Chap.4. Sensation & perception

Movement
Latin animus means “consciousness”

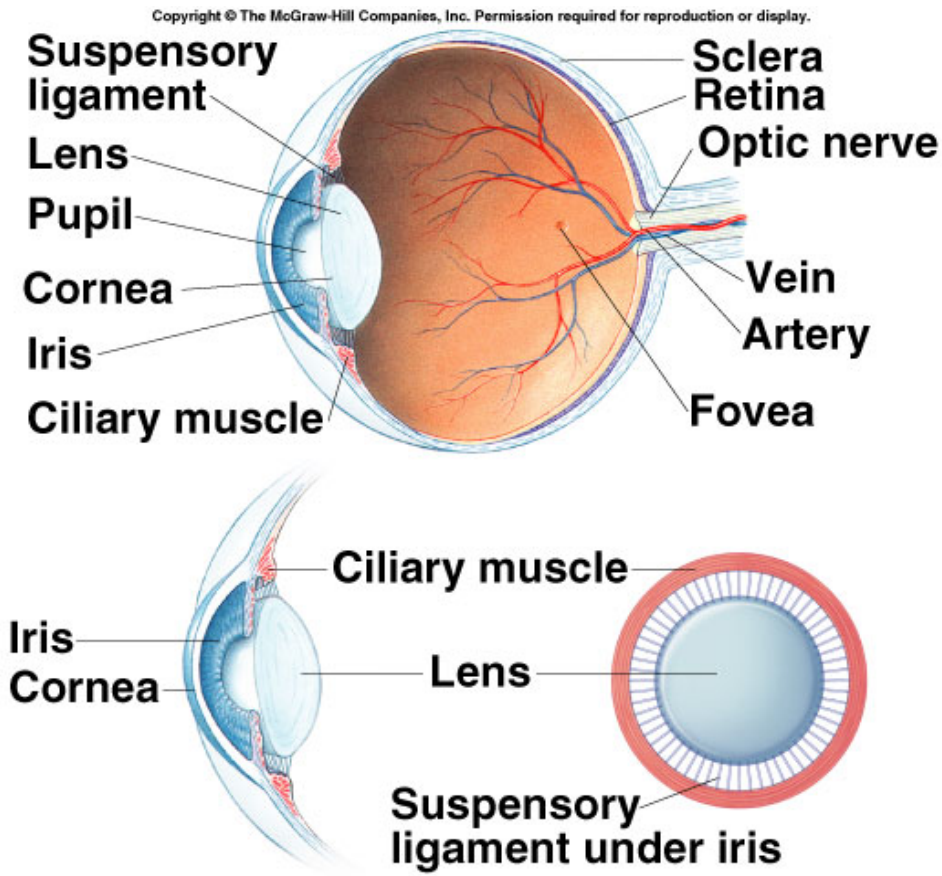
Sea squirt

swimming immature larvae has primitive devices comparable to brain
immotile mature form consumes its own brain

For stationary life forms no brain is necessary

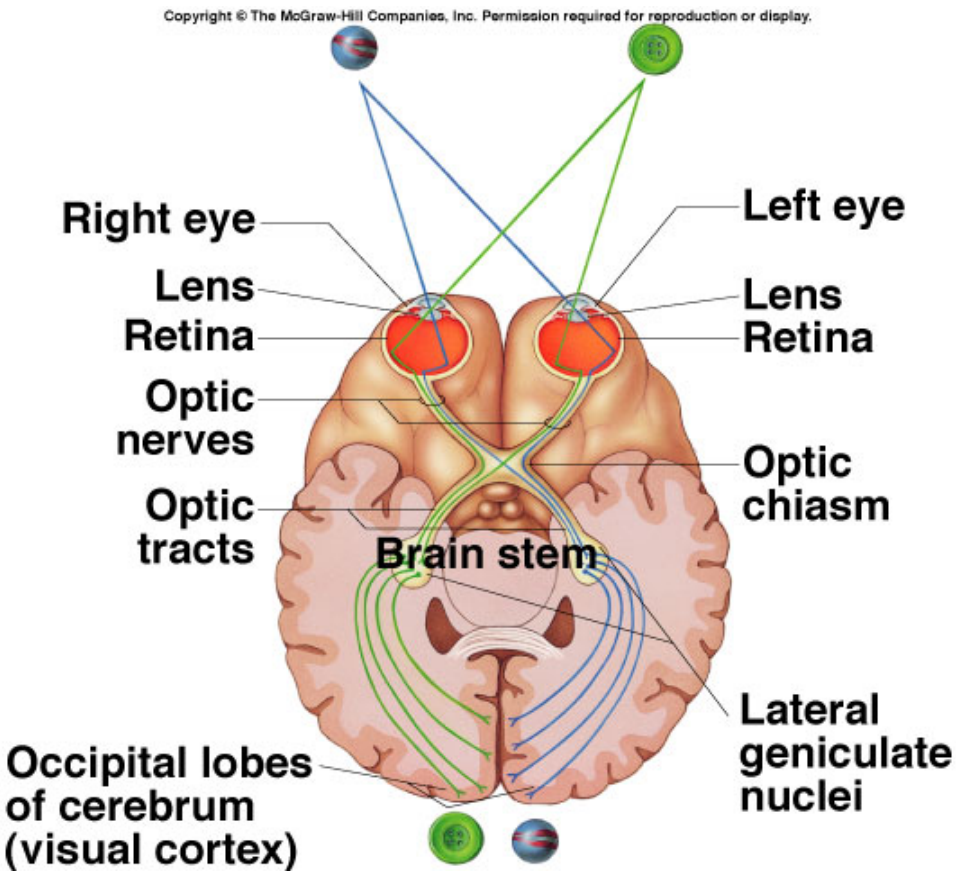
http://www.horizons-2000.org/2.%20Ideas%20and%20Meaning/Topics/NeuroPsychology.htm

