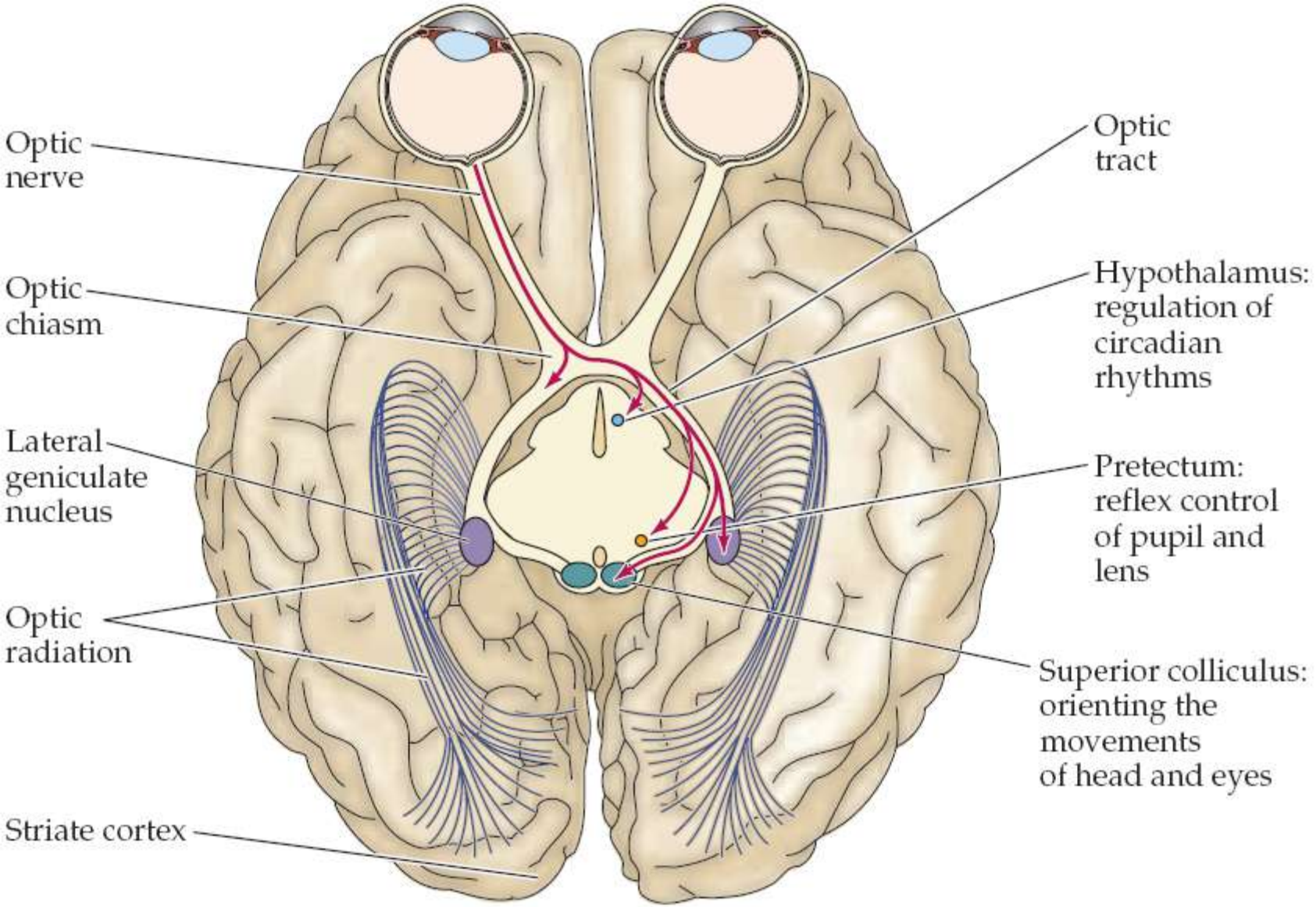
VISUAL PATHWAY


Optic nerve
Optic chiasm
Lateral geniculate nucleus
Optic radiation
Striate cortex
Optic tract
Hypothalamus: regulation of circadian rhythms
Pretectum: reflex control of pupil and lens
Superior colliculus: orienting the movements of head and eyes

Visual pathway:

Optic (II) nerve

↓

Optic chiasm

↓

Optic tract

↓

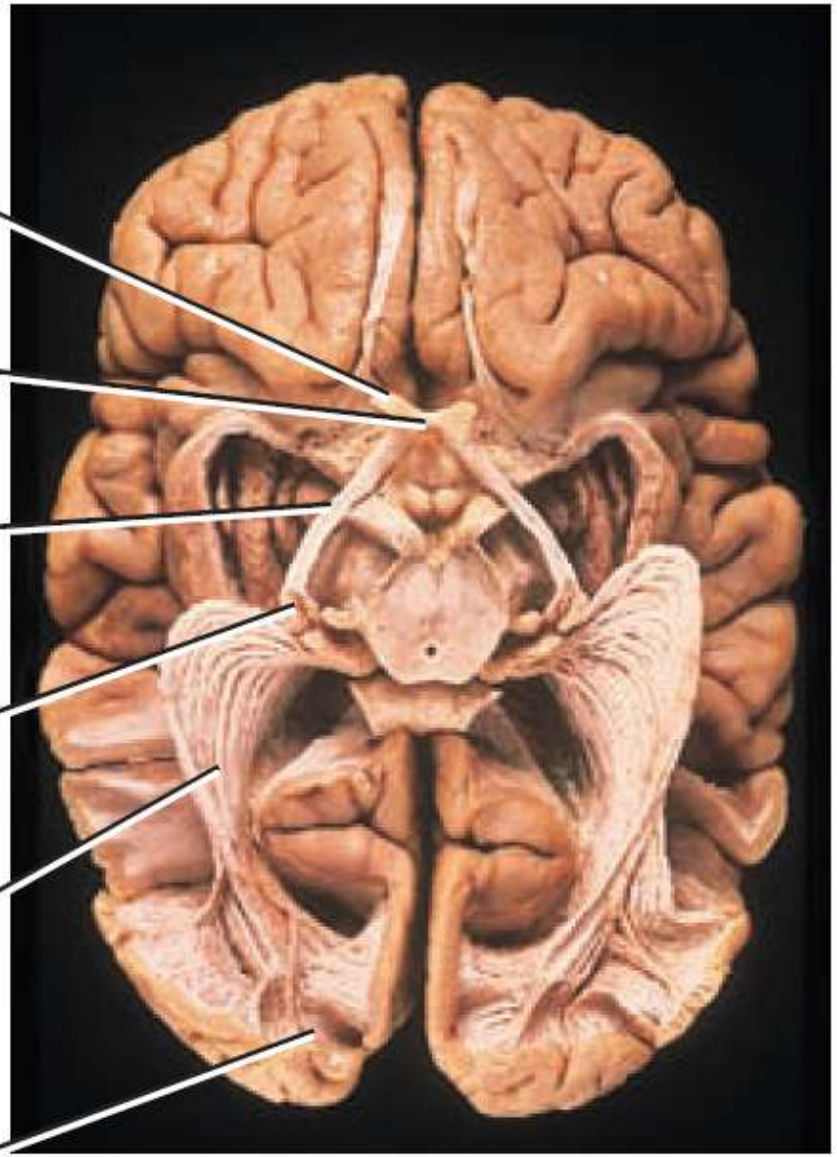
Lateral geniculate nucleus of thalamus

↓

Optic radiations

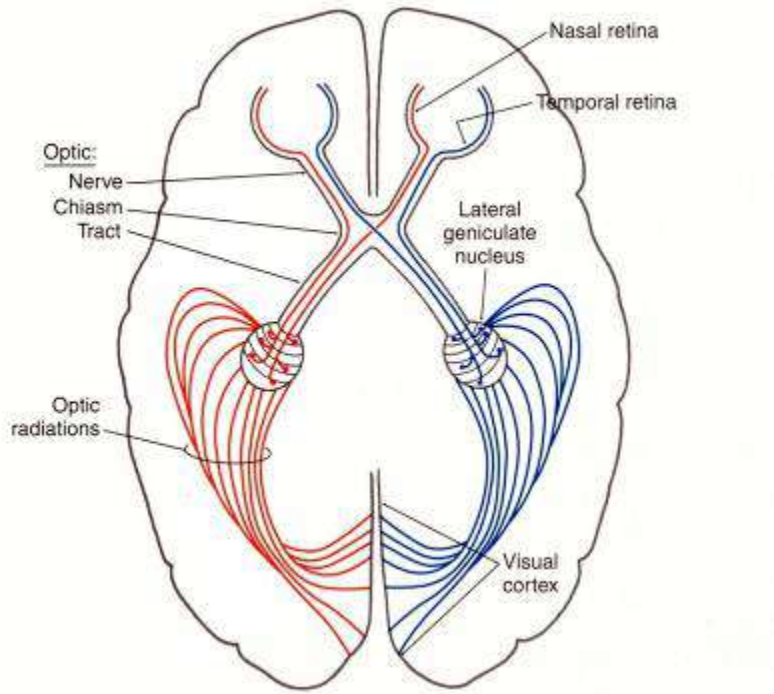
↓

Primary visual area of cerebral cortex (area 17) in occipital lobe



POSTERIOR

Looking down from above



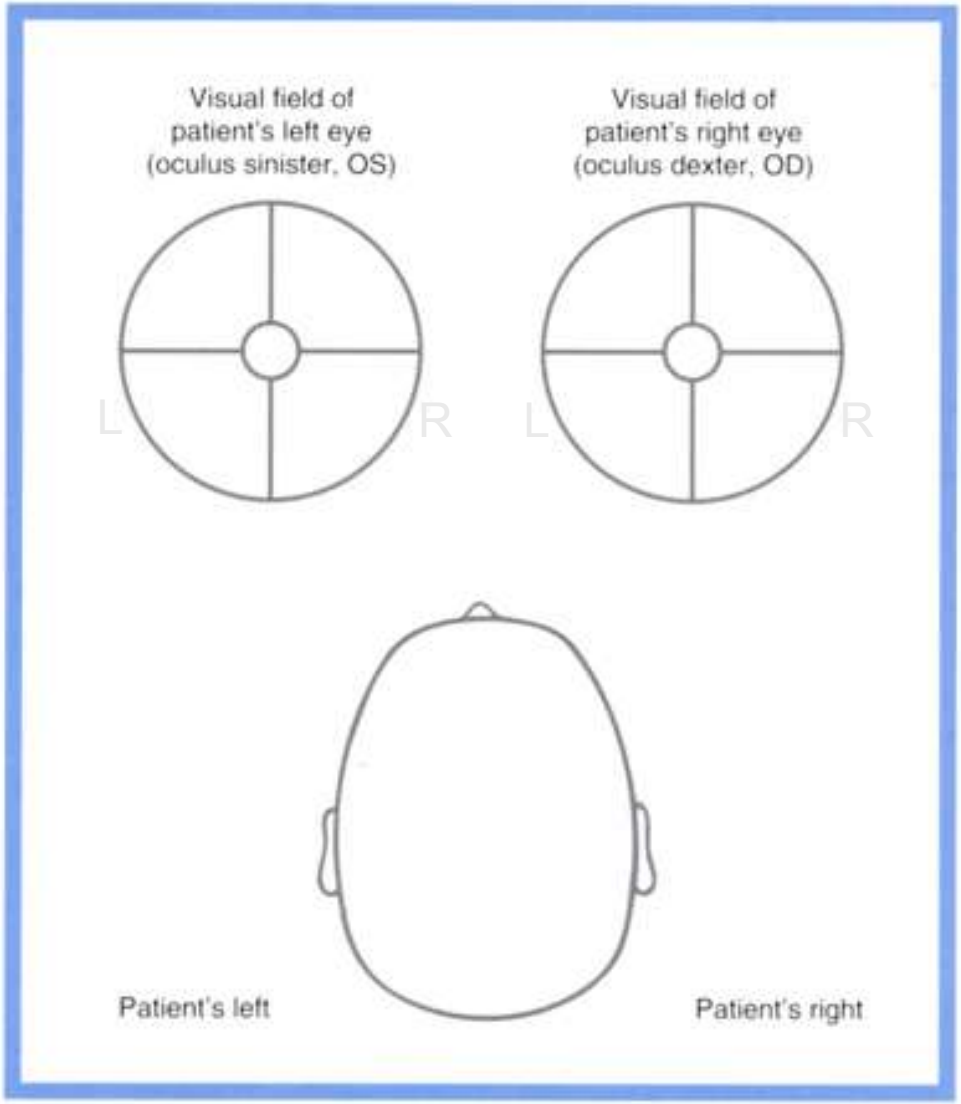
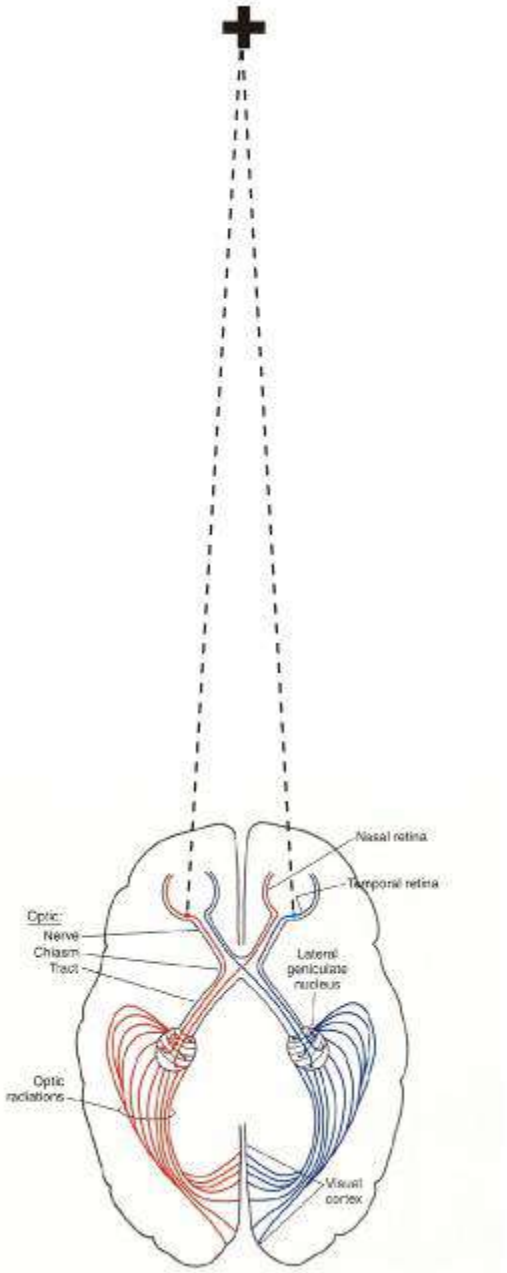
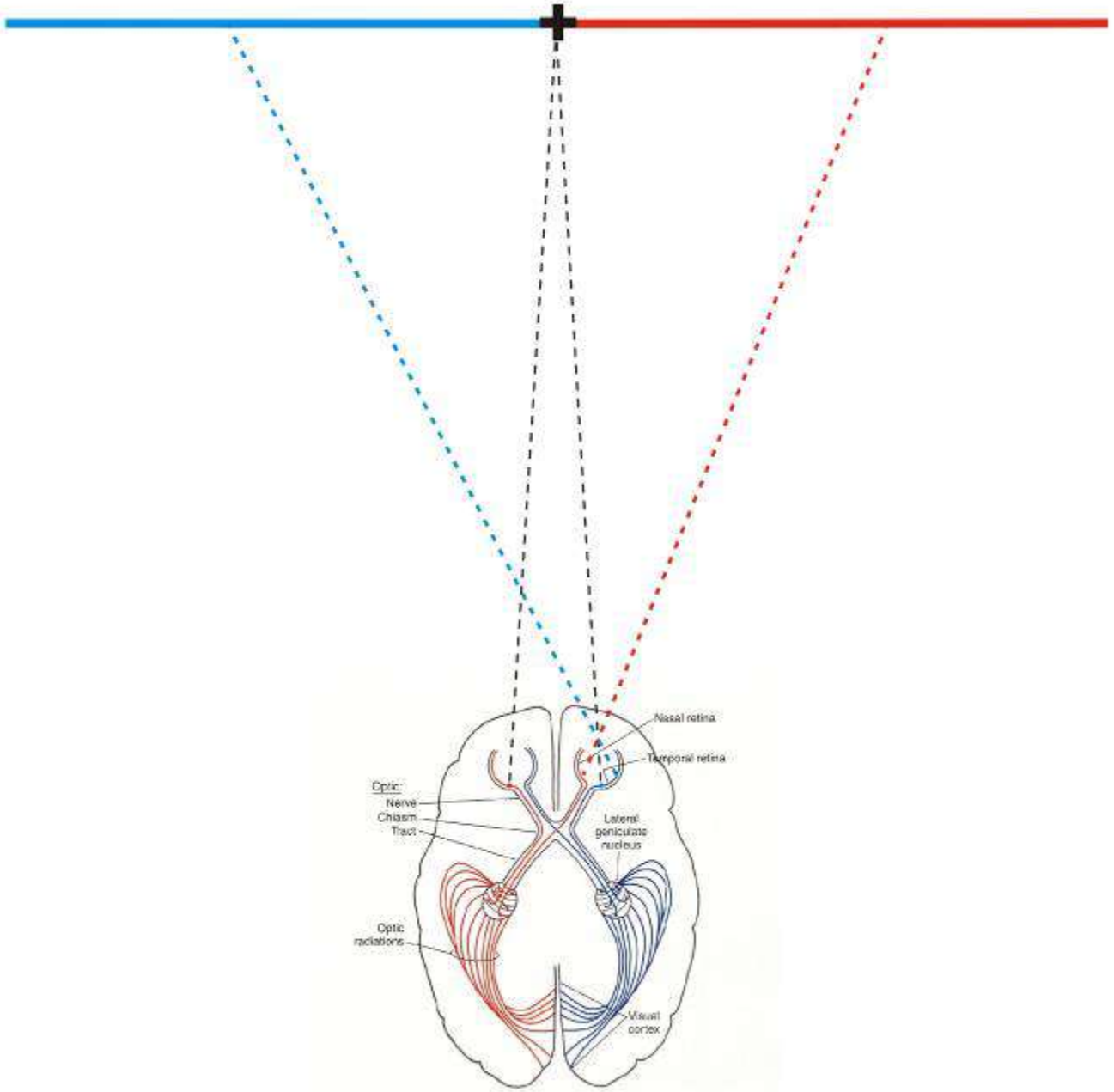
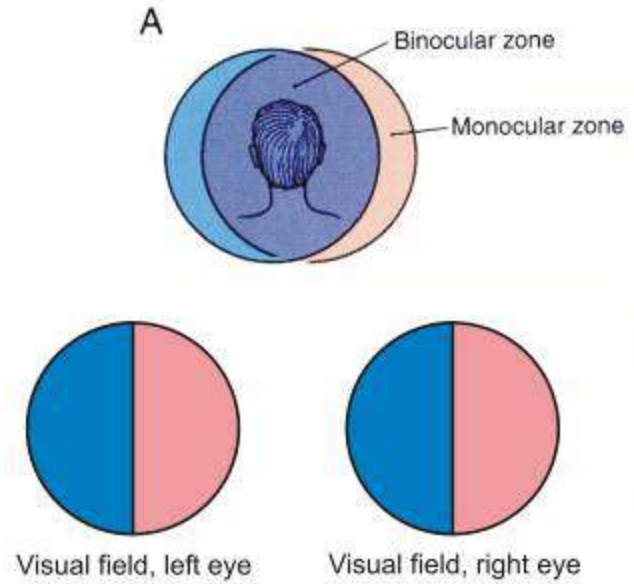
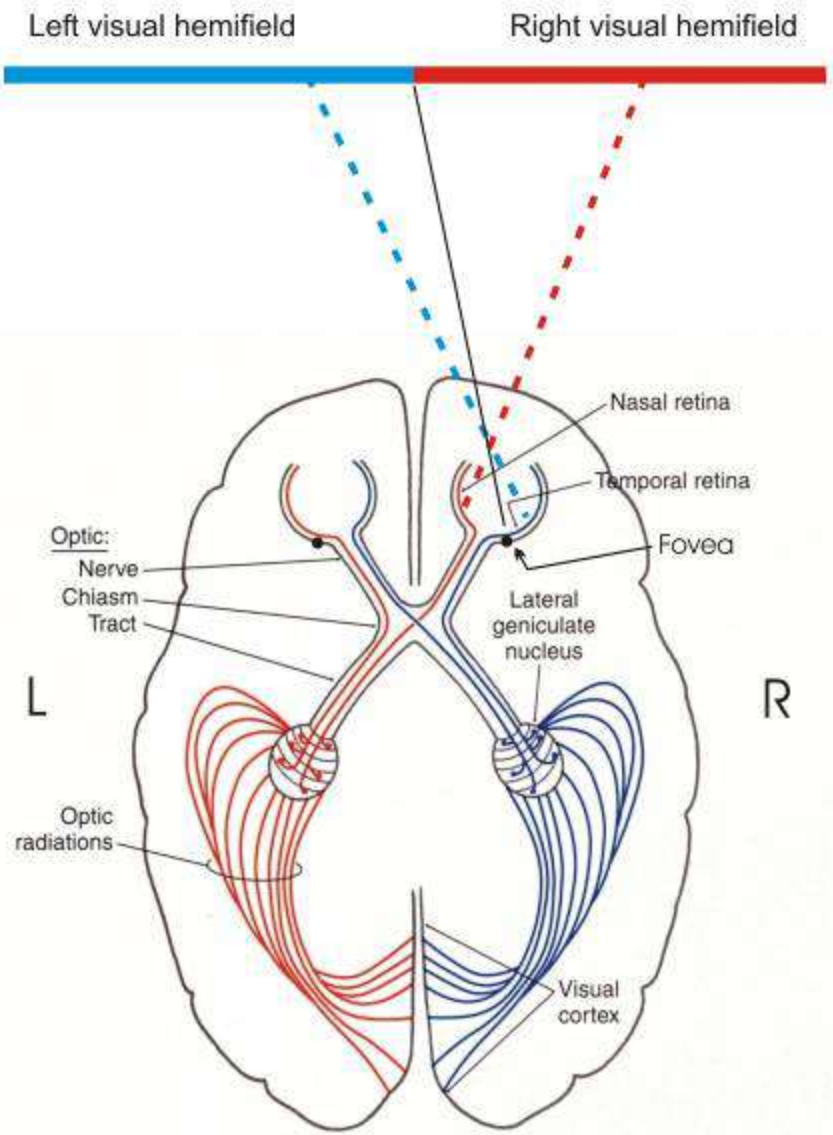


Figure 20-13. Relationship of visual field diagrams to patient being examined. The observer draws the diagrams as if they were on the wall the patient is looking at.

