue (H)

- Is what distinguishes red from yellow or blue

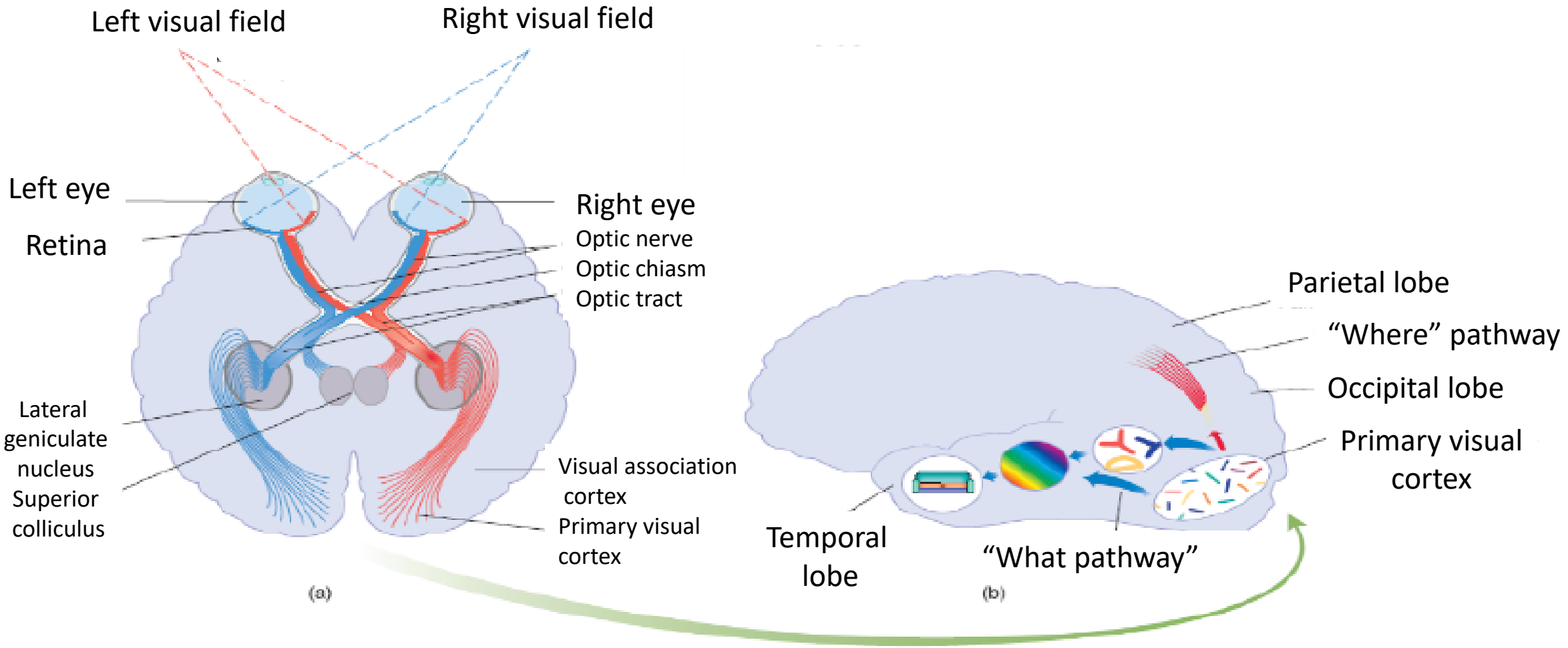
Brightness (or Value, V)

- The perceived intensity of light

Saturation (S)

- Allows us to determine whether a colour is vivid or pale

Pathways


Left visual field
Right visual field
Left eye
Retina
Right eye
Optic nerve
Optic chiasm
Optic tract
Lateral geniculate nucleus
Superior colliculus
Visual association cortex
Primary visual cortex
(a)
Parietal lobe
"Where" pathway
Occipital lobe
Primary visual cortex
Temporal lobe
"What pathway"
(b)

Interesting stuff

"Seeing" evolves very quickly

- Simple light receptors to complex vision in around 360,000 generations (quick!)

Useful aspects of vision co-evolve

(binocular disparity: birds, some cephalopods, and mammals)