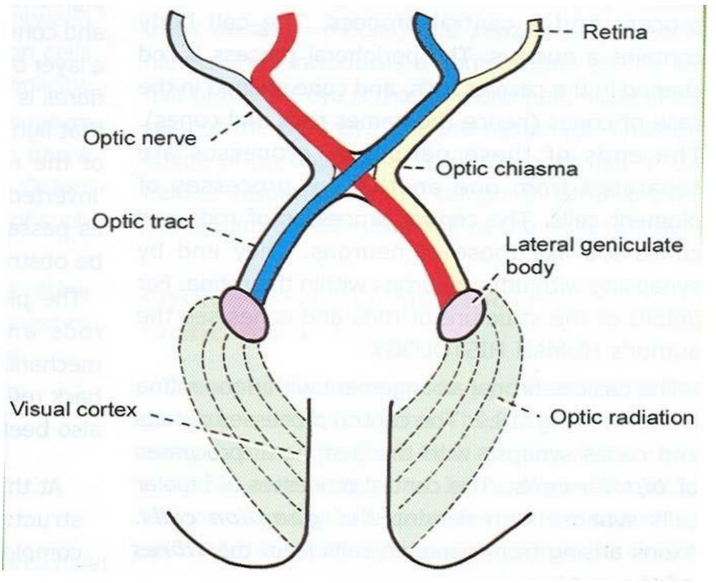
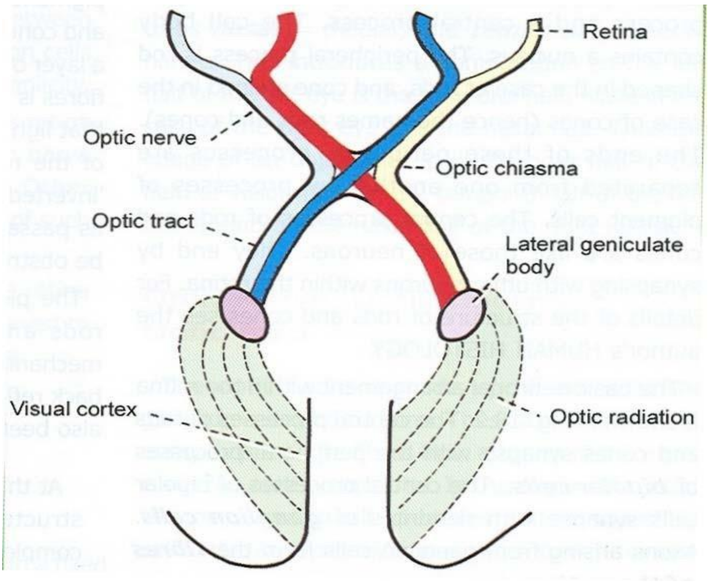


Visual pathway

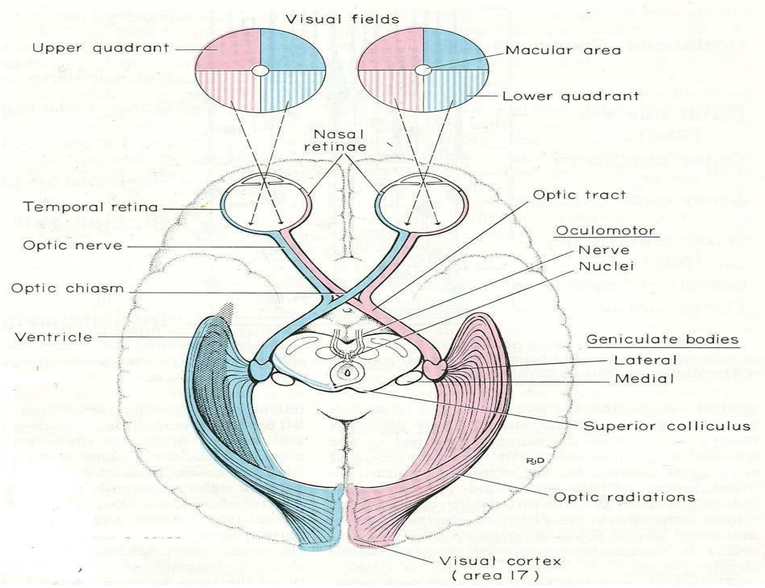
Visual pathway consists of a series of cells & synapses that carry visual information from environment to brain for processing.