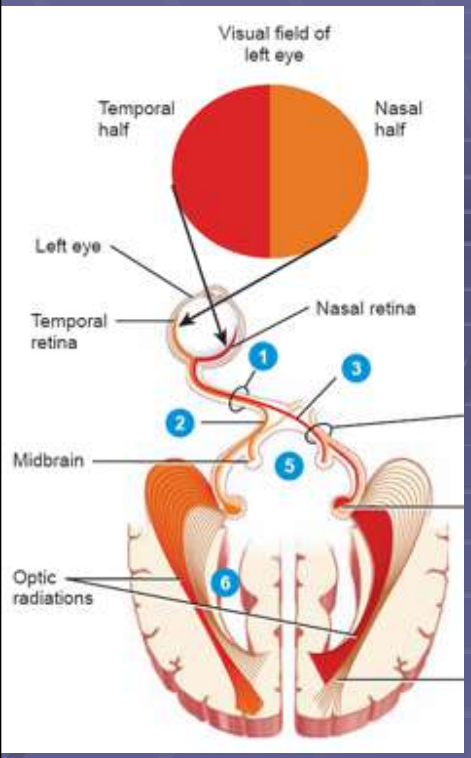

Nasal retina
Temporal retina
Optic
Nerve
Chiasm
Tract
Lateral
geniculate
nucleus
Optic
radiations
Visual
cortex

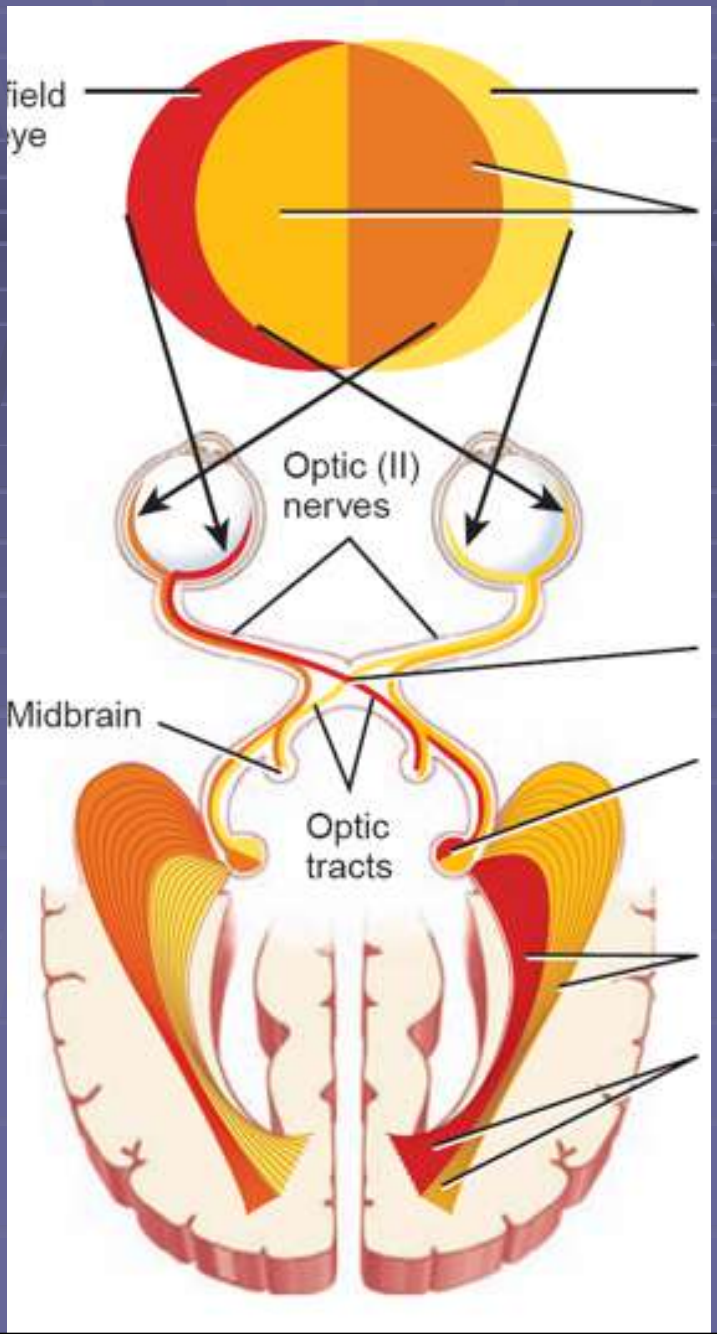

Nasal retina
Temporal retina
Optic
Nerve
Chiasm
Tract
Lateral
geniculate
nucleus
Optic
radiations
Visual
cortex

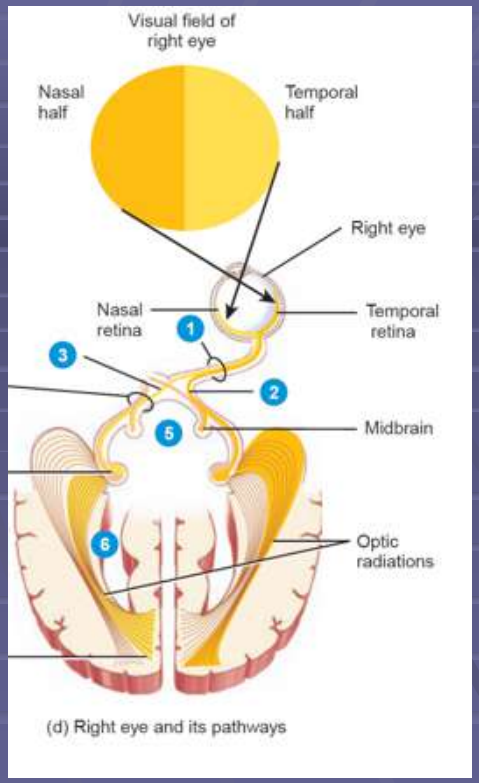

A
Binocular zone
Monocular zone
Visual field, left eye
Visual field, right eye
Hemifield
Quadrant
Fovea
Blind spot

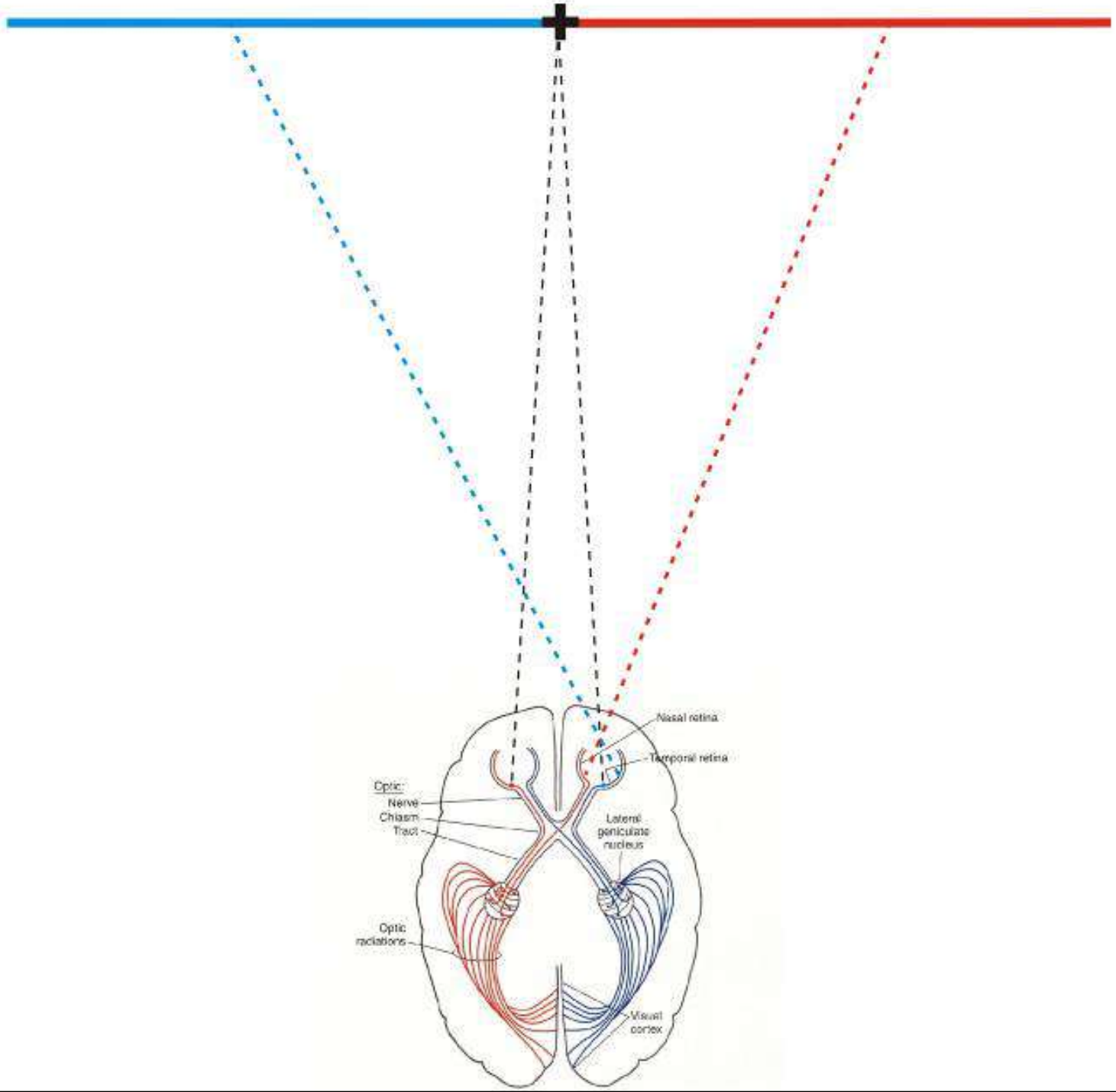

Left visual hemifield
Right visual hemifield
Nasal retina
Temporal retina
Fovea
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
L
R
Optic radiations
Visual cortex

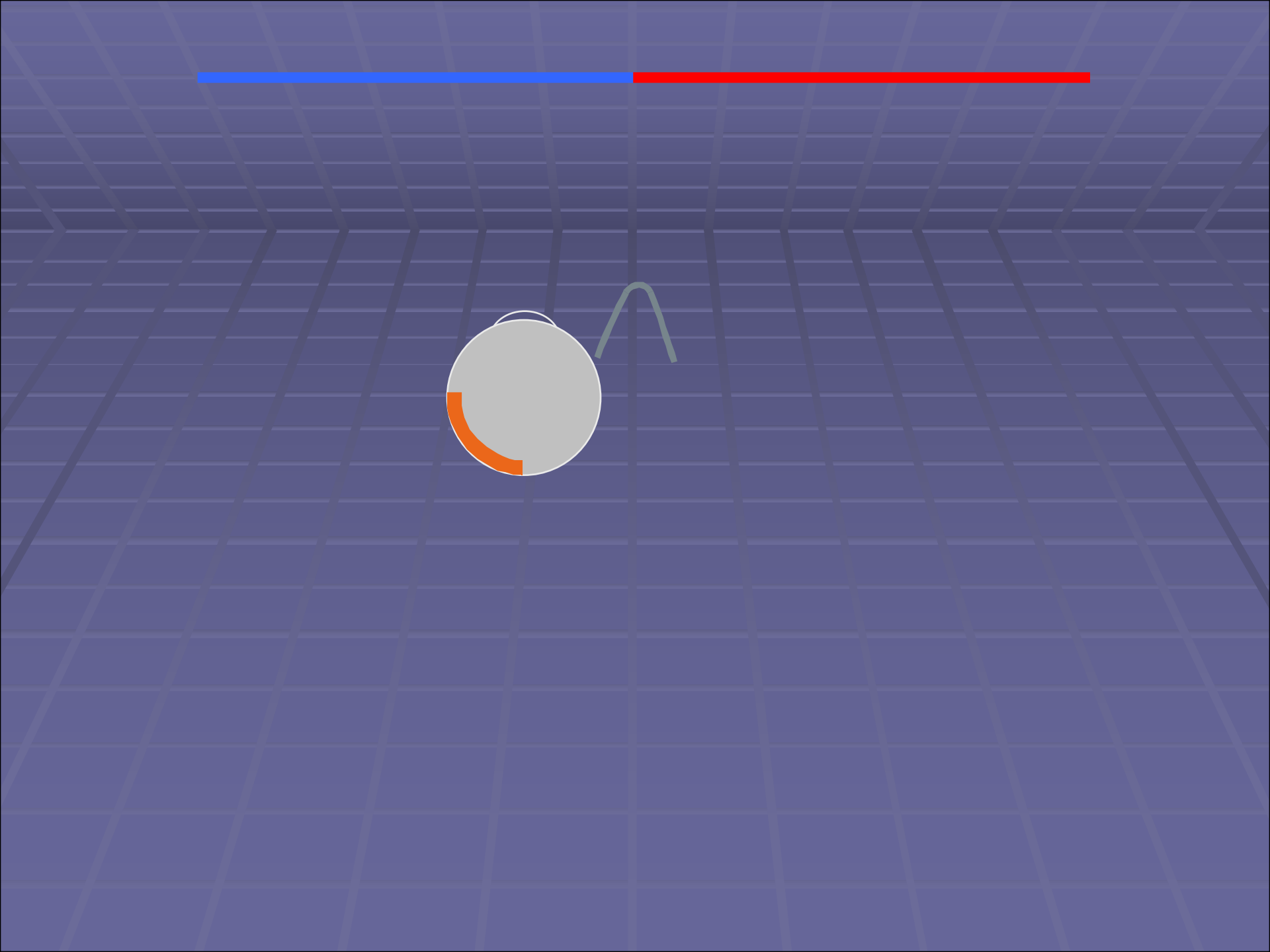
Text Fig. 20-9

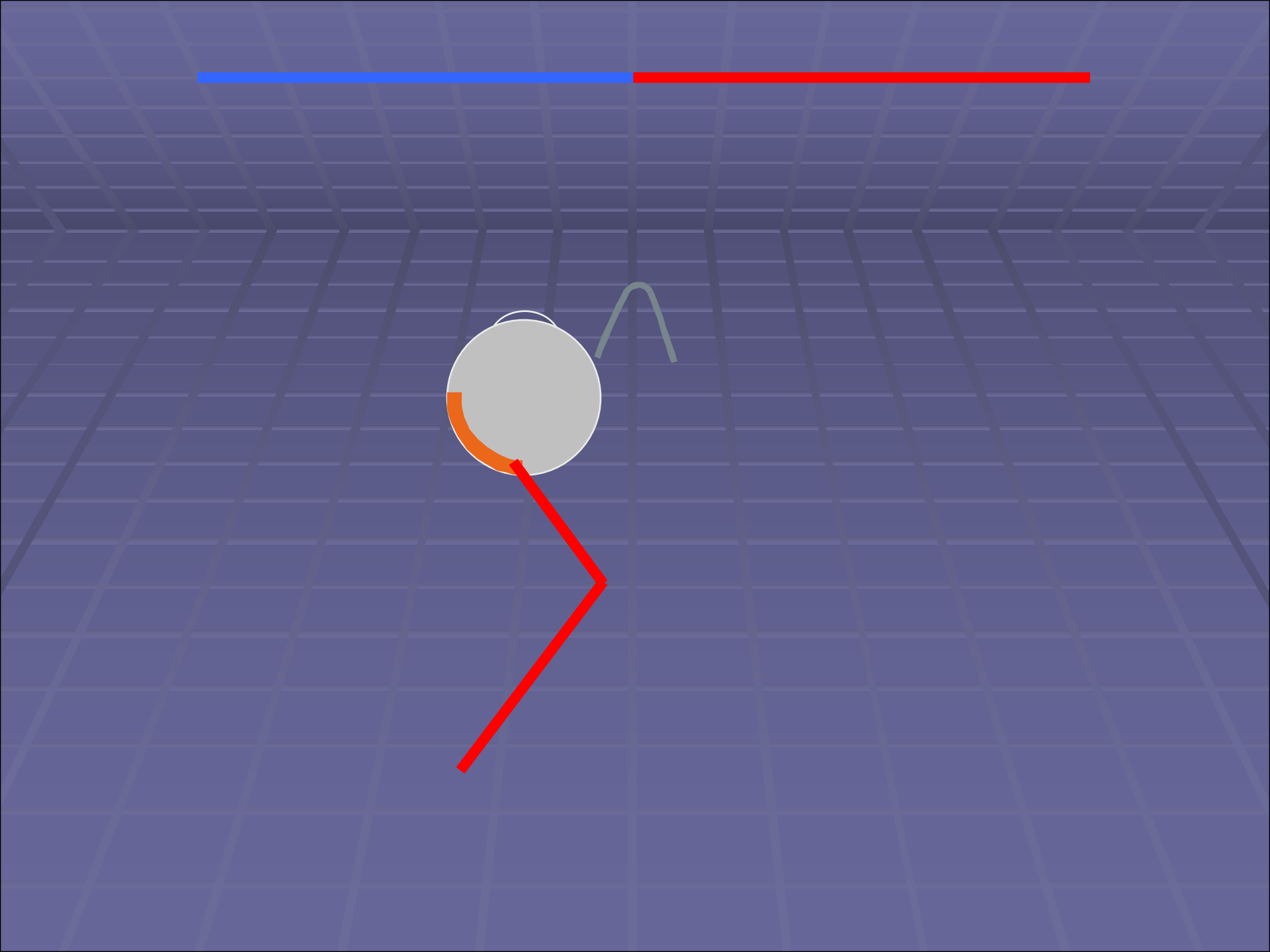

Visual field of
left eye
Temporal
half
Nasal
half
Left eye
Temporal
retina
Nasal retina
1
2
3
Midbrain
5
Optic
radiations
6

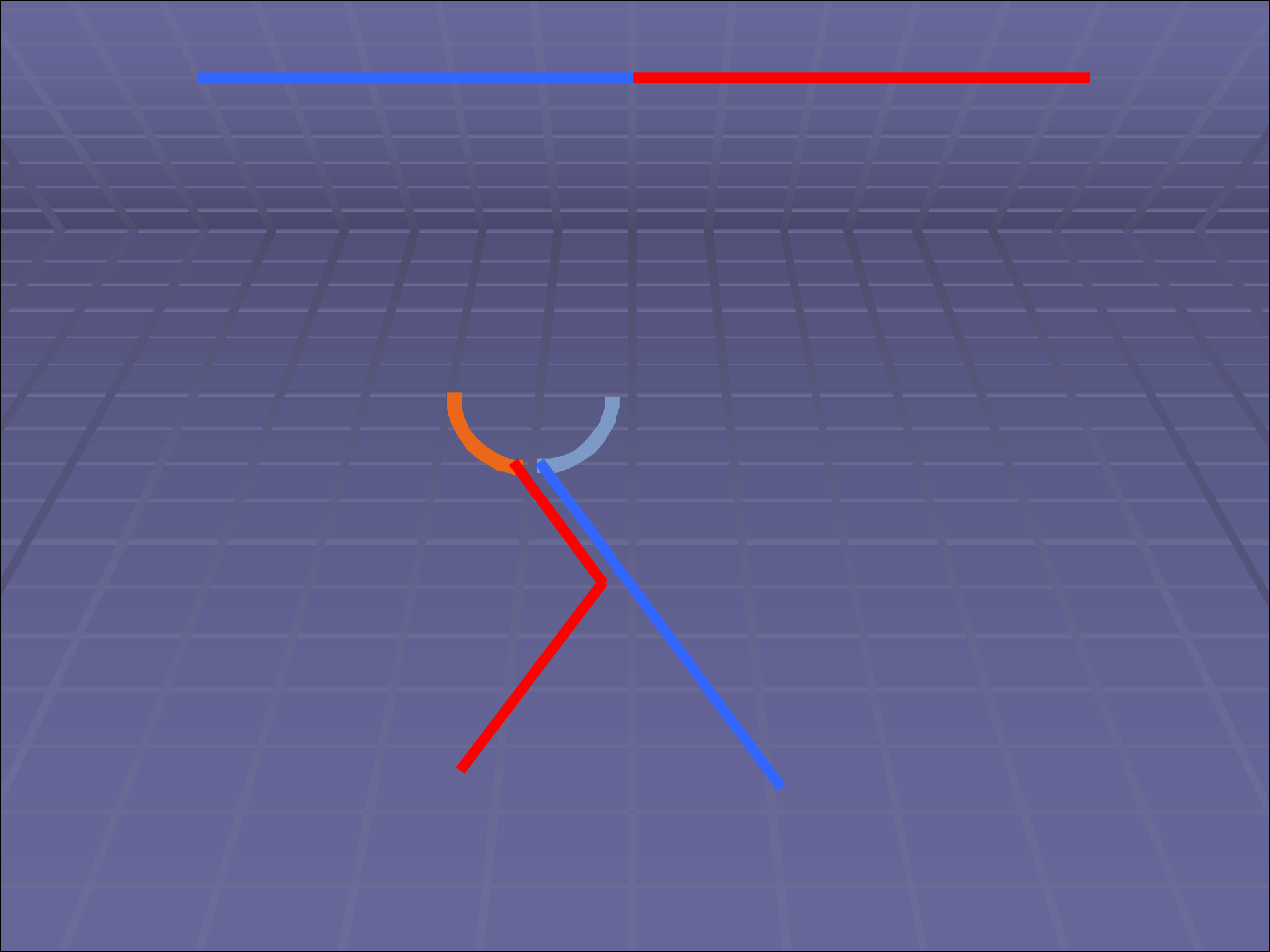

ield
ye
Optic (II)
nerves
Midbrain
Optic
tracts

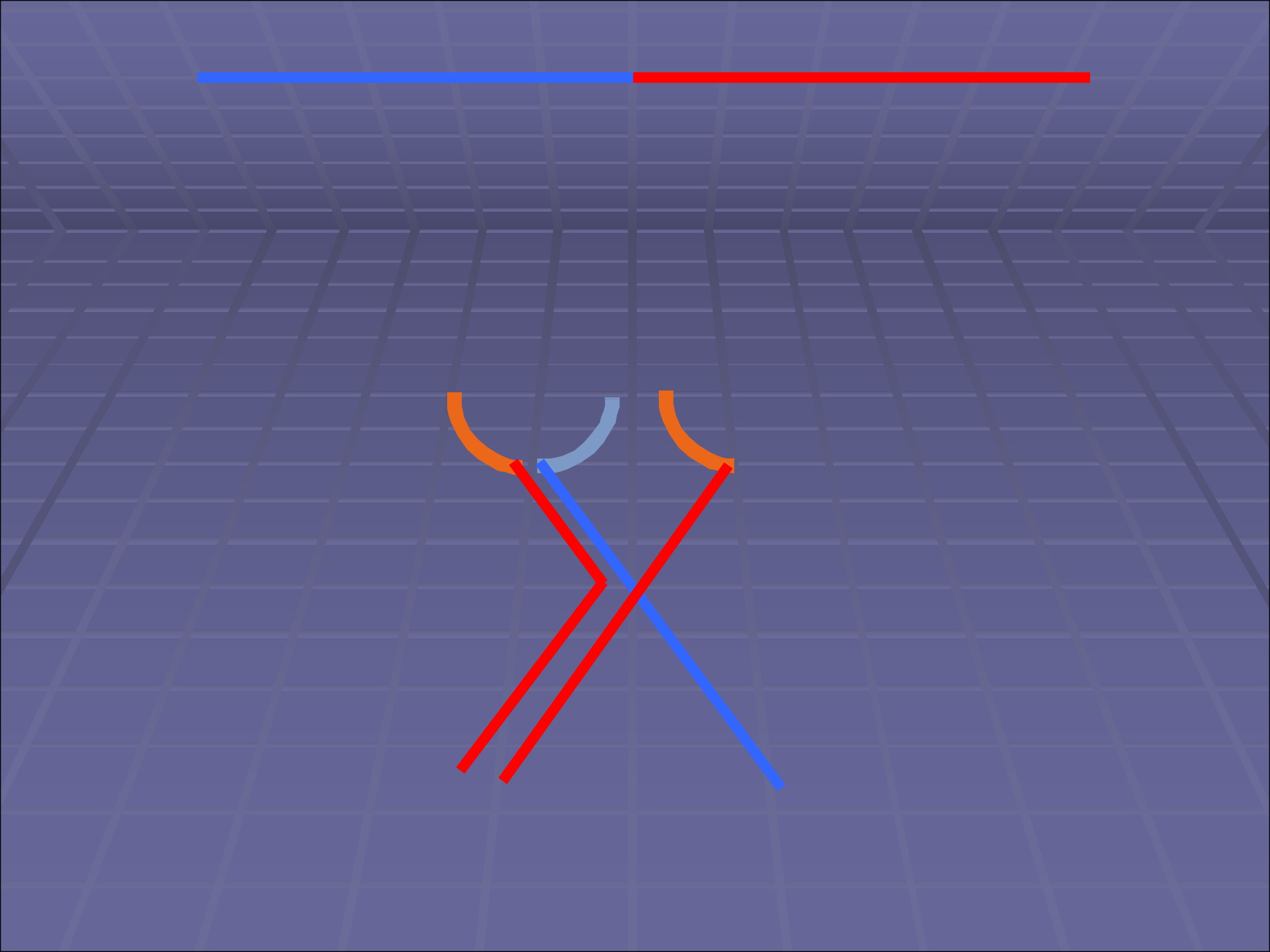

Visual field of
right eye
Nasal
half
Temporal
half
Right eye
Nasal
retina
Temporal
retina
1
2
3
5
Midbrain
6
Optic
radiations
(d) Right eye and its pathways

