Infocommunication
Light and Vision

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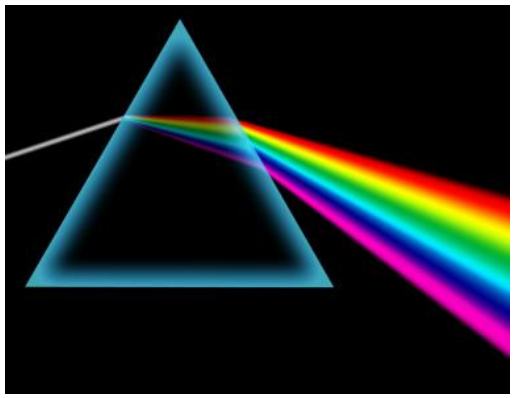

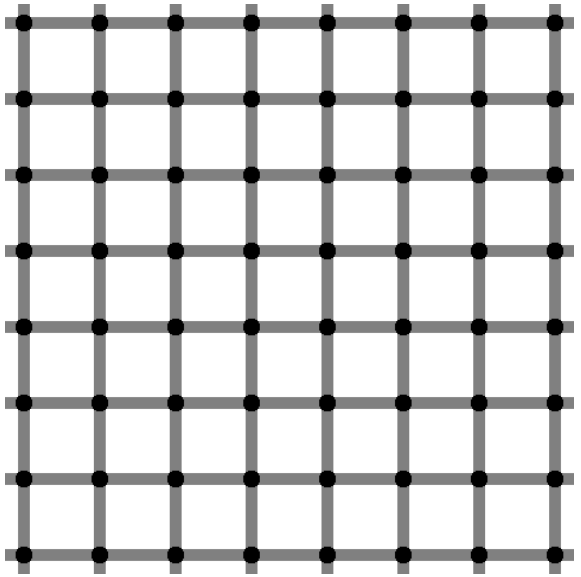