Components : Retina → Optic nerve →Optic chiasma
↓
Optic tract
↓
Lateral geniculate body
↓
Geniculostriate tract
↓
Optic radiation
to visual sensory area
occipital lobe 17,18 &19



Visual field & retinal quadrant:

- One eye is closed.
- Area seen by open eye constitutes visual field of that eye.
- Visual field of the two eye overlap to a great extent.
- On either side there is a small area which is seen only by eye of that side.
- For convenience visual field is divided into right & left halves.

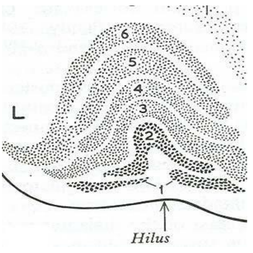


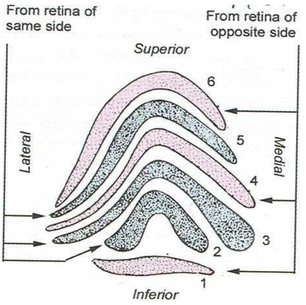
Optic nerve, optic chiasma & Optic tract

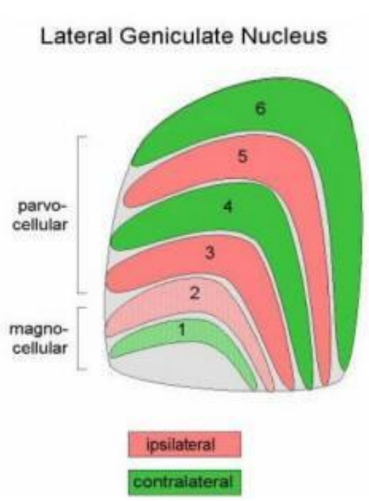
- Optic nerve is made up of axons from ganglion cells of retina
- Fibers of optic nerve arising from four quadrants of retina maintain same relative position with in nerve.
- Fibers of nasal half of each retina enter optic tract of opposite side after crossing in chiasma.
- Fibers from temporal half enter optic tract of same side.
- Optic tract carries these fibers to lateral geniculate body of corresponding side.
- Finally they are relayed into area 17, 18 & 19 of occipital cortex.

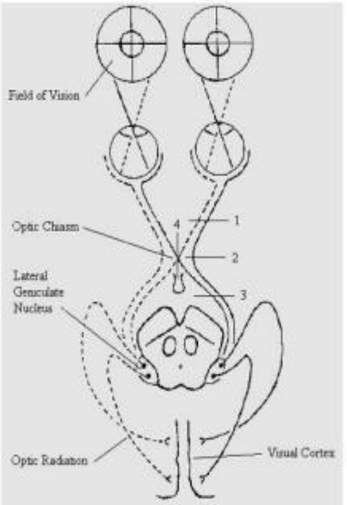
Lateral geniculate body

- Part of metathalamus
- Grey matter in 6 layers
- Fibers from same side of end in lamina 2, 3, & 5.
- Fibers from opposite side of eye end in 1, 4 & 6.
- Macular fiber end in central & posterior part of body & this area is relatively large



