

# Brilho e Contraste

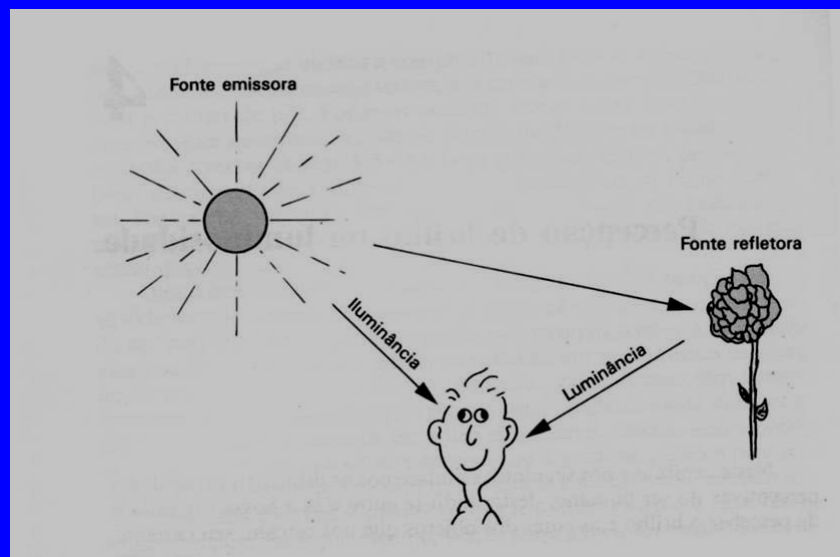


Table 4-1 Photometric Units

Photometric term	What is measured	Unit	How measured	Comments
Radiance or luminous flux	Radiant energy from a light source	Lumen	A candela is the light of a 1-lumen source at a distance of 1 m shone on a square meter	Defined in terms of a standard candle (candela)
Illuminance	Light falling on a surface	Lux	1 lumen/m <sup>2</sup>	As the source moves farther away illuminance decreases
Luminance	Light reflected from a surface	Candelas per square meter	Lumens reflected from a surface	Independent of distance of eye from surface
Reflectance (albedo)	Proportion of light reflected from surface	Percentage reflectance	$\frac{\text{Luminance}}{\text{Illuminance}} \times 100$	Really ratio of reflected to incident light
Retinal illuminance	Amount of light incident on the retina	Trolands	1 candela/m <sup>2</sup> seen through pupil of 1 mm <sup>2</sup> area	Roughly 0.0036 lumens/m <sup>2</sup> through a 1-mm <sup>2</sup> pupil
Brightness	Phenomenal impression of light intensity	Not yet agreed on, but bril is best contender	Relative matching and scaling techniques	Psychological rather than physical quantity

EXHIBIT

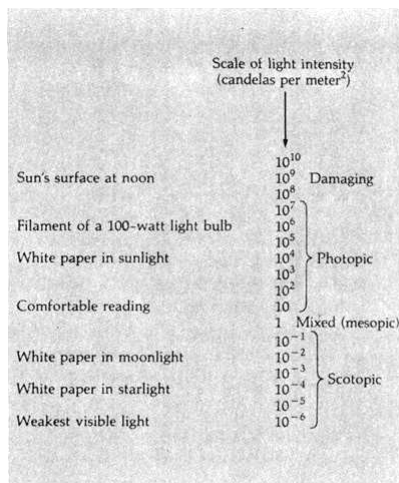
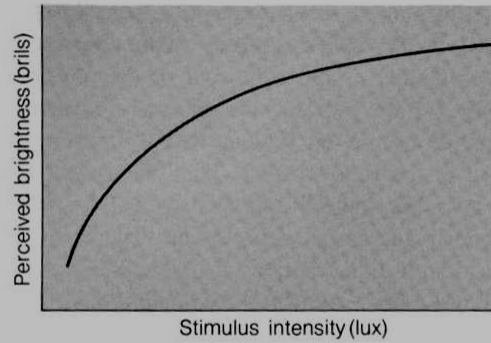


FIGURE 3.17

Scale of light intensity expressed in units called "candelas," a measure of light energy.

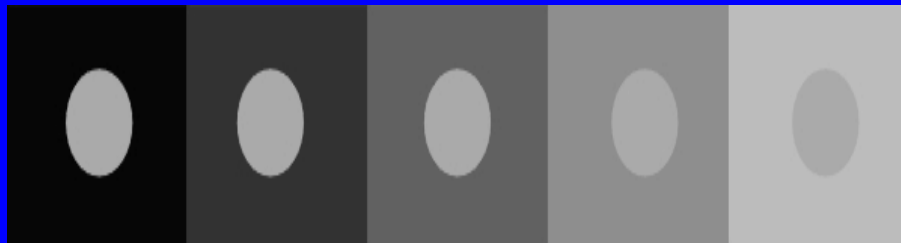
## Brilho x Intensidade Luminosa



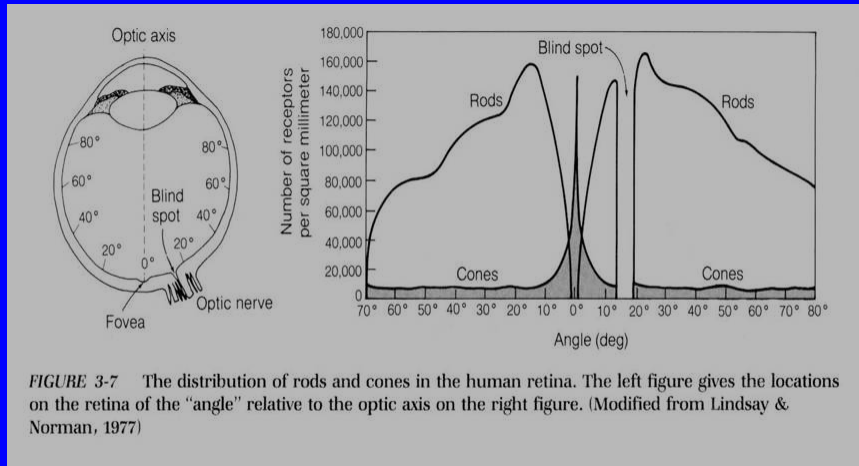
**FIGURE 4-1** The nonlinear relationship between stimulus intensity and brightness.