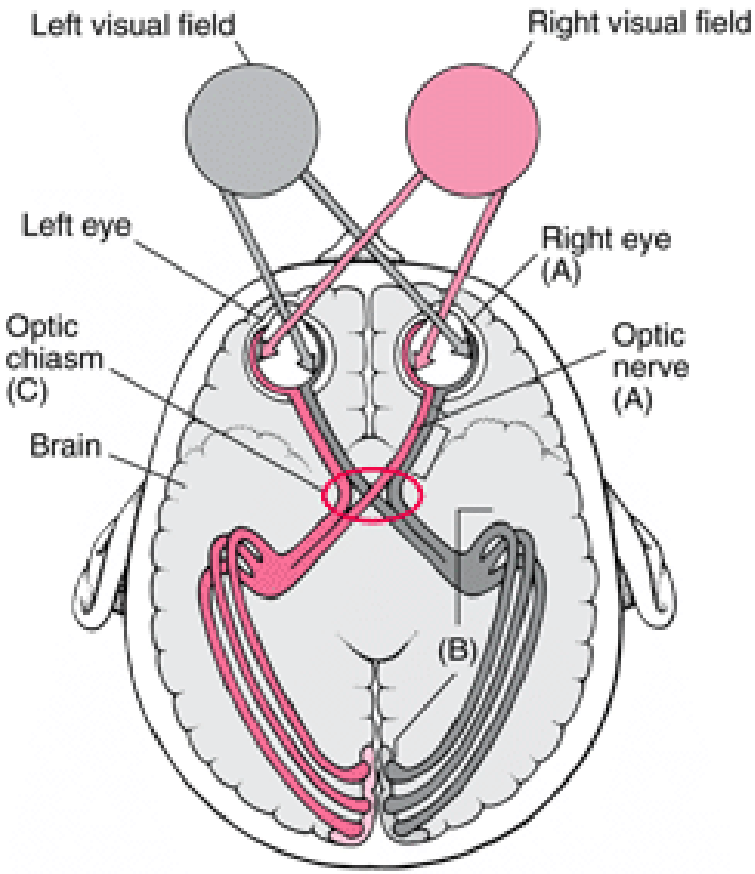
Human Eye

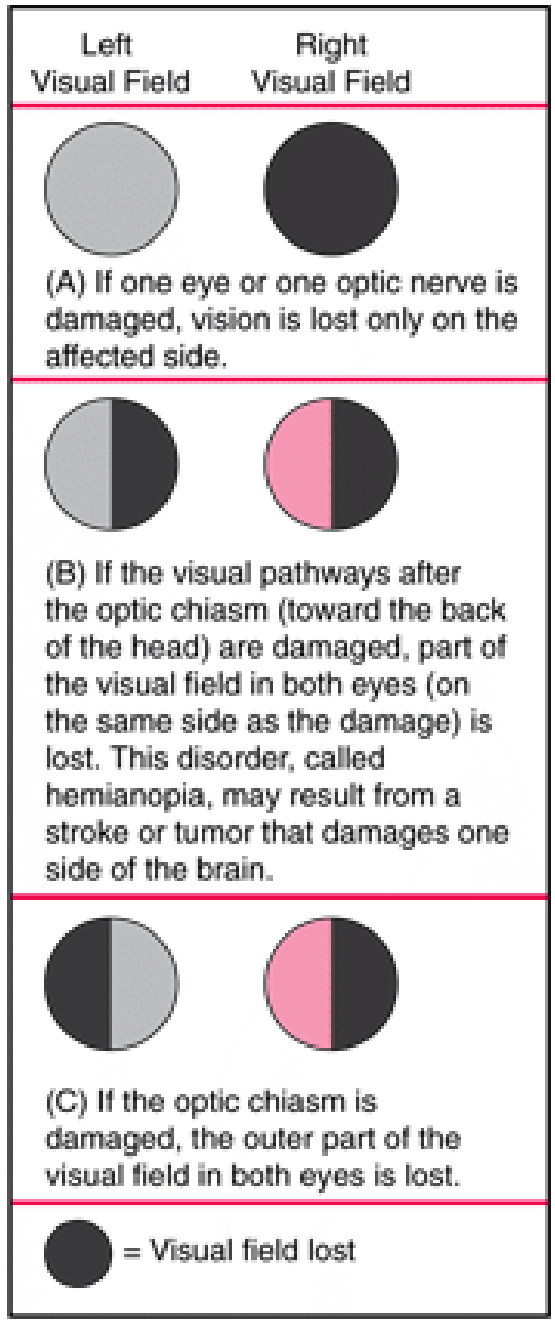


http://optics.snu.ac.kr/on-line/bong/eye1.html

Pathway of Visual Information

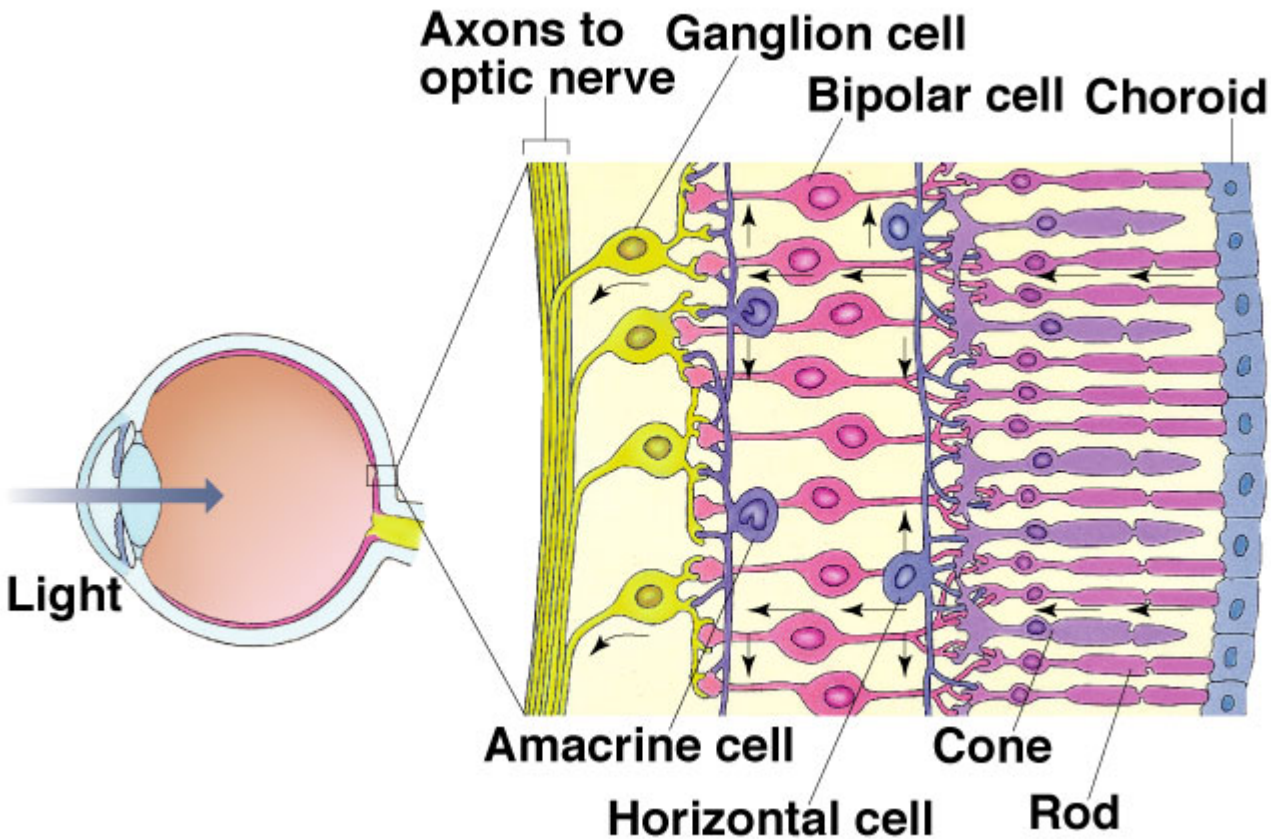






http://www.merck.com/mmhe/sec20/ch225/ch225b.html

Structure of the Retina



- **rods** - 130,000,000