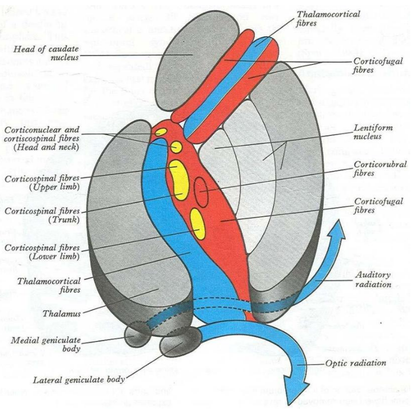




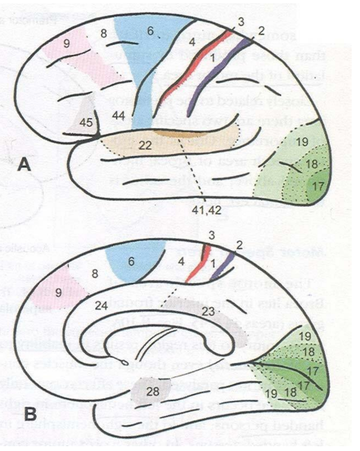


Geniculocalcarine tract & visual cortex

- Fibers arising from lateral geniculate body form geniculocalcarine tract or optic radiation.
- These fiber pass through **retrolentiform** part of internal capsule.
- Radiation end in visual areas of cerebral cortex (Area 17, 18 & 19)



- Cortex Occipital – 17,18 & 19 receives impulses from retinal halves of same side (from opposite halves of field of vision)
- Cortical area of macula is much larger than that for peripheral area.

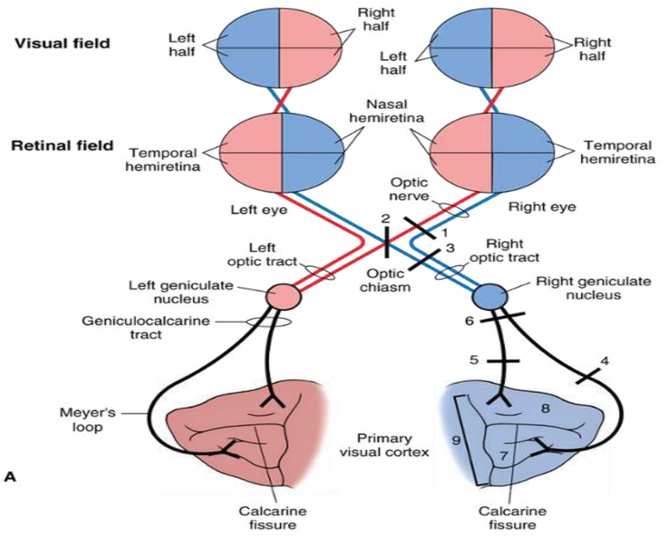


Visual Functional areas

- **Primary visual area: 17 occipital pole** – visual perception
- **Visual association area- 18 & 19** – parastriate cortex ,
- **Area -18 – linear stimuli** &
- **Area-19 –angular stimuli.**
- **Higher visual association area- 39** – **angular gyrus of parietal lobe** – comprehension of various signs & symbols of language by vision.

Visual area….

- **Visual Association area- 18 & 19** - correlation of past and present visual experiences , assess distance ,speed, and orientation in 3d space.
- Lesion- **Visual agnosia** – person is unable to identify an object or a person seen in past.