## Luminância x Brilho

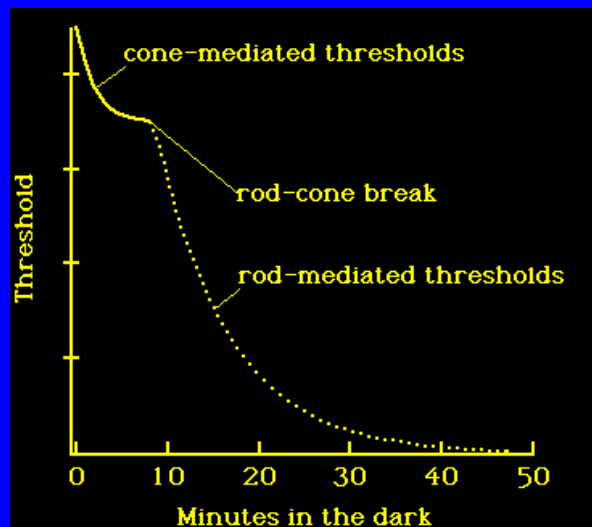
### Contraste Simultâneo



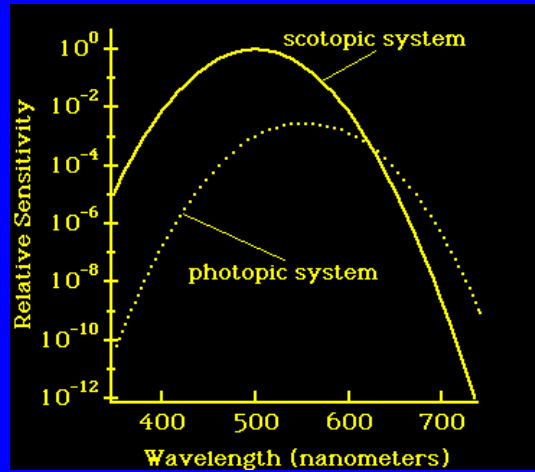
## Distribuição de Bastonetes e Cones



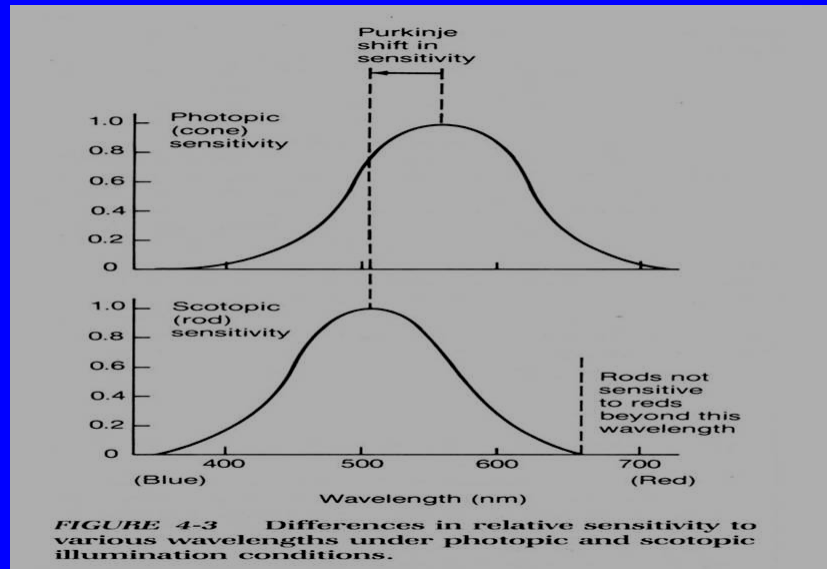
## Adaptação ao Escuro

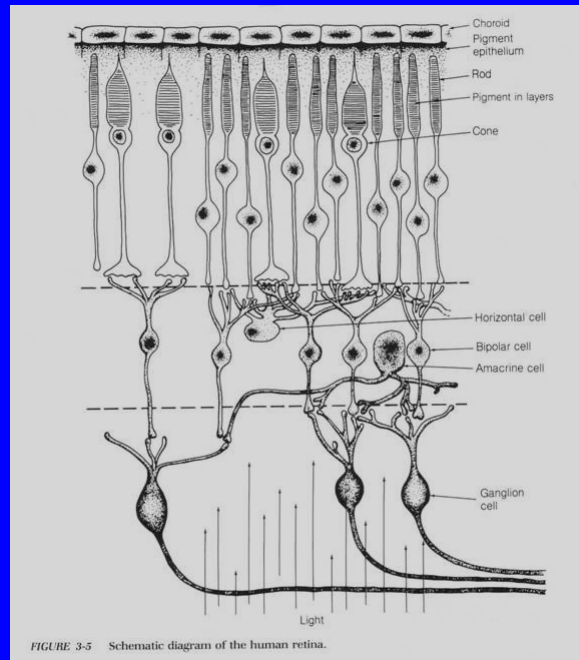


# Sensibilidade Fotópica e Escotópica



# Efeito Purkinje





# Registro Eletrofisiológico

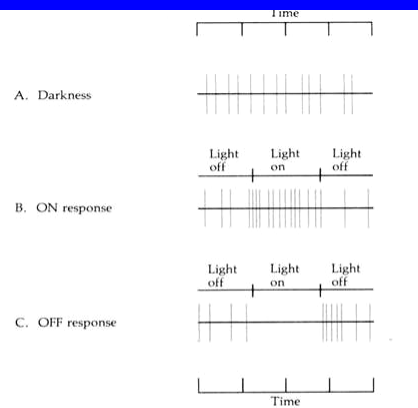
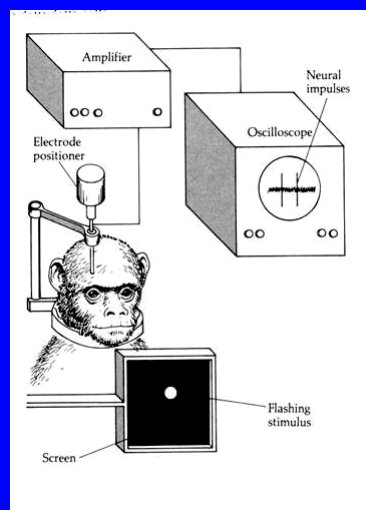
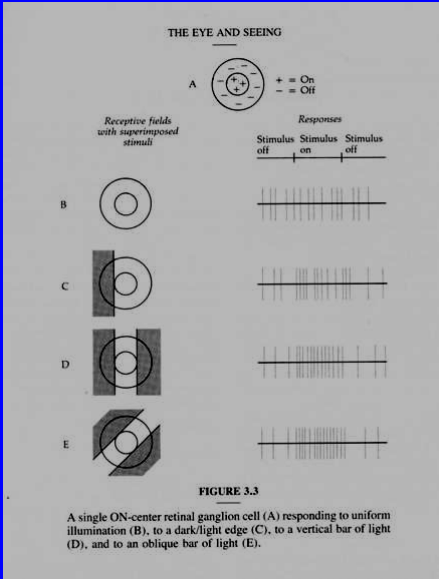


FIGURE 3.2

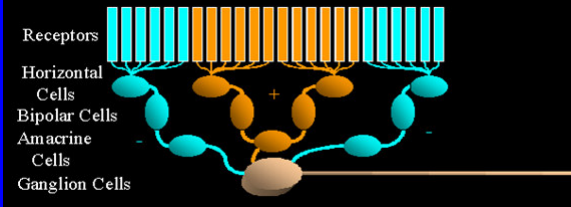
Neural activity (shown as vertical lines) of retinal ganglion cells. See the text for a full discussion.

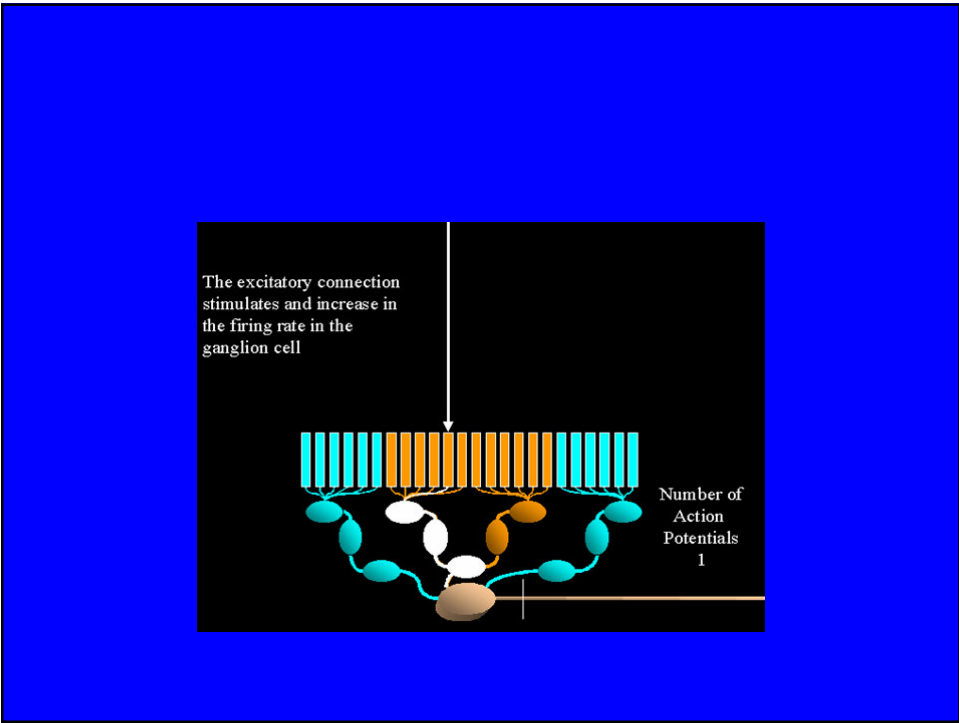
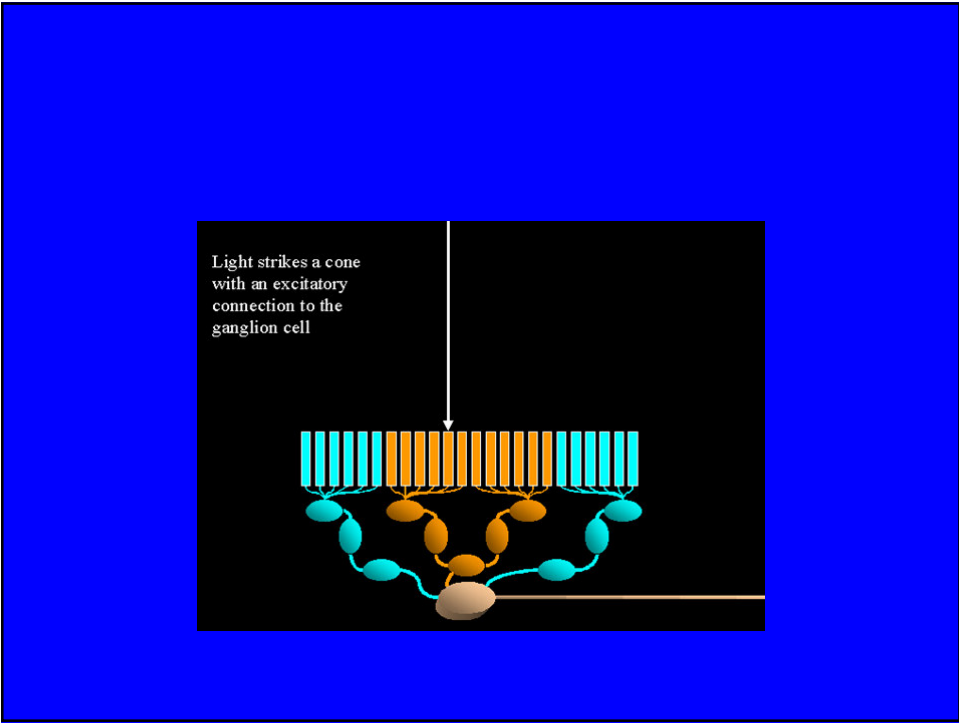
# Inibição Lateral



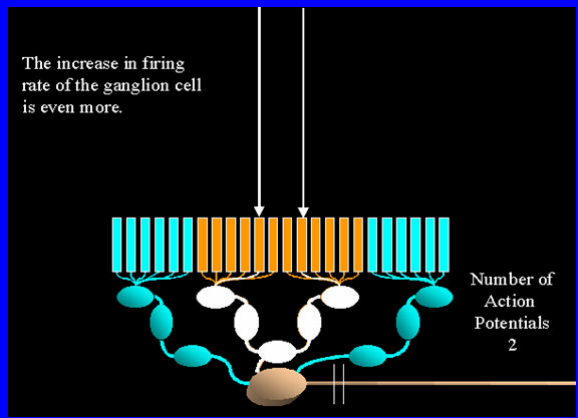
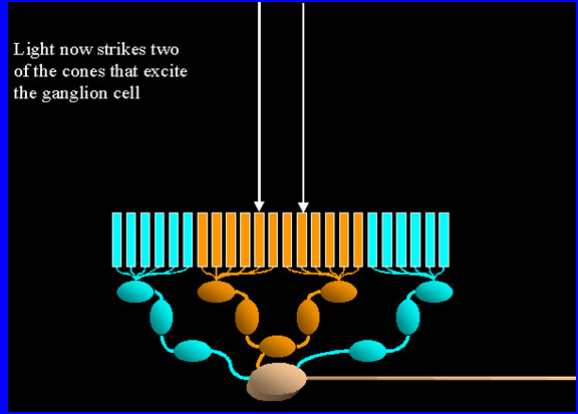
# Schematic Retina Showing a Receptive Field

