Human Eye: HDR

What Mechanisms enable the eye to achieve its high contrast ratio?

What is contrast (ratio)?

- Contrast: The Quotient of the darkest and the brightest spot in a scene/a picture
- Static Contrast: Contrast in ONE scene
- Dynamic Contrast: Contrast over a SERIES of scenes

How good is the eye?

- Human Eye works well at night as well as in bright daylight
- Dynamic contrast 1:1.000.000
- Static contrast: up to 1:10.000
- Cameras atm have up to 1:5000

Three Main Effects

- Mechanical Adjustment
- Chemical Adjustment
- Neuronal Adjustment

Mechanical Adjustment

- Pupil equivalent to aperture
- Iris equivalent to aperture stop

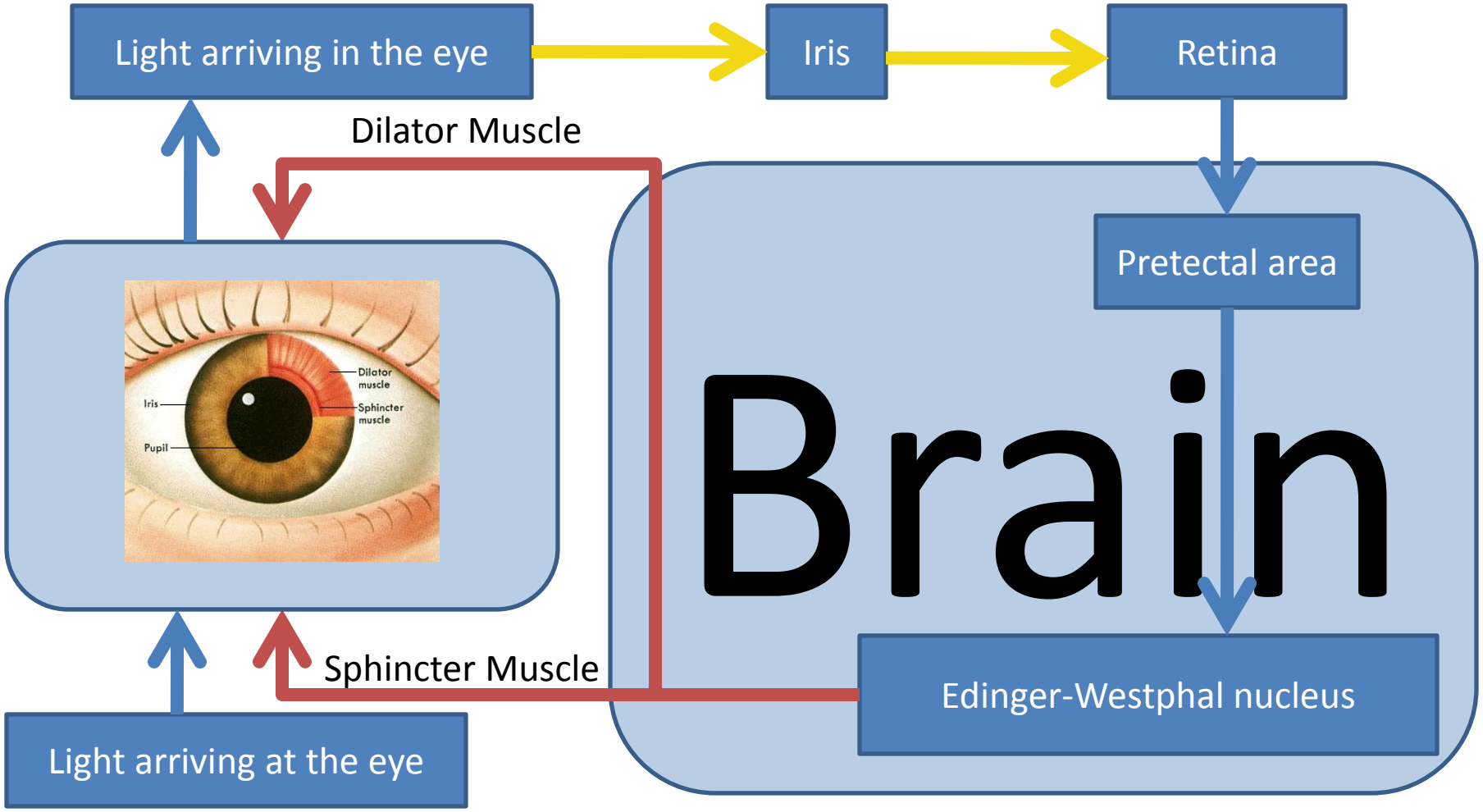
f/2.1

f/1.4

f/8.3

f/22

Mechanical Adjustment