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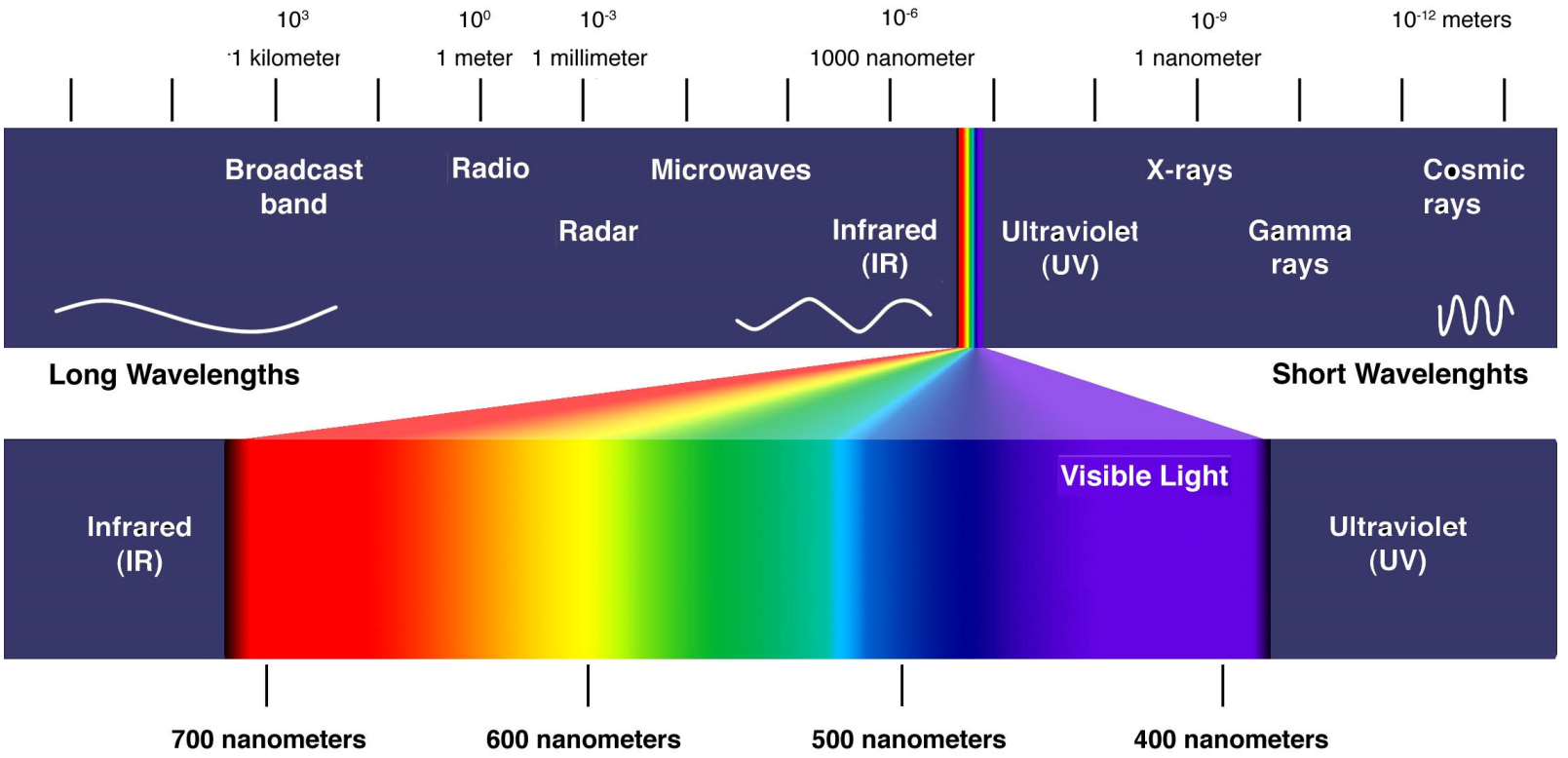
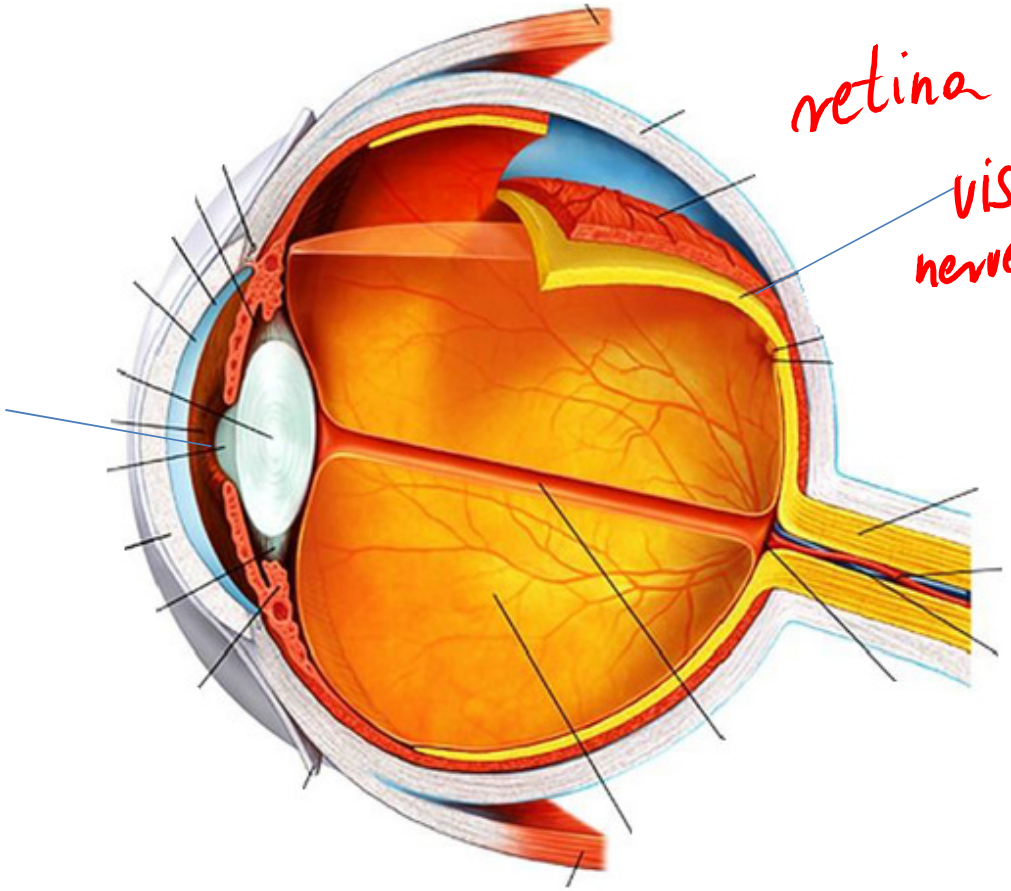
Electromagnetic spectrum