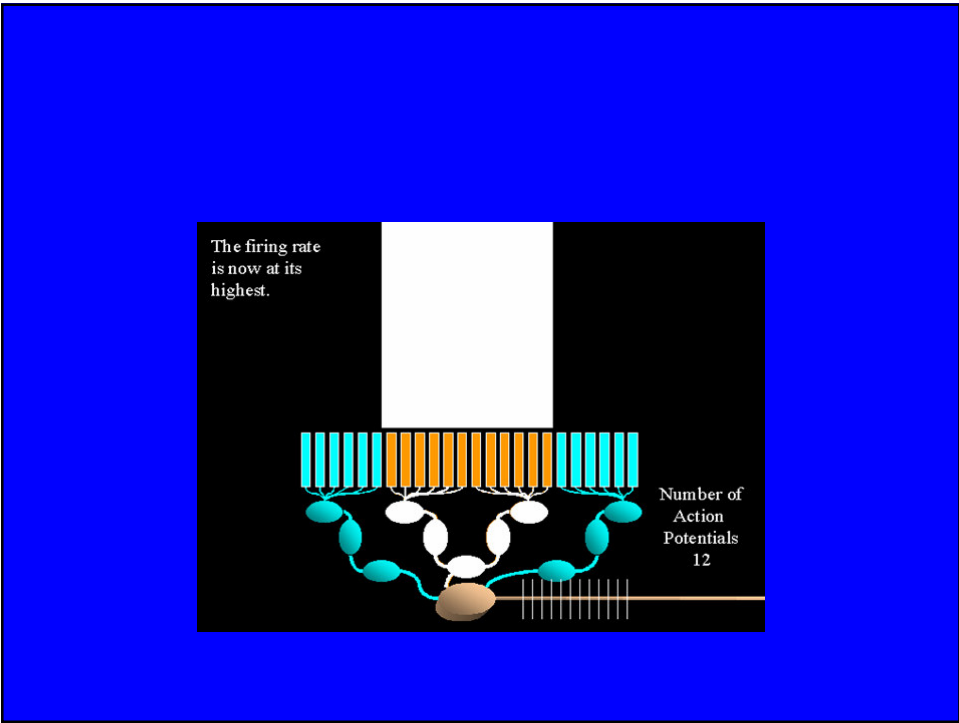
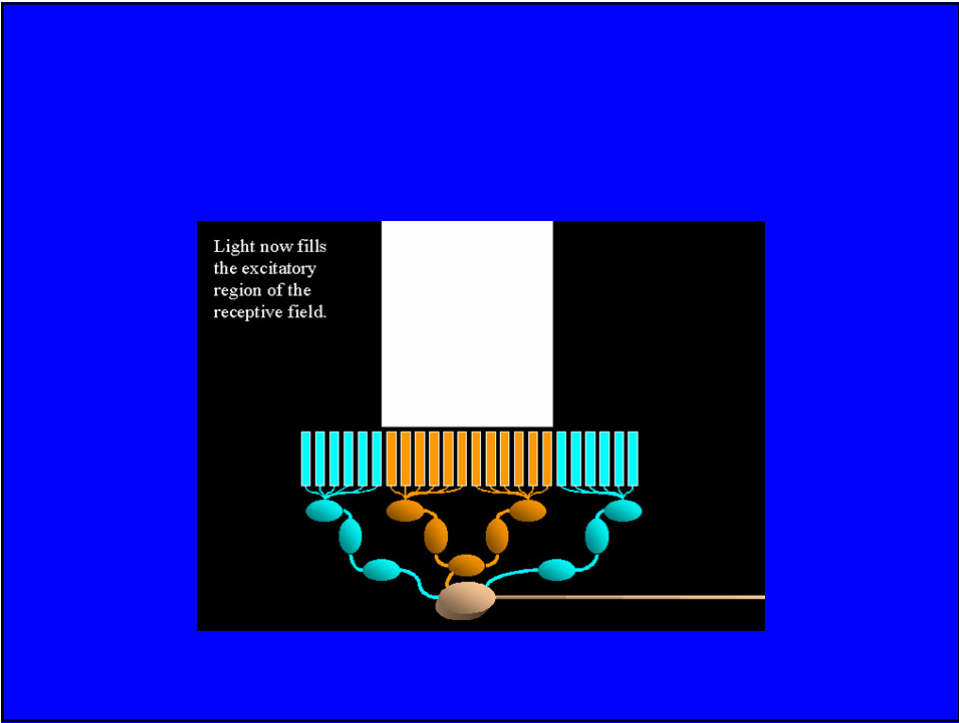
Orange are excitatory inputs into the receptive field.  
 Blue are inhibitory inputs into the receptive field.

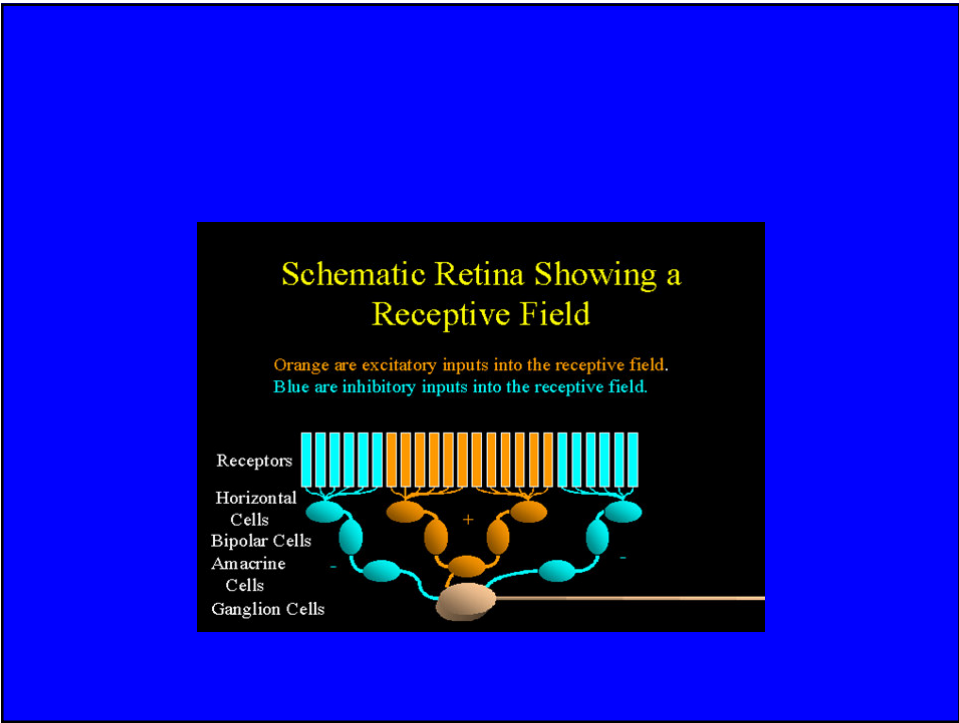
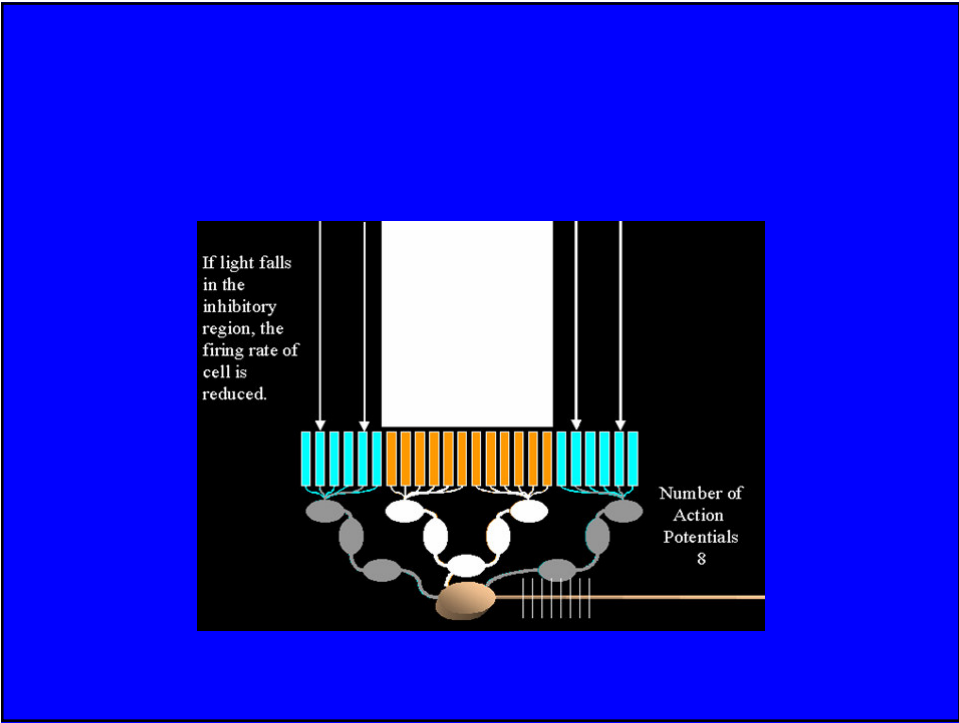


