

Light Reflex , Accomodation & Visual pathway

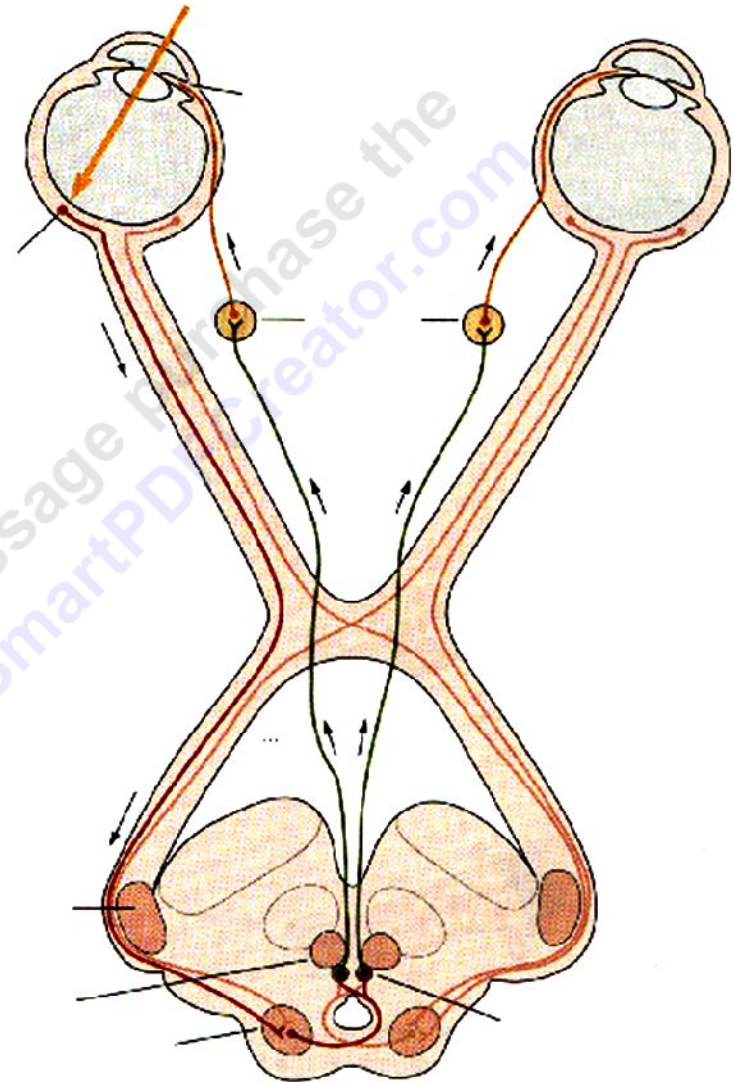
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The light reflex

(Pupillary Light Reflex)

Retina → Optic Tract →
Superior Colliculus →
Oculomotor nucleus →
Parasympathetic Fibers
in Oculomotor nerve →
Pupillary Constrictor
Muscle (Circular Fibers)
→ Pupils Constrict