Source: http://www.astronomersgroup.org/images/EMspectrum.jpg

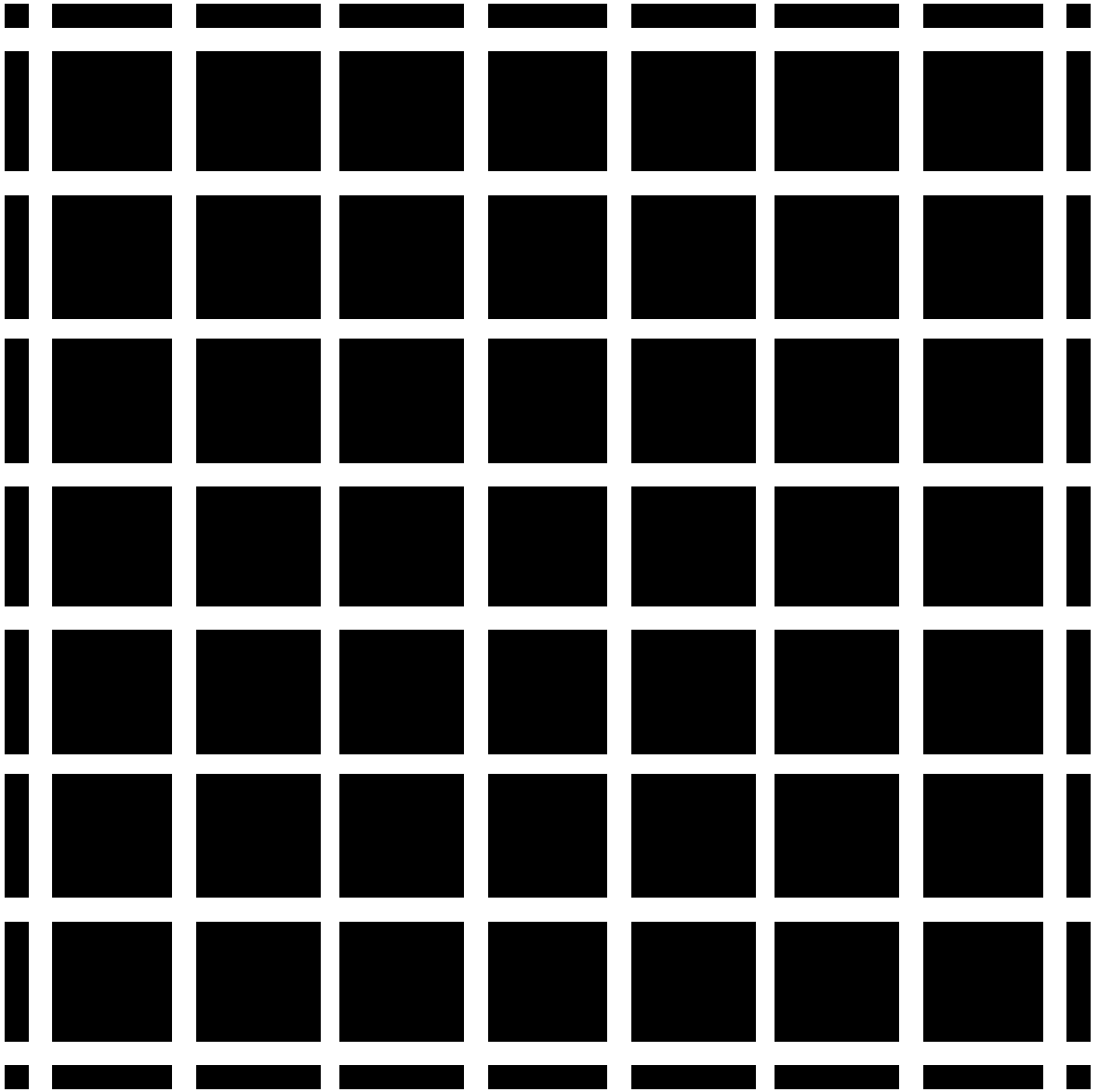
Structure of the eye



Source: http://virtualmedicalcentre.com

Limitations of the human eye

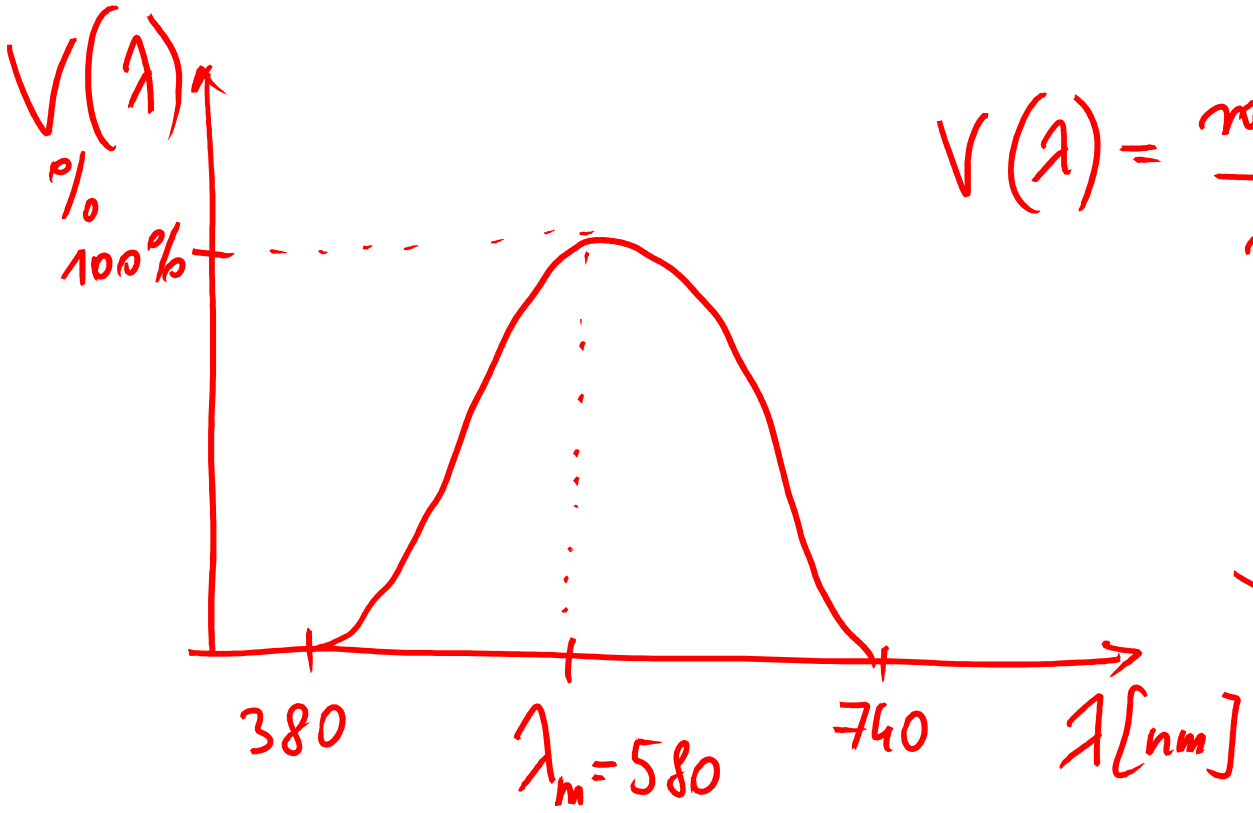
- Optical illusions
  - http://www.michaelbach.de/ot/



Parameters for describing vision

Subjective / perceptual	Objective / measurable
lightness	luminance
hue (red, yellow, green, ...)	λ, dominant wavelength monochrome colors · only 1 freq. component
colorfulness / saturation (light, dark, pastel, ...)	spectral color content

Relative response of the human eye to monochromatic light



$$V(\lambda) = \frac{\text{radiated pows at } \lambda_m}{\text{rad p. at } \lambda}$$

"CIE average eye"