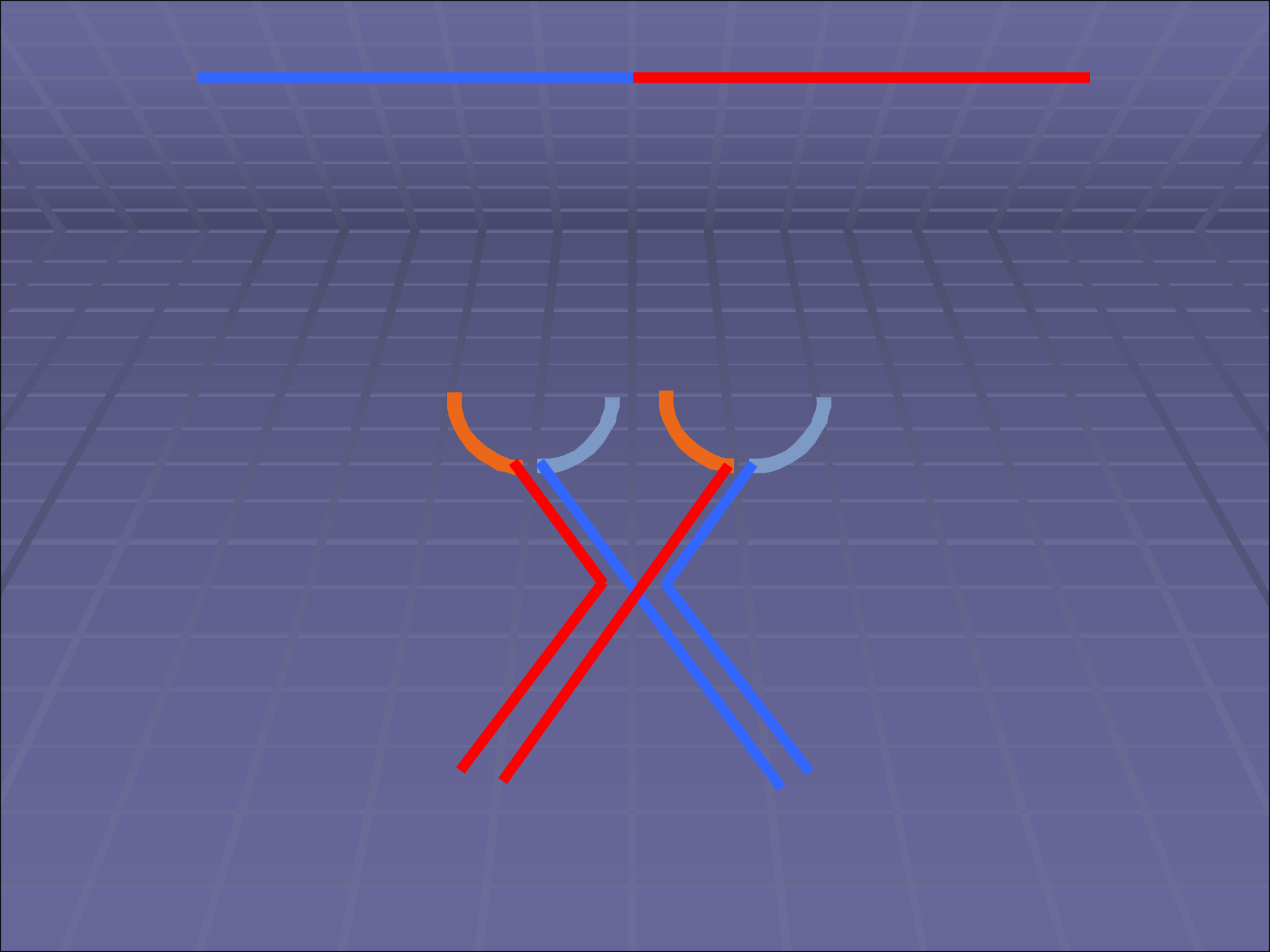

Nasal retina
Temporal retina
Optic
Nerve
Chiasm
Tract
Lateral
geniculate
nucleus
Optic
radiations
Visual
cortex

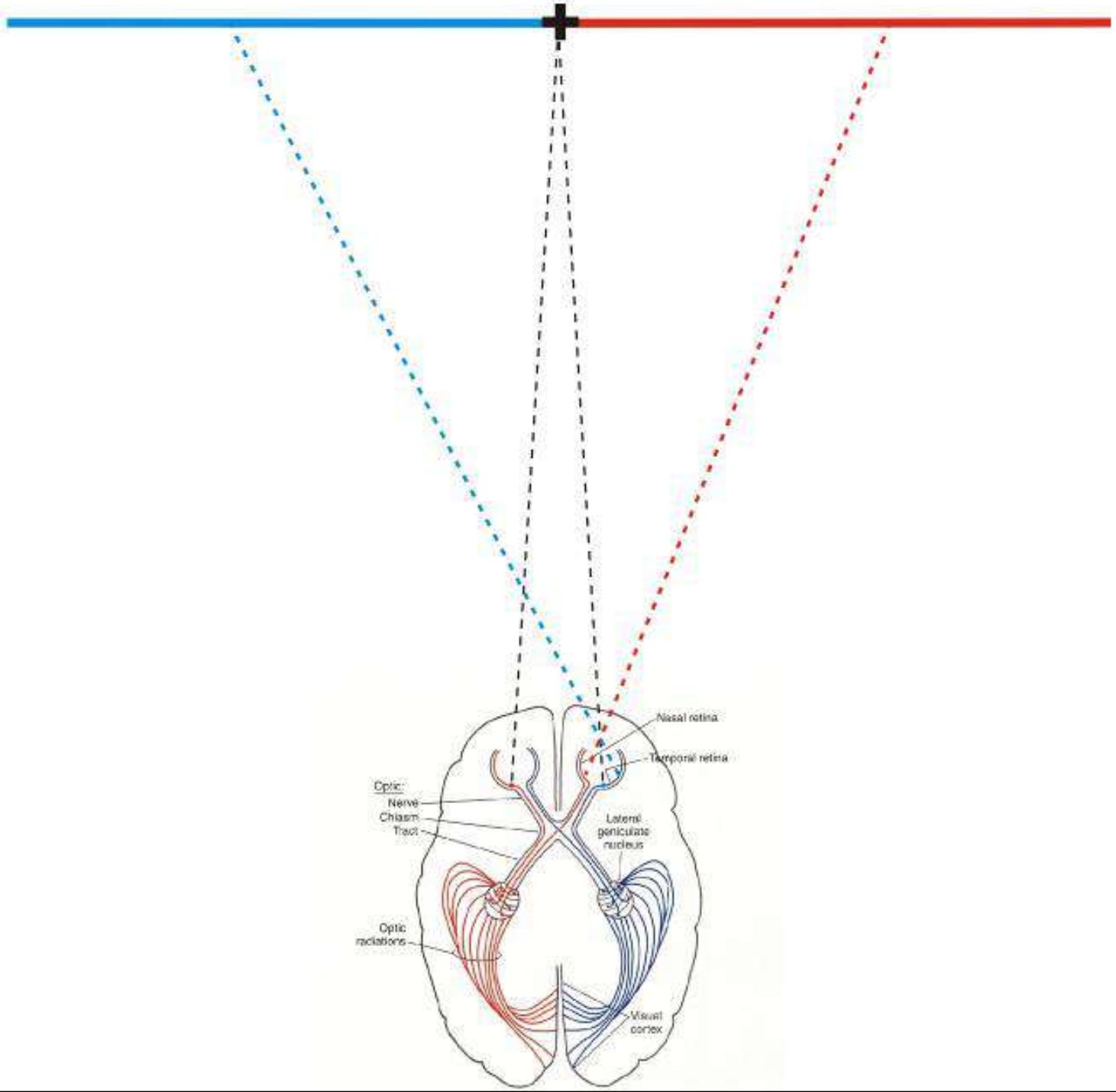




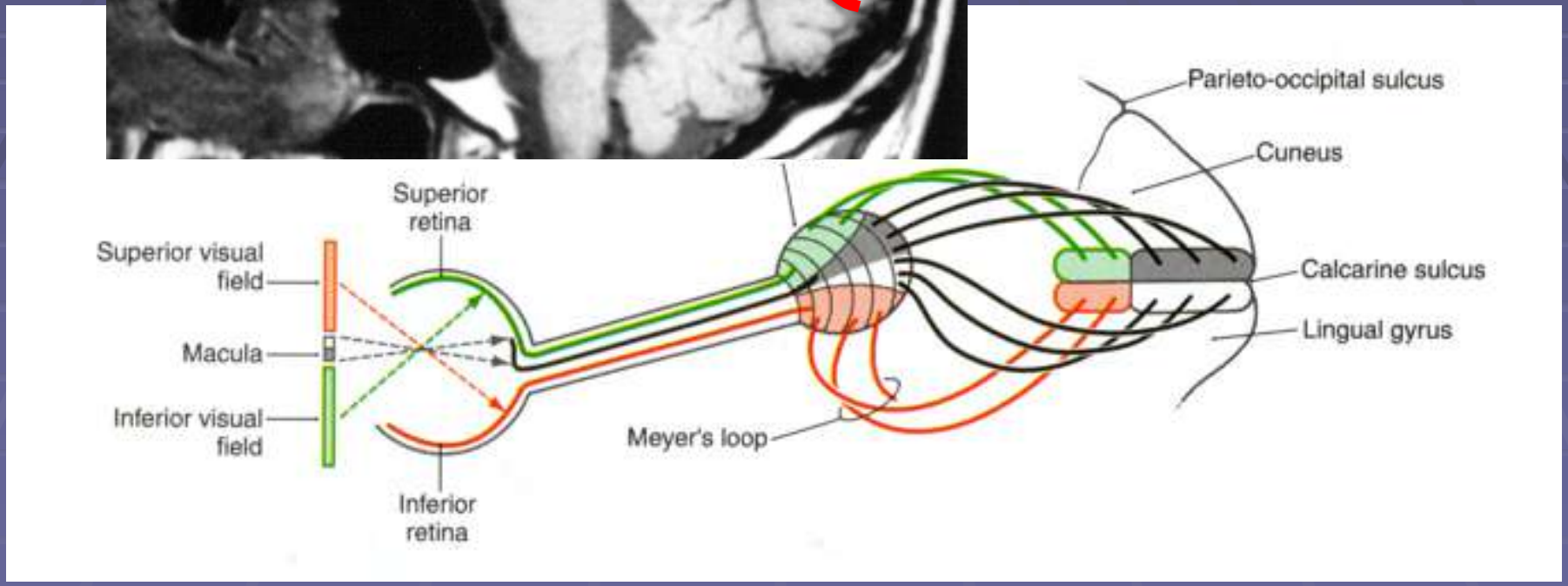




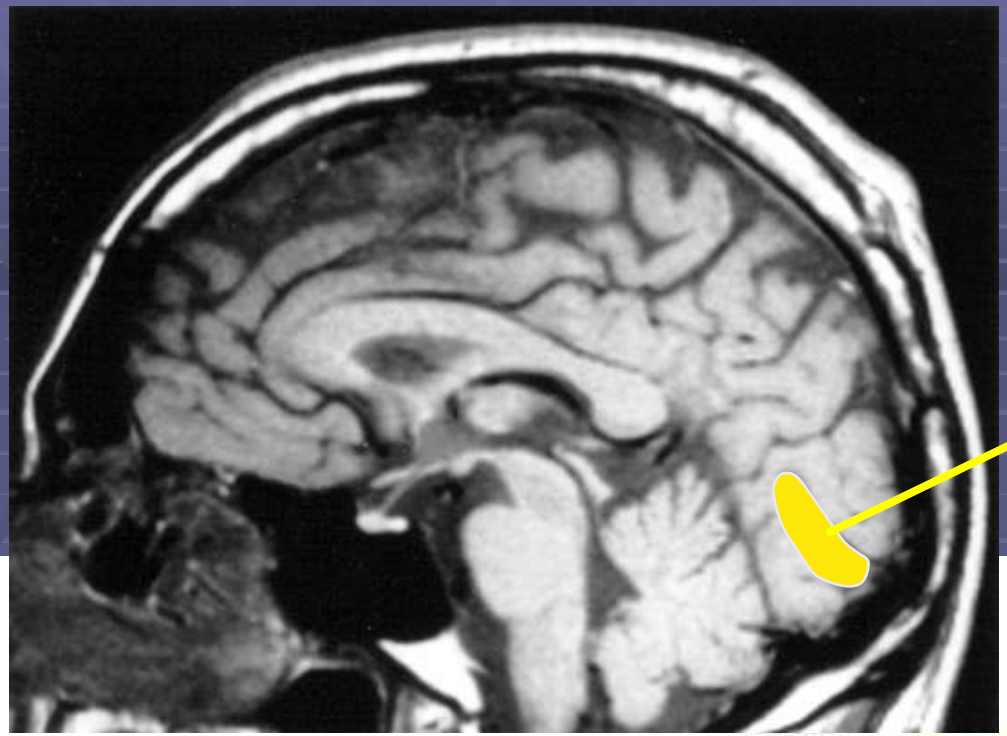


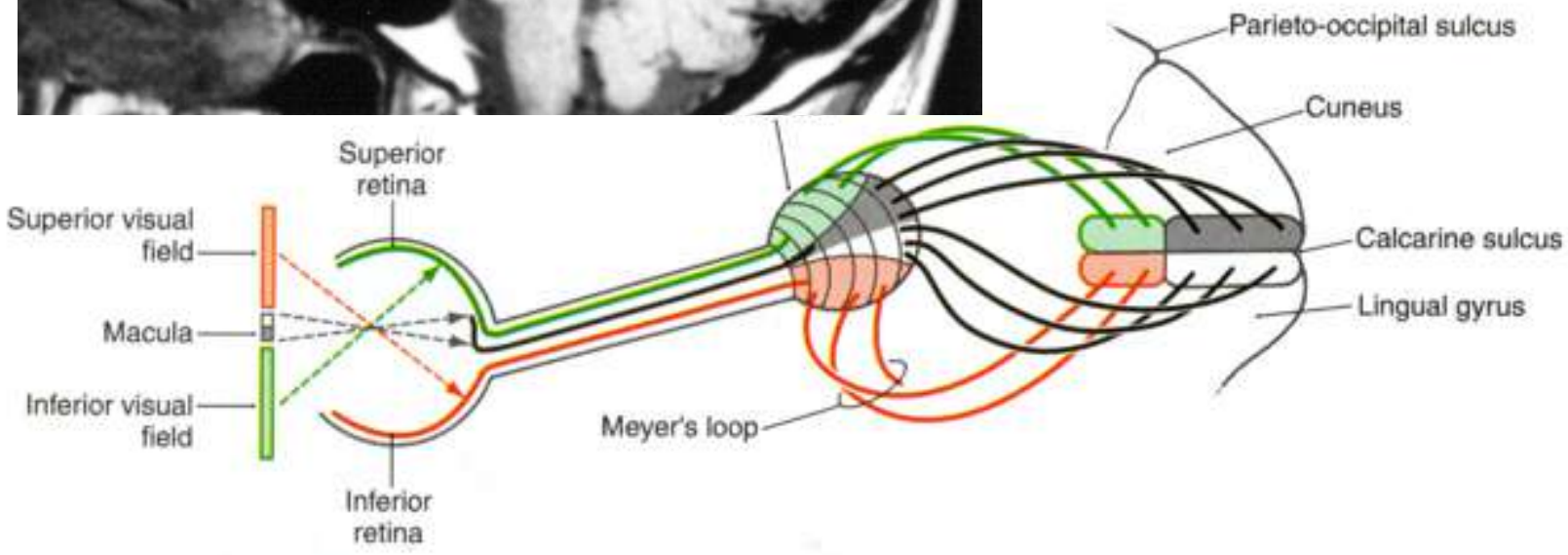

Nasal retina
Temporal retina
Optic
Nerve
Chiasm
Tract
Lateral
geniculate
nucleus
Optic
radiations
Visual
cortex

