VISUAL PATHWAY AND ITS LESIONS

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ALL FIGURES HAVE BEEN TAKEN FROM 'COMPREHENSIVE TEXTBOOK OF PHYSIOLOGY' BY DR. G K PAL WITH RELEVANT PERMISSION)

FIELD OF VISION

- the area of external world that one can see with only one eye with fixed gaze is called *monocular field of vision.*

- *the area of external world that can be seen by both the eyes is called binocular field of vision.*

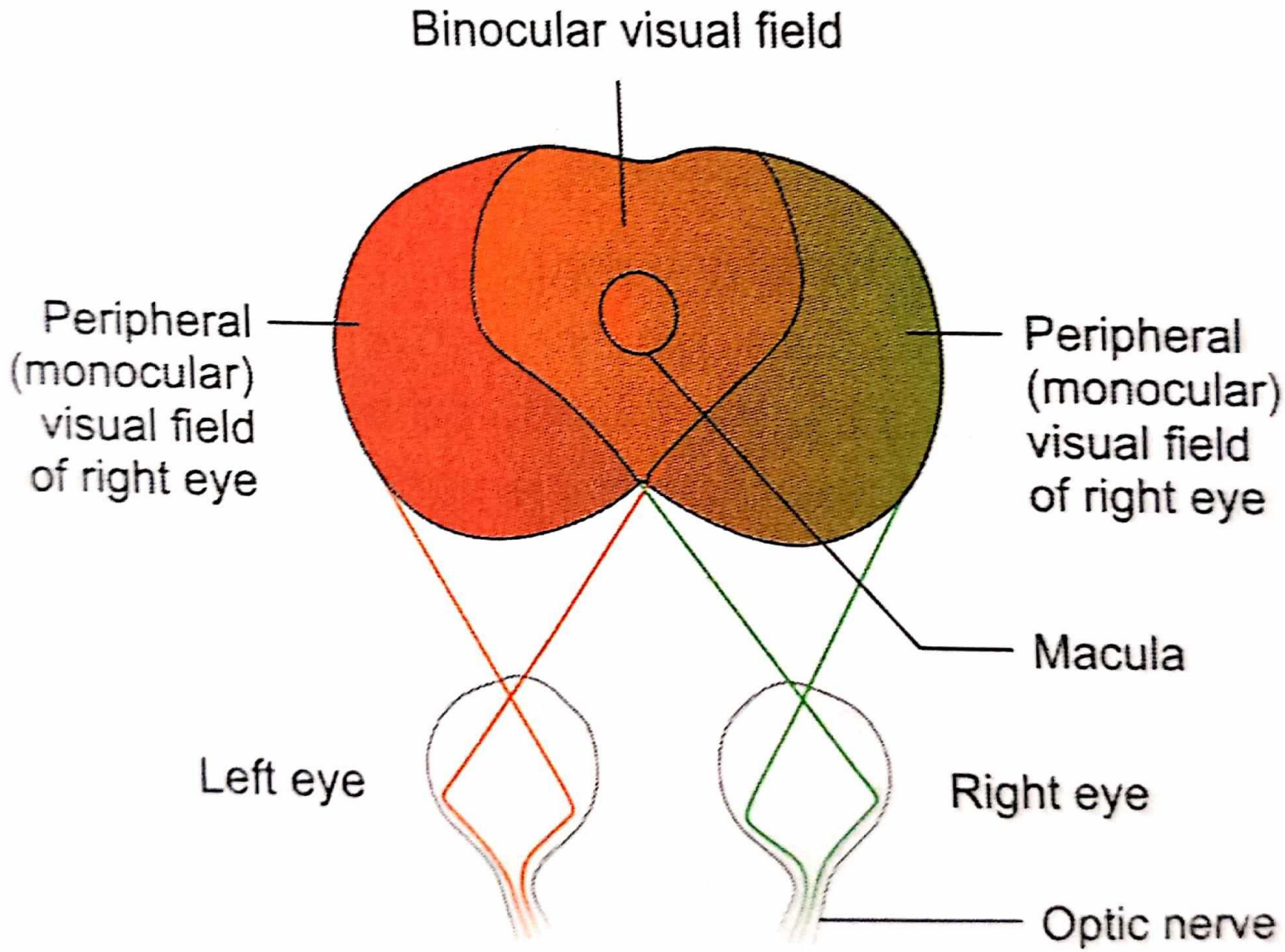


Fig. 146.2: The monocular and binocular visual fields.

- The points on both the retina on which the image of an object must fall if it is to be seen binocularly as a single object are called *corresponding points*.

- Diplopia – one object appears to be two. the cause is either paresis of paralysis of the extra ocular muscles of the eye.