→ link between lightness & luminance

Comparative color measurement

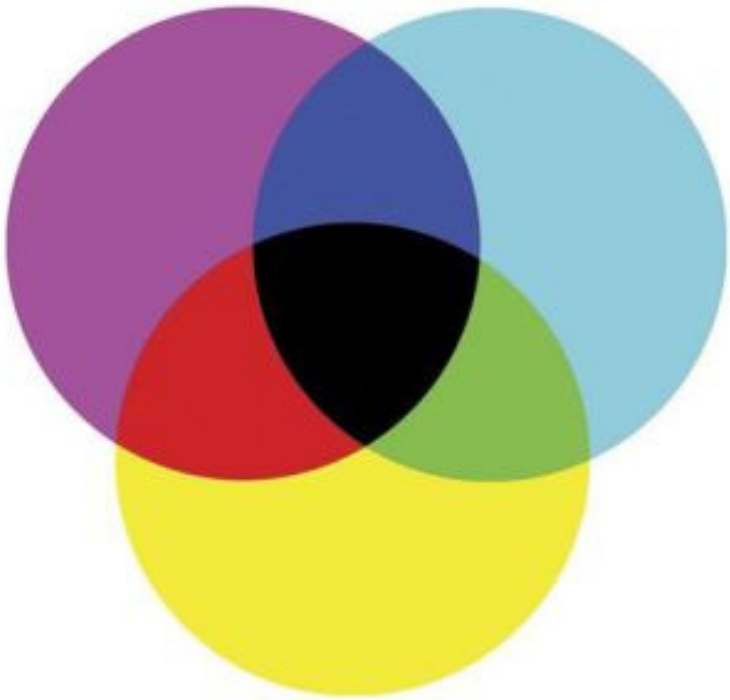
white light spectrum: equal at all freqs