Primary Visual Cortex

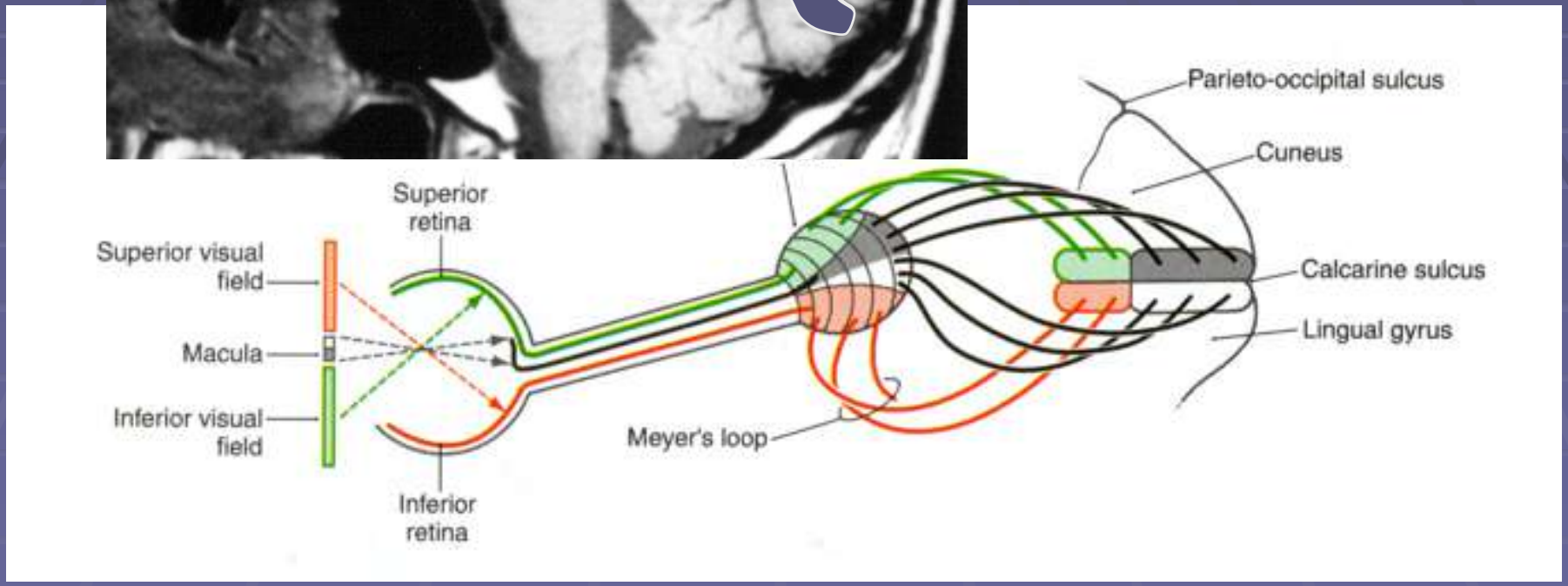


Text Fig. 20-18

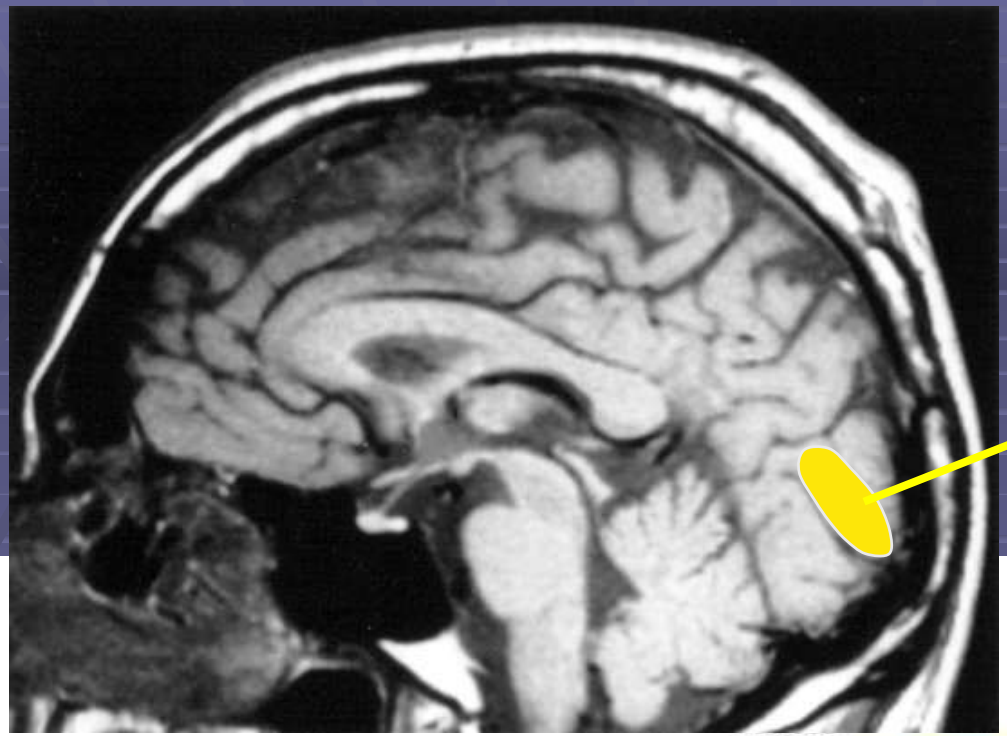


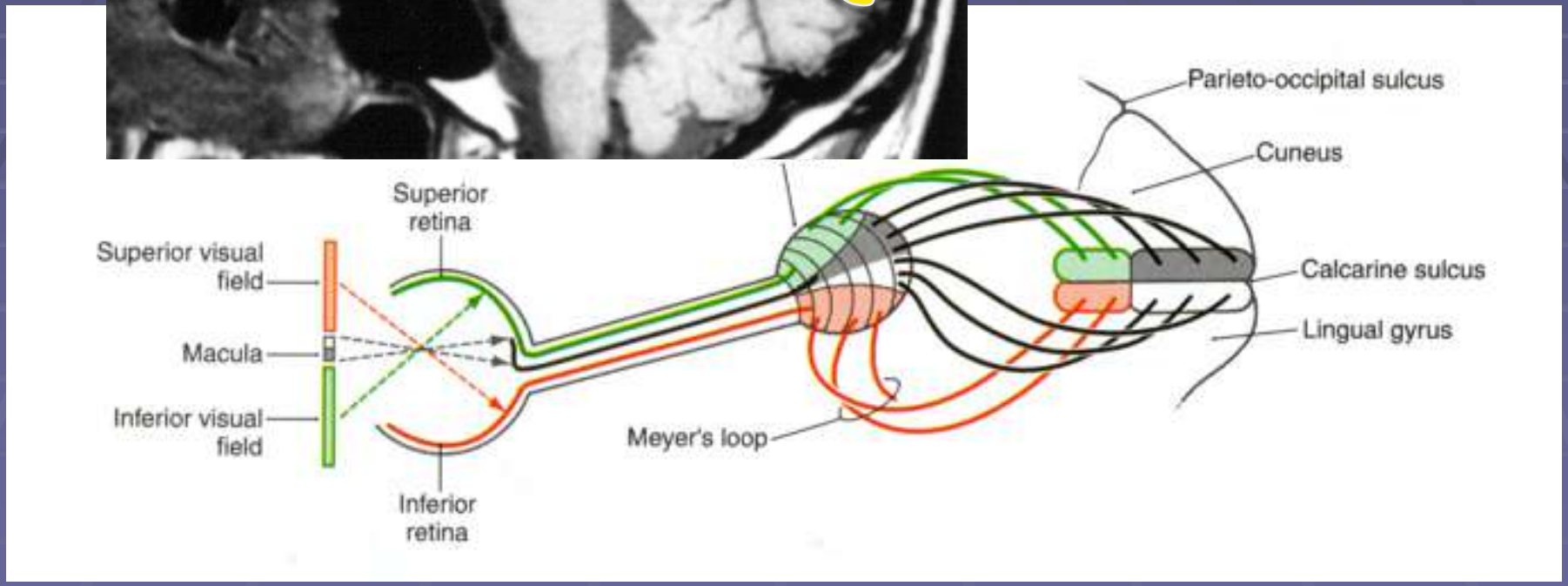


Text Fig. 20-18



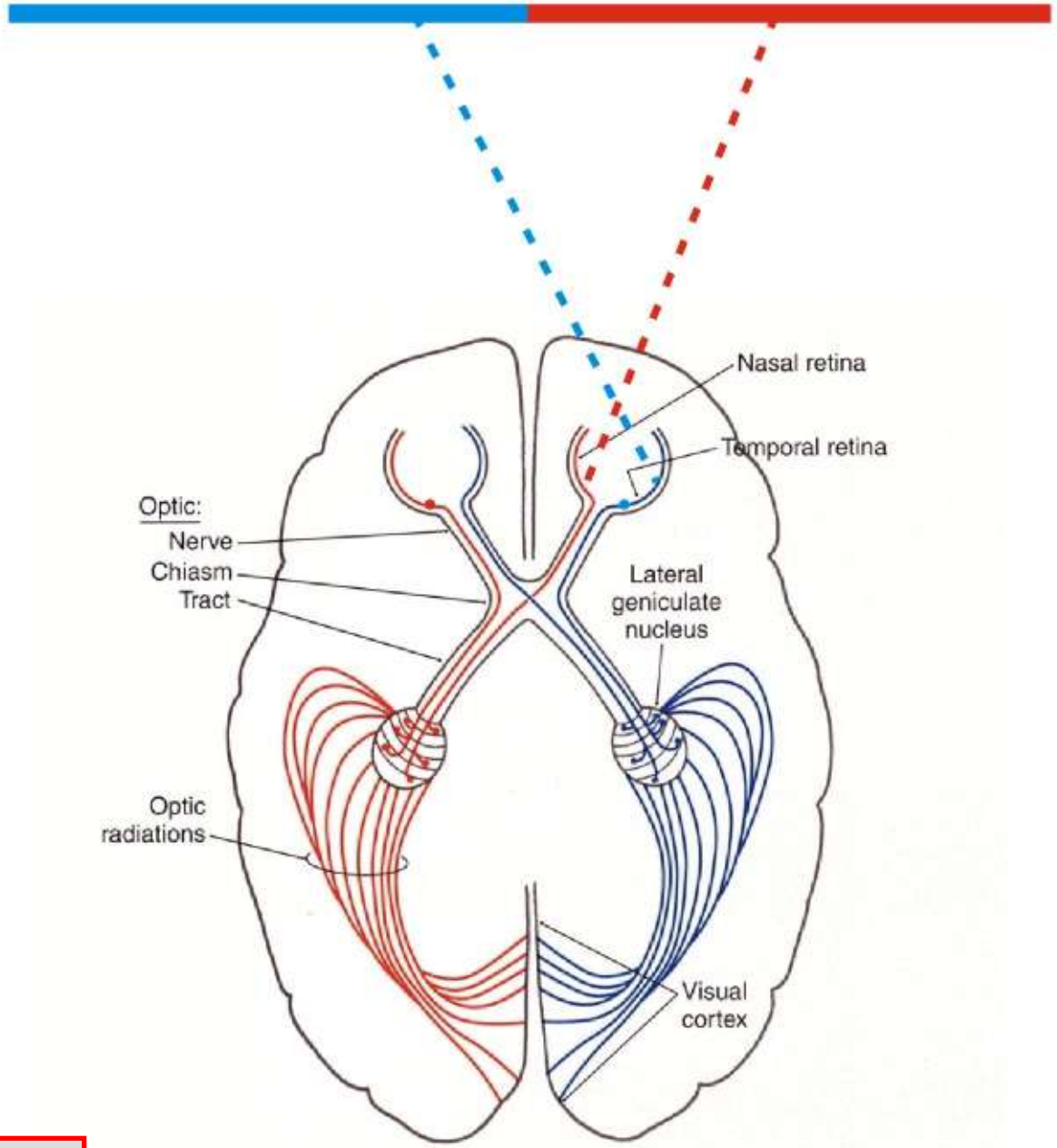
Text Fig. 20-18



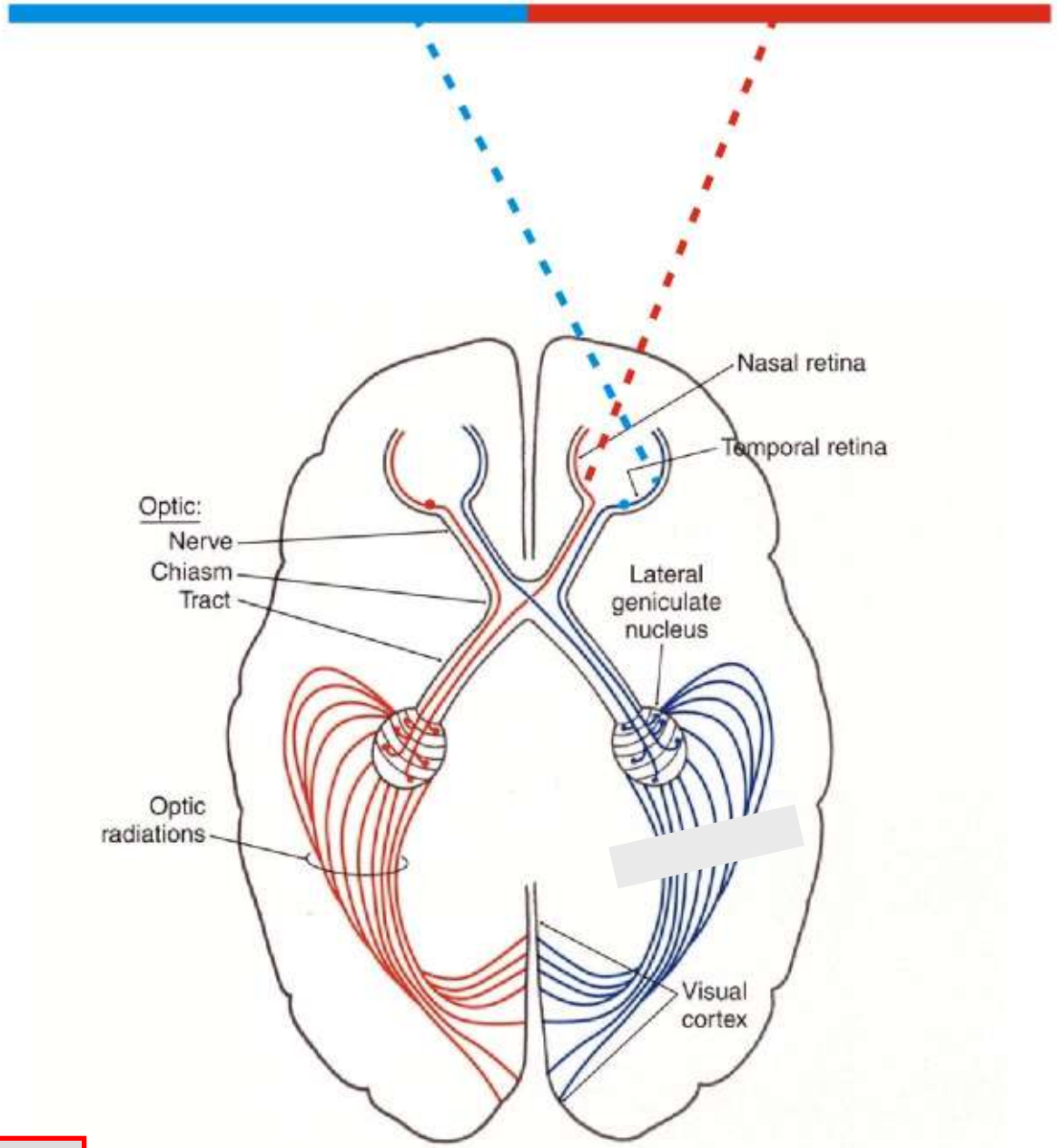


Text Fig. 20-18

Visual Field Deficits

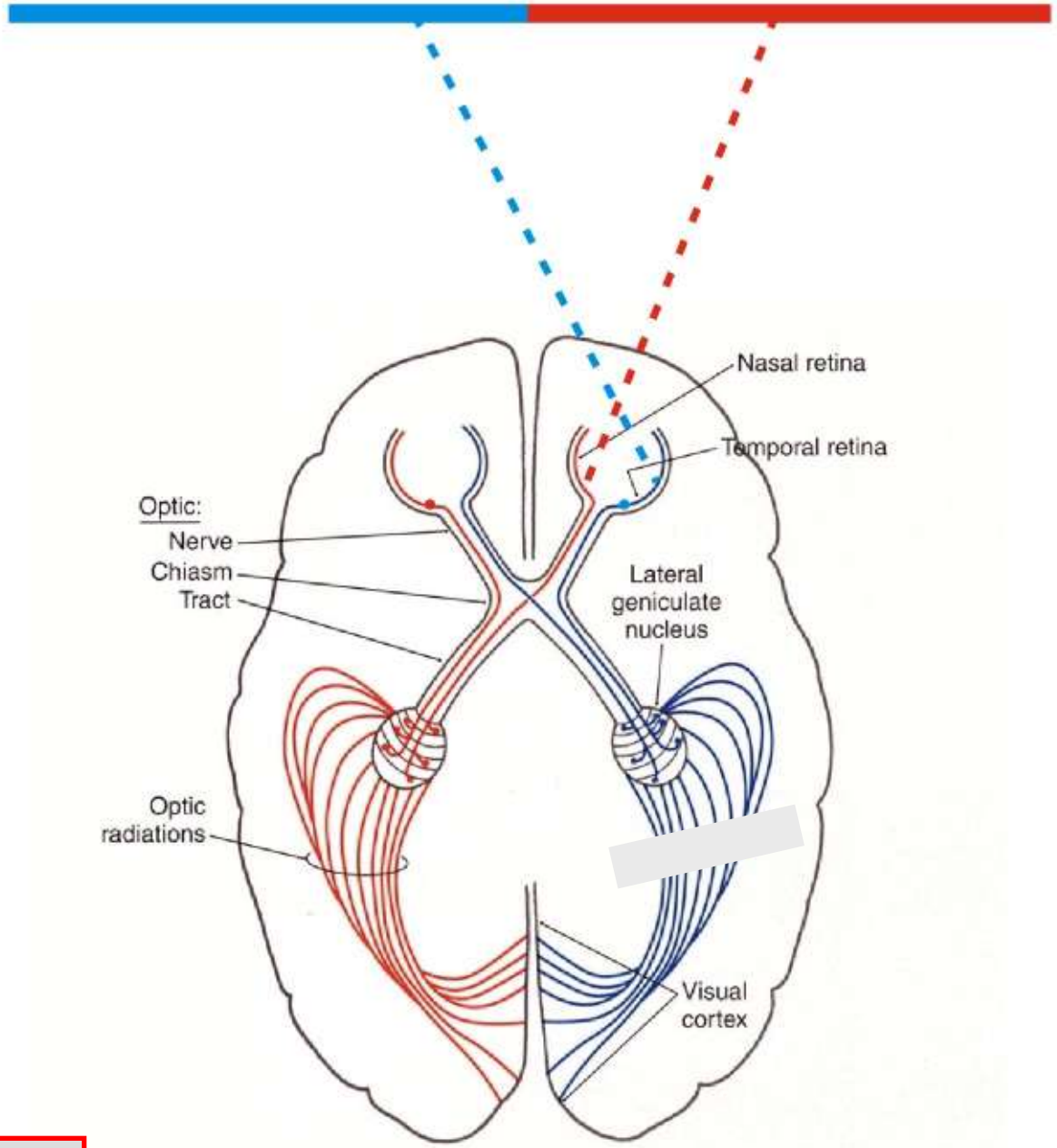

Nasal retina
Temporal retina
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
Optic radiations
Visual cortex

Text Fig. 20-9

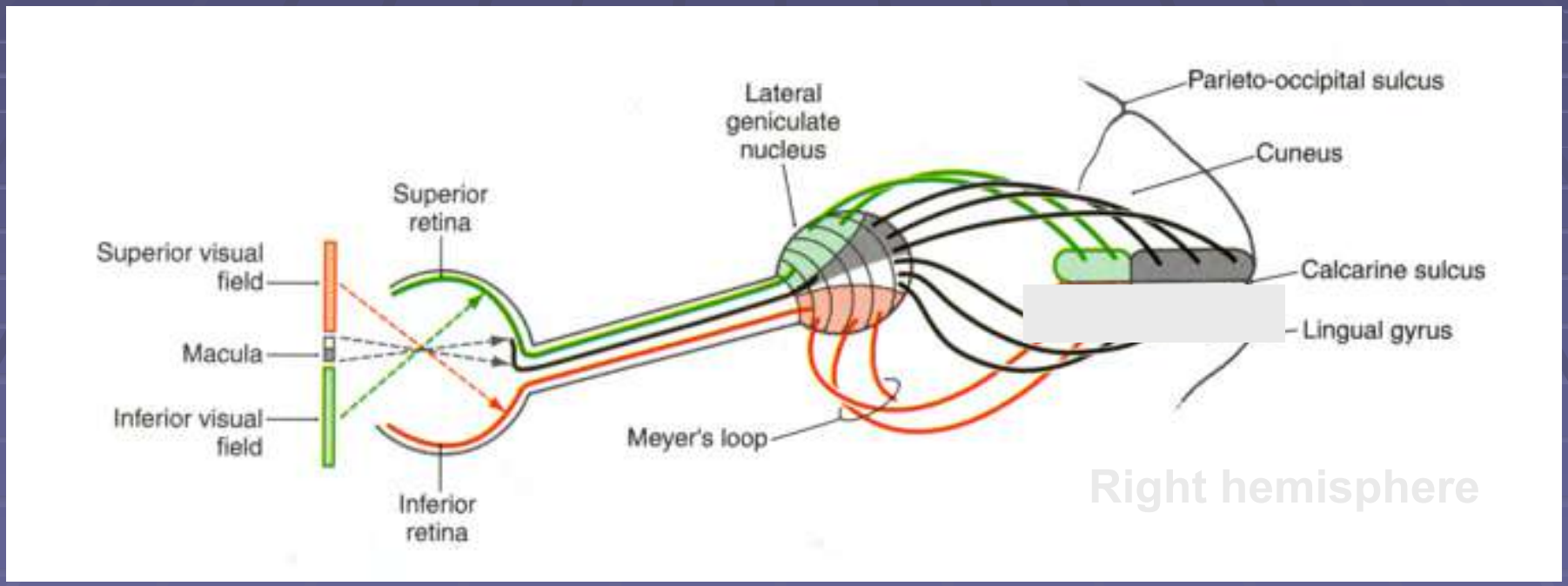

Nasal retina
Temporal retina
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
Optic radiations
Visual cortex

Text Fig. 20-9

Hemi - anopia

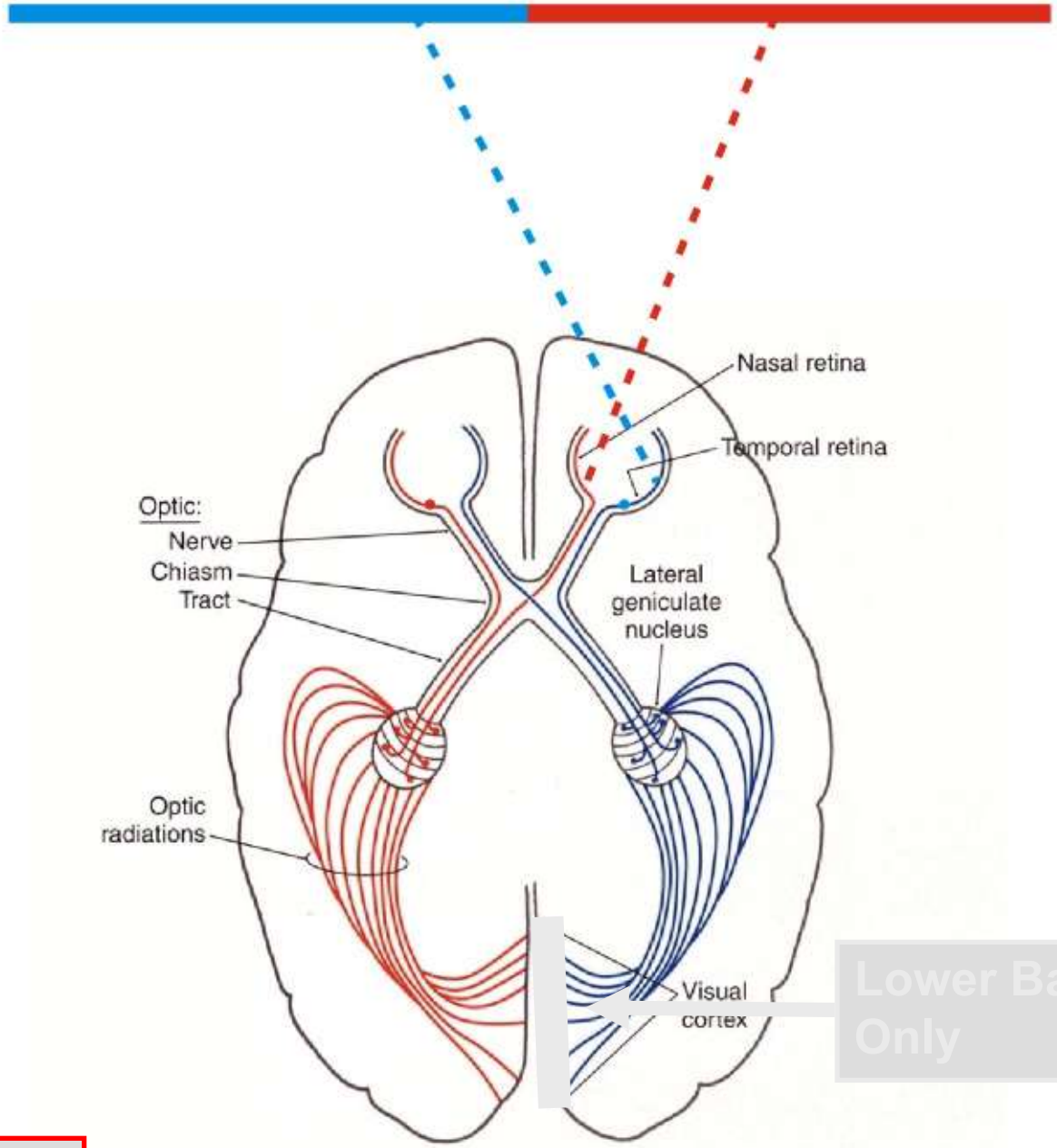

Nasal retina
Temporal retina
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
Optic radiations
Visual cortex

Text Fig. 20-9

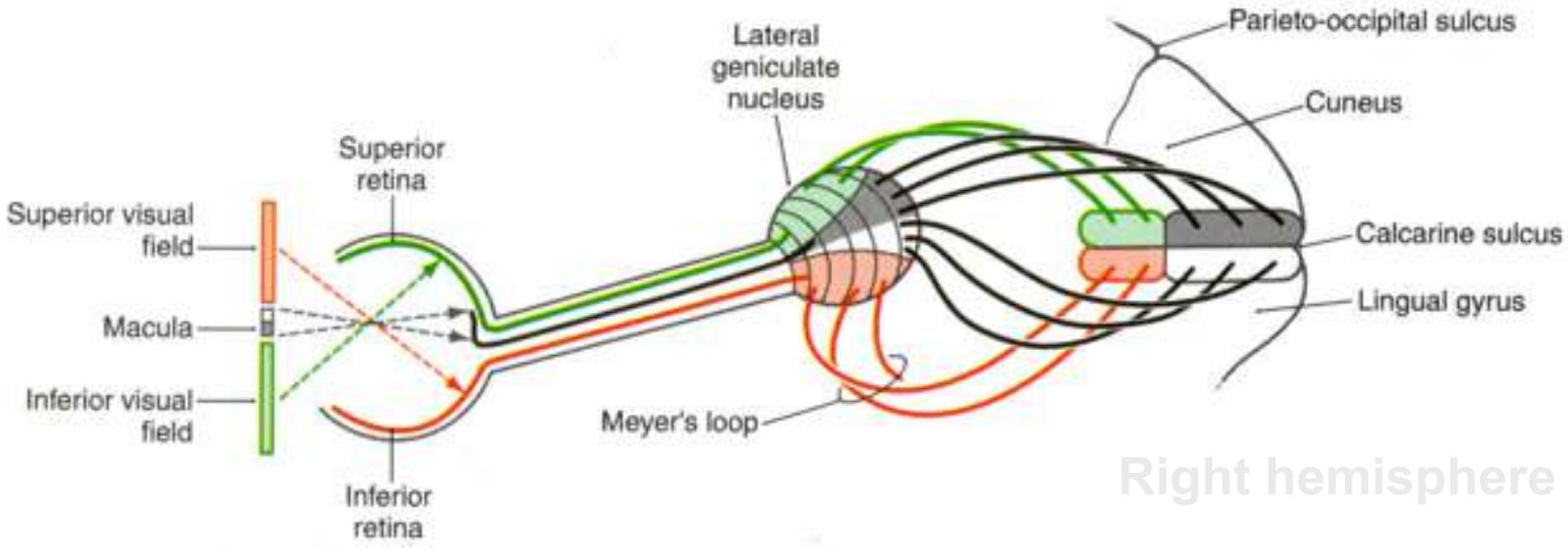


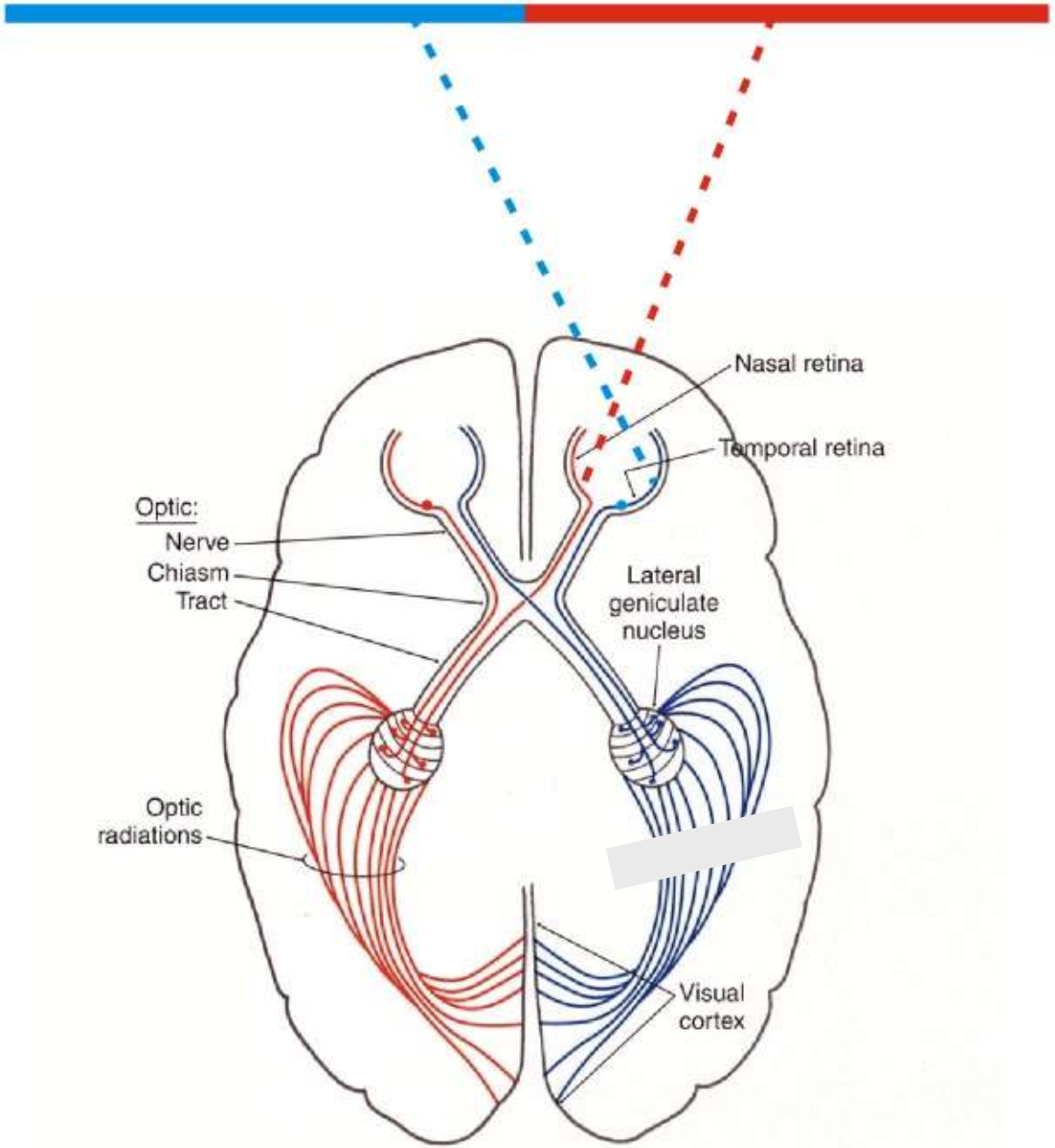
Text Fig. 20-15

Quadrant - anopia

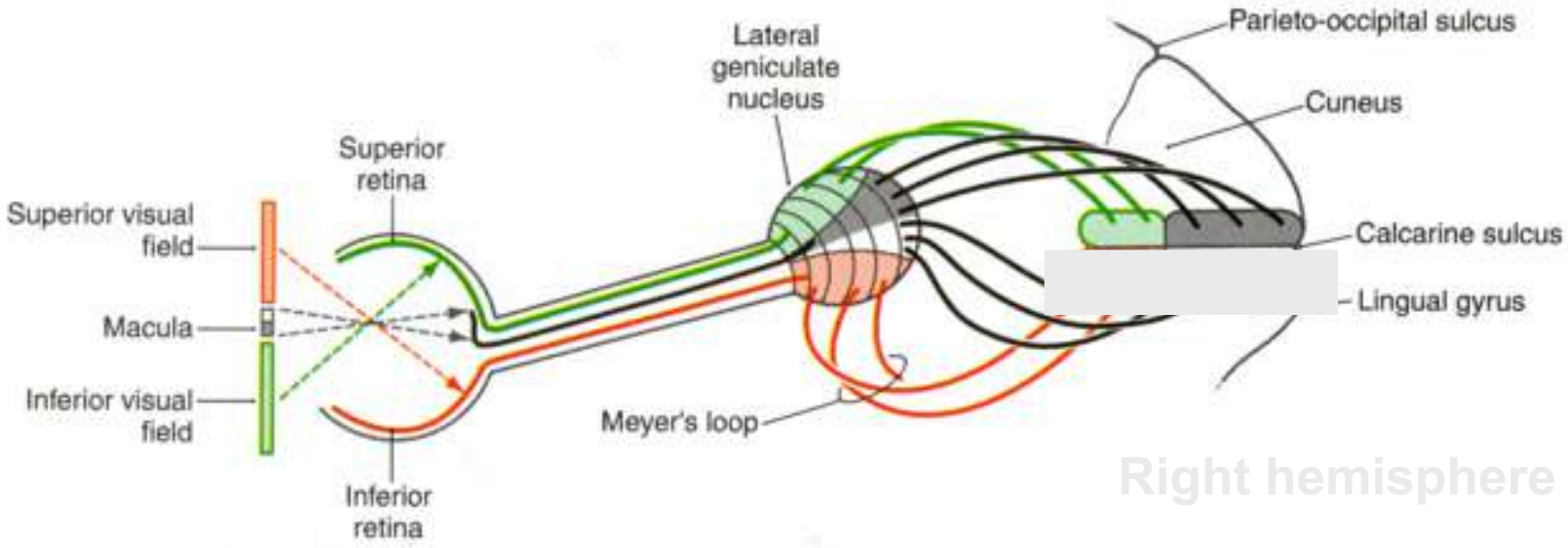

Nasal retina
Temporal retina
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
Optic radiations
Visual cortex
Lower Bank Only