- **cones** - 7,000,000: concentrated in fovea

Receptive field

Spatial summation occurs due to the convergence of photoreceptors onto ganglion cells. This convergence of photoreceptors form a receptive field thus stimulating different photoreceptor within this receptive field would result in one signal. Receptive field sizes vary with eccentricity (figure 26), and helps explain the reason why critical area varies with eccentricity (Shapley and Enroth-Cugell, 1984). Clearly, the size of spatial summation (functional receptive field), will limit resolution capabilities as outlined earlier.

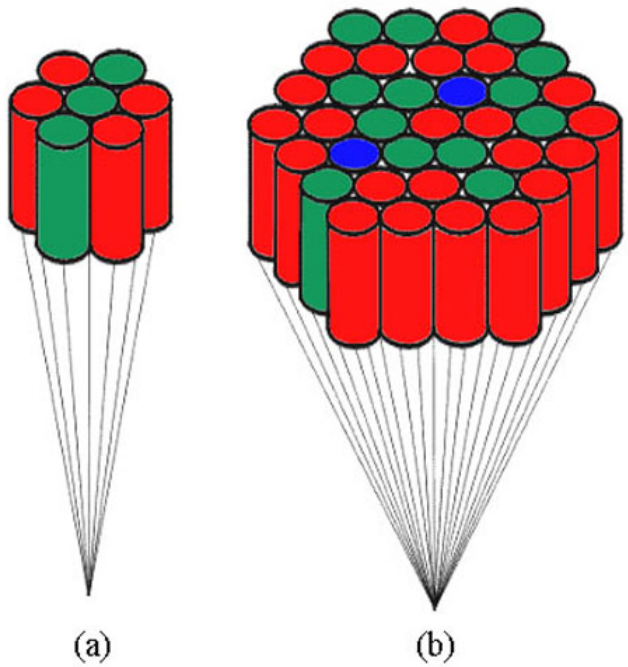
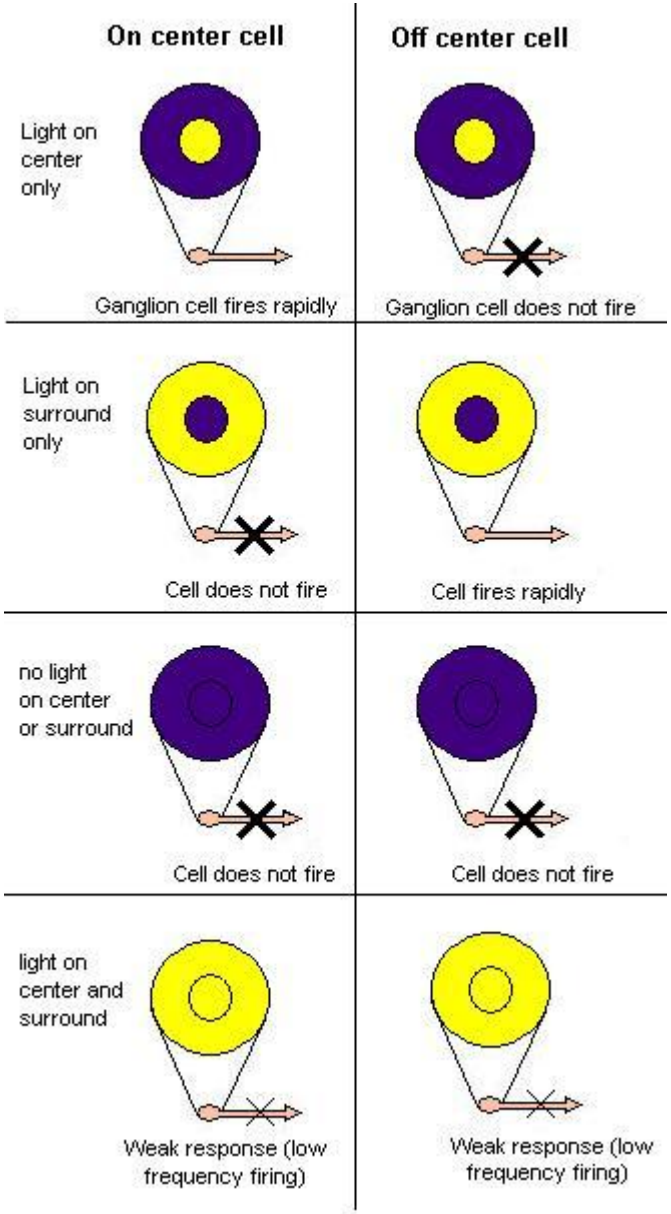