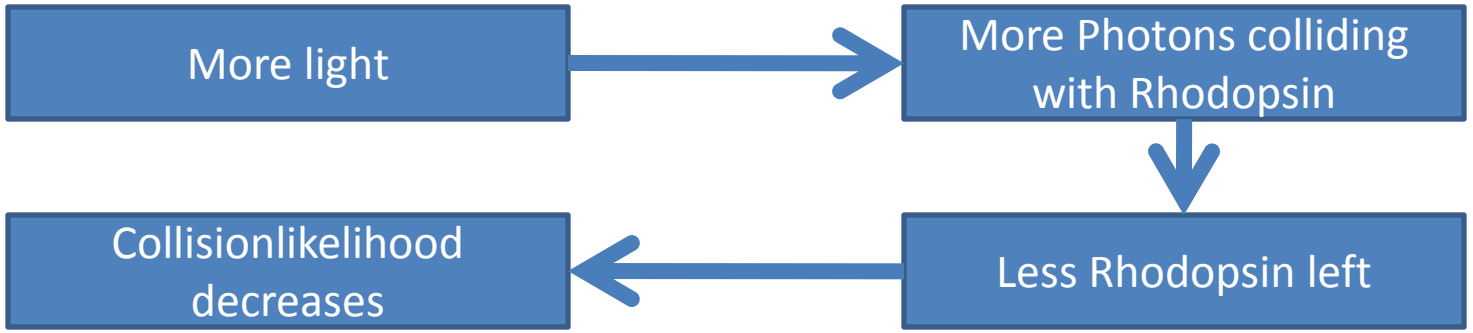


Chemical Adjustments

- Rods and Cones can adjust their sensibility

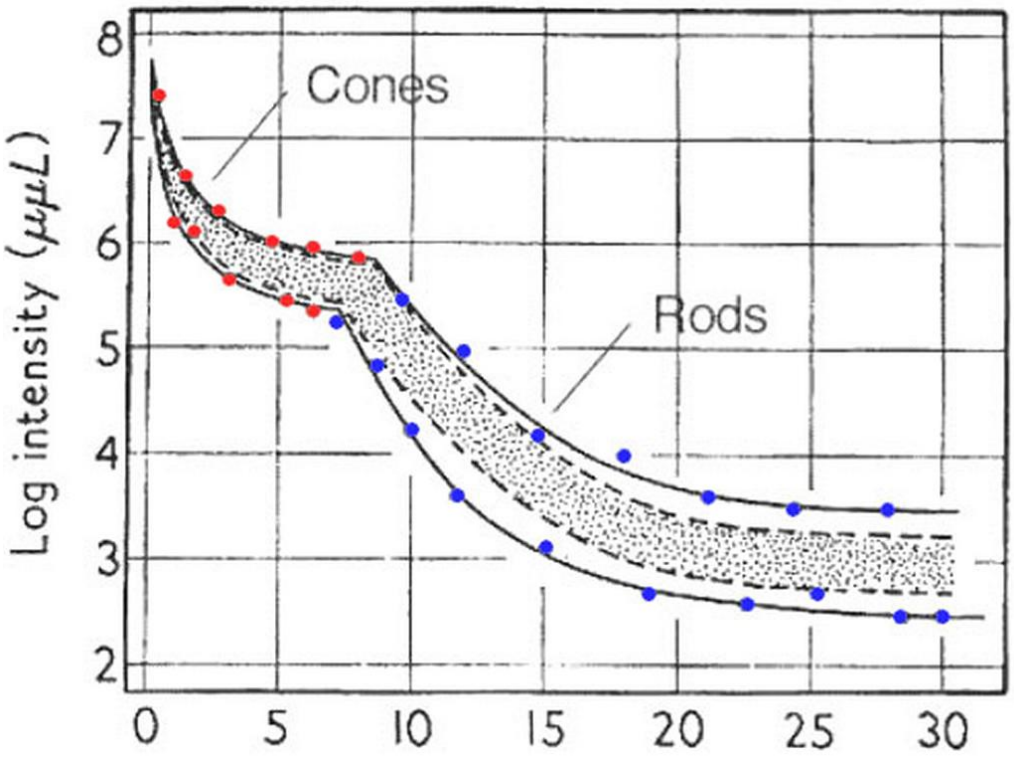
Simplified:

- Rhodopsin regenerates at a constant rate



Chemical Adjustment

- Rods have more Rhodopsin => Suitable for low light conditions



Neuronal Adjustments

- Signals from Rods are bundled in Ganglion-Cells
- Convergence is increased in Darkness => SNR
- Effect is achieved chemically, no structural changes

Purkinje effect

- With increasing darkness, colors fade away
- Red is the color least perceived by rods

Purkinje effect

- => Red light is used to illuminate displays at night (e.g. Submarine)
- Blue-green light is used for theaters etc. (night light)