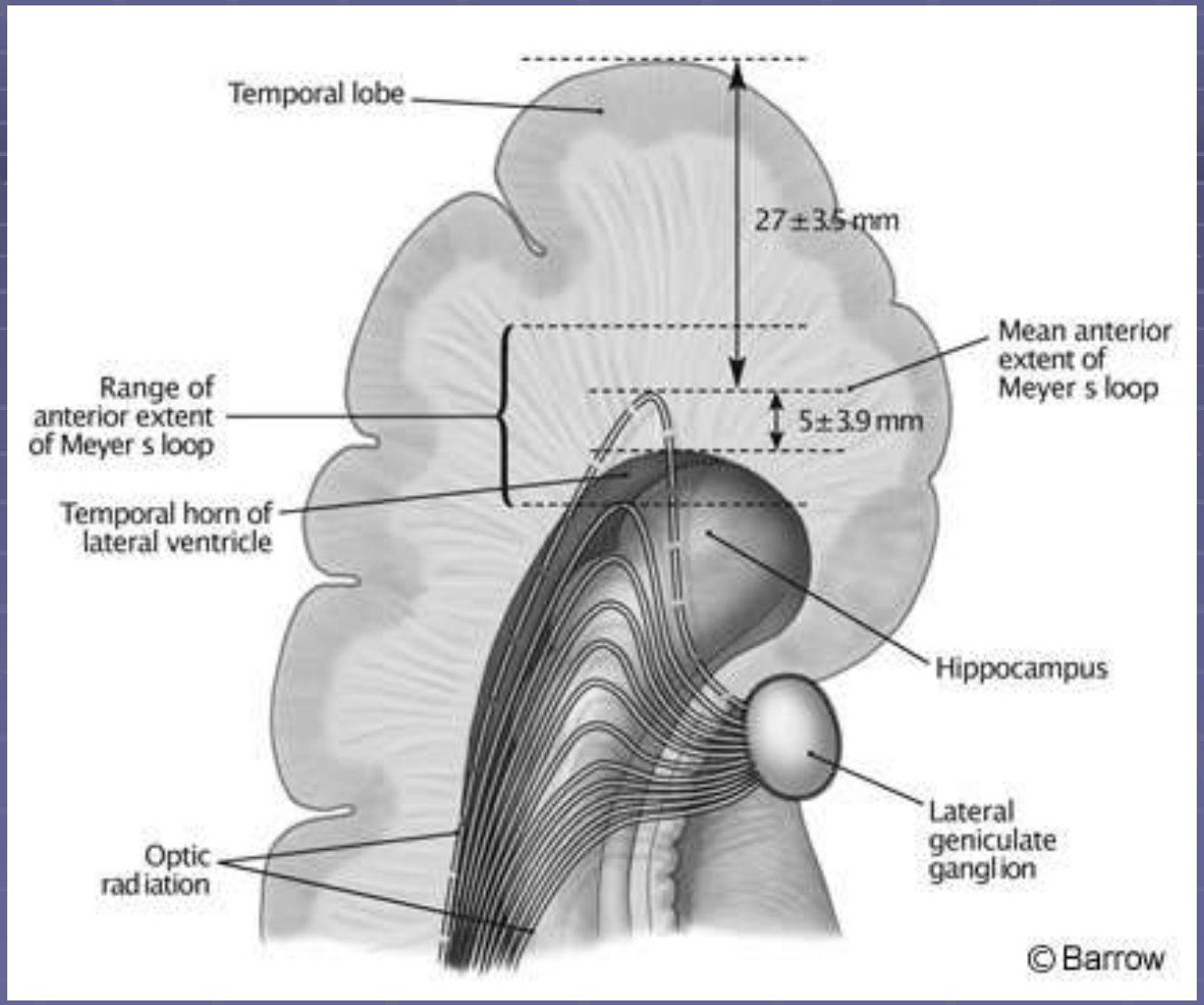
Text Fig. 20-9

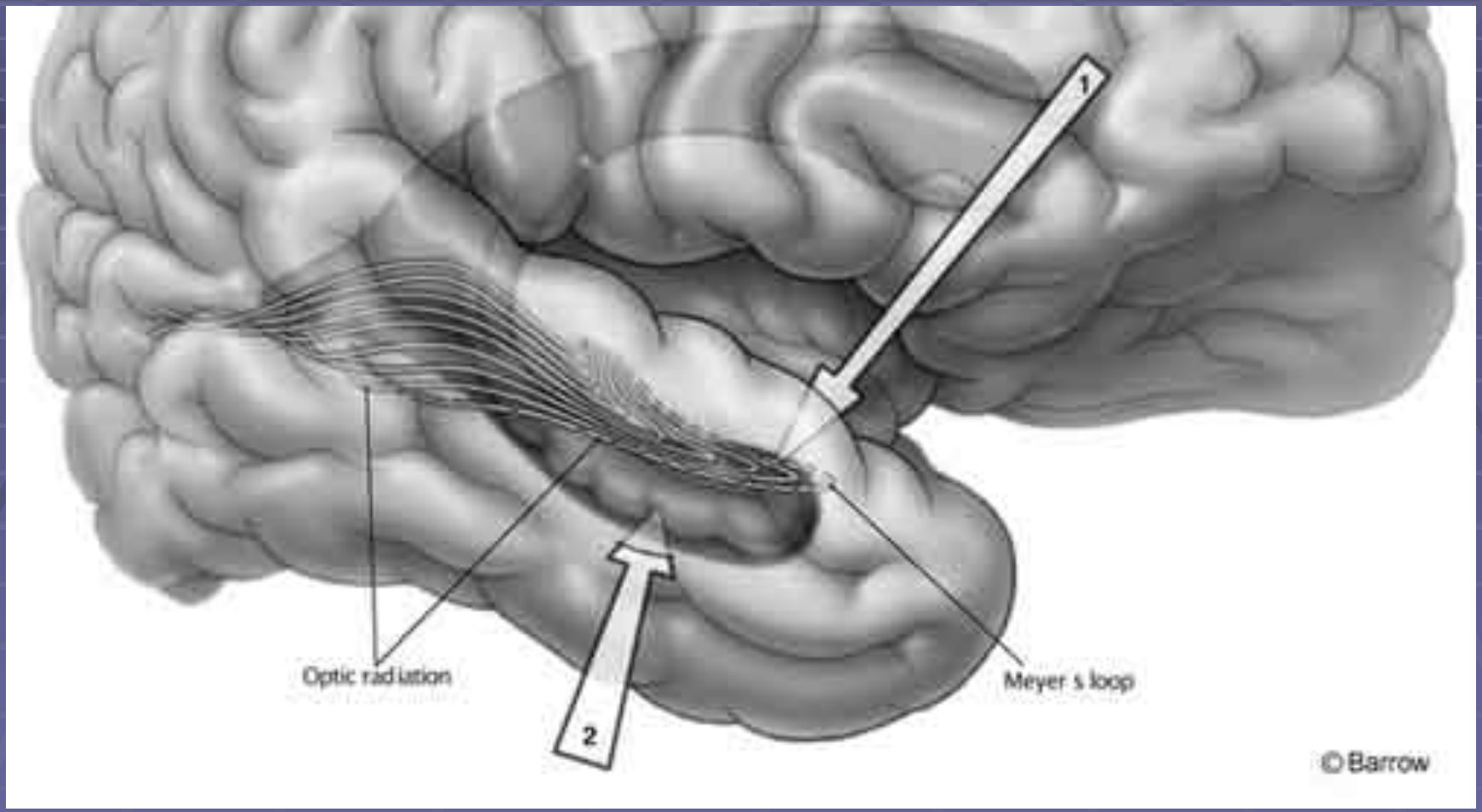

Lateral geniculate nucleus
Parieto-occipital sulcus
Cuneus
Superior retina
Superior visual field
Calcarine sulcus
Macula
Lingual gyrus
Inferior visual field
Meyer's loop
Inferior retina
Right hemisphere


Nasal retina
Temporal retina
Optic:
Nerve
Chiasm
Tract
Lateral geniculate nucleus
Optic radiations
Visual cortex

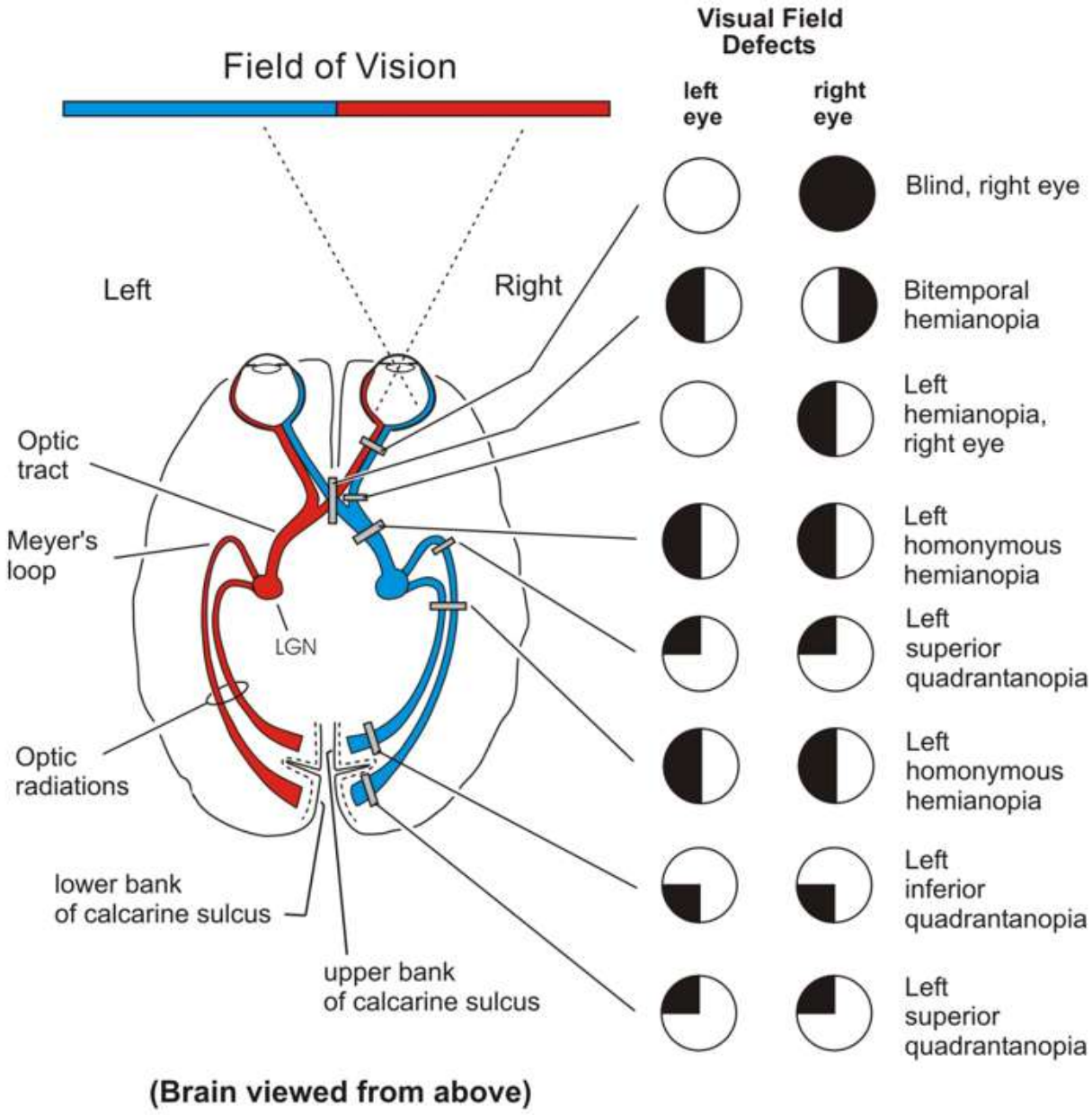
Hemi - anopia

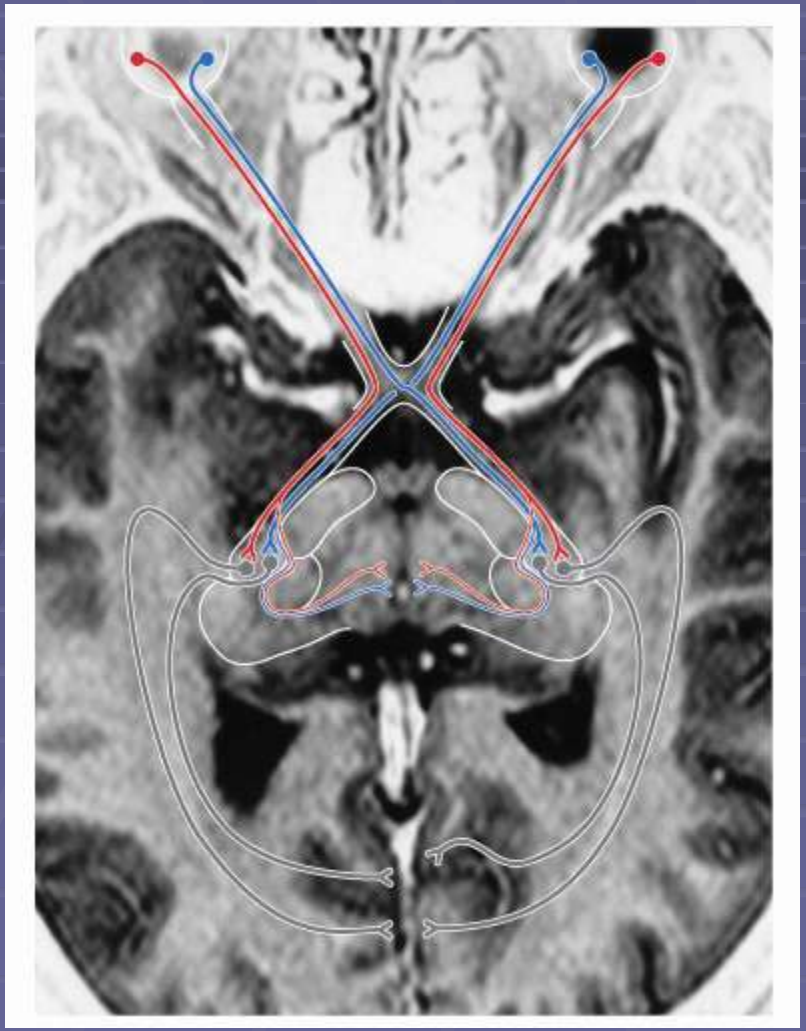

Lateral geniculate nucleus
Parieto-occipital sulcus
Cuneus
Superior retina
Superior visual field
Calcarine sulcus
Macula
Lingual gyrus
Inferior visual field
Meyer's loop
Right hemisphere
Inferior retina


Temporal lobe
27 ± 3.5 mm
Mean anterior extent of Meyer s loop
Range of anterior extent of Meyer s loop
5 ± 3.9 mm
Temporal horn of lateral ventricle
Hippocampus
Lateral geniculate ganglion
Optic radiation
© Barrow

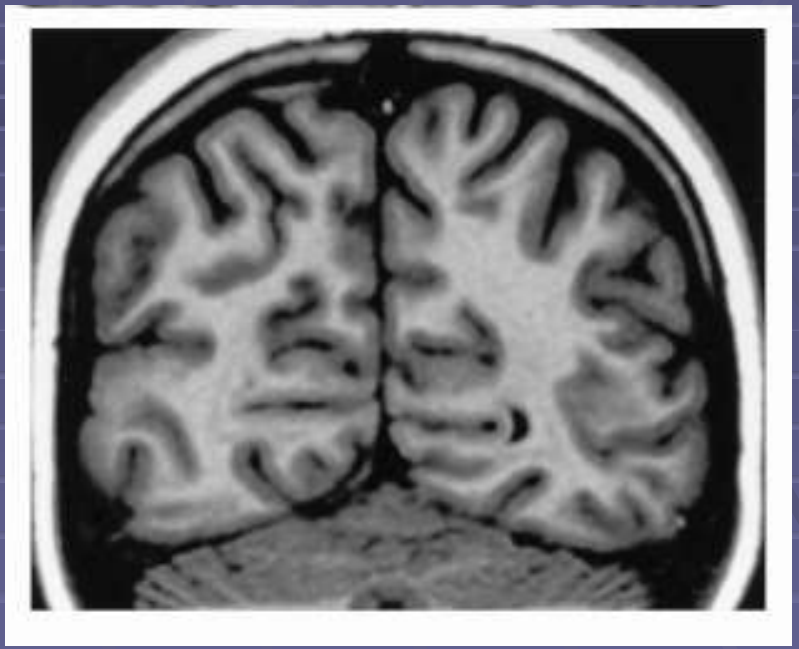

1
2
Optic radiation
Meyer s loop
© Barrow

Quadrant - anopia

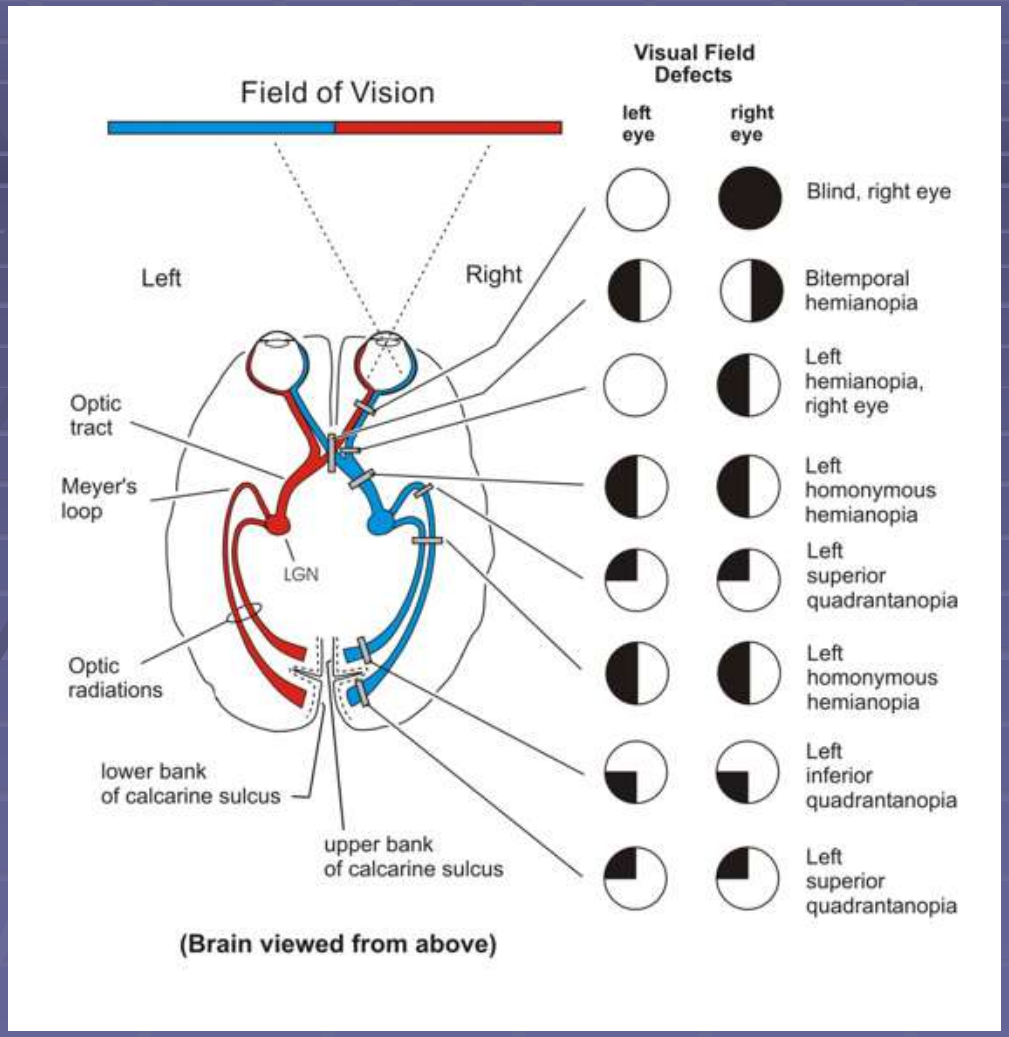

Field of Vision
Left
Right
Optic tract
Meyer's loop
LGN
Optic radiations
lower bank of calcarine sulcus
upper bank of calcarine sulcus
Visual Field Defects
left eye
right eye
Blind, right eye
Bitemporal hemianopia
Left hemianopia, right eye
Left homonymous hemianopia
Left superior quadrantanopia
Left homonymous hemianopia
Left inferior quadrantanopia
Left superior quadrantanopia
(Brain viewed from above)



R L

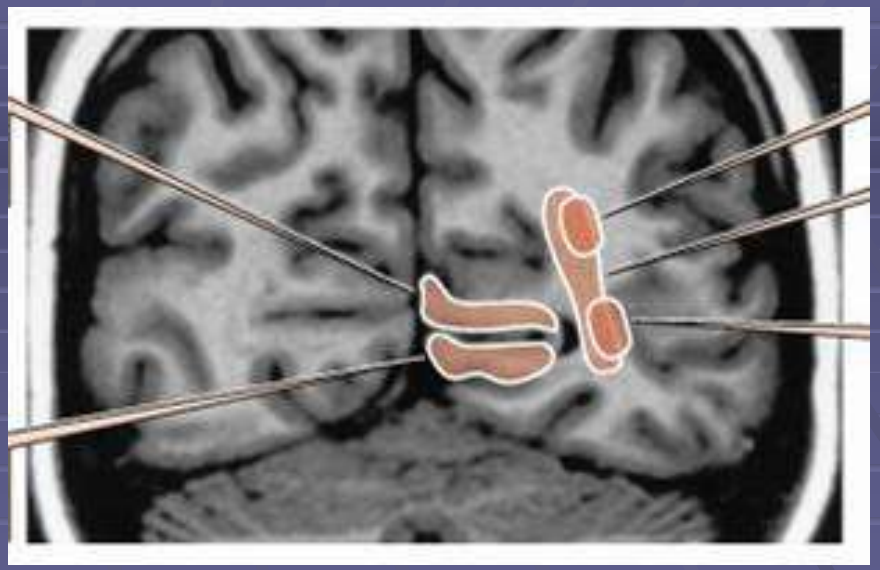


R L


Field of Vision
Left
Right
Optic tract
Meyer's loop
LGN
Optic radiations
lower bank of calcarine sulcus
upper bank of calcarine sulcus
Visual Field Defects
left eye
right eye
Blind, right eye
Bitemporal hemianopia
Left hemianopia, right eye
Left homonymous hemianopia
Left superior quadrantanopia
Left homonymous hemianopia
Left inferior quadrantanopia
Left superior quadrantanopia
(Brain viewed from above)

