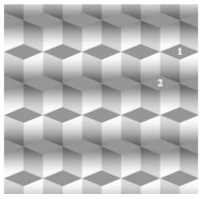
Brightness & Contrast

Definitions:



Intensity
Brightness
– illumination
– reflectance
Lightness
Contrast

1 & 2?

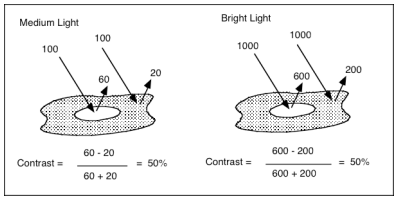
Physical contrast =

Difference in intensity of the 2 areas

Sum of intensity of the 2 areas

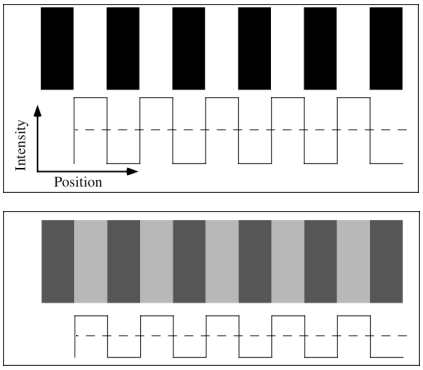
$$\frac{I_1 - I_2}{I_1 + I_2}$$

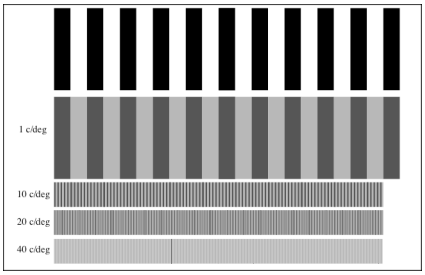
Contrast is independent of light level

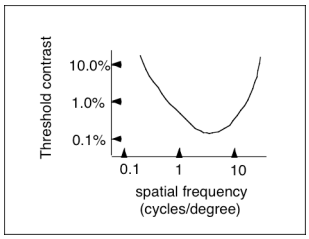


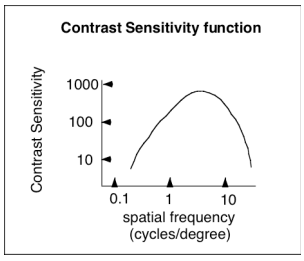
Spatial frequency
vs. perception of contrast:

Contrast Sensitivity function
Experiment:
Blakemore and Campbell

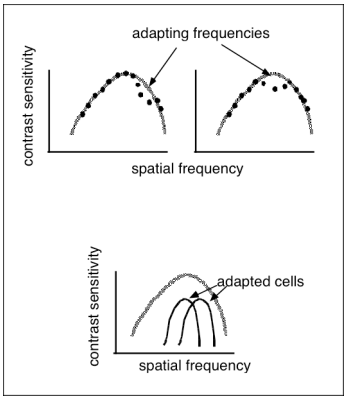


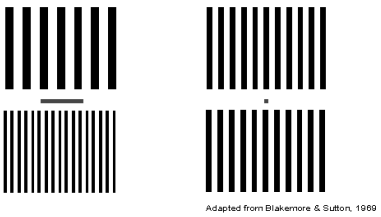




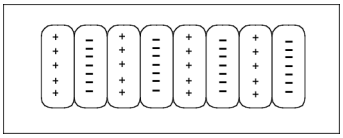


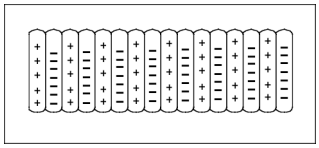
Campbell & Blakemore experiment

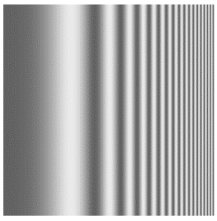


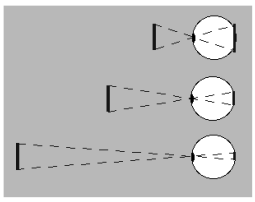


Adapted from Blakemore & Sutton, 1969







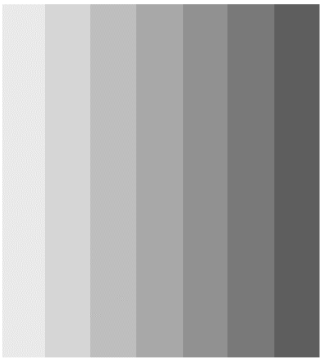


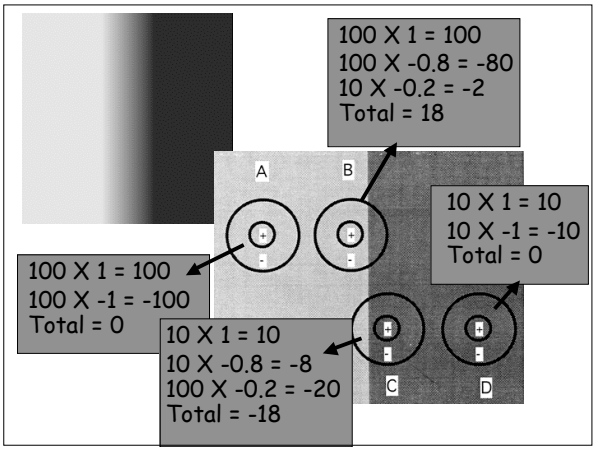
The size of the proximal image is inversely proportional to the square of the viewing distance. In other words, when we increase the viewing distance by a factor of 2, we decrease the size of the image on the retina by a factor of 4.