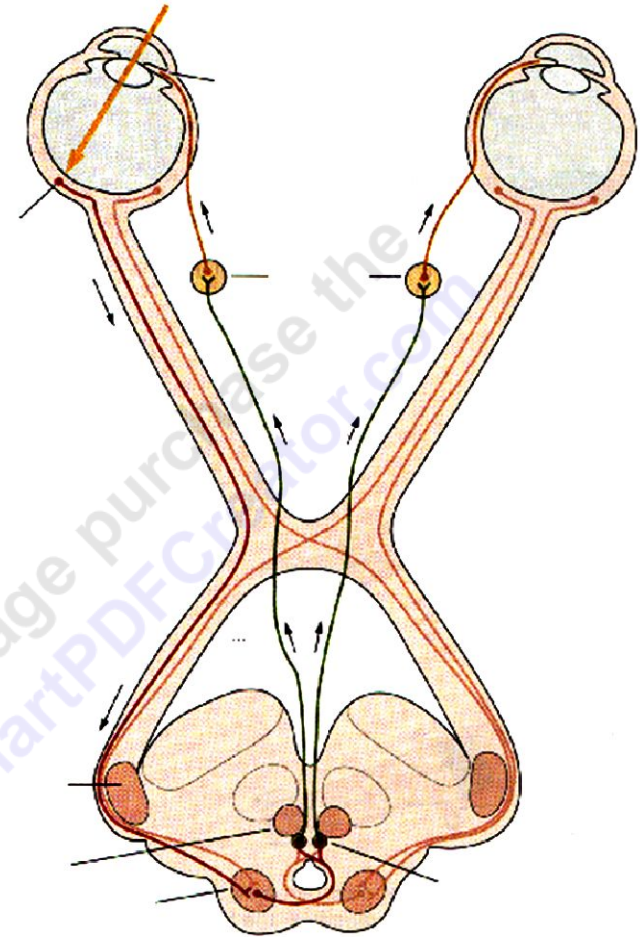


Pupillary Light Reflex

- ✓ Light falls on one eye → constriction (miosis) of this pupil (direct) + the other pupil (indirect, consensual)

Pathway of Consensual (Indirect) Light Reflex

- ✓ Light on eye → retina → optic nerve → optic chiasma → optic tract → Pretectal nucleus, called Edinger-Westphal Nucleus (center of Reflex) → Both Oculomotor nerve nuclei → both Ciliary Ganglia → Pupils → Miosis in both eyes
- ✓ Atropine drops : block parasympathetic supply → mydriasis (pupillary dilatation)
- ✓ vision



Argyll Robertson pupil :

In syphilis Tabes Dorsalis destroys Pretectal nucleus
→ light reflex is lost on the diseased side , but
accommodation reflex remains → pupil does not react
to light , but constricts to near vision (accommodation reflex intact)

Accomodation

Accomodation

Q : What is Accomodation ?

- ✓ It is the process by which the eye forms sharp image of near and distant objects

Physiological Definition :

- ✓ It entails modification of the refractive power of the eye to form sharp image of near and distant objects
- ✓ For far objects : by keeping the lens thinner
- ✓ For near objects : by making the lens thicker to increase its refractive power

**Q: What does the Near Response
(Accomodation-Convergence Reflex) consist of**

- (1) Increased lens thickness**
- (2) Pupillary constriction (pupilss constrict)**
- (3) Convergence of the Visual axes**

These 3 constitute



The near response

Mechanism of accommodation for Near Objects

Ciliary muscle contraction:



Relaxation of the suspensory ligament



Lens more convex



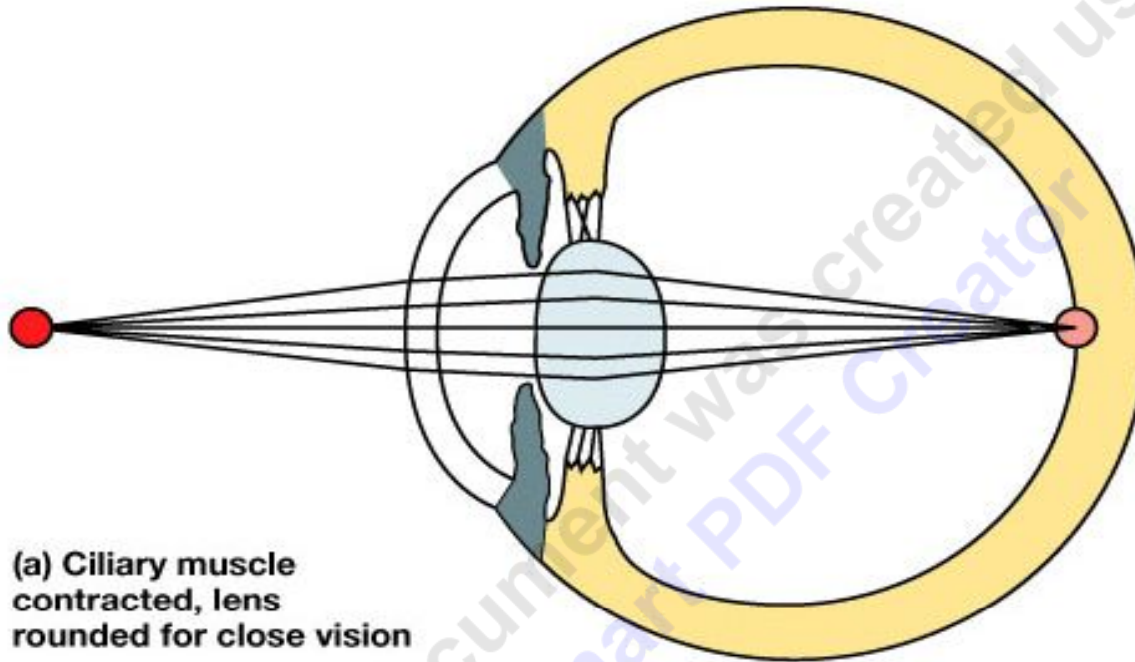
Increase dioptric power of the lens (& eye)



Near object focussed on the retina

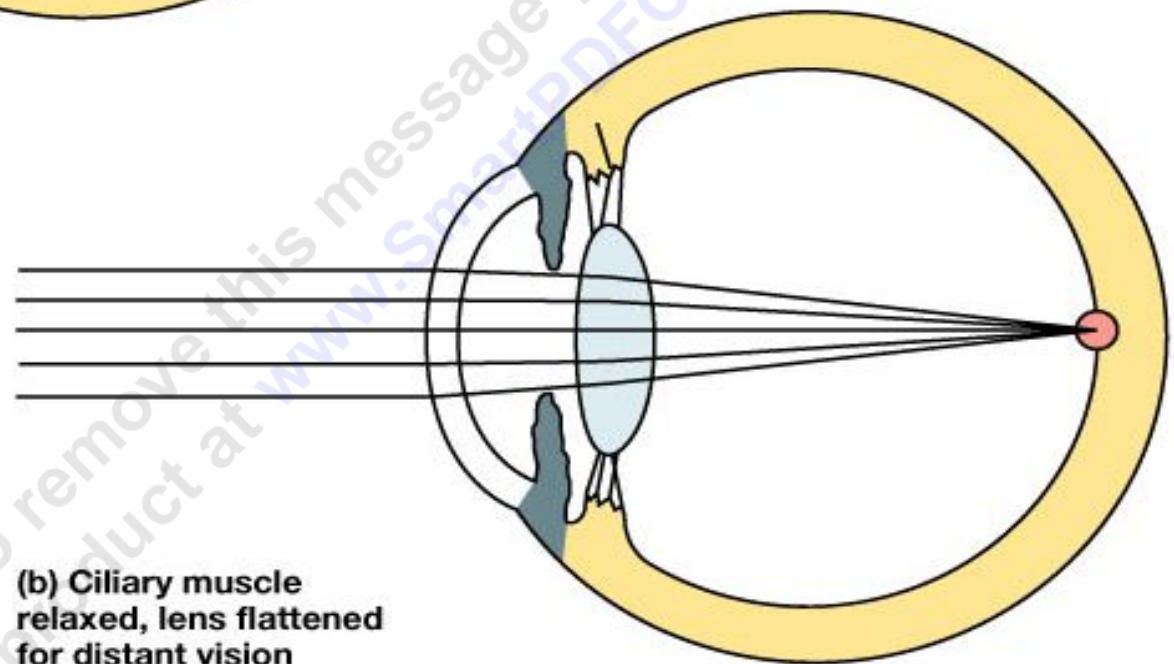
- **NB : Lens can change its diopter power (but cornea can not)**

Accommodation



(a) Ciliary muscle contracted, lens rounded for close vision

(1) When you look at a distant object the ciliary muscle is relaxed and the suspensory ligament is taut, pulling on the lens and making it thinner → reducing its refractive power .