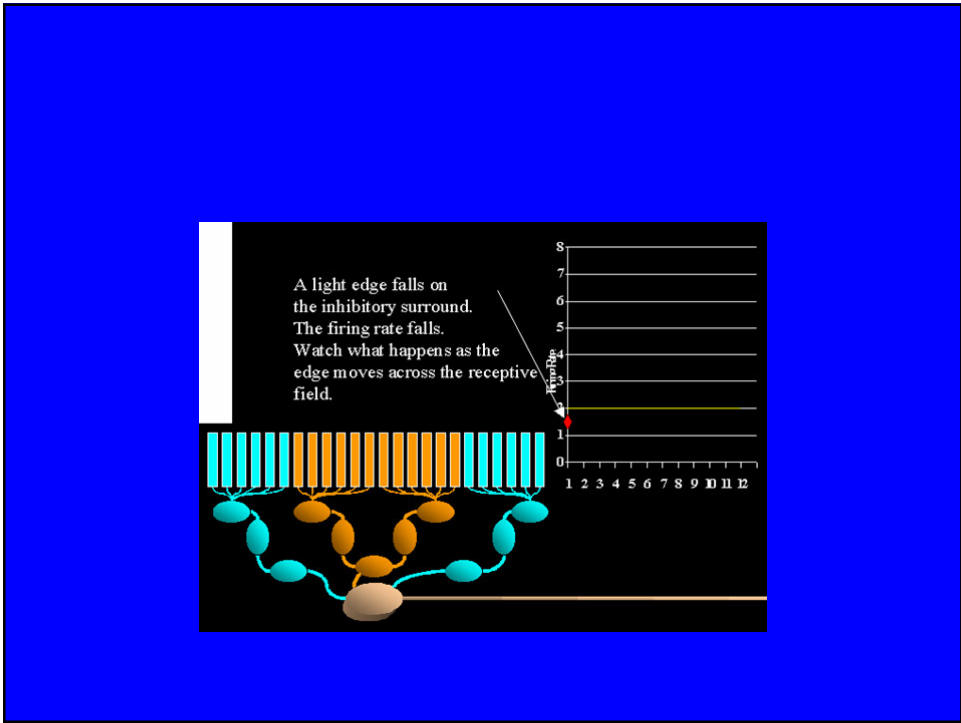
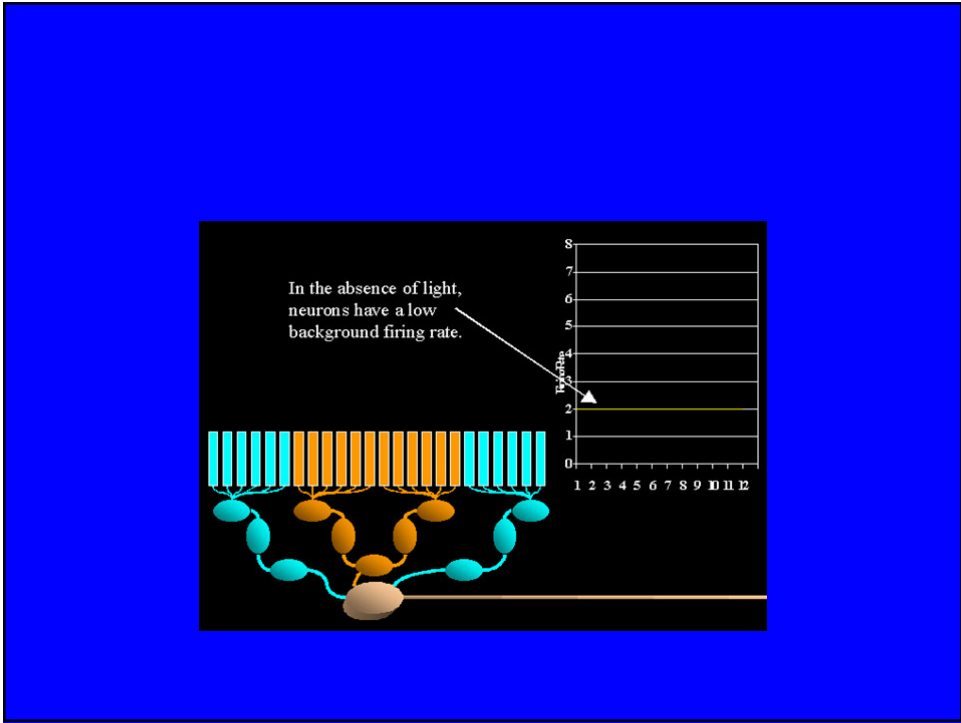


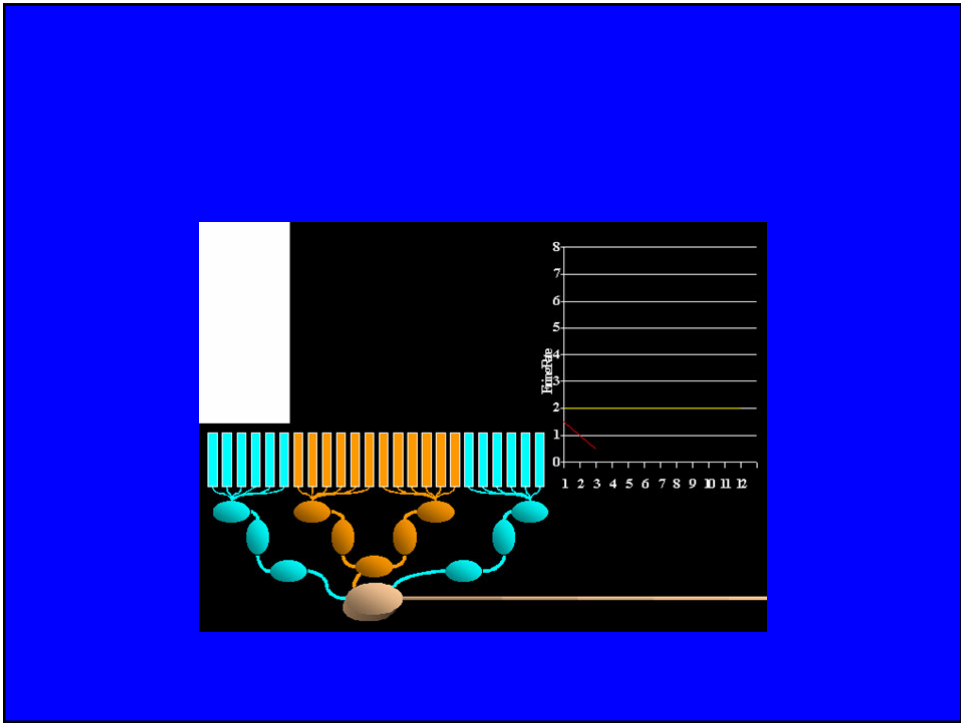
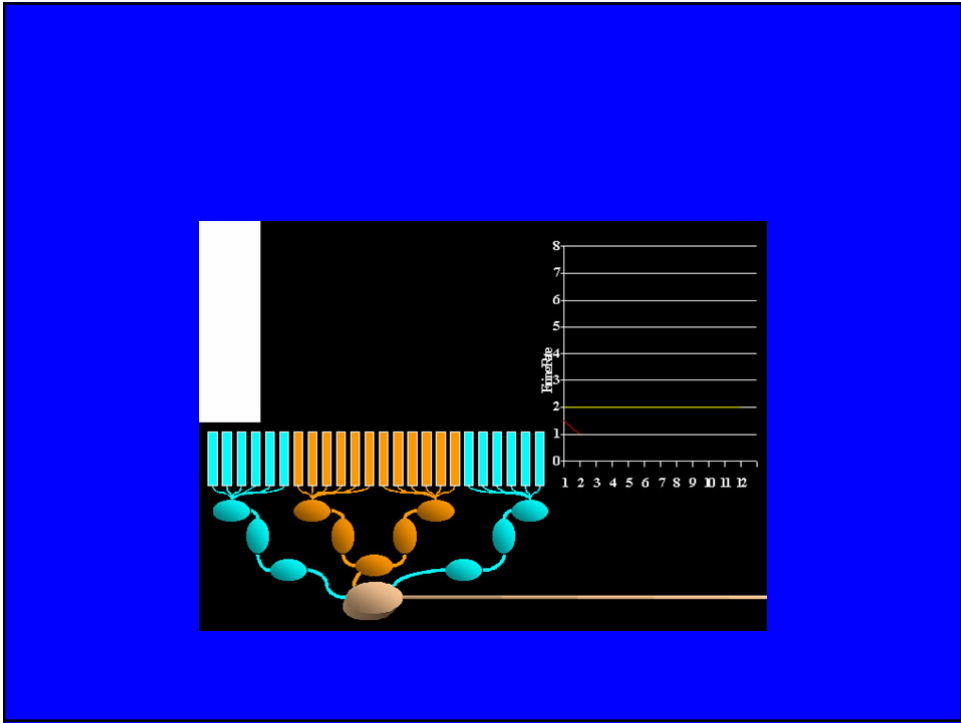