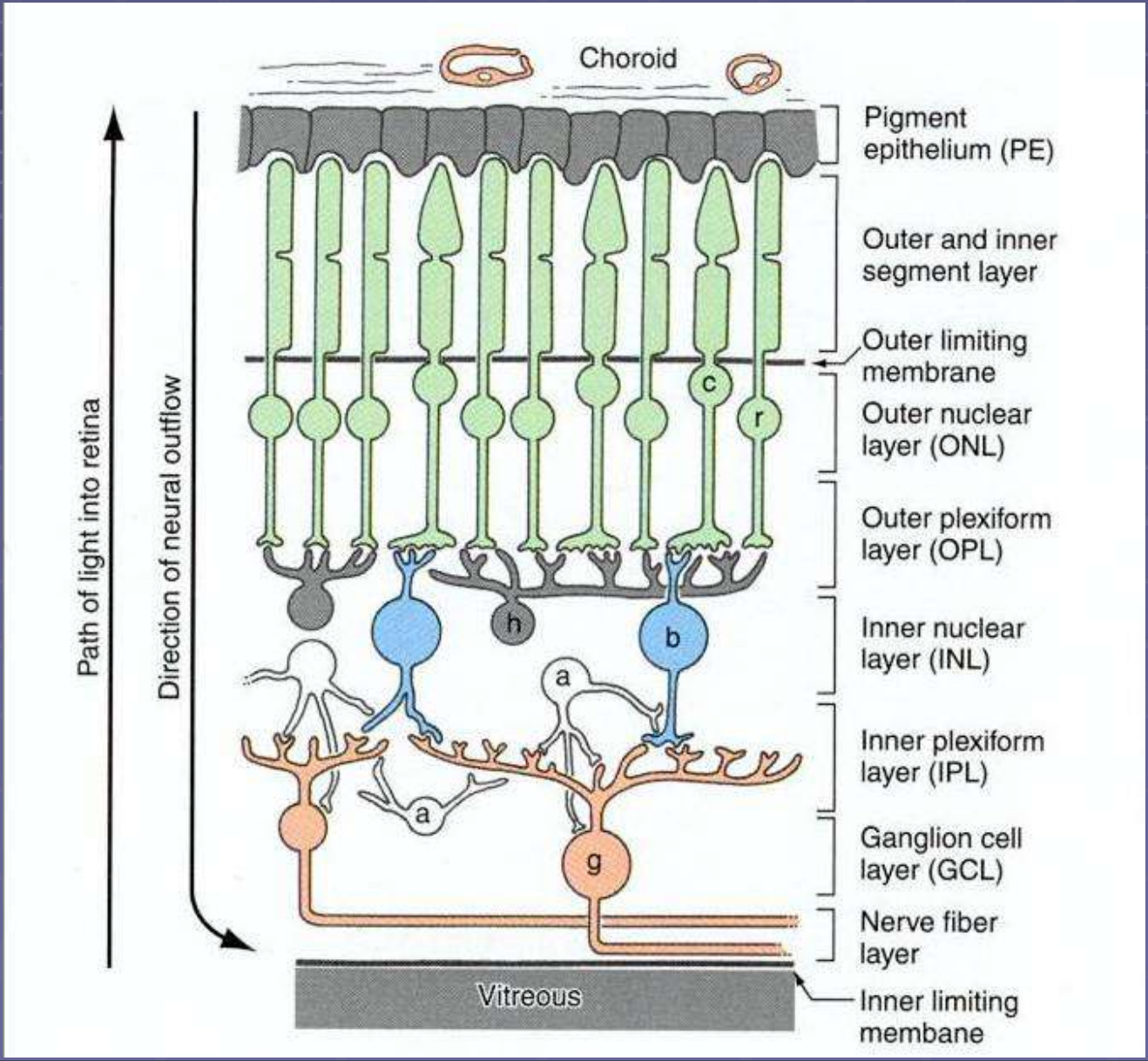
L R R L

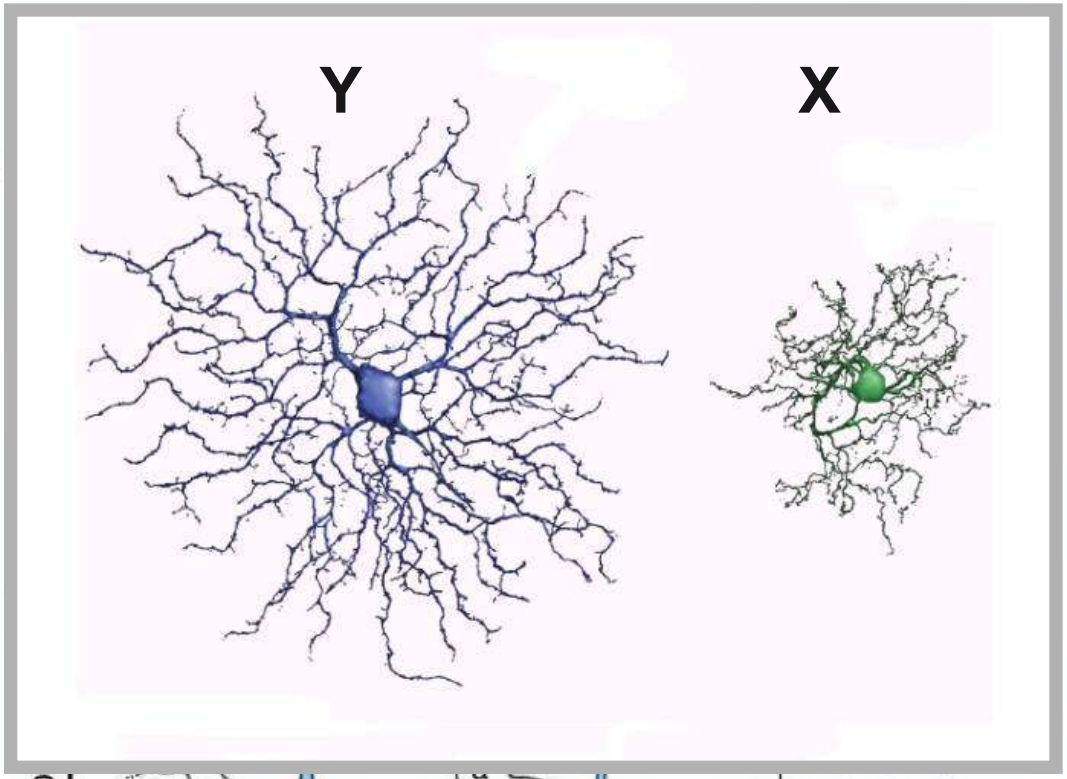
R L



R L

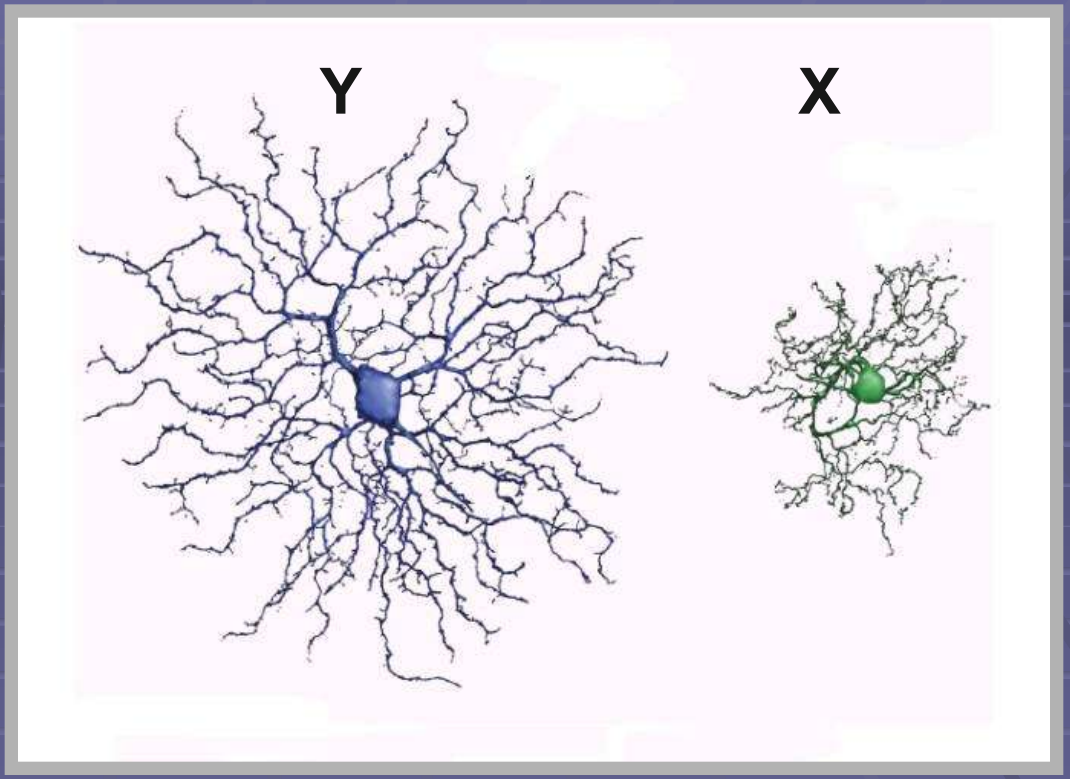
Ganglionic Cells Subtypes



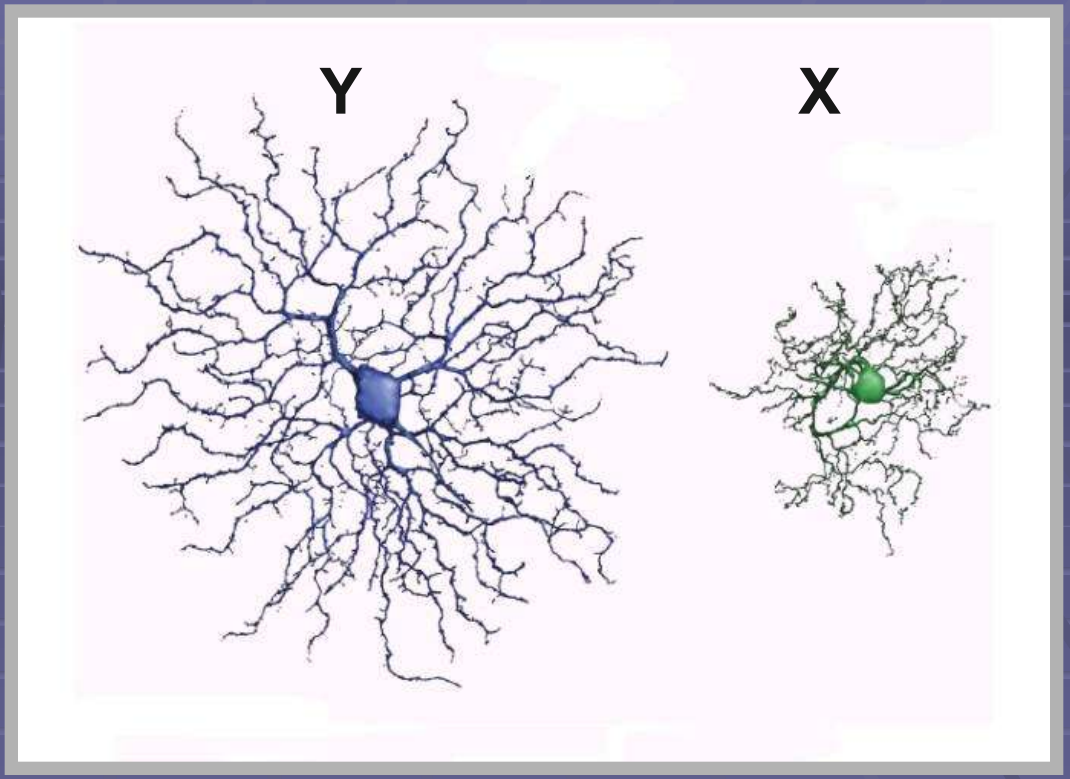

Y
X

Path of light into retina
a
g
Vitreous
Inner plexiform layer (IPL)
Ganglion cell layer (GCL)
Nerve fiber layer
Inner limiting membane