LAYERS OF RETINA

(I) PIGMENT LAYER

(II) NEURAL LAYER

1. RODS AND CONES
2. OUTER LIMITING MEMBRANE
3. OUTER NUCLEAR LAYER: NUCLEUS OF RODS AND CONES.
4. OUTER PLEXIFORM LAYER
5. INNER NUCLEAR LAYER: BIPOLAR CELLS, HORIZONTAL CELLS, AMACRINE CELLS
6. INNER PLEXIFORM LAYER
7. LAYER OF GANGLIONIC CELLS
8. LAYER OF OPTIC NERVE FIBERS
9. INNER LIMITING MEMBRANE

PHYSIOLOGICAL LAYERS

- RODS AND CONES
- BIPOLAR CELLS
- GANGLION CELLS

- NORMAL FIELD OF VISION:

- UPPER- 60,
- LOWER- 75,
- NASAL- 60,
- TEMPORAL- 100 OR MORE.

SCOTOMA

- peripheral– peripheral field of vision is lost –retinitis pigmentosa.
- central –of vision is lost– optic neuritis.
- patchy –diabetes mellitus due to detachment of retina.
- loss of field of vision due to lesion in optic pathway is called *hemianopia*.

RODS AND CONES

- RODS: 120 MILLION
- CONES: 6 MILLION

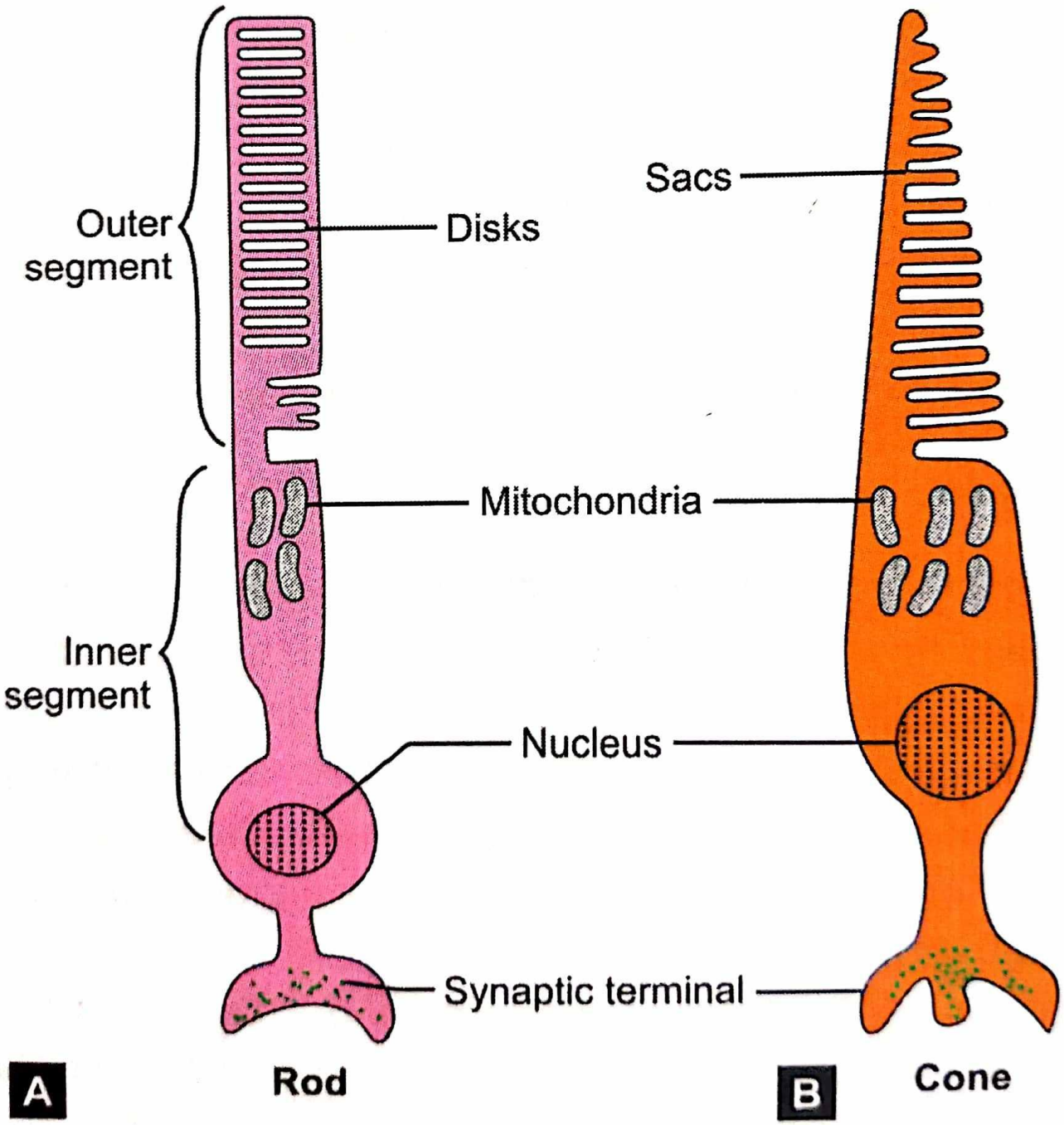
- outer segment:
- discs containing rhodopsin / iodopsin

inner segment

nuclear region

synaptic region

- the interval between the threshold for rods and cones is called ***achromatic interval*.**