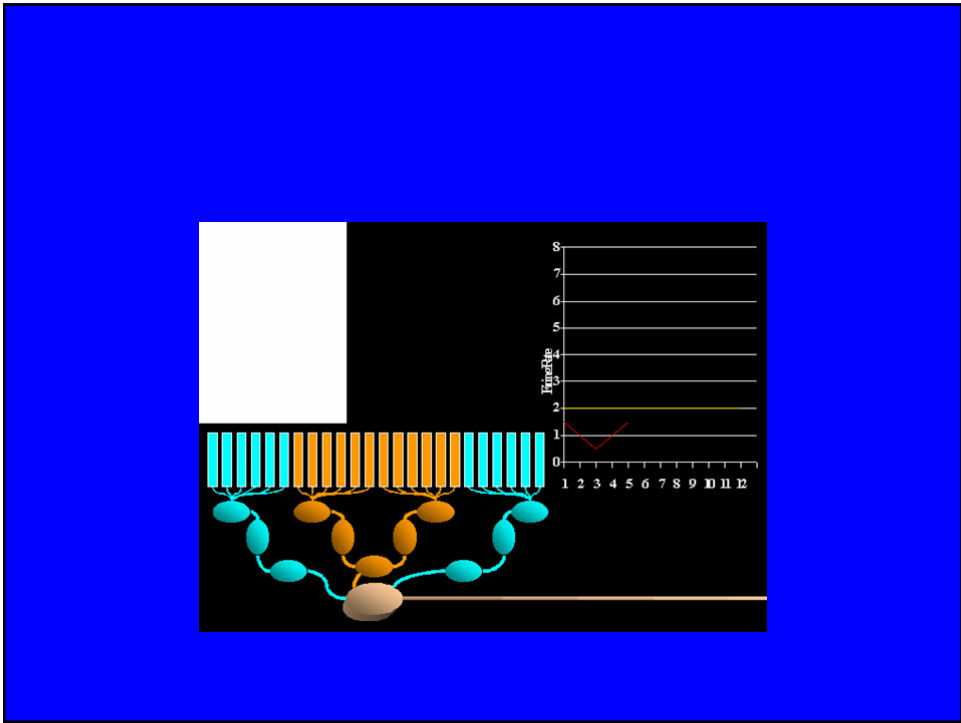
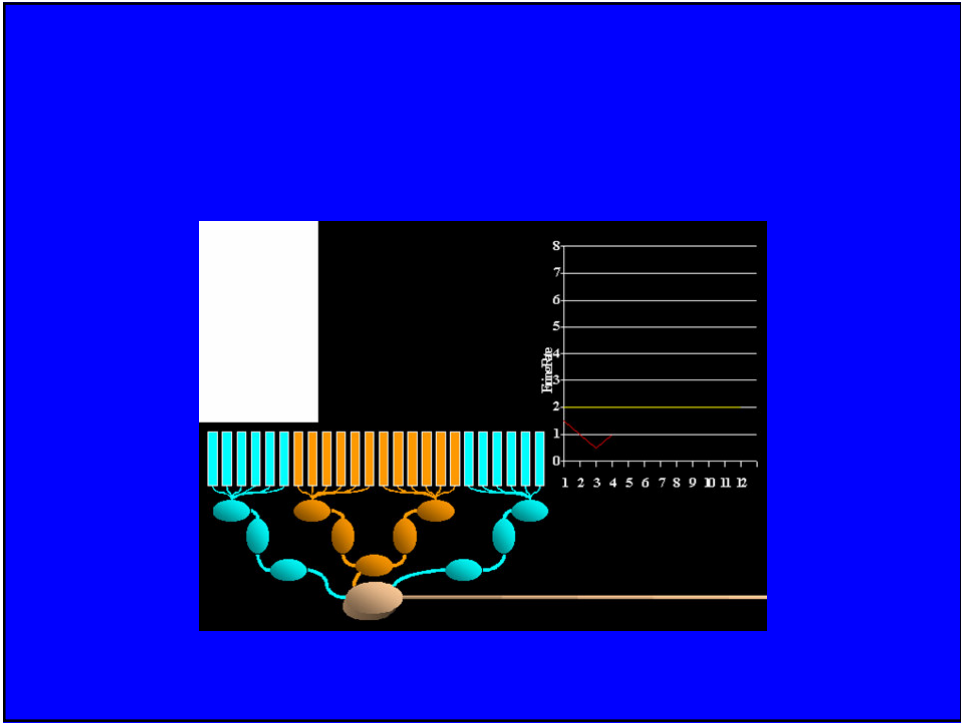


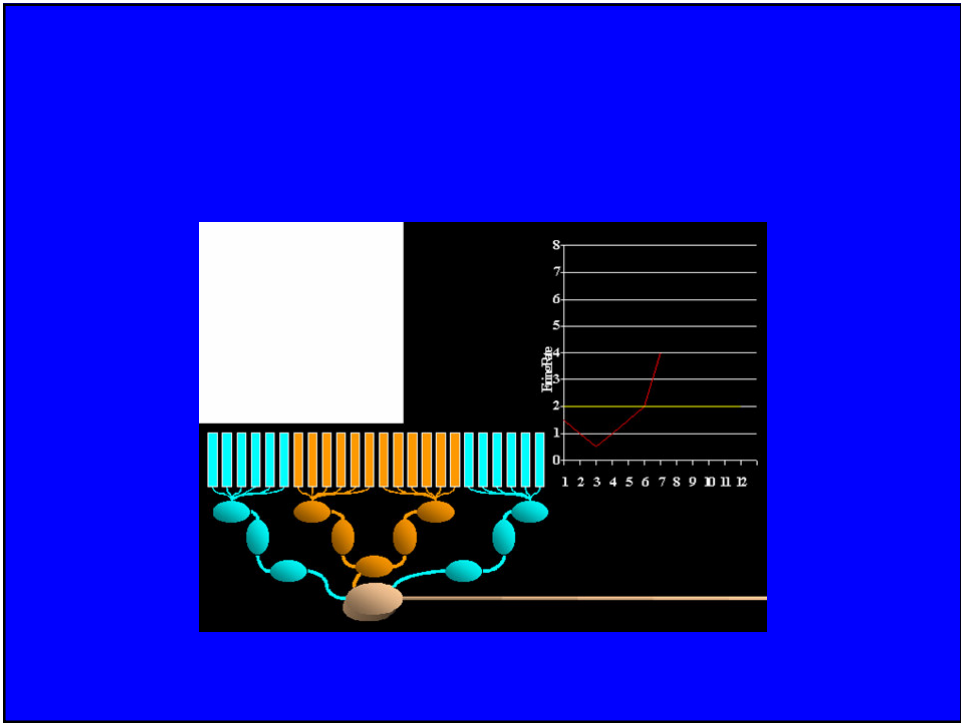
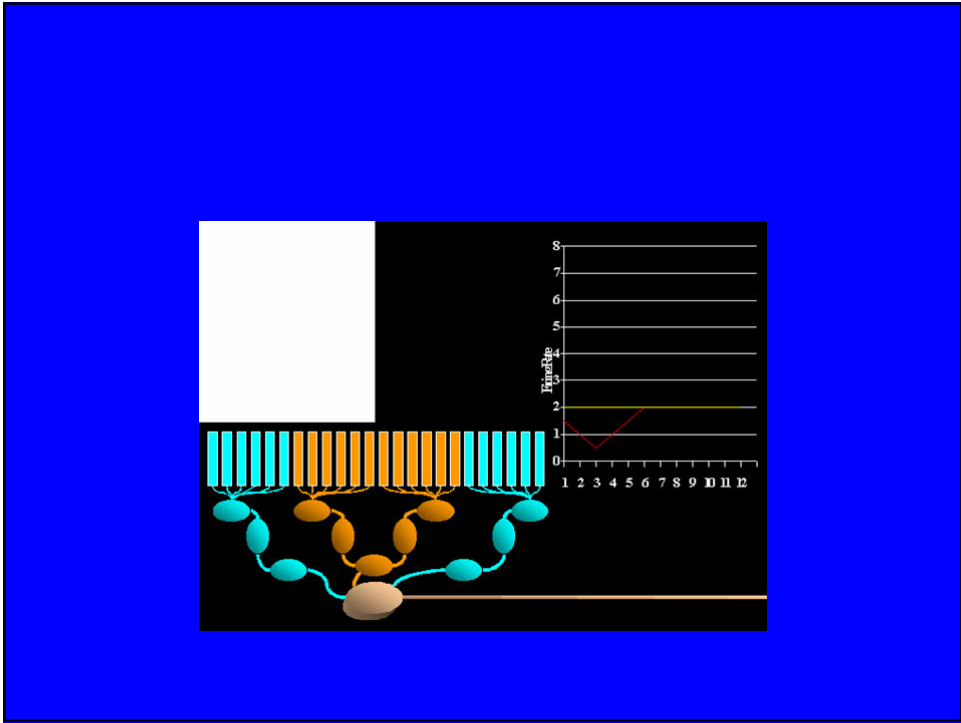


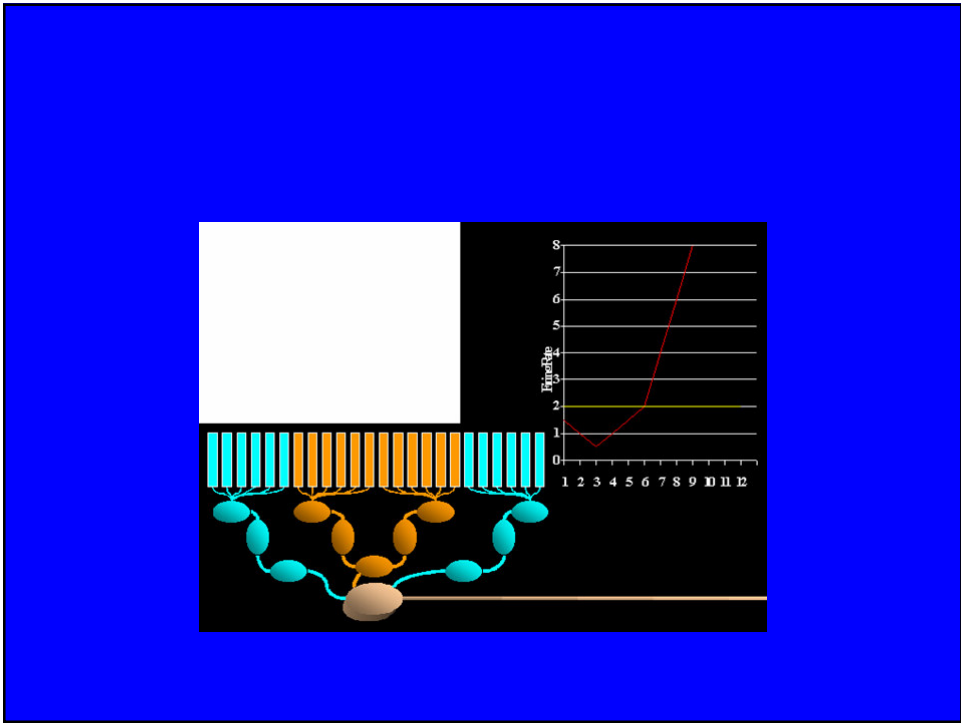
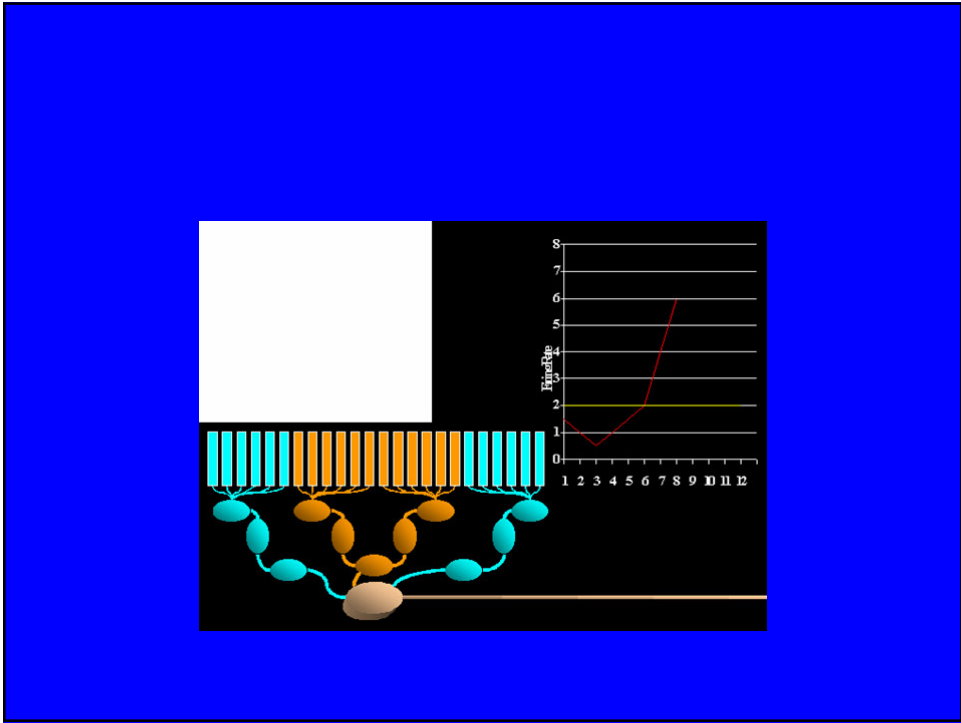