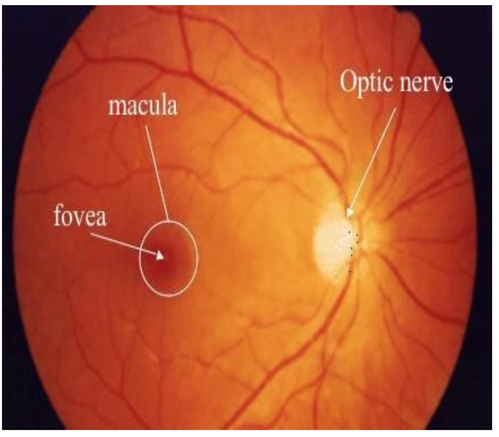
Site of Lesion (Right side)	Deficit in the visual field: Left eye	Deficit in the visual field: Right eye	Name of the disorder
Optic nerve: 1			a. Total loss of vision in the right eye
Optic chiasm (midline): 2			b. Non-homonymous bitemporal hemianopia
Optic tract: 3			c. Contralateral (left) homonymous hemianopia
Temporal lobe (Meyer's loop); 4			d. Superior left homonymous quadrantanopia (pie in the sky disorder)
Parietal lobe: 5			e. Inferior left homonymous quadrantanopia (pie in the floor disorder)
Geniculocalcarine tract: 6			f. Contralateral (left) homonymous hemianopia
Inferior bank of calcarine fissure: 7			g. Superior left homonymous quadrantanopia (with macular sparing)
Superior bank of calcarine fissure: 8			h. Inferior left homonymous quadrantanopia (with macular sparing)
Both banks of calcarine fissure: 9			i. Contralateral (left) homonymous hemianopia (with macular sparing)

B

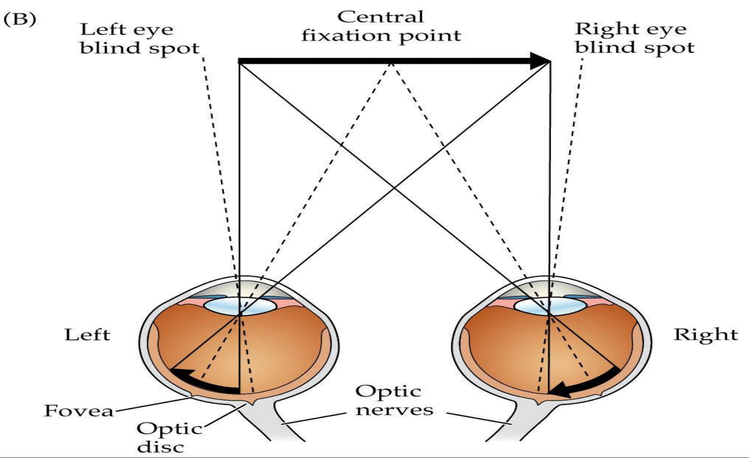
Eyes & retina:

Fovea: central fixation point of each eye - region of retina with highest visual acuity.

Macula: oval region approximately 3-5 mm that surrounds fovea, also has high visual acuity.



Eyes & retina:



Eyes & retina:

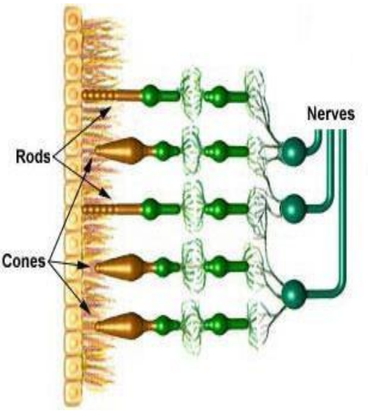
Optic disc: region where axons leaving retina gather to form ***Optic nerve.***

Photoreceptors are absent over **optic disc** >> creates small **blind spot** →located 15 lateral and inferior to central fixation point of each eye.

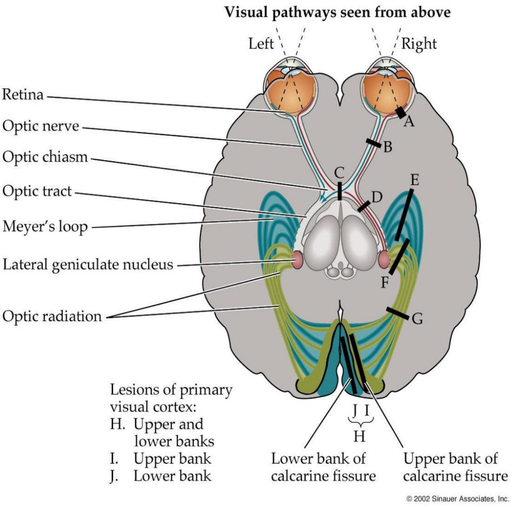
Photoreceptors:

Rods: more numerous than cons-20:1, have poor spatial & temporal resolution of visual stimuli, do not detect colors >> vision in low level lighting conditions.