Outer segment
Disks
Inner segment
Mitochondria
Nucleus
Synaptic terminal
A
Rod
Sacs
B
Cone

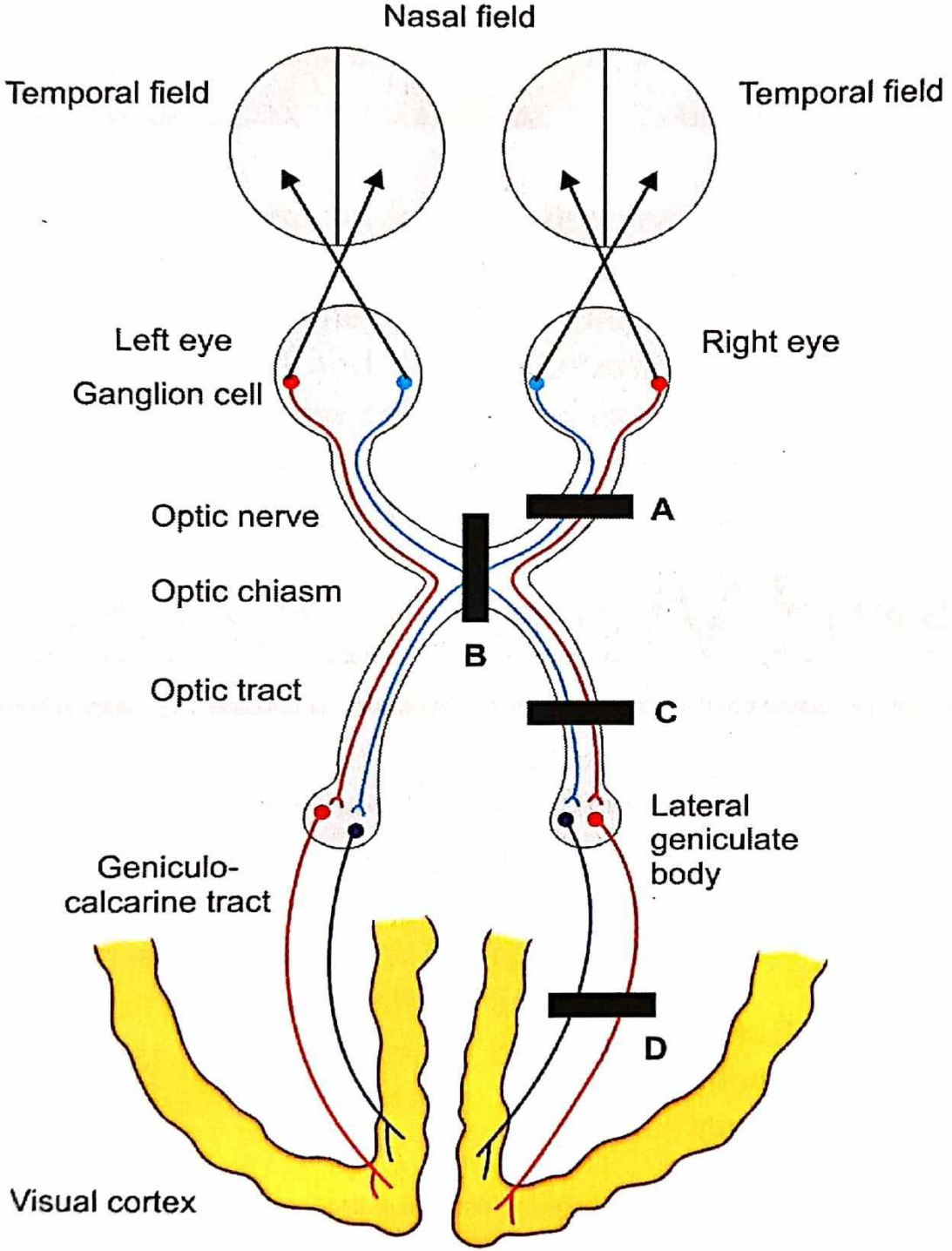
VISUAL PATHWAY

- 3 ORDER NEURON PATHWAY.