Additive color mixing

3 well chosen colors

Additive and subtractive color mixing

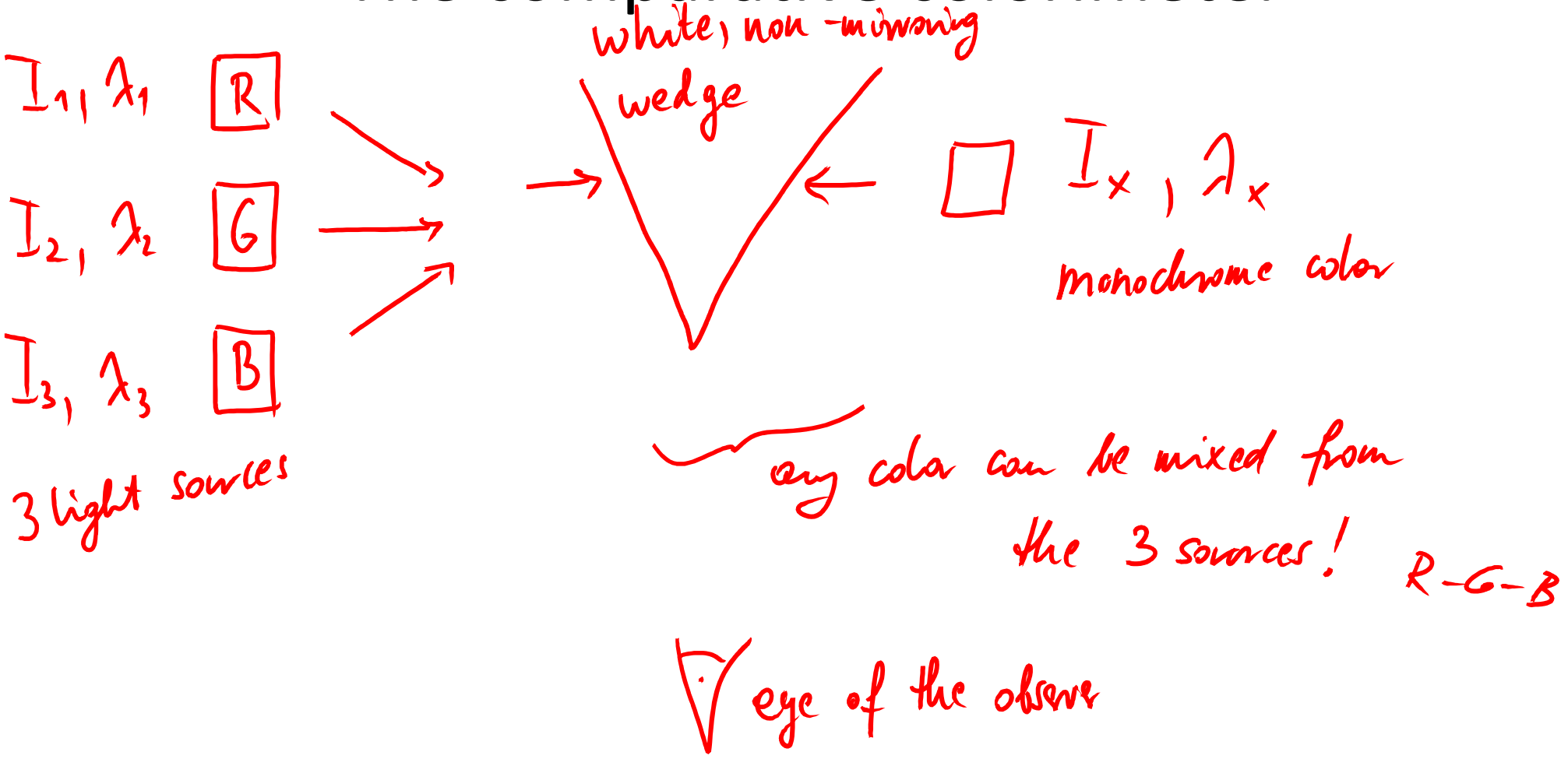
Additive color mixing



Subtractive color mixing

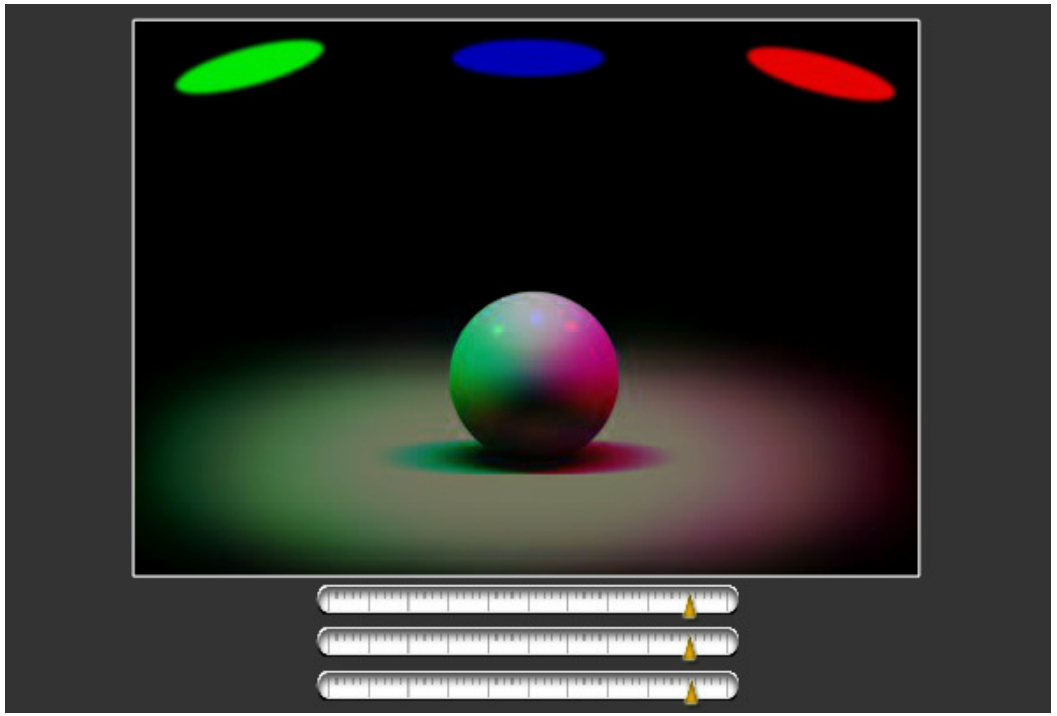
Source: https://www.tvtechnology.com/opinions/additive-and-subtractive-color-mixing

