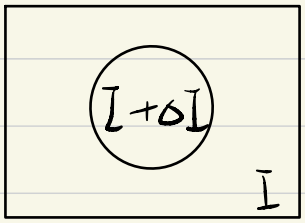
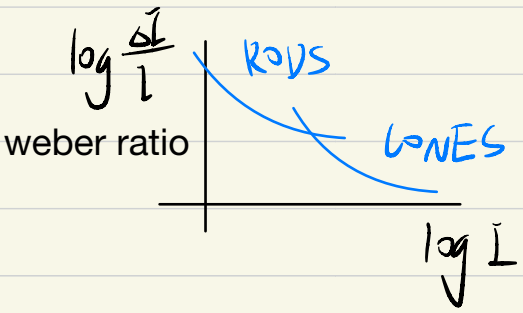
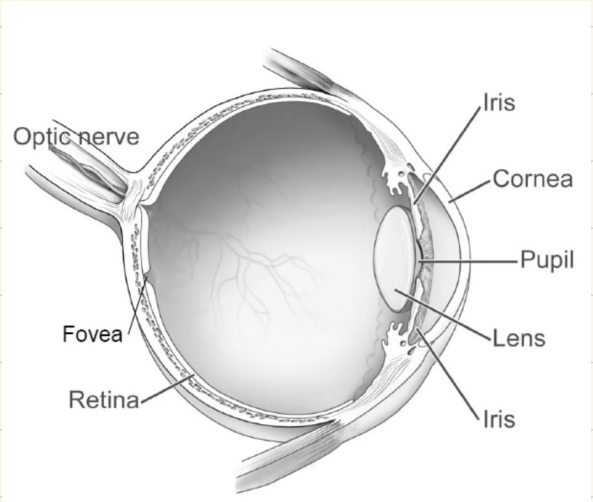
Brightness
eyes has a huge range dynamic range O(10^10)
Subjective brightness is (basically logarithmic as a function of incident intensity

Brightness adaptation iris opens/closes to let in/restrict amount of light



just noticeable difference





Critical Fusion Frequency

emitted radiation	(w)
filtered by hvs	(lumens)
brightness	(perceptual)

Rods
very sensitive to light intensity
night “scotopic” vision
achromatic
low acuity (many rods per nerve ending)
peripheral vision
slow response
75-150M/retina

Cones
only sensitive to direct light
“photopic” vision
very sensitive to color, chromatic (3 colours)
concentrated in fovea (1 per nerve end)
high visual acuity, spatial resolution
fast response
6-7M/retina

Cones enable colour perception, and 3 types

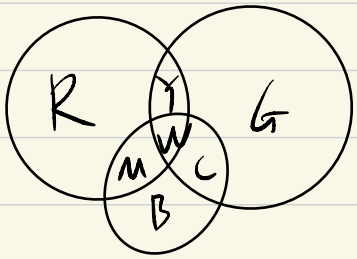
L: long sensitive to “red” <- actually more yellow-green 65%

M: medium sensitive to “green” <- green-blue 33%

S: short sensitive to “blue” <- blue-purple 2% but most sensitive

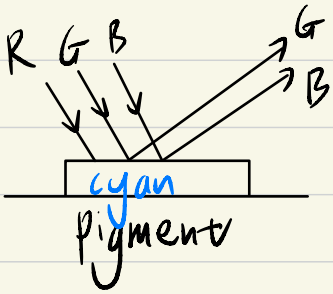
CIE standard
R: 700nm
G: 546nm
B: 436nm

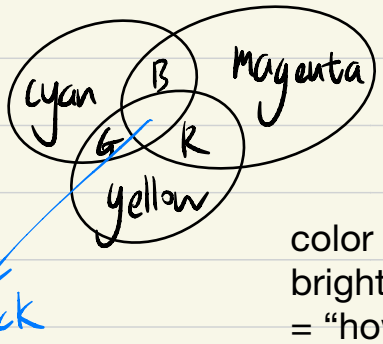
standard primary color



	R	G	B
R	1	0	0
Y	1	1	0

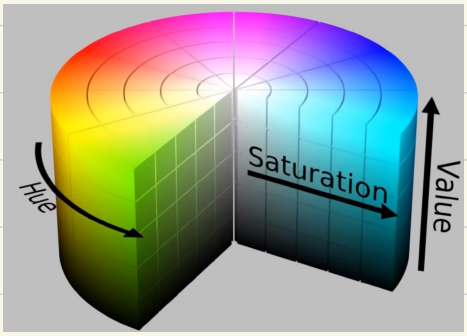
Subtractive color space





color terms
brightness/intensity/value
= “how much” light there is

hue=dominant color
saturation=purity/strength color



hue+saturation define the chromaticity of a color

amounts of reference cie primaries needed to form a color are called the tristimulas value
X, Y, Z
we characterize a color by

$$\frac{X}{X+Y+Z}, \frac{Y}{X+Y+Z}, \frac{Z}{X+Y+Z}$$

$$X = \int_0^{\infty} L(\lambda) \cdot x(\lambda)\, d\lambda$$

$L(\lambda)$: spectural power distribution
$x(\lambda)$: color matching function

Color spaces: RGB — web safe (00, 33, 66, 99, CC, FF)
CMYK, HSV (HSI)