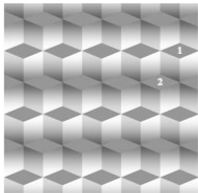


# Brightness & Contrast

## Definitions:



1 & 2?

Intensity  
 Brightness  
 - illumination  
 reflectance  
 Lightness  
 Contrast



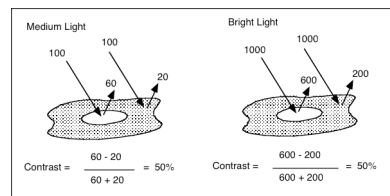
Physical contrast =

Difference in intensity of the 2 areas

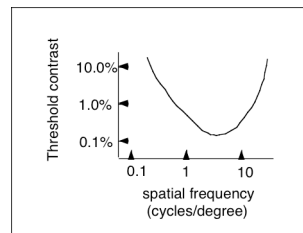
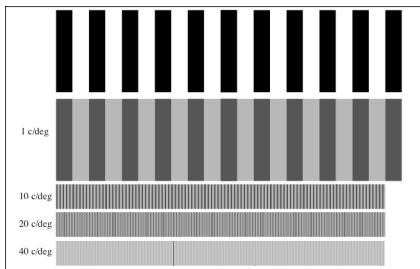
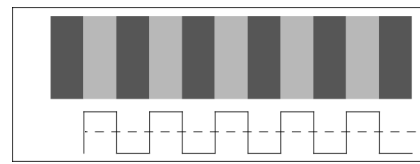
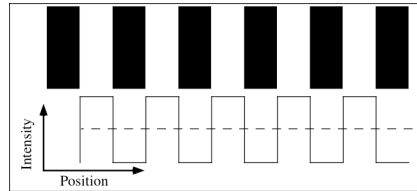
Sum of intensity of the 2 areas

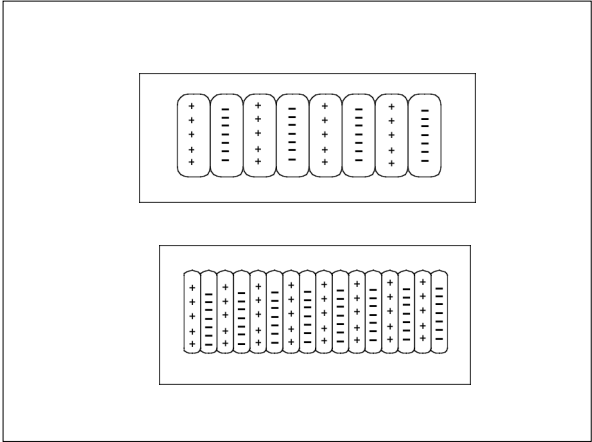
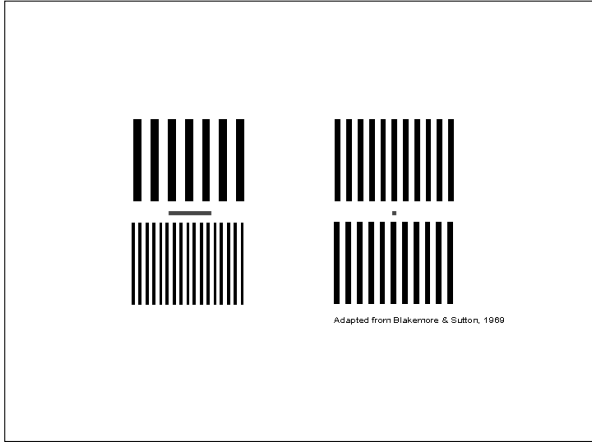
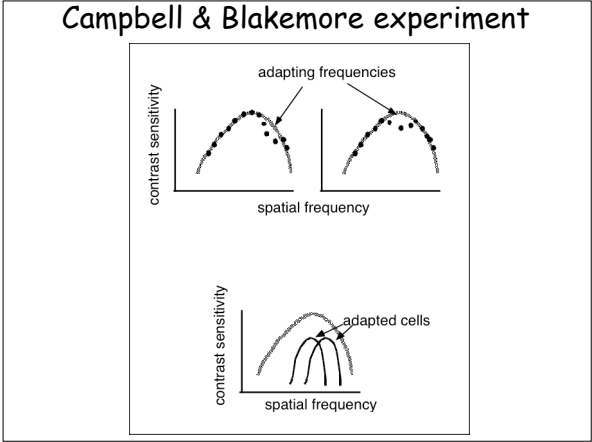
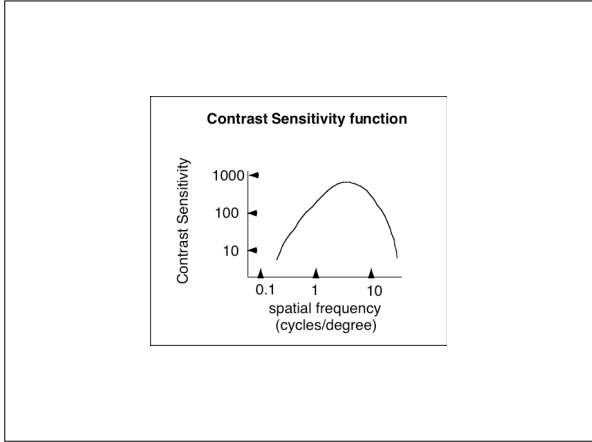
$$\frac{I_1 - I_2}{I_1 + I_2}$$