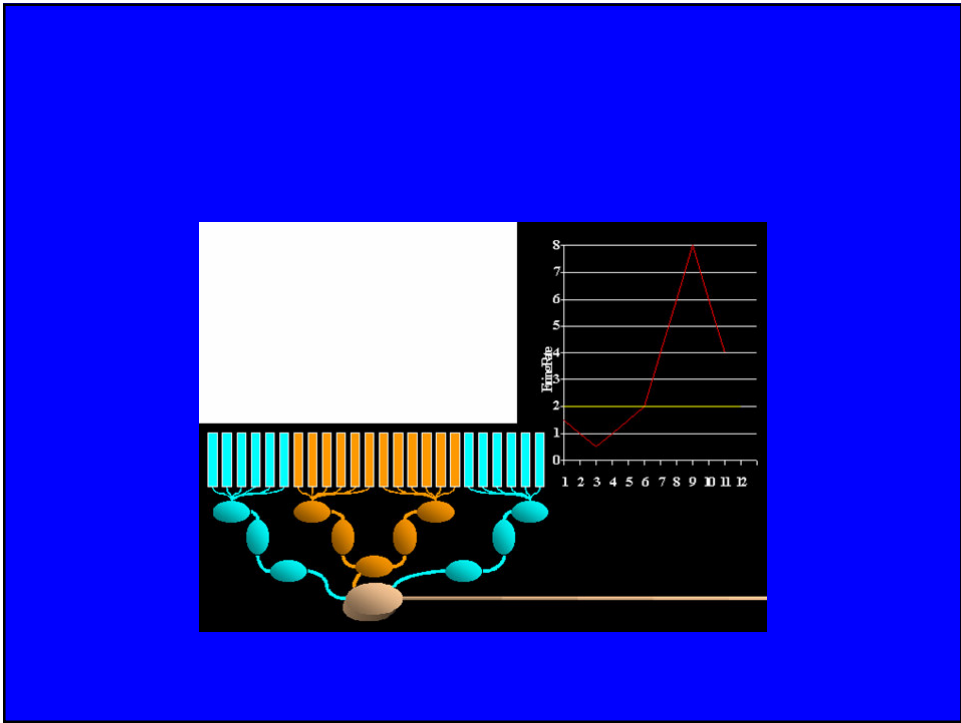
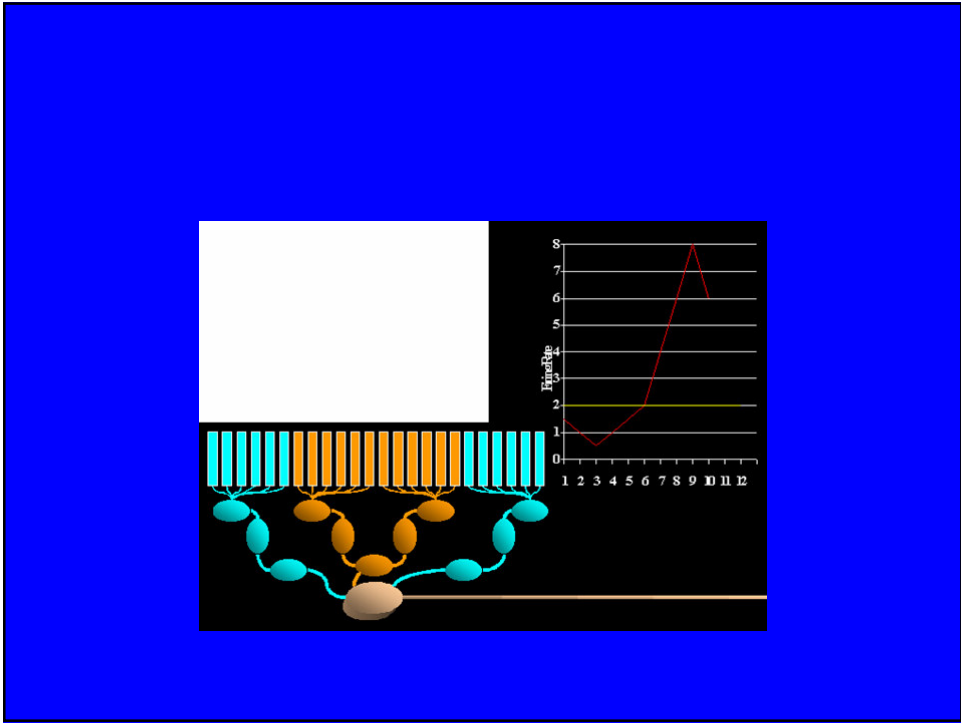


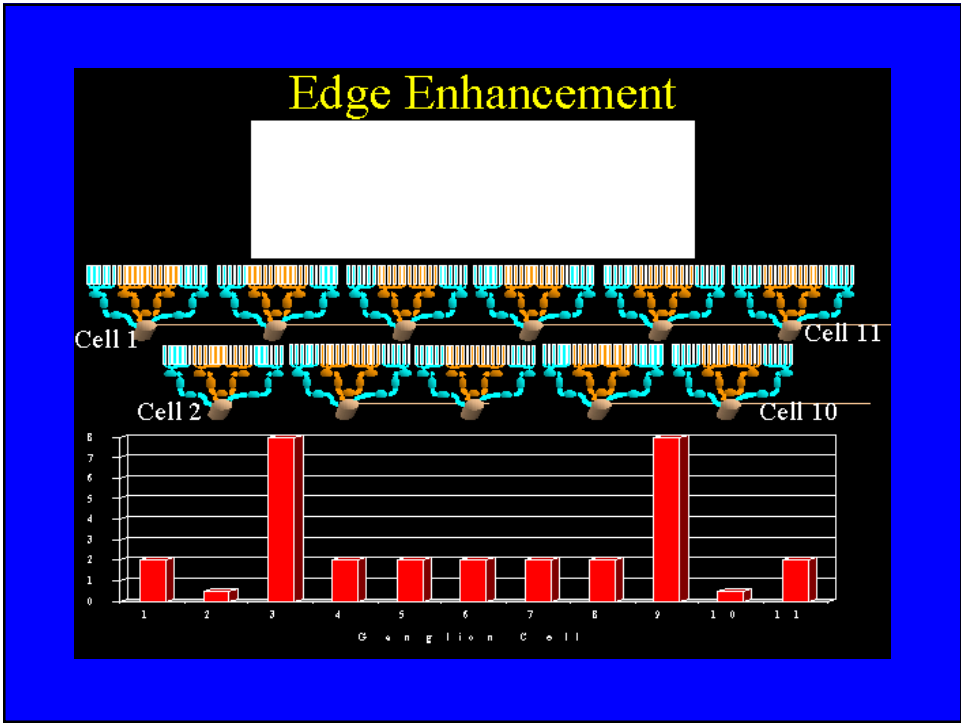
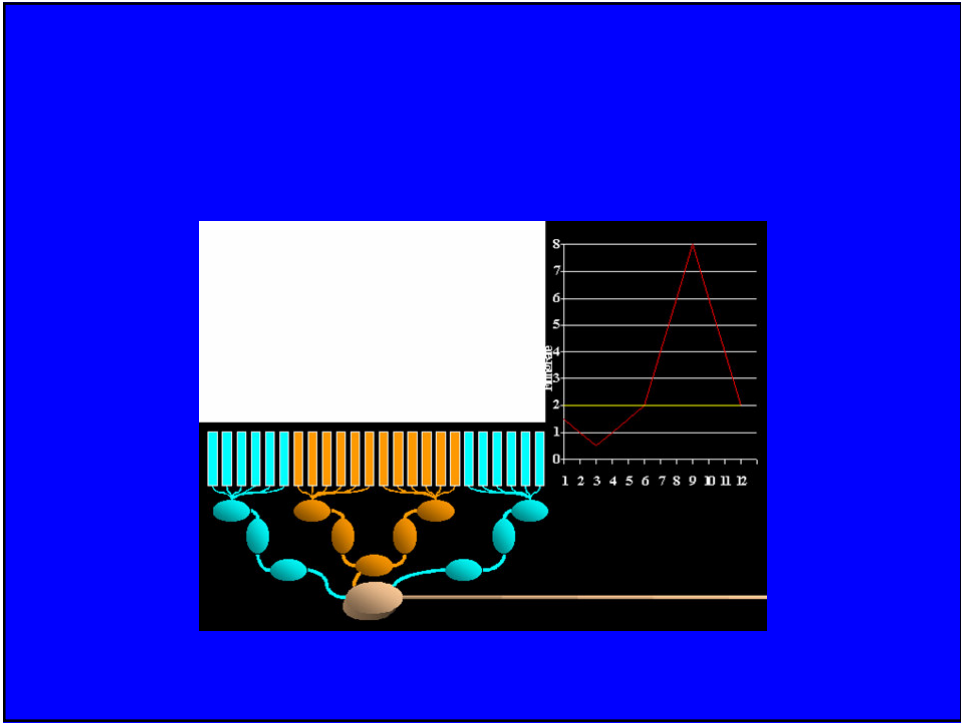