(b) Ciliary muscle relaxed, lens flattened for distant vision

(2) Once you shift your gaze from the distant object to focus on a close object, the Ciliary muscle contracts → relaxing the Suspensory ligament → allowing the lens to bulge and increase in thickness → thereby increasing its refractive power (focusing on a close object) .

Mechanism of accommodation for Far Objects

Ciliary muscle relaxation



Contraction of the suspensory ligament
(actually : ligament becomes less taut)



Lens less convex (more vflat , thinner)



Decrease diopteric power of the eye



Far object focused on the retina

The accommodation Reflex

Afferent:

Retina → optic nerve → optic chiasma
→ optic tract → lateral geniculate body
→ visual cortex

Efferent: Occulomotor nucleus →
(parasympathetic) → ciliary ganglion →
ciliary muscle → circular pupillary muscle

• The Near point:

- Nearest point to eye at which object can be brought into focus on retina by ACCOMODATION
- 10 years-----9 cm
- At 60 years-----80-100 cm, due to hardness of lens & loss of accommodation.

VISUAL ACUITY

Definition : Degree to which details of objects are perceived

Visual threshold is minimal amount of light that elicit sensation of light

-Snellen s chart

Normal acuity = 6/6

A person of 12/6 has better vision than normal vision (not hyperope)

A person of 6/12 has less vision than normal vision
(d/D Patient/normal)