The comparative colorimeter



Color mixing

- http://www.huevaluechroma.com/042.php



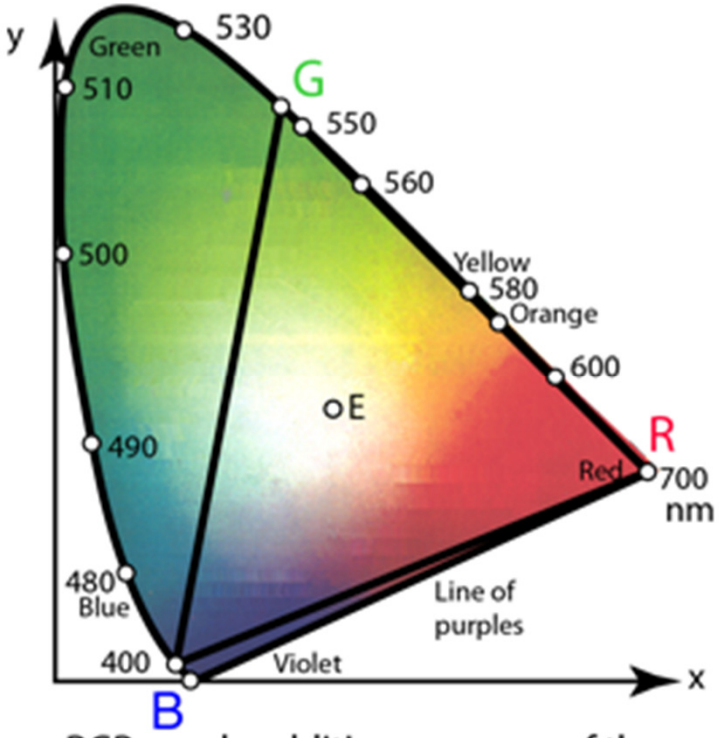
Isochromatic colors

colors with different spectral content
seen to be the same by our vision

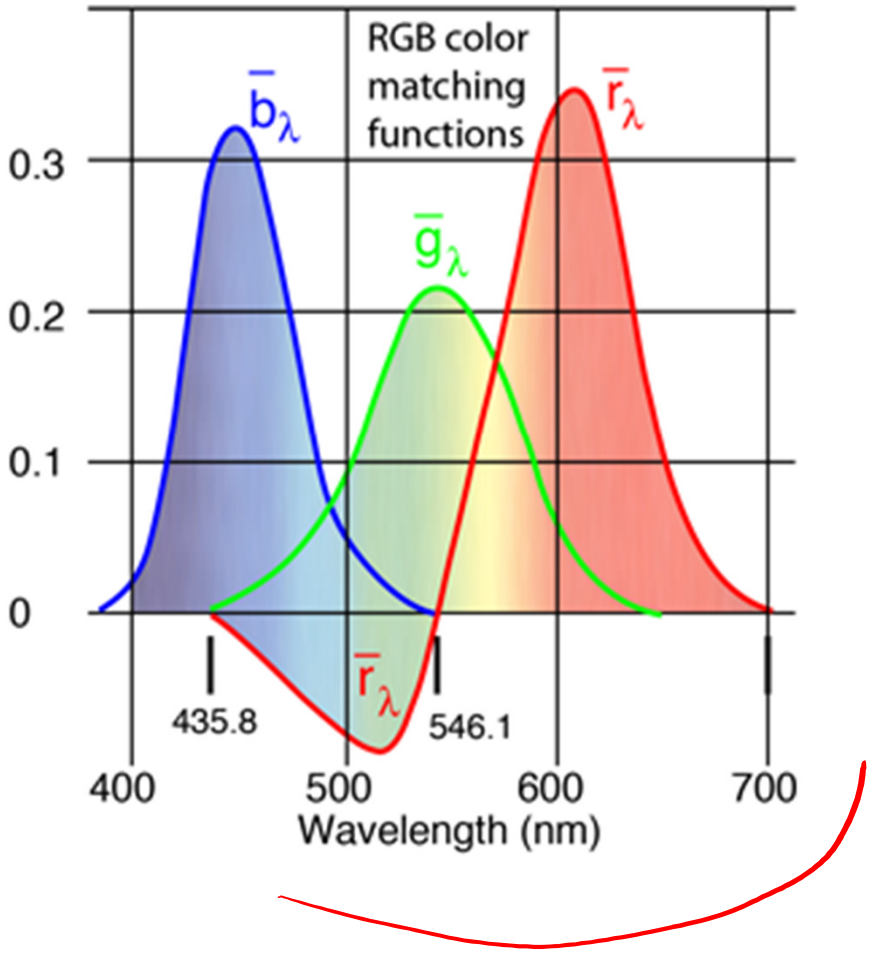
$\Rightarrow$ R – G – B can be used

Luminance

$$Y = 0.3 \cdot R + 0.59 \cdot G + 0.11 \cdot B$$



RGB purely additive coverage of the range of the eye's perceived hues.