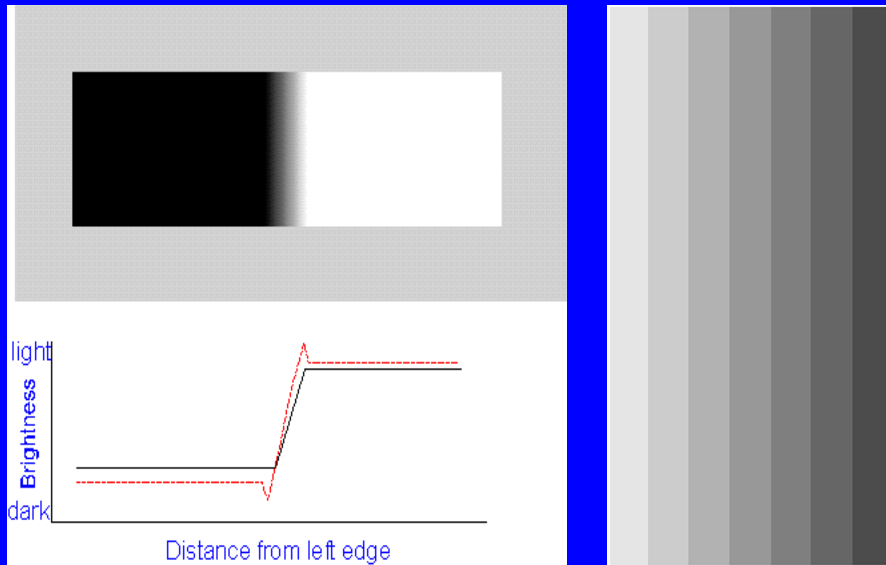






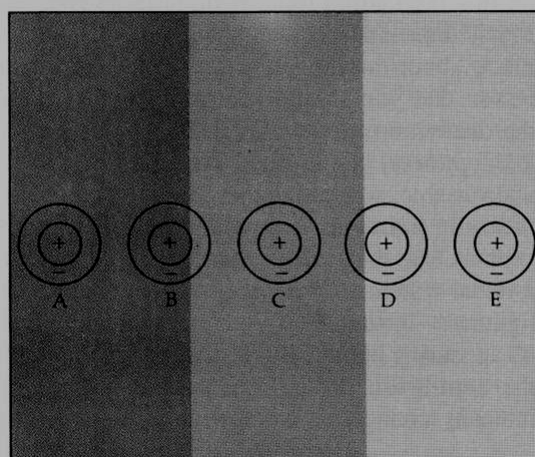


# Bandas de Mach

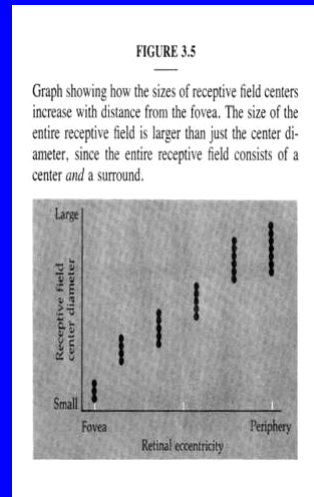
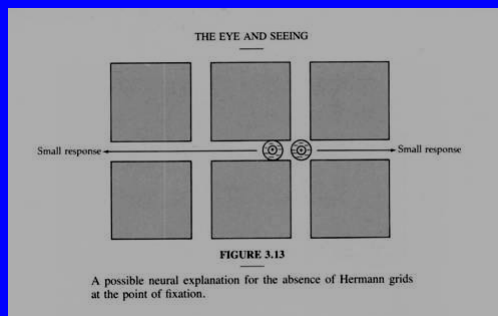
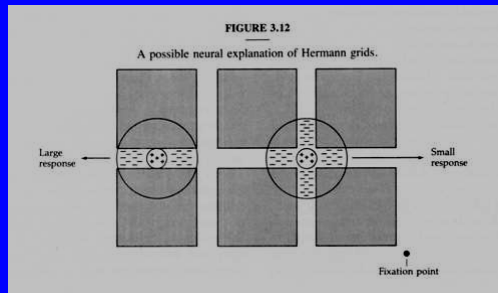
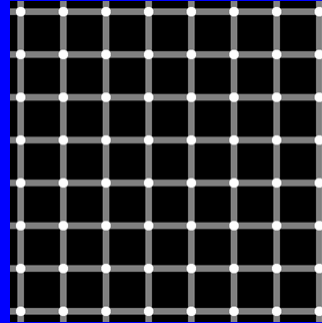
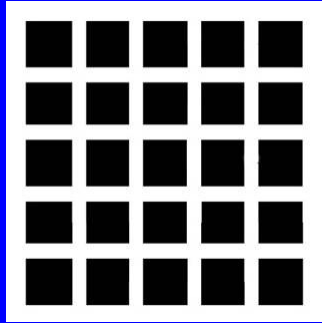


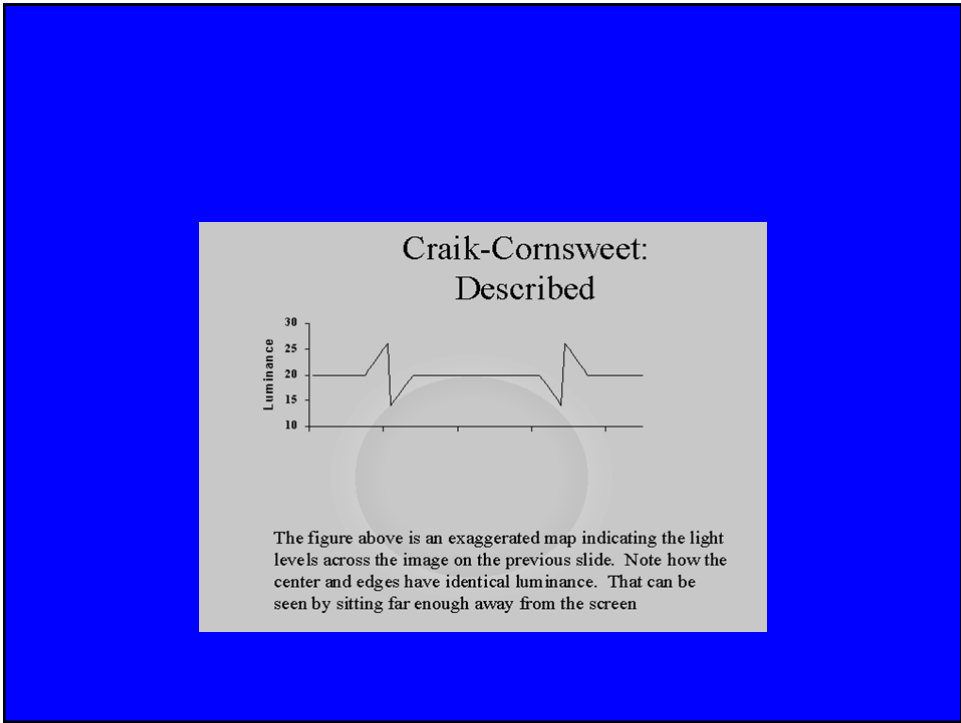
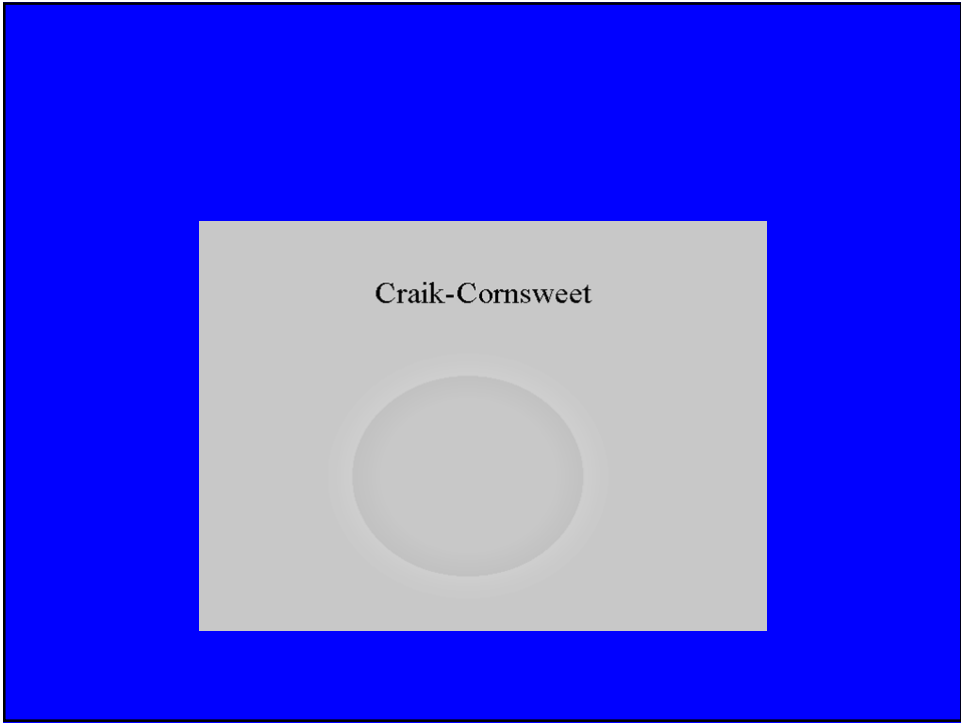
**FIGURE 3.9**

Possible neural explanation of Mach bands.

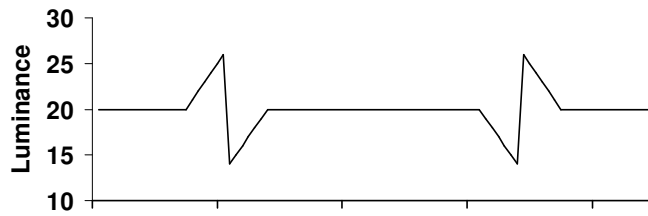


# Redes de Hermann





## Craik-Cornsweet: Described



The figure above is an exaggerated map indicating the light levels across the image on the previous slide. Note how the center and edges have identical luminance. That can be seen by sitting far enough away from the screen.