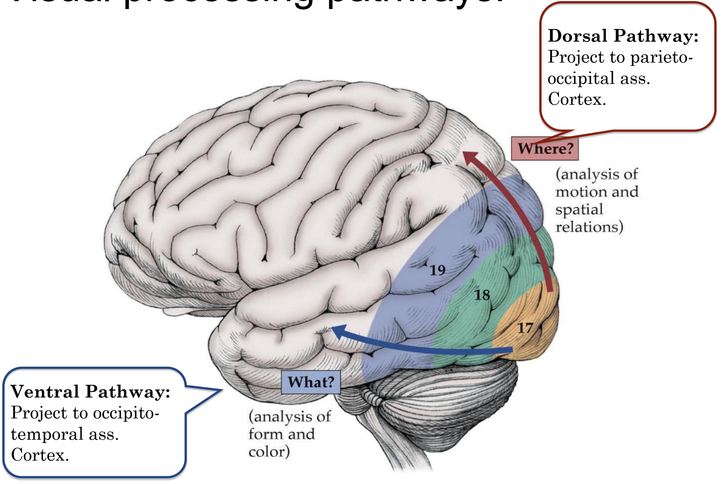
Cons: less numerous, much more highly represented in fovea >> have high spatial & temporal resolution >> they detect colors.



Optic nerve, chiasma and tract:



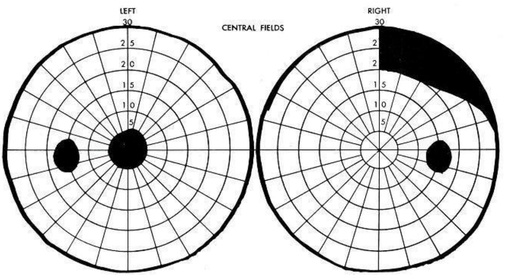
Visual processing pathways:



Positive phenomenon:

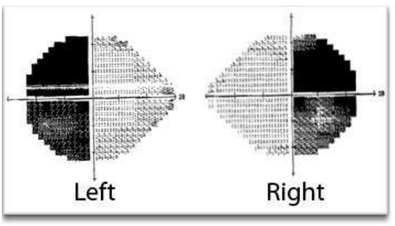
- Light flashes >> **retinal detachment**.
- Rainbow-colored halos around objects >> **acute glaucoma.**
- **Migraine:** visual blurring, scotoma that have scintillating appearance or consist of jagged alternating light and dark zigzag lines (fortification scotoma).
- Pulsating colored lights/moving geometric shapes >> **occipital seizures.**

Describe the visual field defect ?



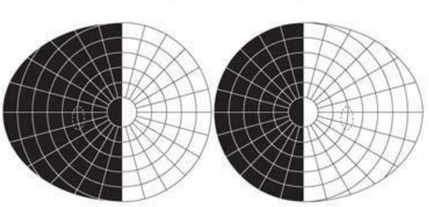
Junctional scotoma: lesion at junction of optic nerve and chiasm

Describe visual field defect ?

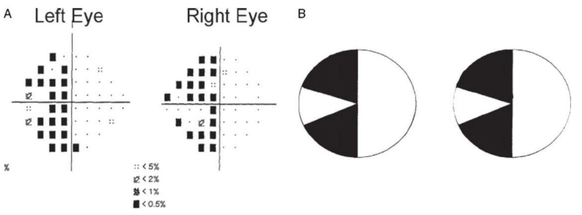


Bitemporal Homonymous Hemianopia

Describe visual field defect ?