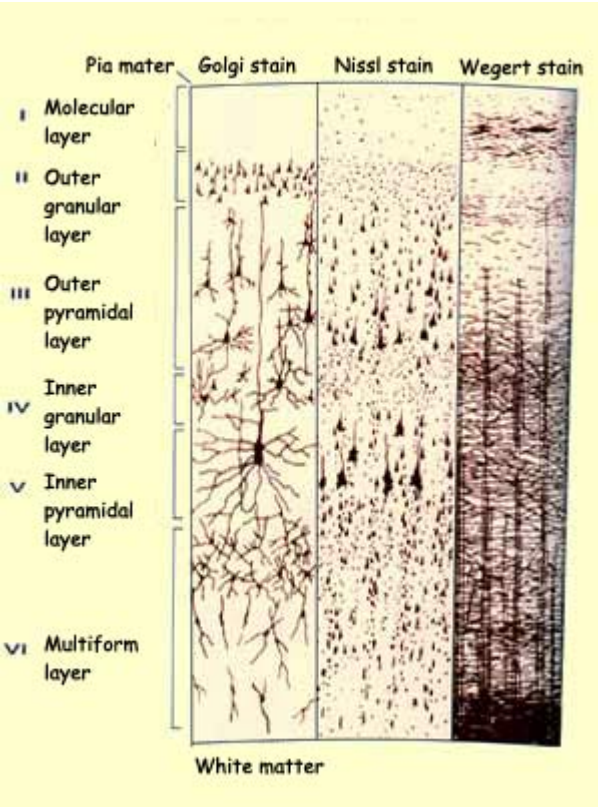
Figure 26. Schematic illustration of the size of receptive fields in (a) the parafoveal region (7^{o} eccentricity) and in (b) the peripheral retina (35^{o} eccentricity).