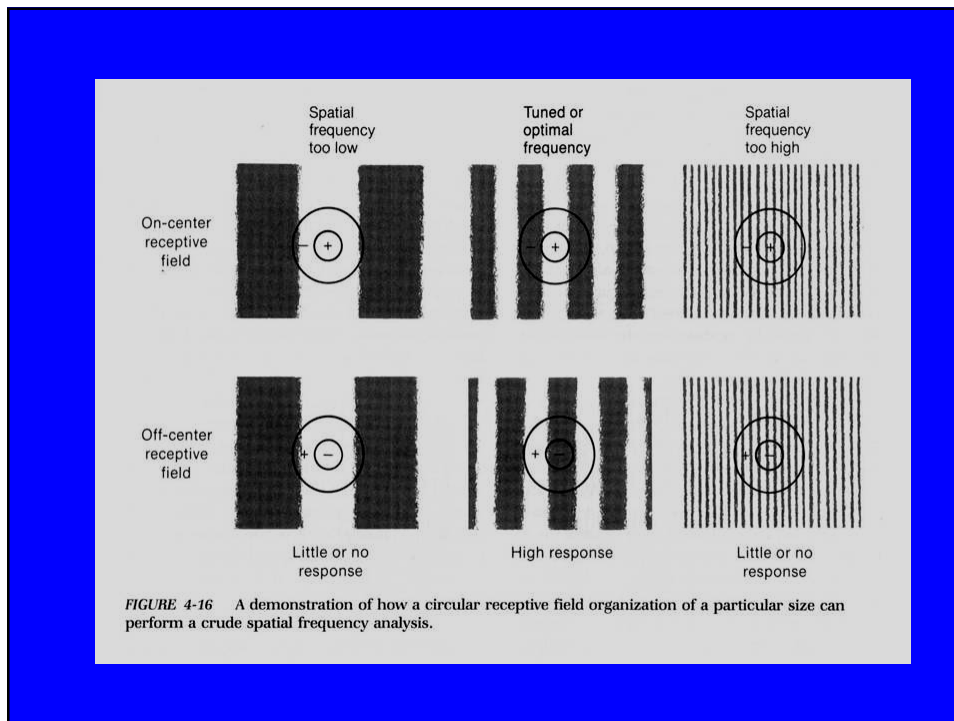
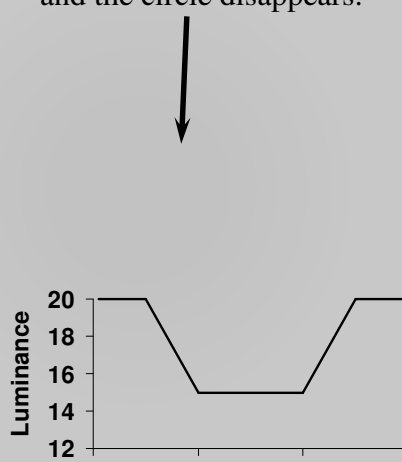
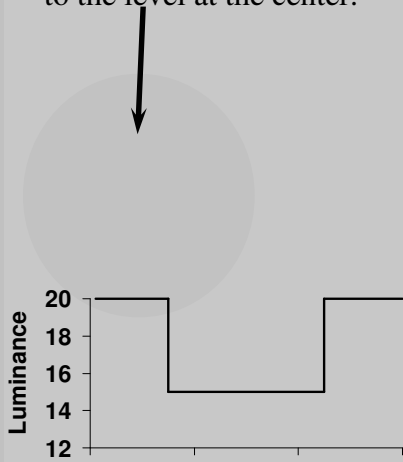
Minimal Contours



## Minimal Contours Described

There are two circles below. Both circles have the same luminance (intensity level) at the center. This one changes abruptly to the level at the center.

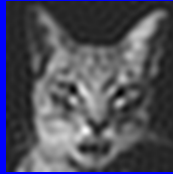
Click on your mouse and watch as the edges are blurred and the circle disappears.



## Filtros de Frequência Espacial



- Sem filtragem

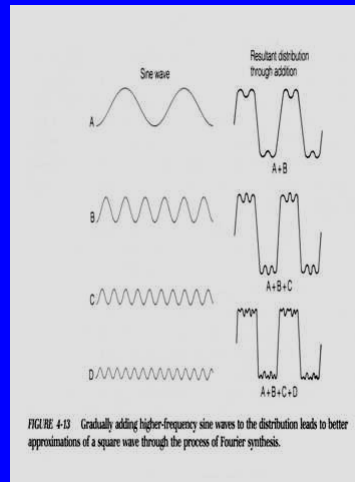
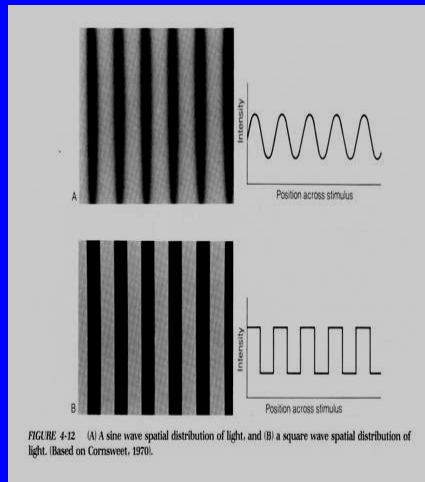


- Passa baixo



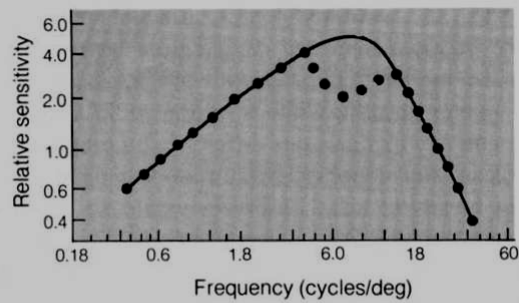
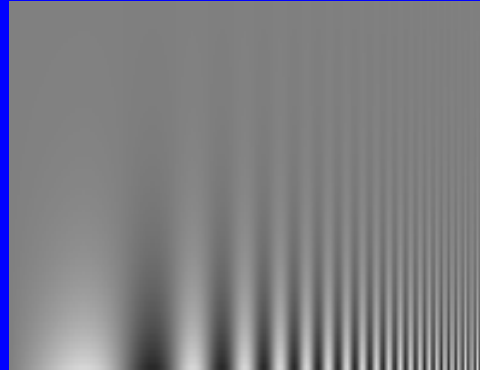
- Passa alto

## Síntese de Fourier





## Sensibilidade ao Contraste



**FIGURE 4-15** The modulation transfer function, which shows the relative visibility of targets of various spatial frequencies. The solid line represents the normal transfer function; the dotted line represents the transfer function after selective adaptation to a 6 cycle/deg stimulus.

# Acuidade Visual

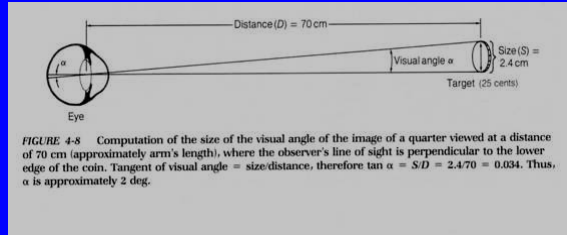


FIGURE 4-8 Computation of the size of the visual angle of the image of a quarter viewed at a distance of 70 cm (approximately arm's length), where the observer's line of sight is perpendicular to the lower edge of the coin. Tangent of visual angle = size/distance, therefore  $\tan \alpha = S/D = 2.4/70 = 0.034$ . Thus,  $\alpha$  is approximately 2 deg.

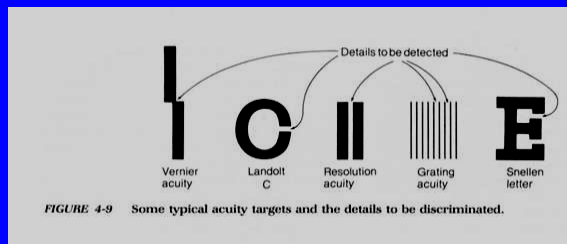
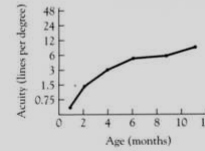
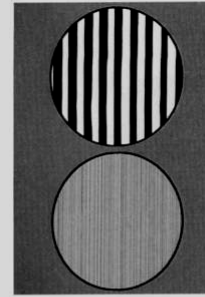


FIGURE 4-9 Some typical acuity targets and the details to be discriminated.



At the top are examples of the type of display used to study acuity in infants. The graph below shows the results of one such study, which measured the thinnest lines (in numbers of lines per degree of visual angle) that the infant preferred over a blank field.

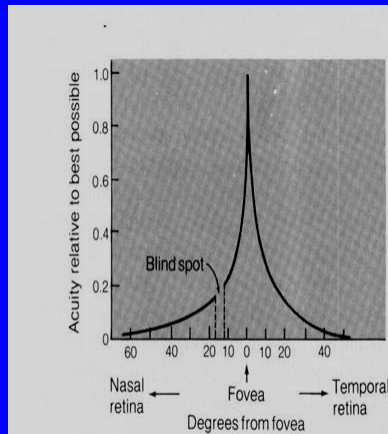


FIGURE 4-10 The distribution of visual acuity across the retina.

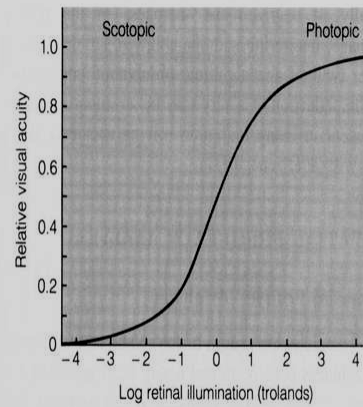


FIGURE 4-11 The effect of illumination on visual acuity.