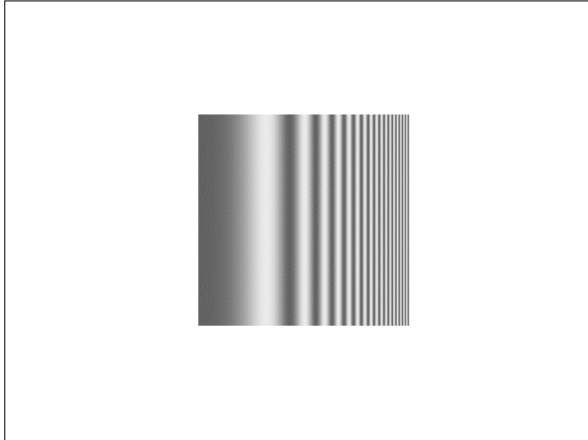
Contrast is independent of light level



**Spatial frequency  
vs. perception of contrast:**  
**Contrast Sensitivity function**  
Experiment:  
Blakemore and Campbell





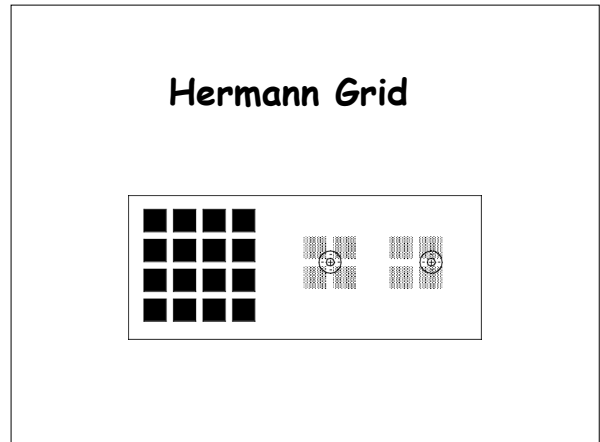
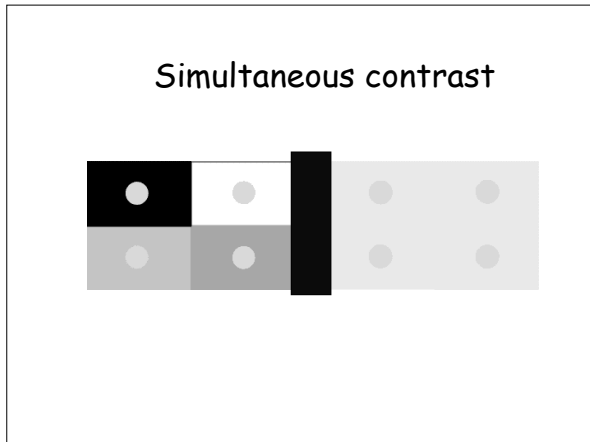
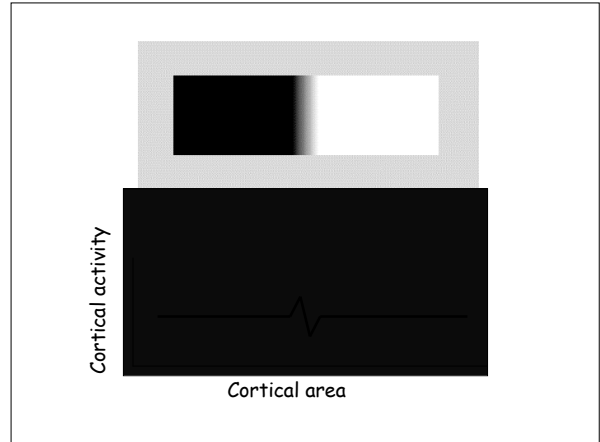
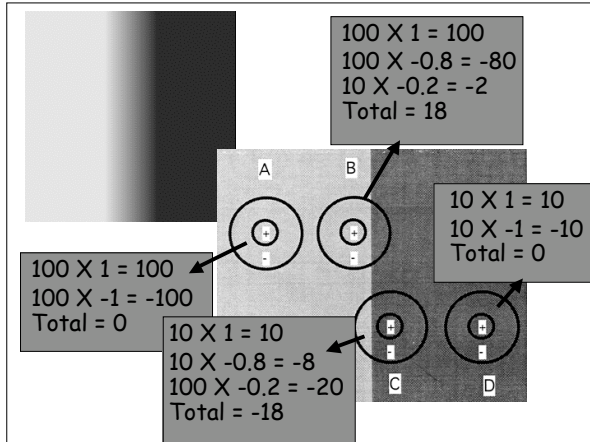