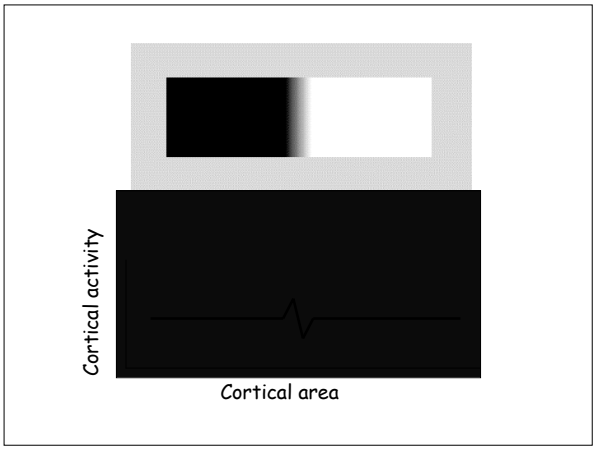
Physiology (brain activity):

Mach Band
Simultaneous contrast
Hermman Grid
The Craik-O'Brien-Cornsweet illusion

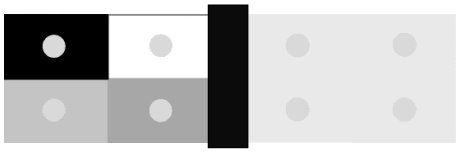
Mach Bands



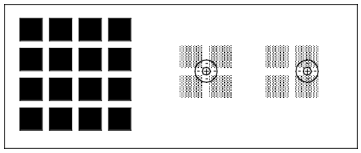


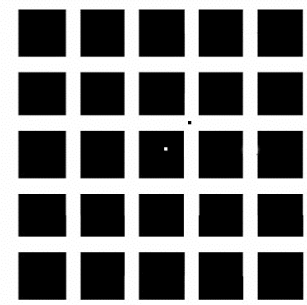


Simultaneous contrast

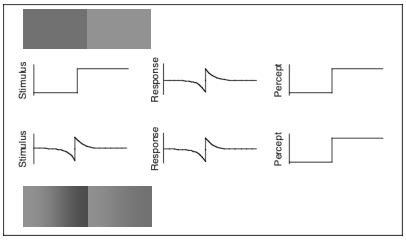


Hermann Grid

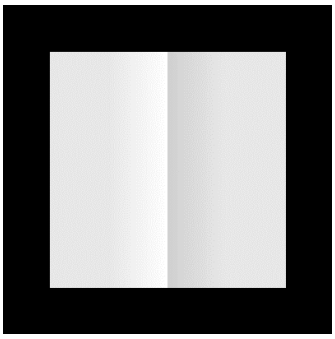


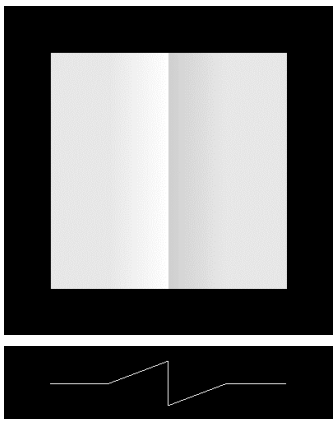


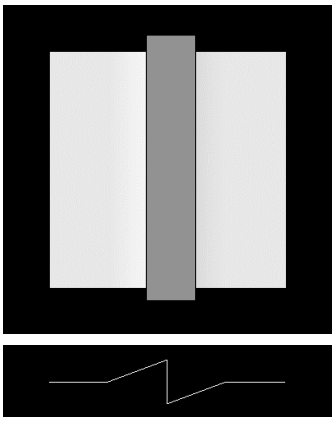
The Craik-O'Brien-Cornsweet illusion



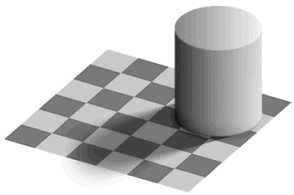
The Craik-O'Brien-Cornsweet illusion







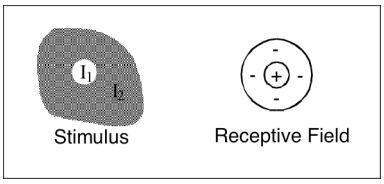
For more… See Ted Adelson



Mean intensity vs. contrast:

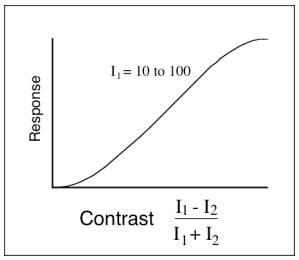
Operating curve
Experiment: Schweitzer-Tong
Constancies (lightness, colour)

Experiment: Schweitzer-Tong



Operating curve

One receptor: Wide range of mean luminance



Operating curve

Many receptors: Small range of mean luminance