THE VISUAL PATHWAY

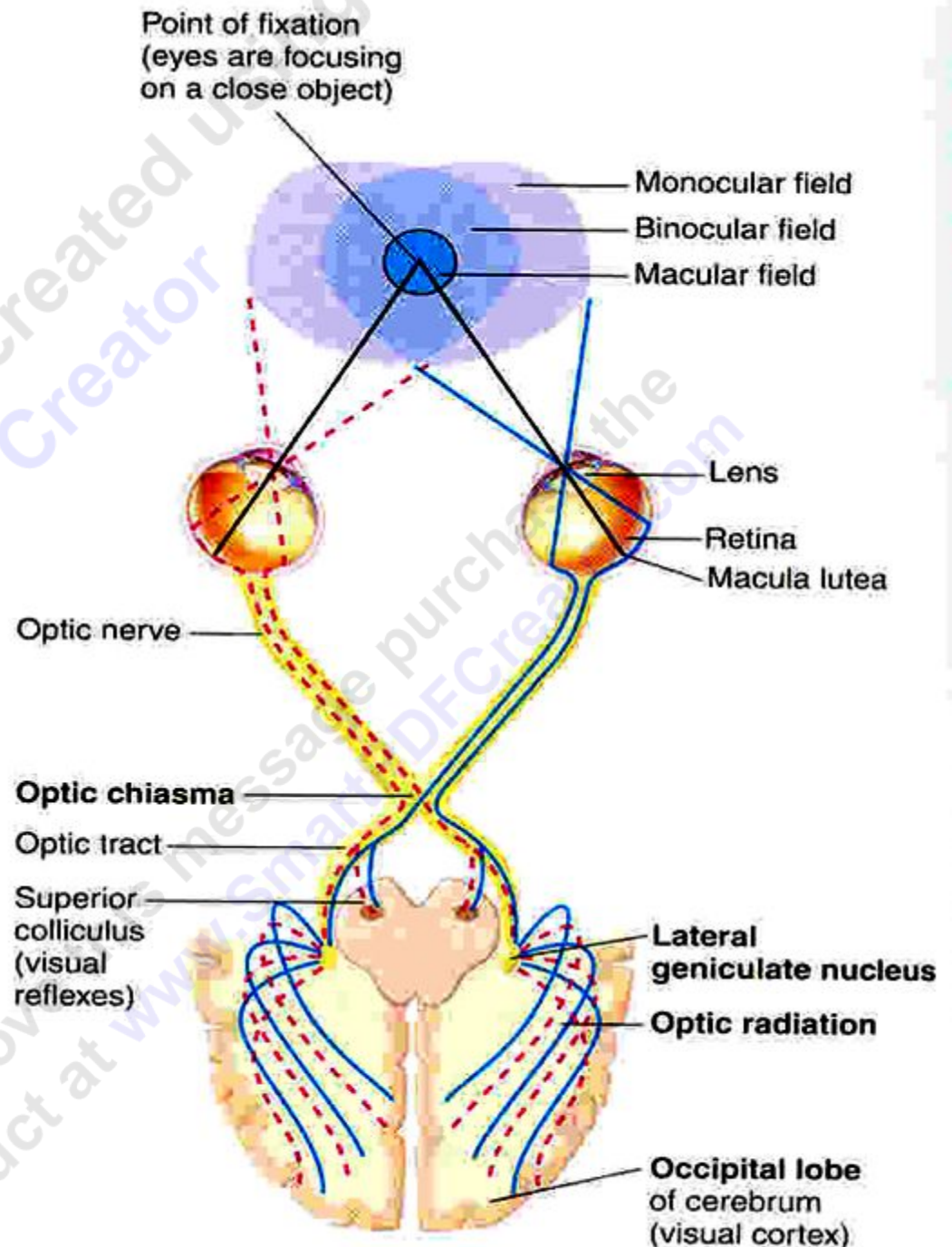
Visual Pathway

(Pathway from Retina to the Visual Centers in the Brain)

- Photoreceptors Rods and Cones synapse on Bipolar Cells , which in turn , synapse on Ganglion Cells .
- Axons of Ganglion Cells constitute the Optic Nerve. These axons converge at the Optic disc ,which is also called Blind Spot (Why?) .
- Passing through the Blind Spot → they leave the eye , constituting the Optic Nerve .