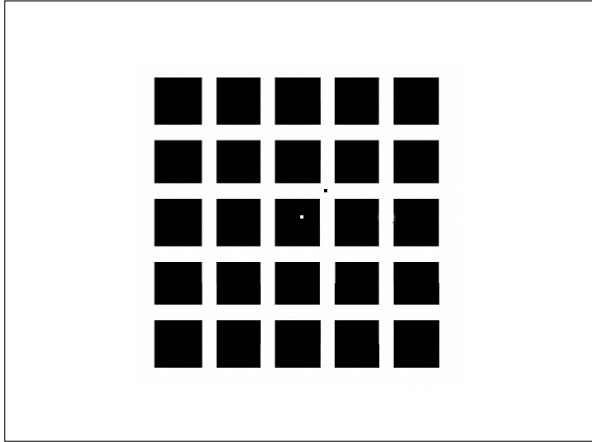
**The size of the proximal image is inversely proportional to the square of the viewing distance.**  
In other words, when we increase the viewing distance by a factor of 2, we decrease the size of the image on the retina by a factor of 4.

**Physiology (brain activity):**

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

**Mach Bands**



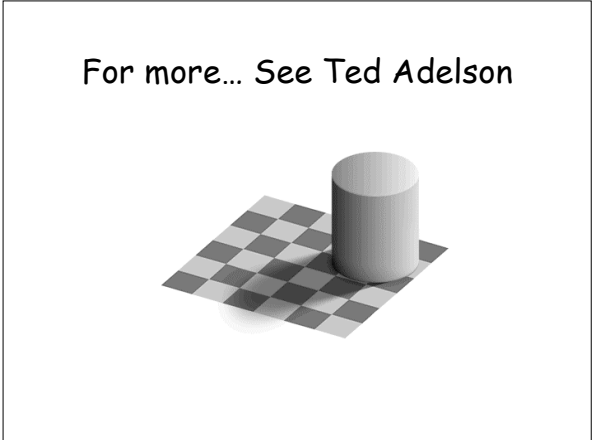
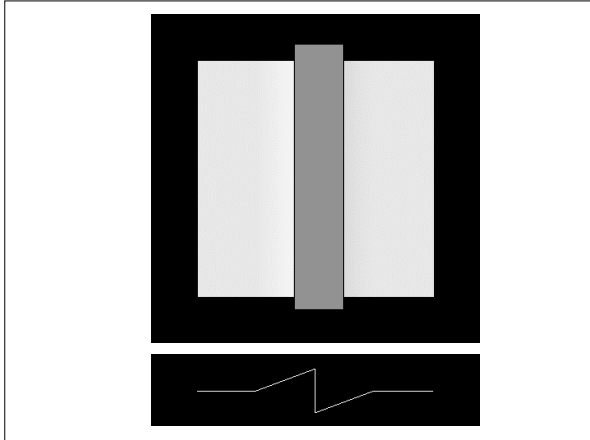


**The Craik-O'Brien-Cornsweet illusion**

The diagram illustrates the Craik-O'Brien-Cornsweet illusion. At the top, a horizontal bar shows a grayscale gradient from dark to light. Below this, two rows of graphs show the relationship between stimulus, response, and percept. The top row shows a stimulus with a step function, a response with a step function, and a percept with a step function. The bottom row shows a stimulus with a step function, a response with a step function, and a percept with a step function.

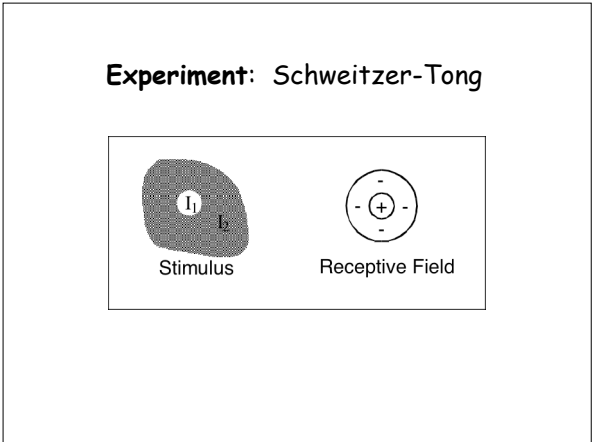
**The Craik-O'Brien-Cornsweet illusion**

The diagram shows a square with a black border and a grayscale gradient from light to dark. Below the square, a graph shows a step function, representing the perceptual response to the stimulus.



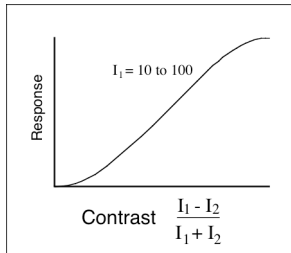
**Mean intensity vs. contrast:**

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



### Operating curve

**One  
receptor:  
Wide range  
of mean  
luminance**



### Operating curve

**Many  
receptors:  
Small range  
of mean  
luminance**