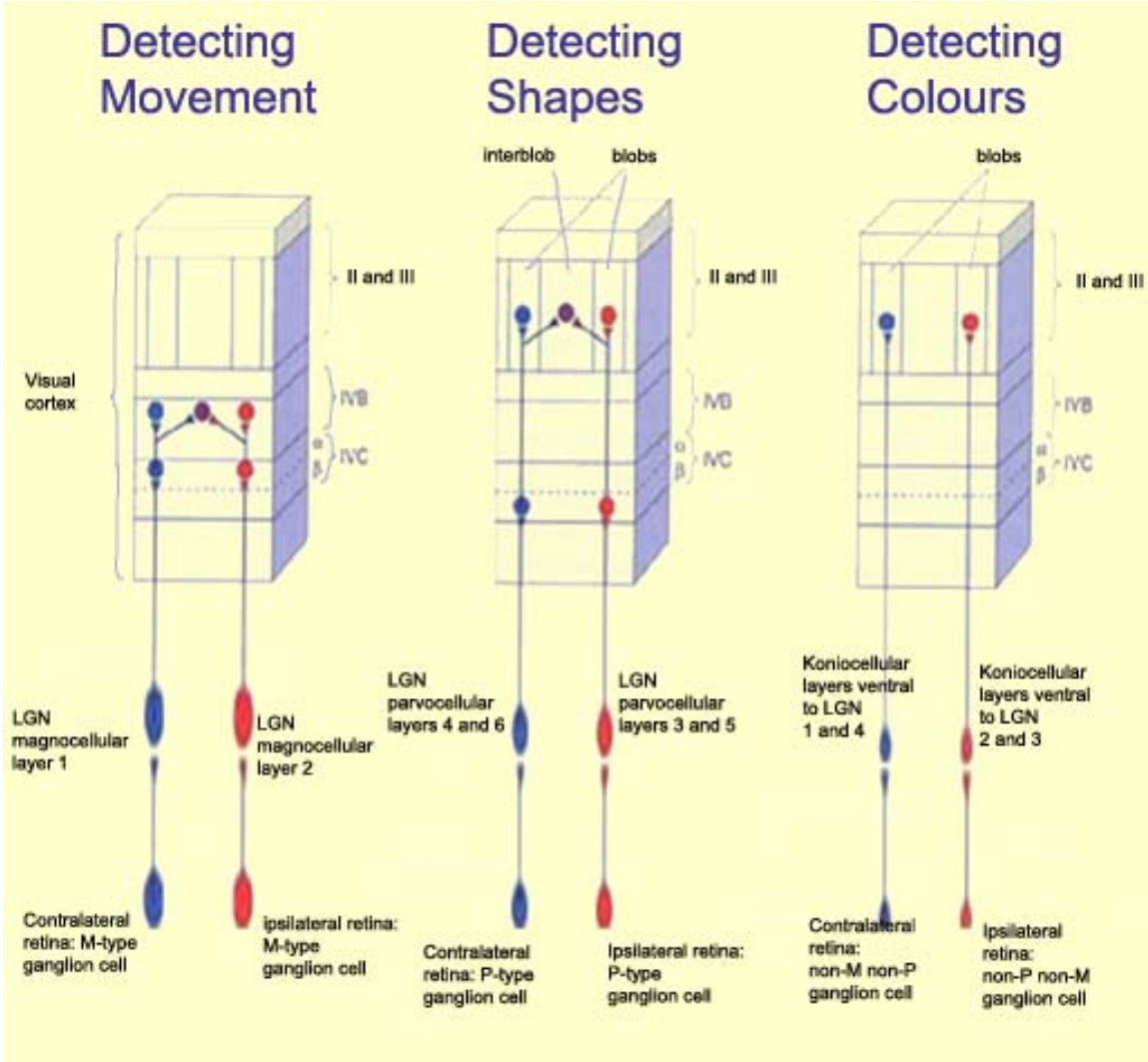
http://webvision.med.utah.edu/KallSpatial.html



http://www.answers.com/topic/receptive-field-jpg-1

Visual cortex





How is light registered in the brain?

Conversion of light energy into electrical impulses
Two light sensitive cells
rod: mediated by rhodopsin
cone: sensitive to color
wavelength dependent excitation of red, green, or blue cells
Images are relayed into the brain with an enormous bias
retina is more concerned with states of change
such as contrasting edges or movement

Nerve fibers exiting via the blind spot to the thalamus and then to visual cortex
What happen in the visual cortex?

Patients with visual problems

1. A woman damaged in the visual cortex
   deficient in detecting moving objects
2. George Riddoch
   see movement but not shape or color
3. See form and movement but not experience color
   deficit of cones or damage to visual cortex
4. See movement and color but not form: agnosia
   see objects but not identify
   vary in its severity and time dependent
   Is it because there is a gradual process of integrating patterns?

Vision of form, movement, and color occur independently of each other
They are processed simultaneously but in different parts of the brain
How and where they are integrated?

A hypothesis of grand central station

convergence of different pathways

but there should be a area which, when damaged,

leads to complete loss of vision

A hypothesis of interactive parallel brain regions

connections between brain regions are not directed to converge

into an executive center

but are likely to take the form of balanced dialogues between them

<u>Seeing and recognition</u>

Is it possible to separate visual event from

the intervention of consciousness into the visual process?

activation of parts of brain under visual process

is reproduced under unconsciousness condition

Blind sight

Separation of visual process from conscious awareness

patients who cannot see but guess objects: blind sight

meaning that the brain is still functioning

but the consciousness is lost of actually seeing the object

balance between brain regions

signals to cortex for processing

signals intercepting the incoming information

Rupture in the balanced circuitry: suggested by Zeki

dialogue between brain regions are not operational

However, blind sight is conditional: physical entity and properties of the object

Prosopagnosia: face blindness

the reverse of blind sight: awareness without recognition

but improved by psychological linkage

consciousness depends on more than one factor

Perceptions are unified wholes

depending on personal characters

Why the electrical signal in the visual cortex is experienced as vision?
Learn through experience?
Linked to movement?

A mixing of senses: synesthesia

see musical notes in colors

mostly in childhood or schizophrenia or hallucination

probably a problem of association cortex

a malfunctioning of physiology rather than anatomy