- Position
- Receptive field
- Details
- movement

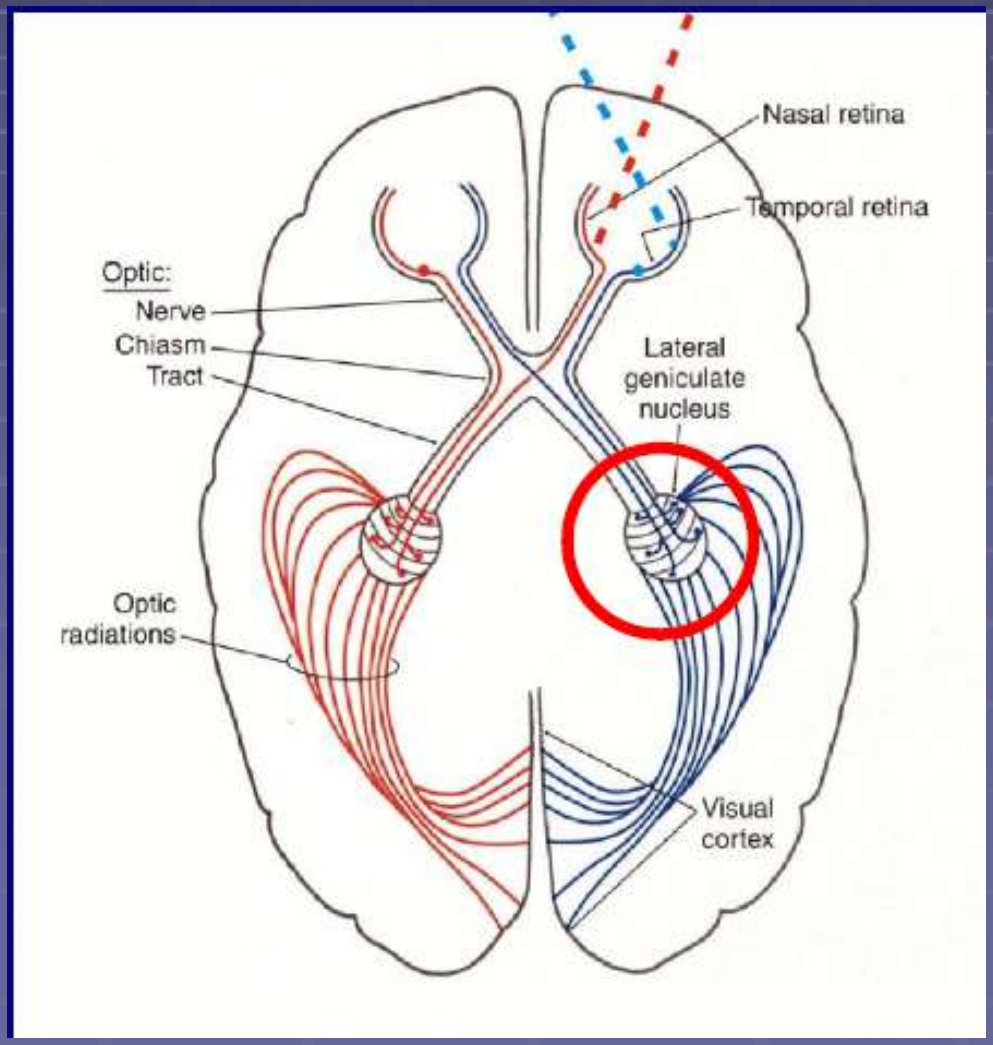


- Position
- Receptive field
- Details
- movement

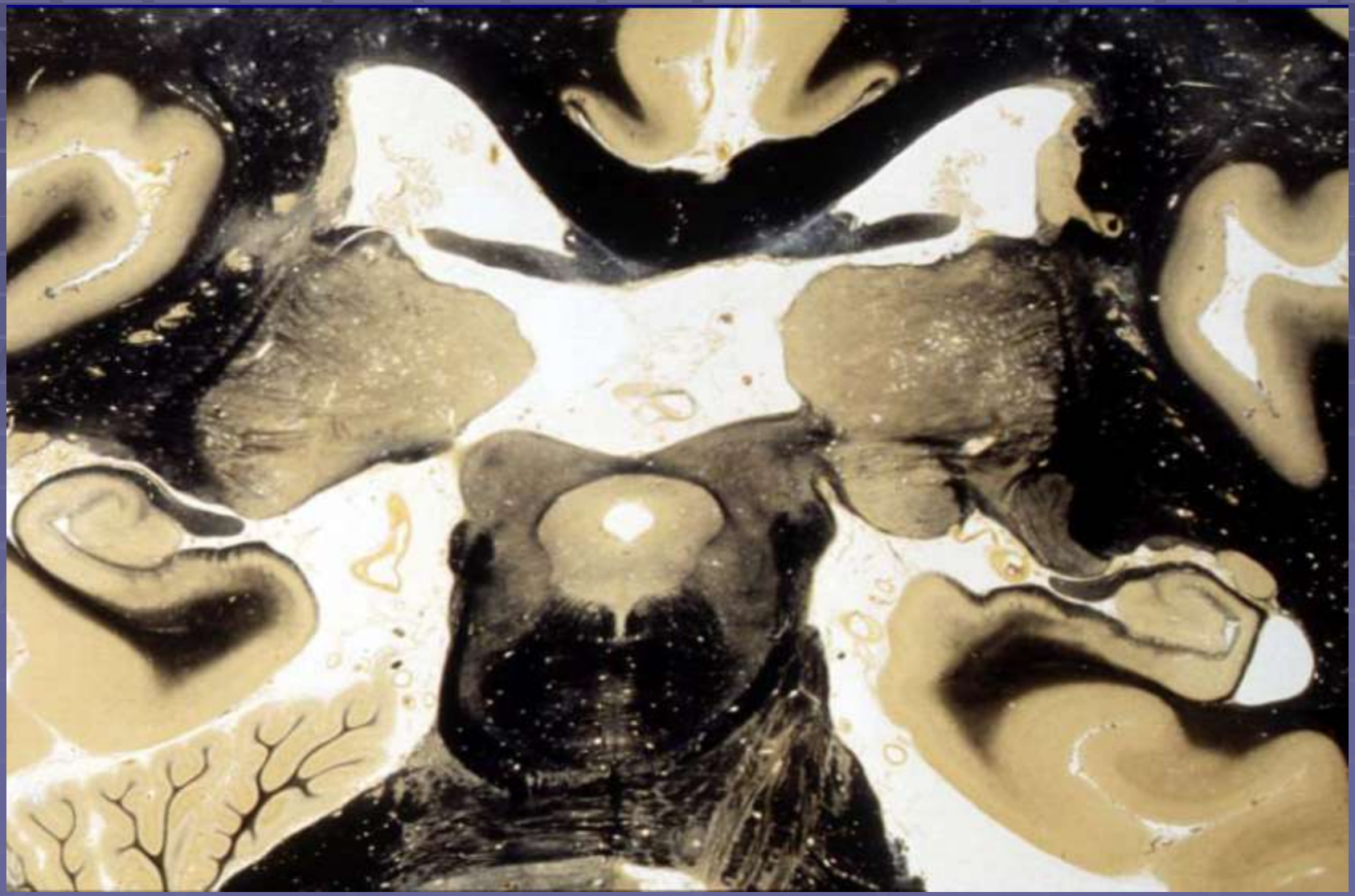


W

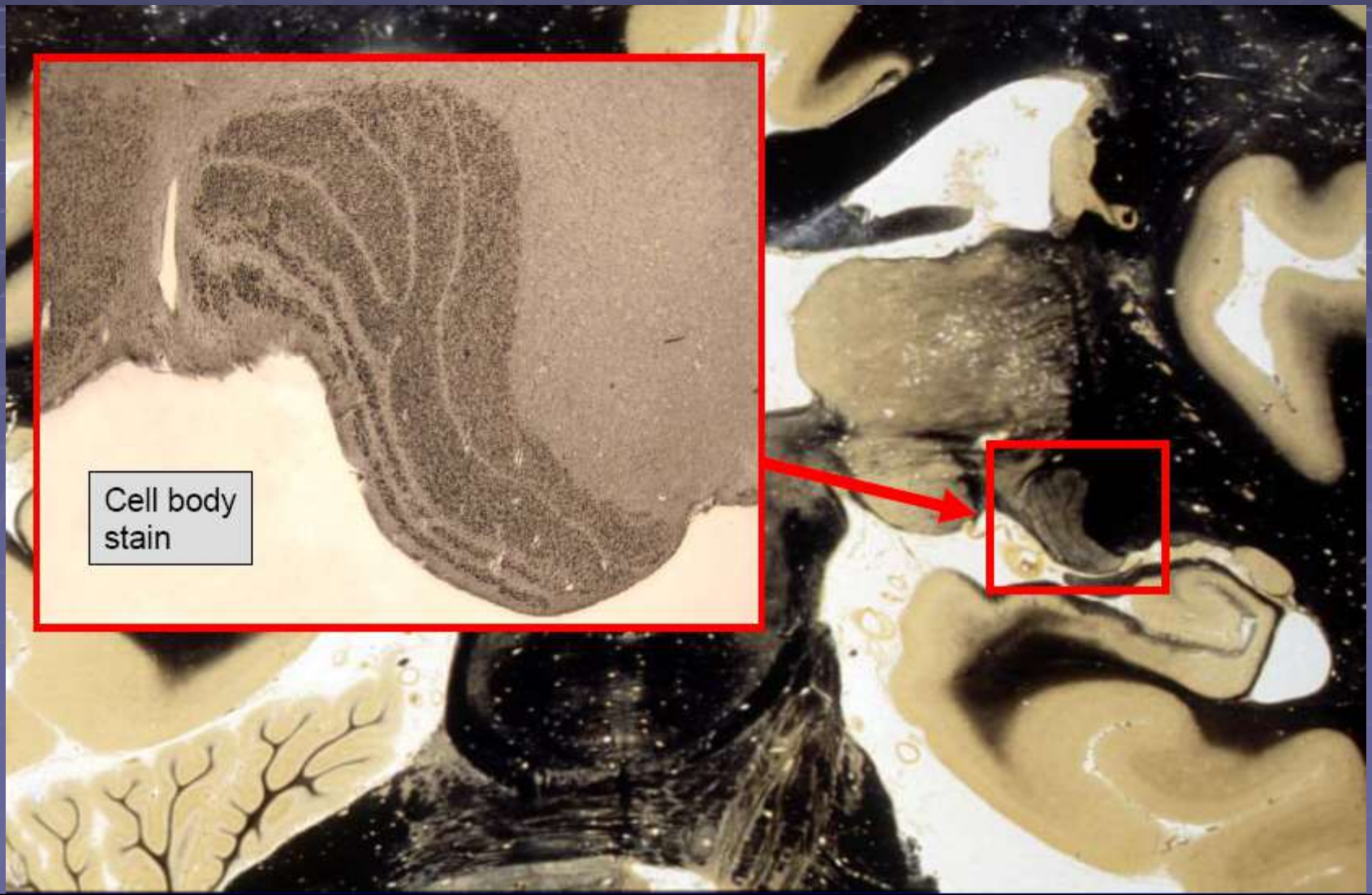
Lateral geniculate nucleus



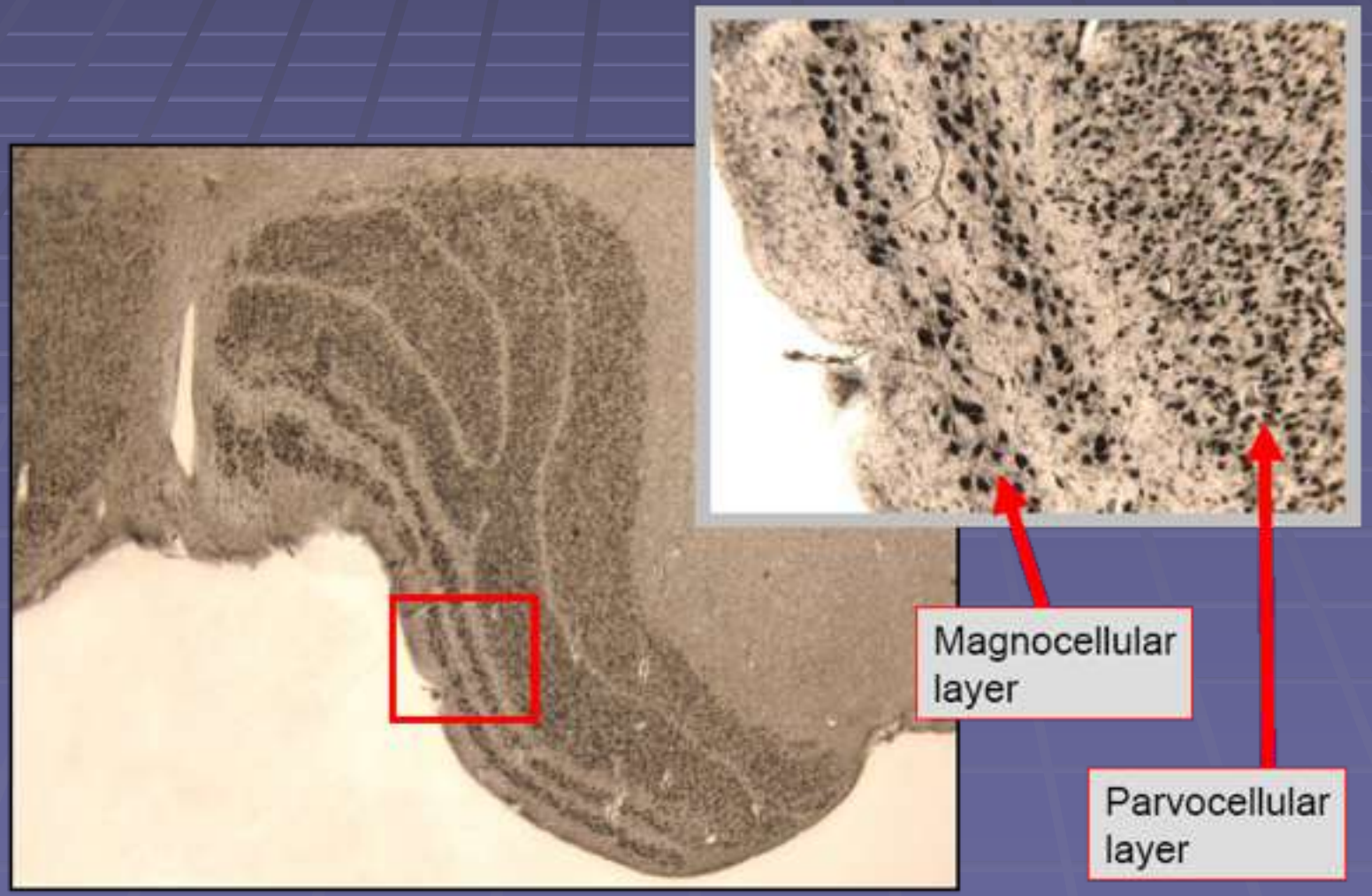
Lateral geniculate nucleus



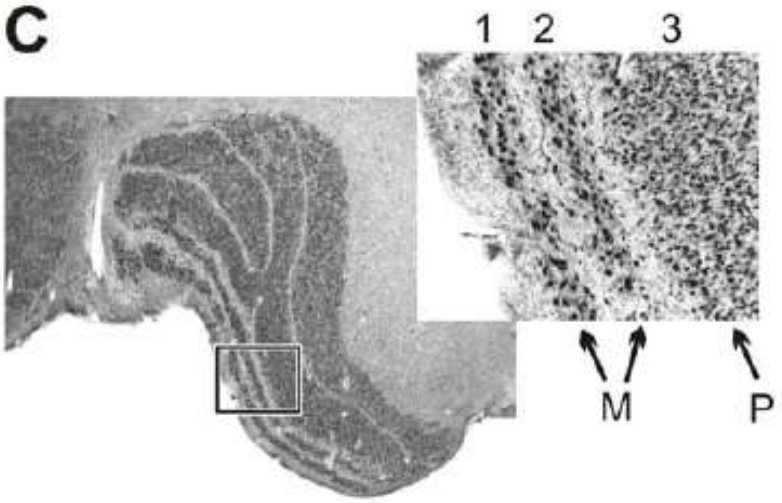
Lateral geniculate nucleus



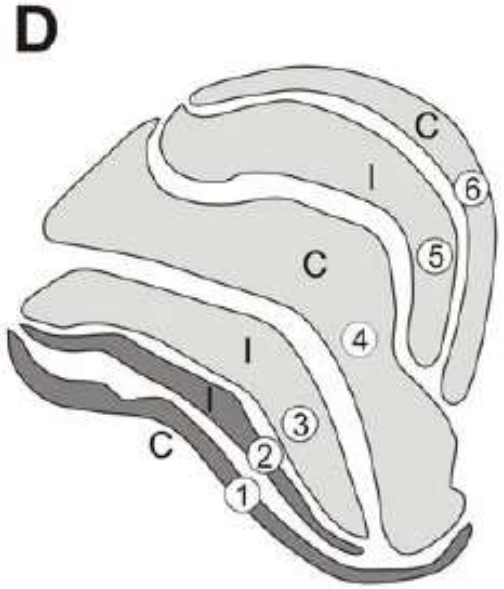
Lateral geniculate nucleus



Lateral geniculate nucleus



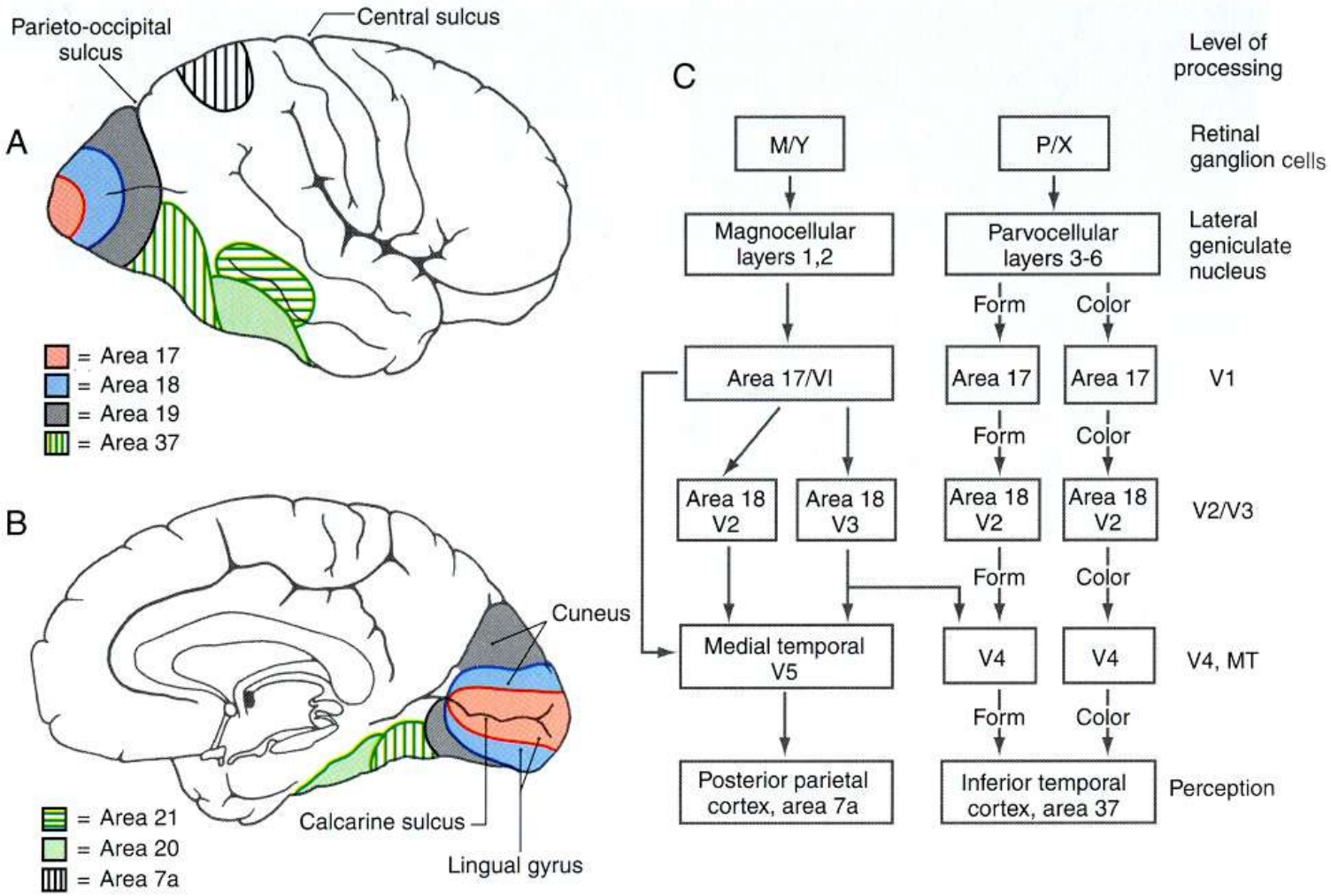
Left Lateral geniculate nucleus
(coronal plane, posterior part of nucleus)
M: magnocellular layers
P: parvocellular layers

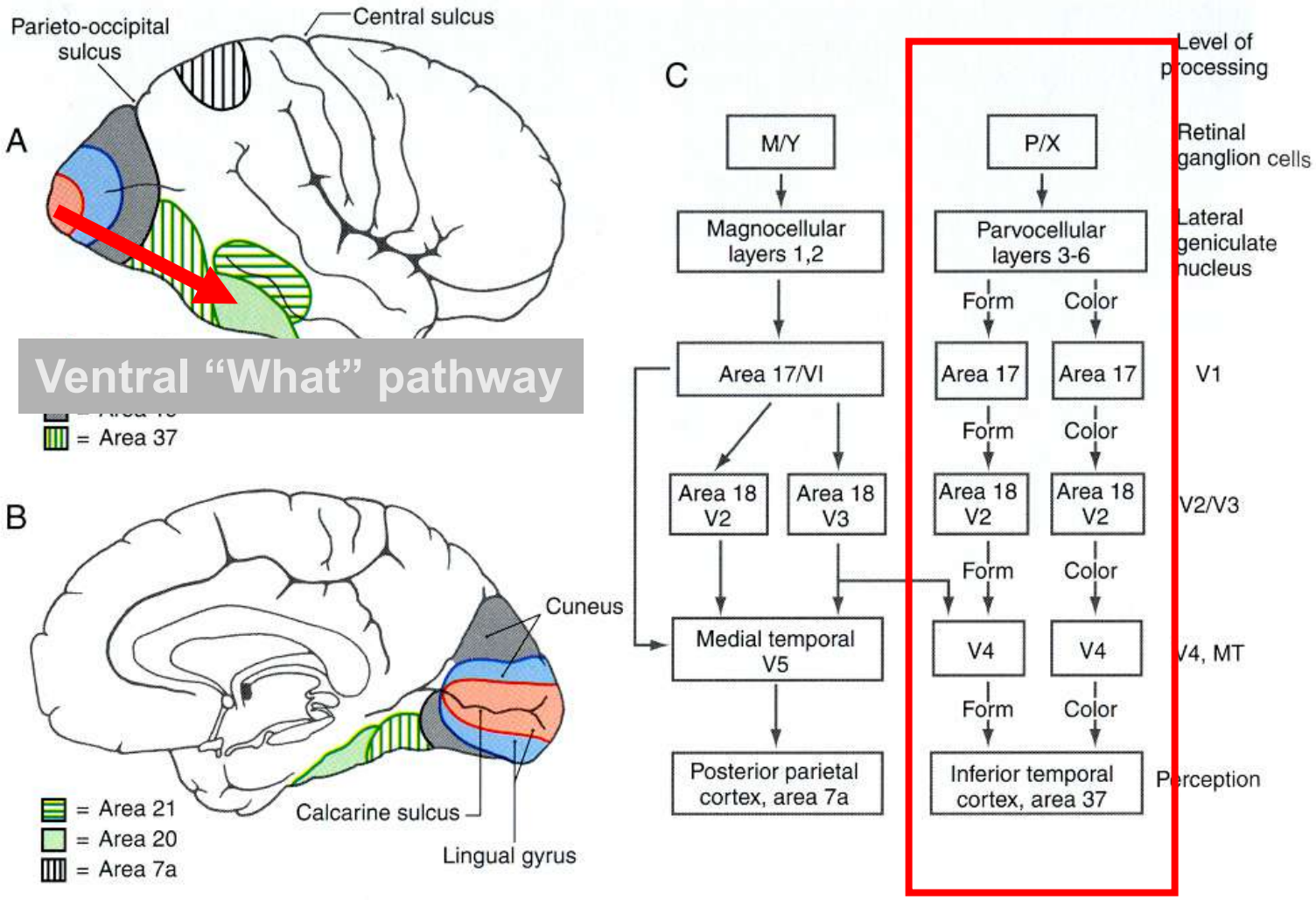


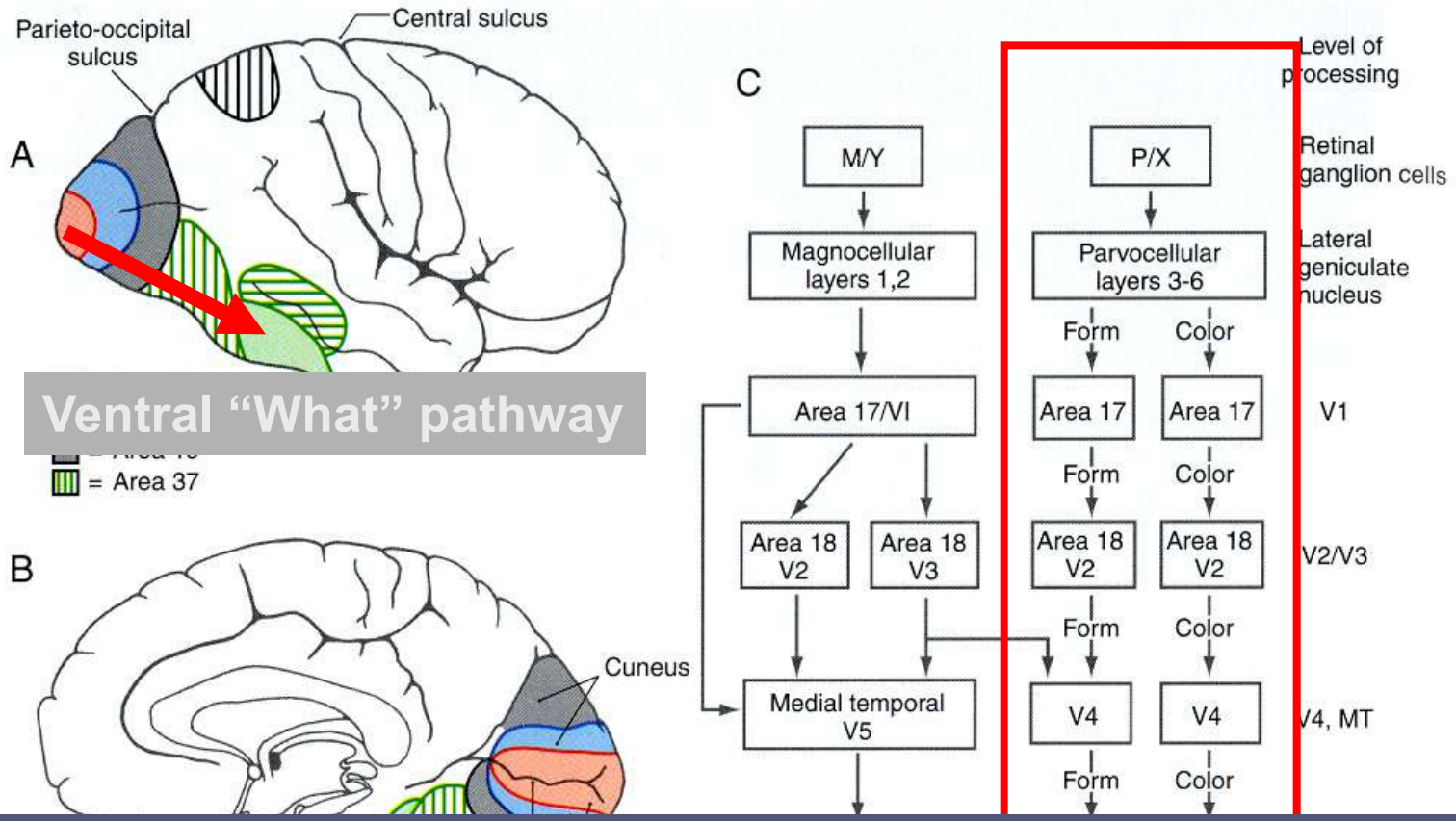
Left Lateral geniculate nucleus
(coronal plane, middle of nucleus)
Layers 1 and 2: magnocellular layers
Layers 3-6: parvocellular layers
C: layer receives input from contralateral eye
I: layer receives input from ipsilateral eye

Magnocellular system

Parvocellular system

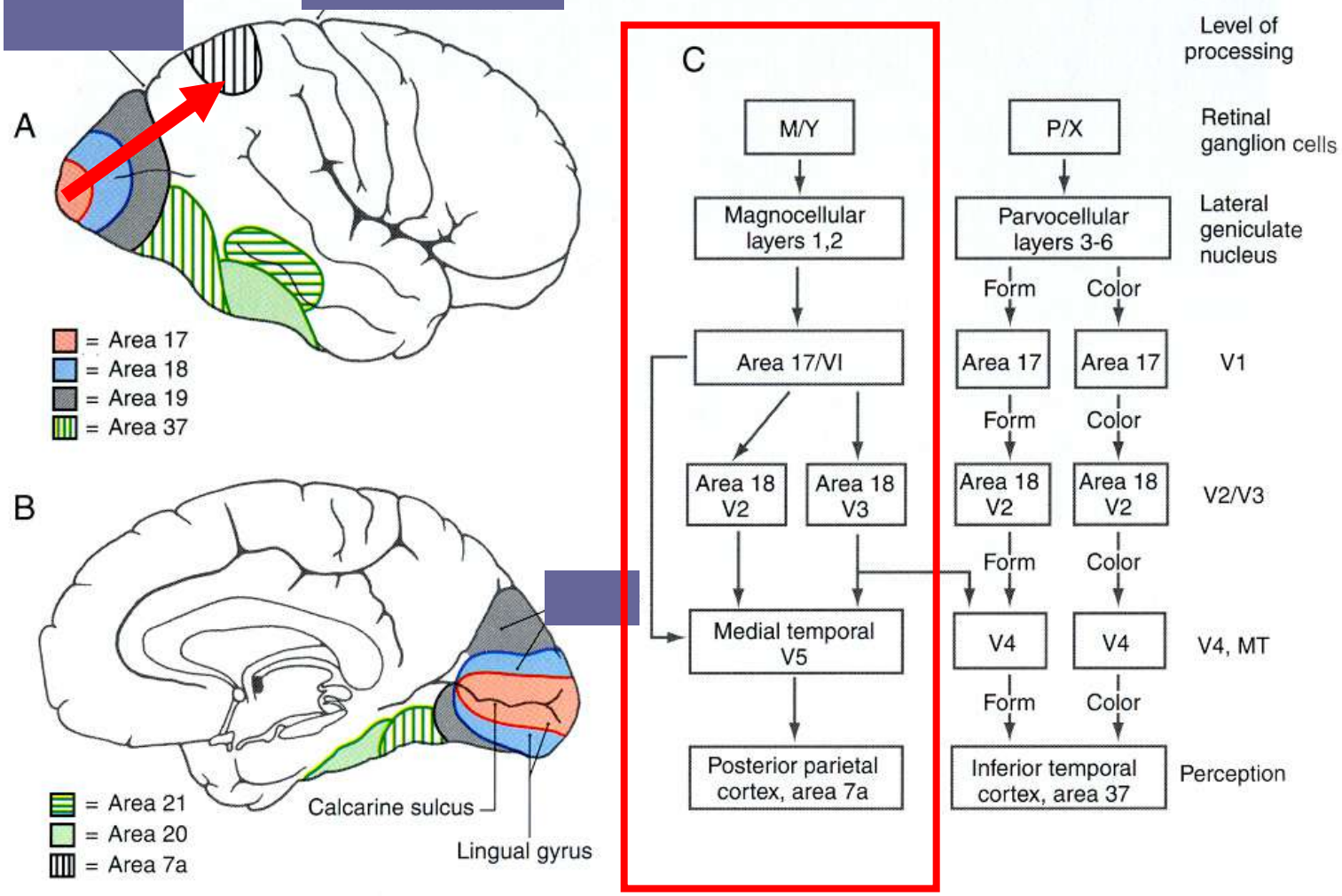

A
Parieto-occipital sulcus
Central sulcus
= Area 17
= Area 18
= Area 19
= Area 37
B
Cuneus
= Area 21
= Area 20
= Area 7a
Calcarine sulcus
Lingual gyrus
C
Level of processing
M/Y
P/X
Retinal ganglion cells
Magnocellular layers 1,2
Parvocellular layers 3-6
Lateral geniculate nucleus
Form
Color
Area 17/VI
Area 17
Area 17
V1
Area 18 V2
Area 18 V3
Area 18 V2
Area 18 V2
V2/V3
Medial temporal V5
V4
V4
V4, MT
Posterior parietal cortex, area 7a
Inferior temporal cortex, area 37
Perception


A
Parieto-occipital sulcus
Central sulcus
= Area 37
Ventral "What" pathway
B
Cuneus
= Area 21
= Area 20
= Area 7a
Calcarine sulcus
Lingual gyrus
C
Level of processing
M/Y
P/X
Retinal ganglion cells
Magnocellular layers 1,2
Parvocellular layers 3-6
Lateral geniculate nucleus
Form
Color
Area 17/VI
Area 17
Area 17
V1
Area 18 V2
Area 18 V3
Area 18 V2
Area 18 V2
V2/V3
Medial temporal V5
V4
V4
V4, MT
Posterior parietal cortex, area 7a
Inferior temporal cortex, area 37
Perception

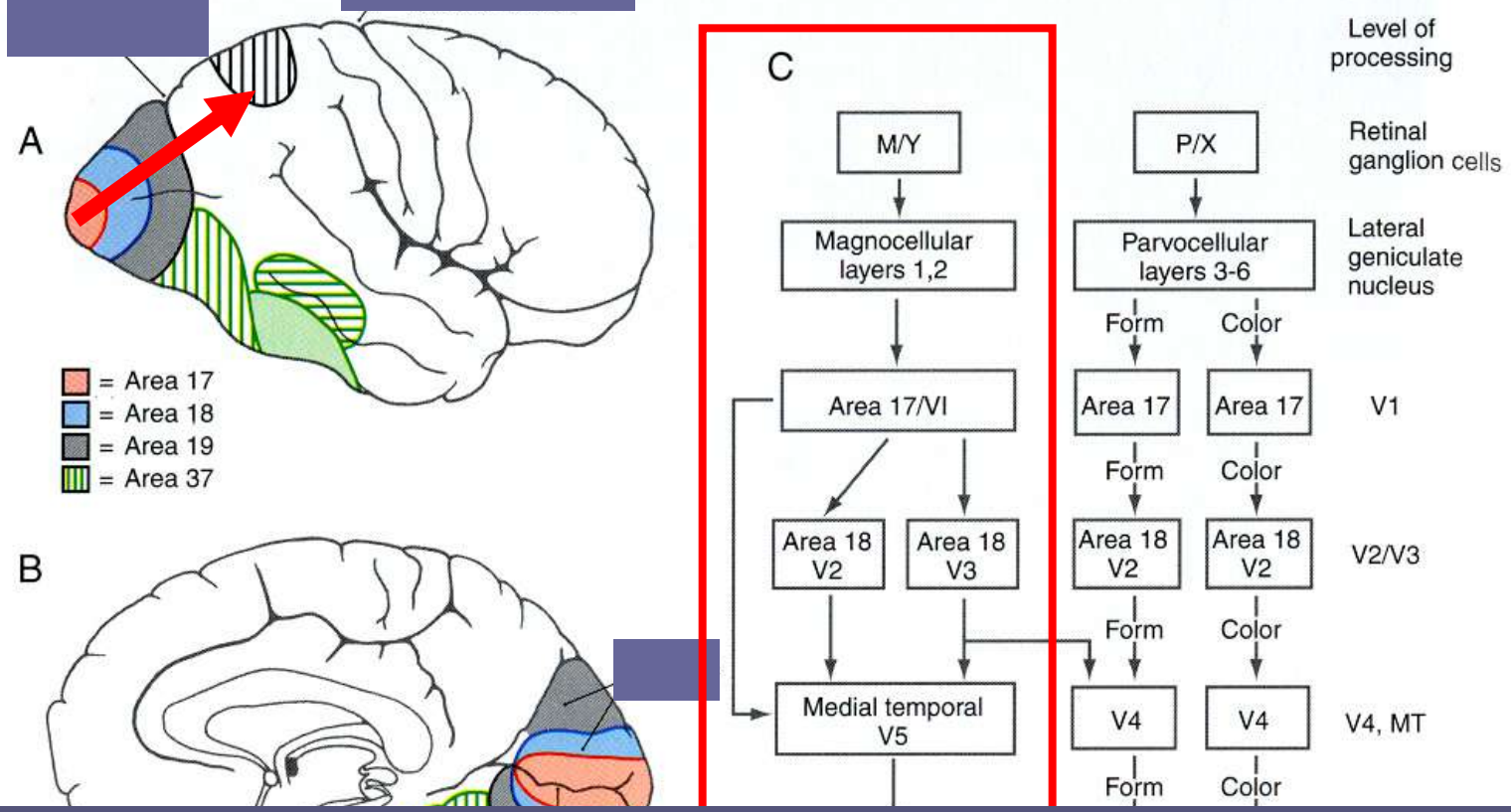


- Carries information about **static object properties** such as **colour, luminance, stereopsis and pattern recognition.**
- Slow pathway from P-ganglion cells (through laminae 3-6 of LGN, V1) to V2, V4 and **inferior temporal** cortex