Source: http://hyperphysics.phy-astr.gsu.edu/hbase/vision/colspa.html

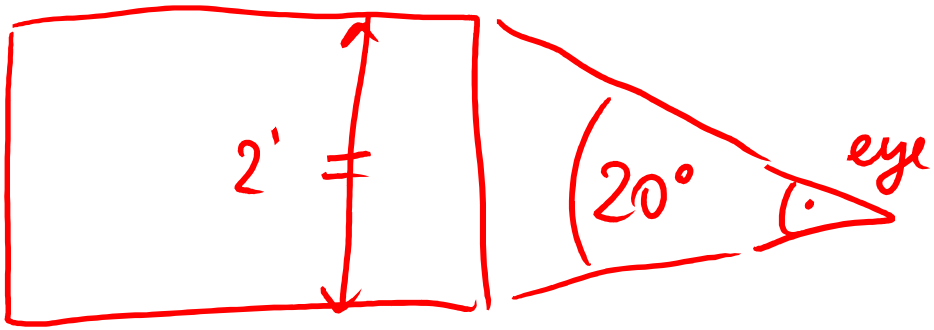
The picture

pixels – optimal resolution ?

$2' = \frac{2}{60}°$

– if 2 light sources are within 2',
the eye can't differentiate them

– if 2 color light s. 10',
the eye can't differentiate the color



$\frac{20°}{2'} = \frac{20 \cdot 60'}{2'} = 600$ pixel

optimal aspect ratio : 4 : 3

800 × 600 pixels

Optical illusions

- Stepping feet
  - http://www.michaelbach.de/ot/mot-feetLin/index.html
- Motion Induced Blindness
  - http://www.michaelbach.de/ot/mot-mib/index.html
- Stereokinetic Effect
  - http://www.michaelbach.de/ot/mot-ske/index.html
- Scintillating Grid
  - http://www.michaelbach.de/ot/lum_scGrid/index.html
- Hinton's “Lilac Chaser”
  - http://www.michaelbach.de/ot/col-lilacChaser/index.html
- Watercolor Illusion
  - http://www.michaelbach.de/ot/col-watercolor/index.html
- Tilted Table Illusion
  - http://www.michaelbach.de/ot/ang-tiltedTable/index.html

The END

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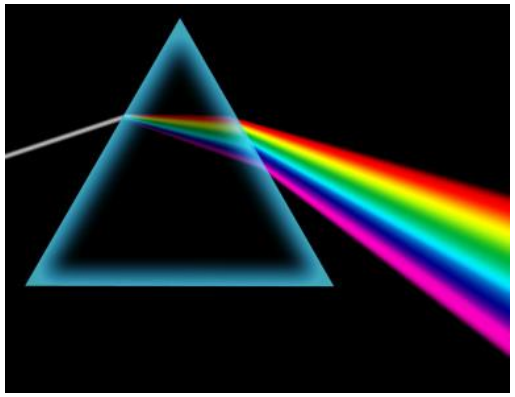
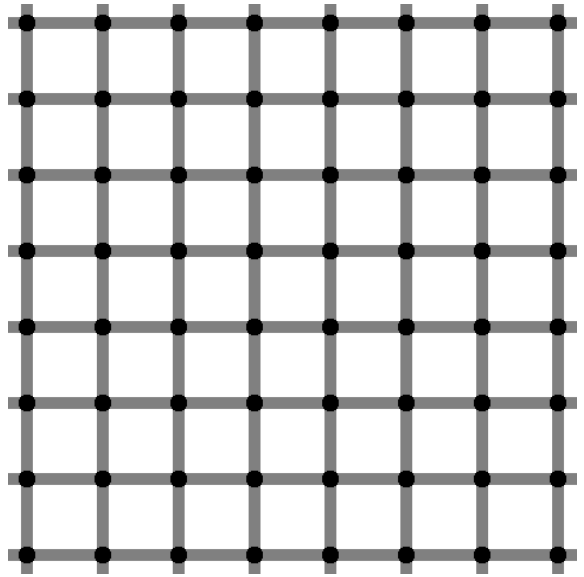
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