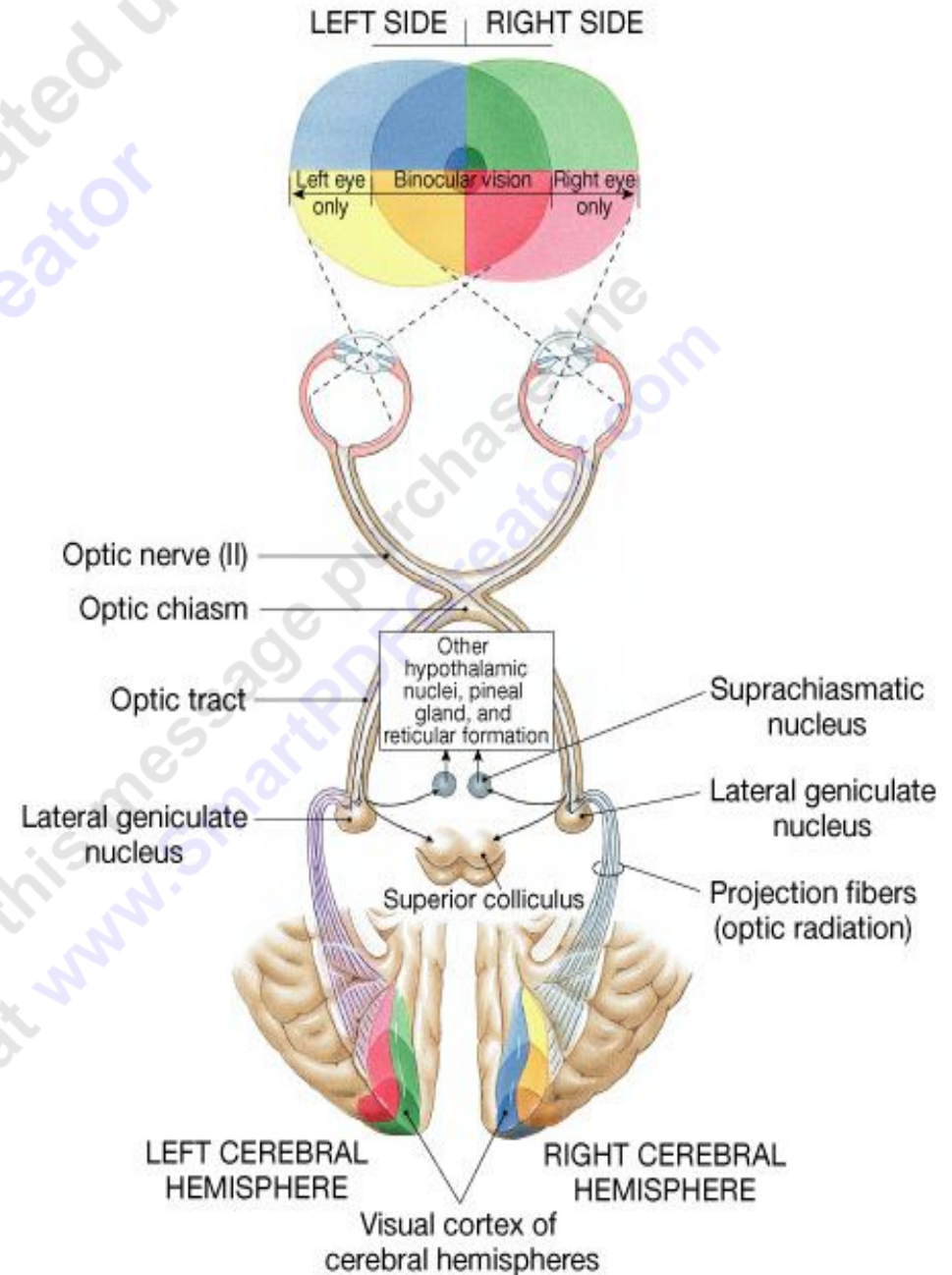
VISUAL PATHWAY

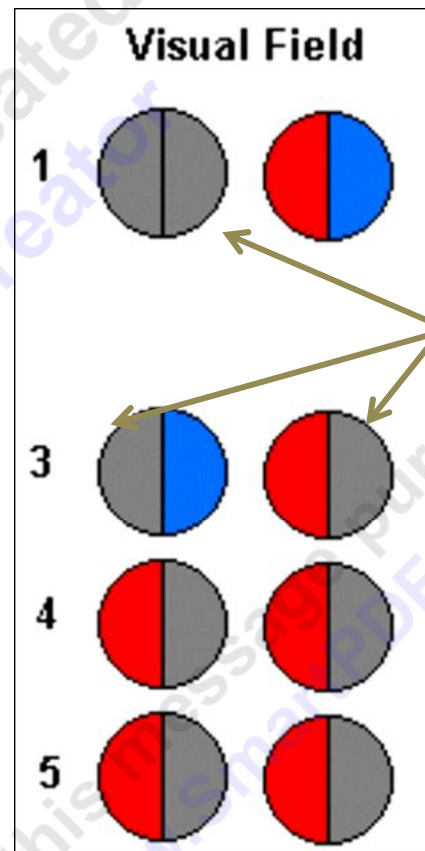
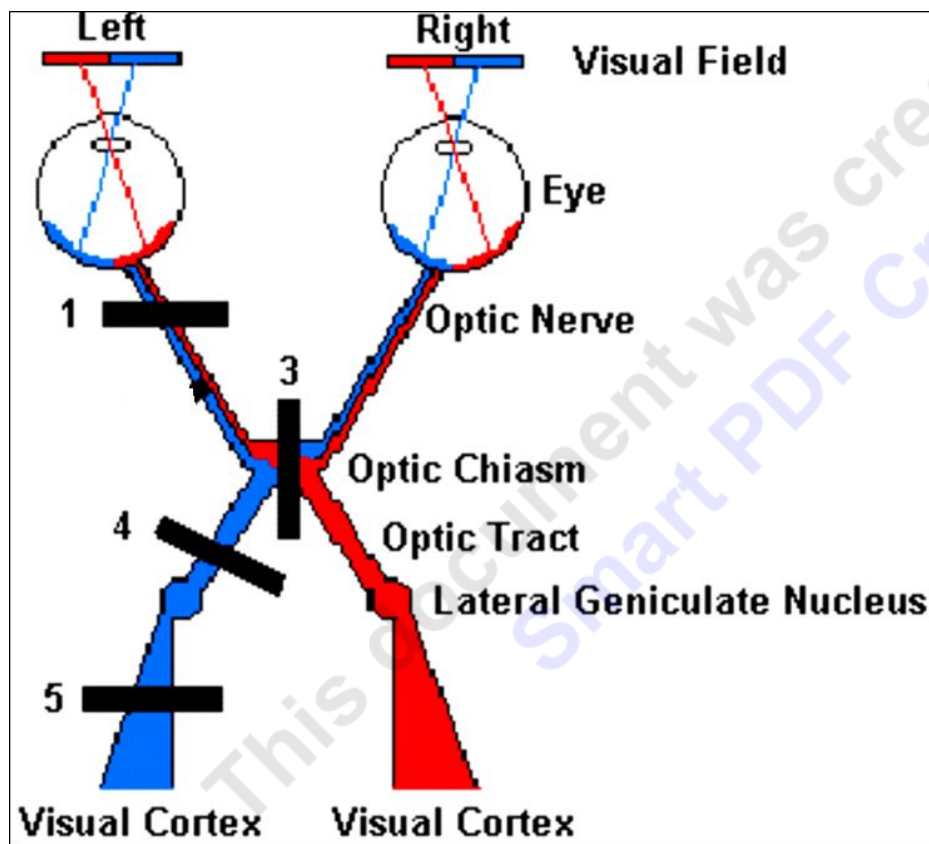
- ✓ Cones & rods → bipolar cells → ganglion cells → optic nerve (axons of ganglion cells) →
- ✓ optic chiasma →
- ✓ optic tract →
- ✓ Lateral Geniculate (LGN) body in thalamus →
- ✓ The fibers from ipsilateral nasal half of the retina + temporal half of contralateral retina form the GeniculoCalcarine tract →
- ✓ optic radiation → visual cortex in occipital cortex (Brodmann's area 17 on sides of calcarine fissure)



The Visual Pathway 2

- Optic nerve fibers from the medial (nasal) side of retinae decussate in the Optic Chiasma .
- Therefore an Optic Chiasma lesion (e.g, Pituitary Tumor) will cause vision loss from the both lateral halves of the Field of Vision → Bitemporal hemianopia
- Optic nerve fibers from the lateral (temporal) parts of the retinae do not decussate .
- Therefore , each optic tract carries fibers from the both the temporal side of the ipsilateral retina + nasal side of the contralateral retina.
- **Example : Left optic tract corresponds to the right half of field of vision .**
- Therefore , a lesion in optic tract will cause loss of vision from the ipsilateral nasal field of vision + contralateral temporal field of vision .





Left Optic n Atrophy → Blind Left Eye

Frey color represents the blind part of the visual field

Optic Chiasma Lesion → Bitemporal Hemianopia

Left Optic Tract Lesion → Right Homonymous Hemianopia

The Visual Cortex

- Primary Visual Cortical Area

- Brodmann area 17
- perceive sensation of vision (movement + shapes+ stereognosis+ brightness) & has blobs for color detection
- Columnar arrangement

- Secondary (Association) Visual Cortex

- Brodmann areas 18 and 19
- Interpretation of visual stimuli(perception)

- Thanks

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