Dorsal "Where" pathway



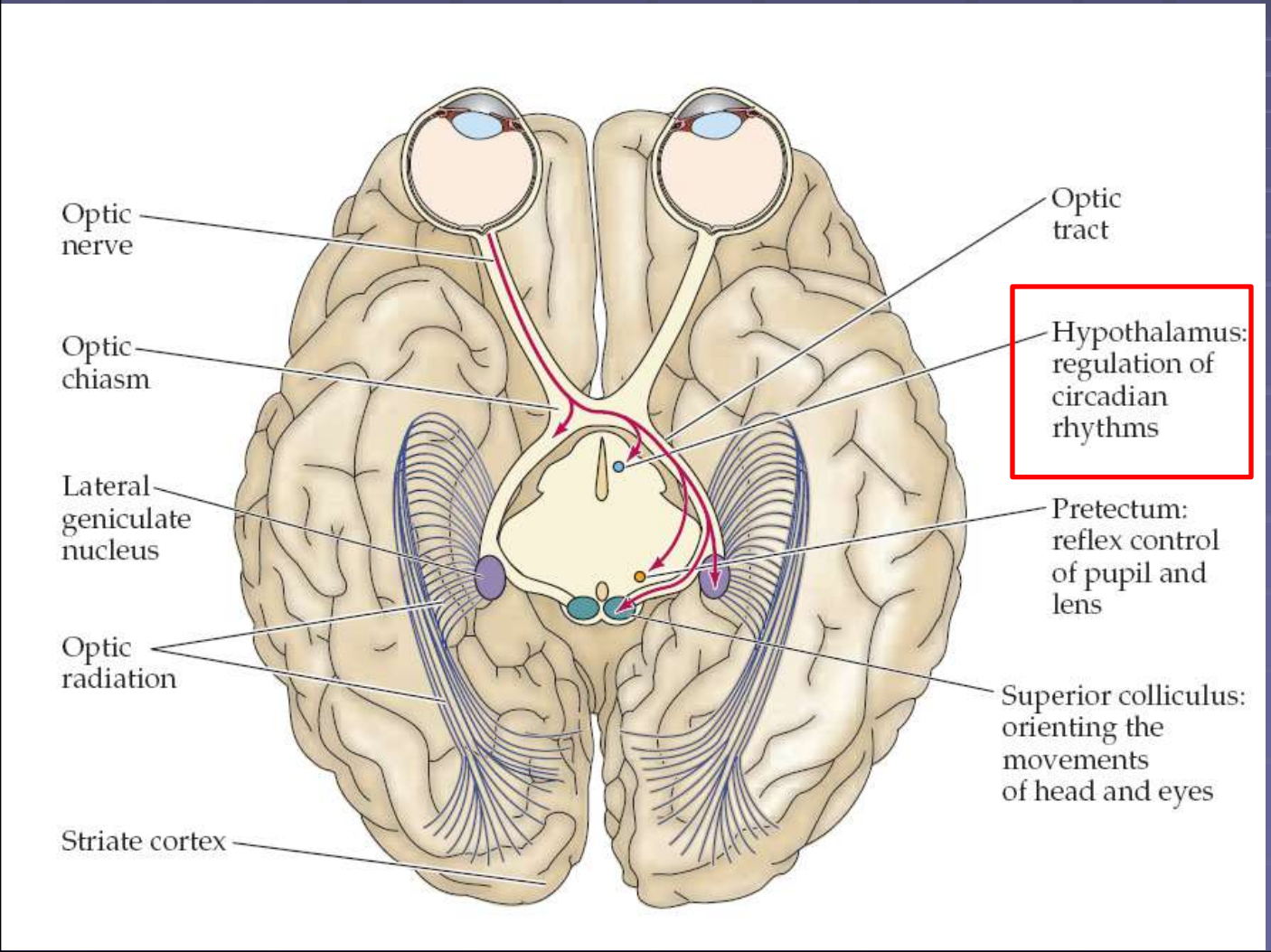
Dorsal "Where" pathway

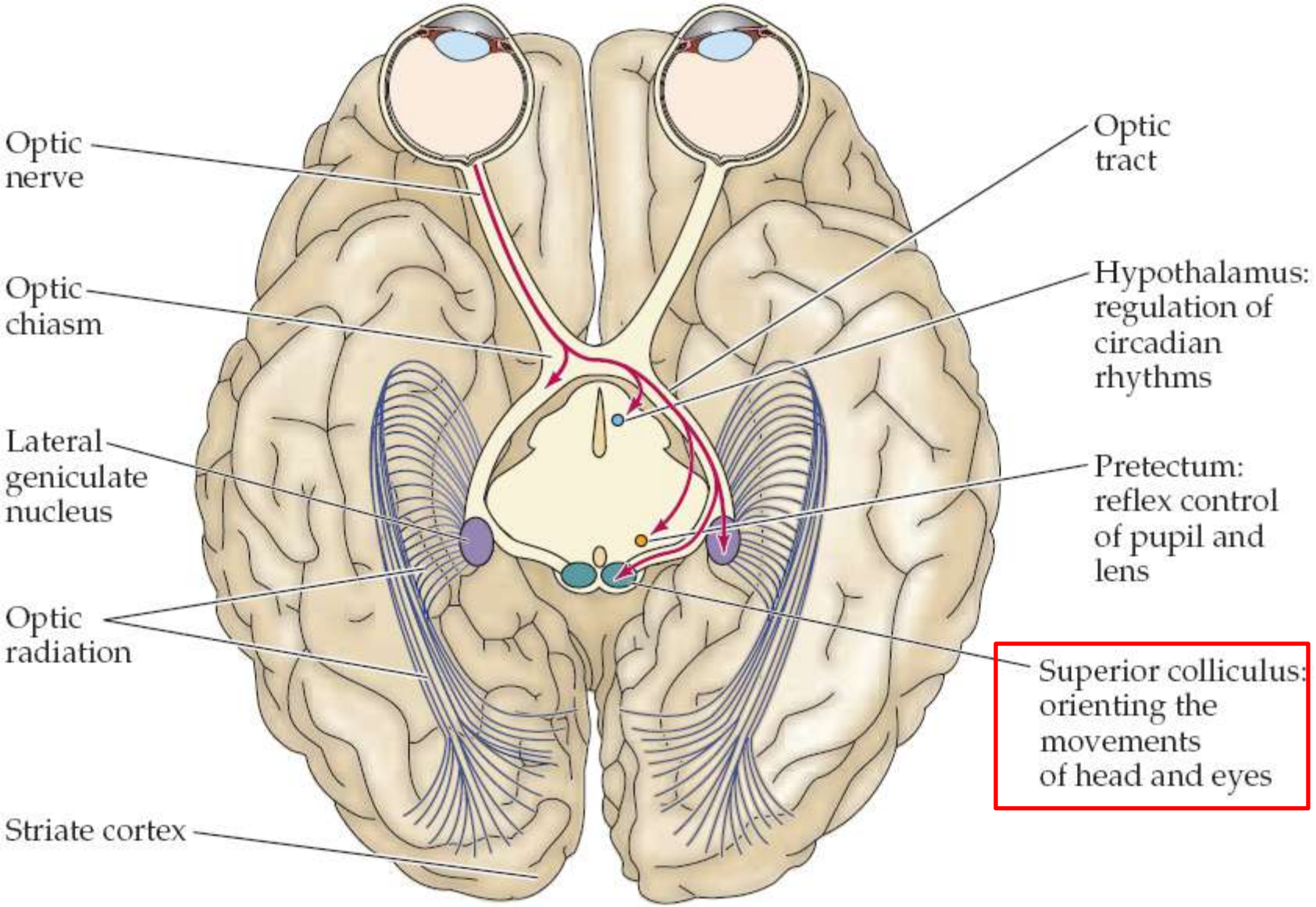


- Information about **dynamic object properties- motion and spatial relationships**
- Fast pathway for transient visual signals
- Pathway to V1, V2, MT, medial superior temporal and parietal lobe

The **retinohypothalamic pathway**

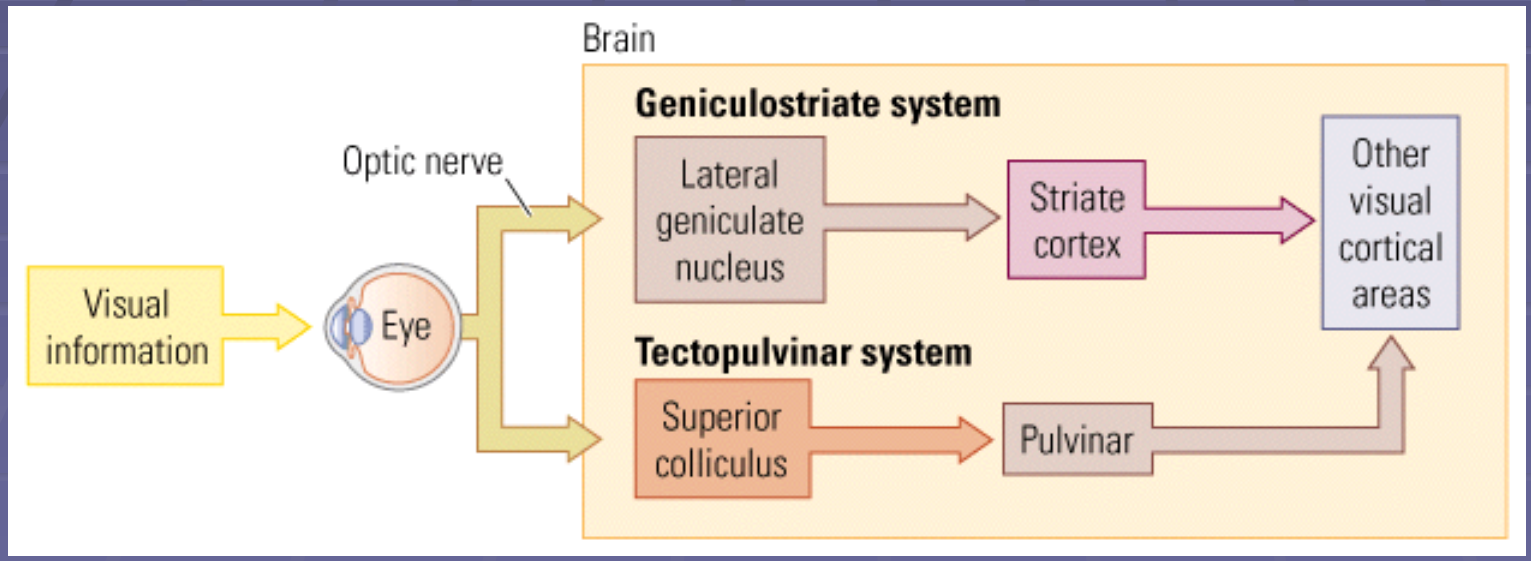
- day/night cycle
- Melanopsin ganglionic cells



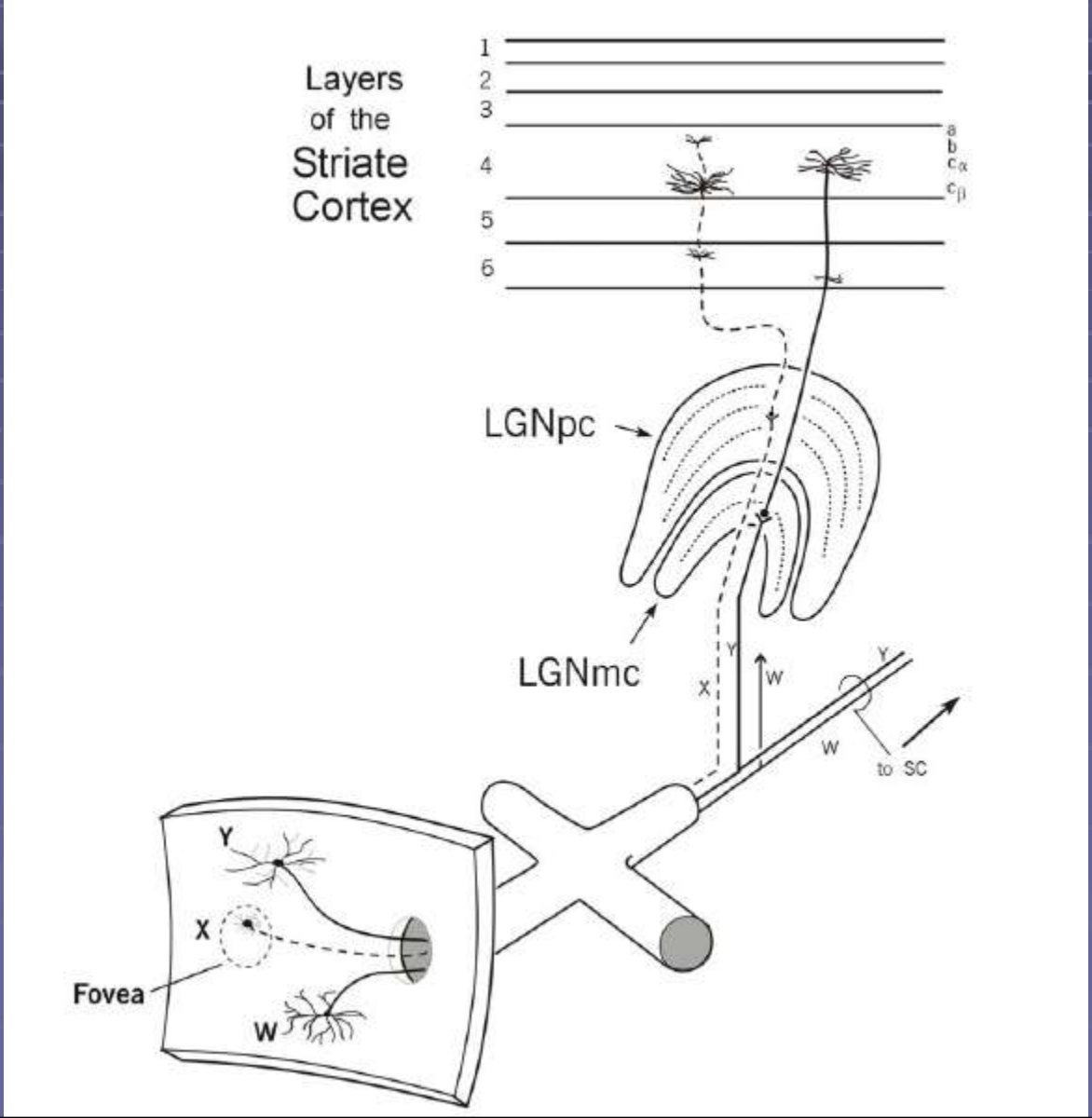

Optic nerve
Optic chiasm
Lateral geniculate nucleus
Optic radiation
Striate cortex
Optic tract
Hypothalamus: regulation of circadian rhythms
Pretectum: reflex control of pupil and lens
Superior colliculus: orienting the movements of head and eyes

Visual Pathways

The optic nerve has two principle branches

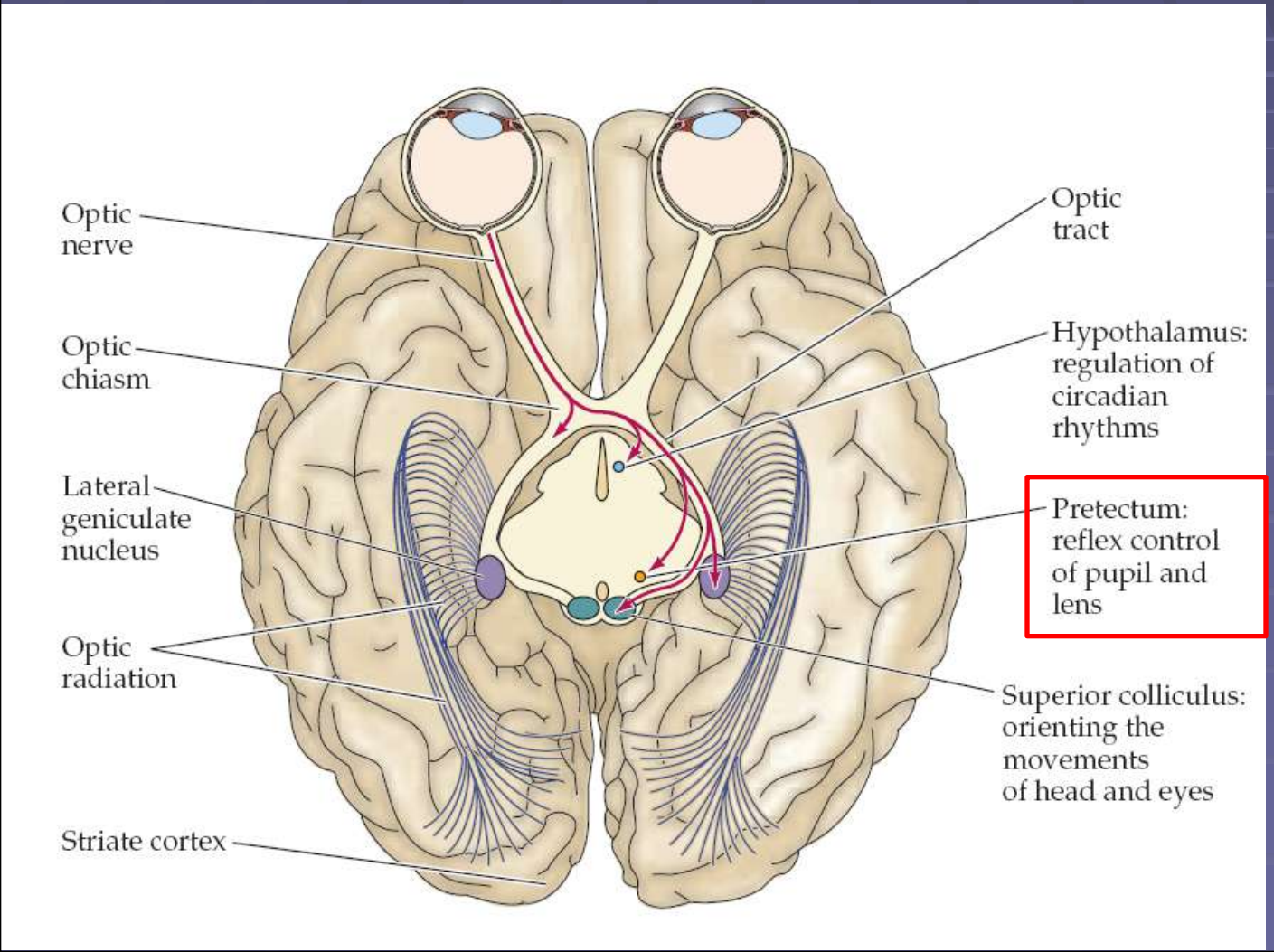


Primary visual cortex

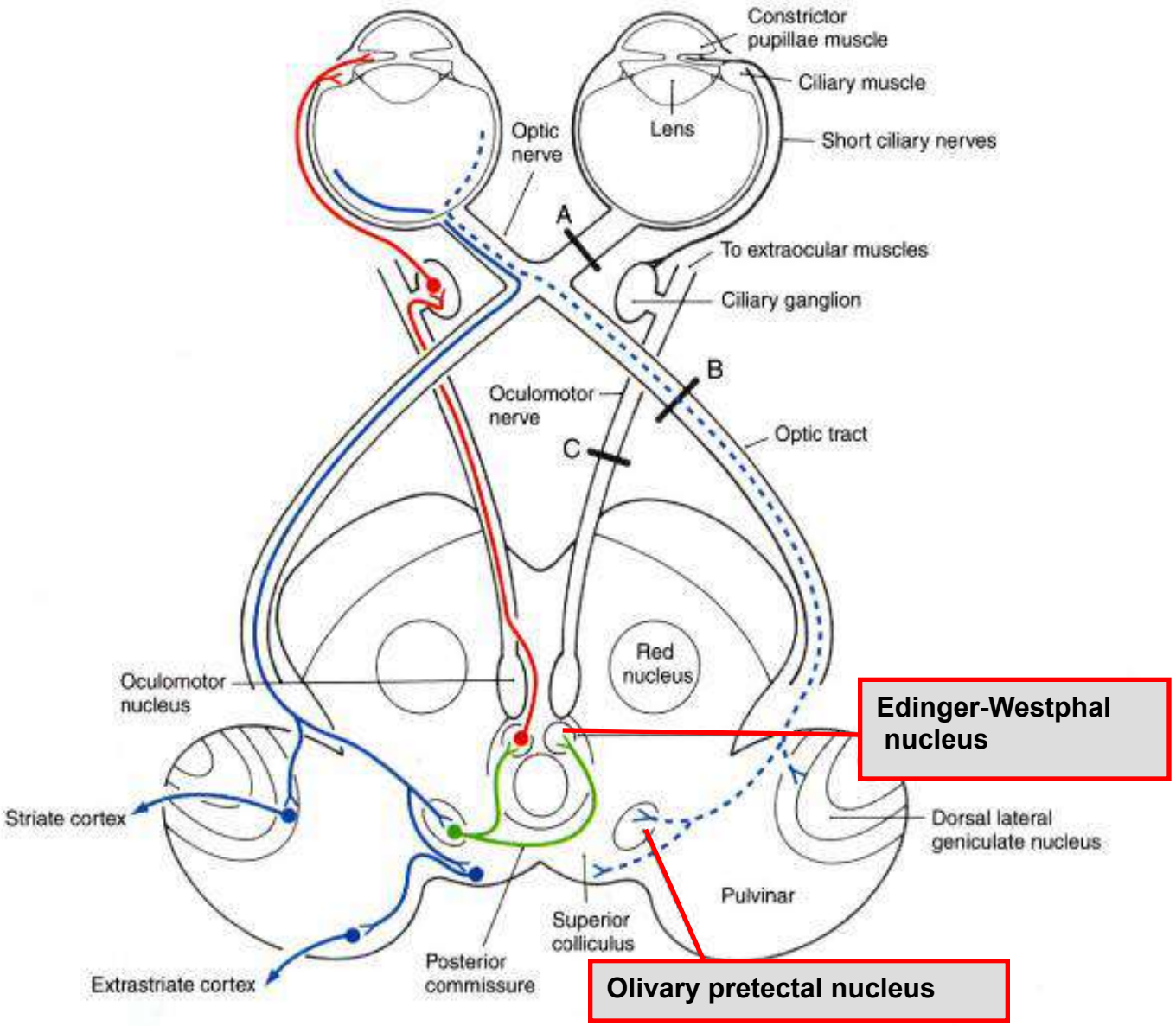


The **retinohypothalamic pathway**

- day/night cycle
- Melanopsin ganglionic cells



Pupillary Light Reflex


Constrictor pupillae muscle
Ciliary muscle
Lens
Short ciliary nerves
Optic nerve
A
To extraocular muscles
Ciliary ganglion
B
Oculomotor nerve
Optic tract
C
Red nucleus
Oculomotor nucleus
Edinger-Westphal nucleus
Striate cortex
Dorsal lateral geniculate nucleus
Pulvinar
Superior colliculus
Posterior commissure
Extrastriate cortex
Olivary pretectal nucleus

Edinger-Westphal nucleus