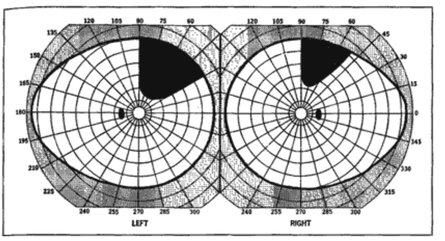


Describe visual field defect ?



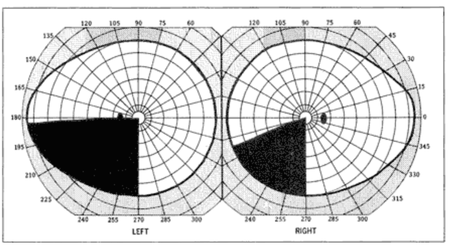
Left sector sparing homonymous hemianopia >> lesion at LGN.

Describe visual field defect ?



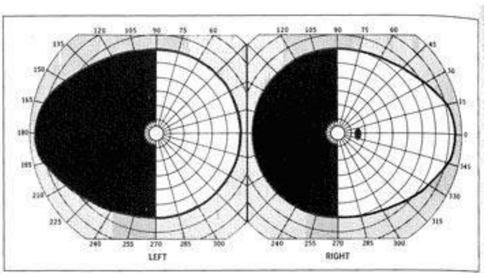
Right superior quadrantanopia >> temoporal lobe lesion

Describe visual field defect ?



Left inferior quadrantanopia >> parietal lobe lesion

Describe visual field defect ?



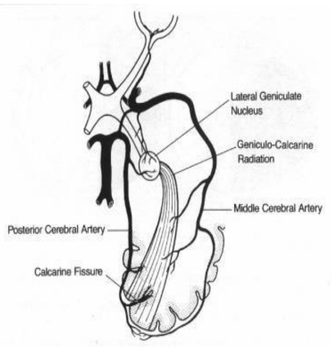
Left homonymous hemianopia with macular sparing

Macular sparing:

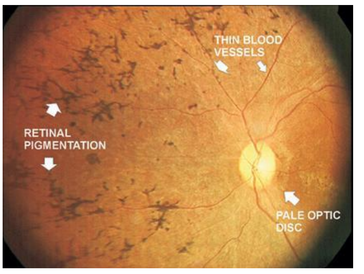
Watershed area with respect to blood supply.

The ‘macular’ visual cortex is supplied by terminal branches of posterior & middle cerebral arteries.

Visual cortex subserving the midperipheral & peripheral field is supplied only by the PCA. The area is supplied by a more proximal ‘not terminal’ vessel.

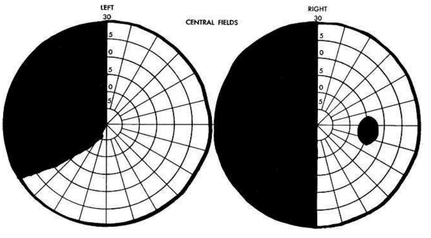


Optic disc drusen: globules of mucoproteins and mucopolysaccharides that progressively calcify in the optic disc.



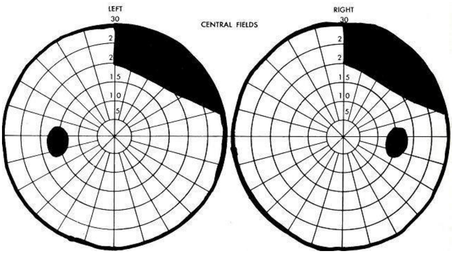
Retinitis Pigmentosa

Describe the visual field defect ?



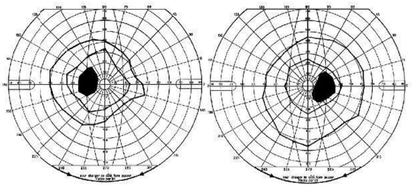
Left incongruous homonymous hemianopia

Describe visual field defect ?



Right congruous homonymous hemianopia

Describe visual field defect ?



Left eye Right eye

Enlarged Blind Spot