- 1ST ORDER NEURONS : BIPOLAR CELLS
- 2ND ORDER NEURONS: GANGLIONIC CELLS
- 3RD ORDER NEURONS: LATERAL GENICULATE BODY

VISUAL PATHWAY

- OPTIC NERVE
- OPTIC CHAISMA
- OPTIC TRACT
- LATERAL GENICULATE BODY
- VISUAL CORTEX



COMPREHENSIVE TEXTBOOK OF PHYSIOLOGY' BY Dr. G K PAL WITH PERMISSION

- i) majority of the fibers end in – lateral geniculate body (relay station in thalamus),
- (ii) pretectal region (midbrain)
- (iii) superior colliculus
- (ii) & (iii) responsible for light reflex.

- some fibers of optic tract also end in the suprachiasmatic nucleus of hypothalamus (reticulo hypothalamic tract –communicates with pineal gland and is responsible for regulation of circadian rhythm)

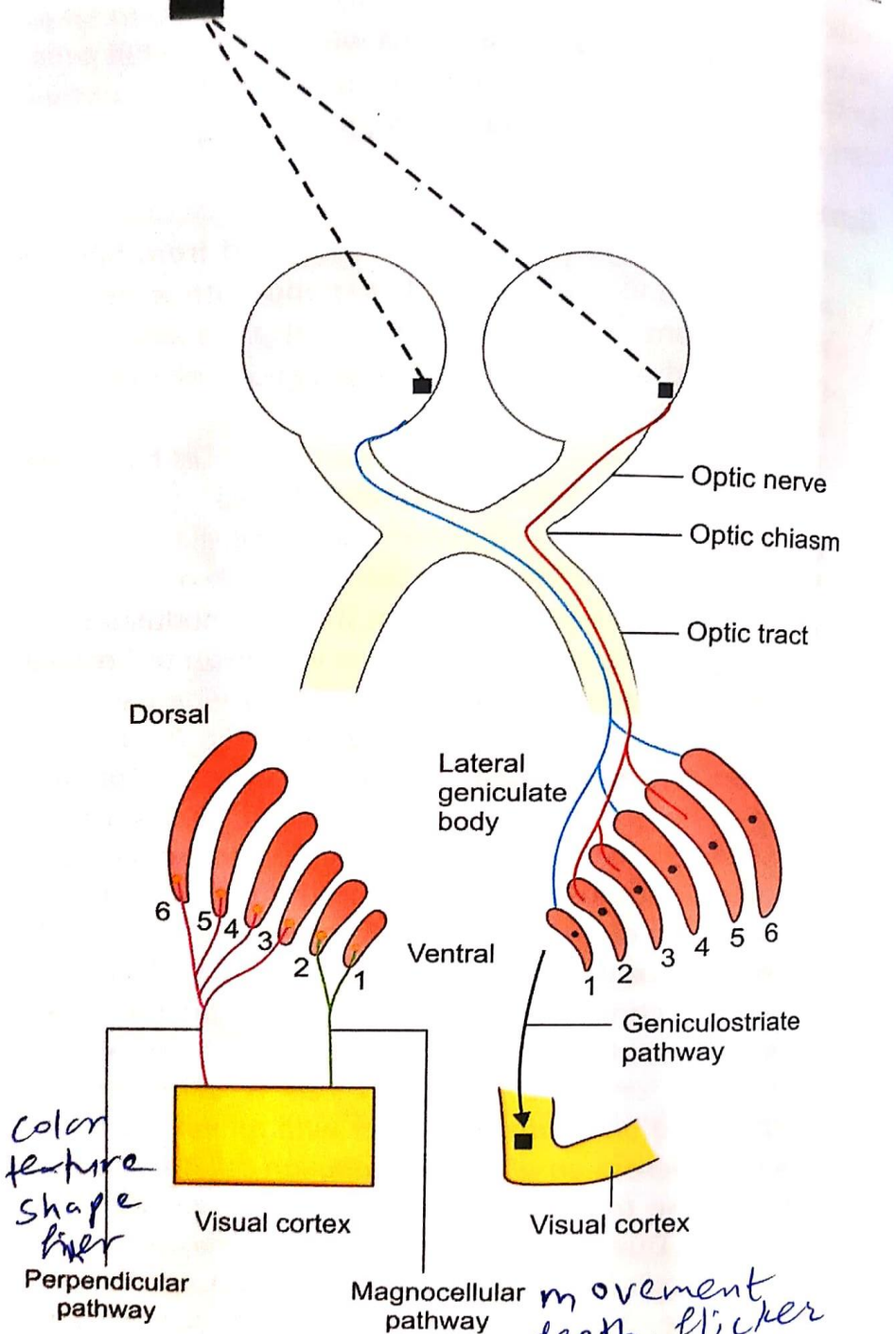


Fig. 145.3: Anatomy of ... pathway. A rectangu-

VISUAL CORTEX

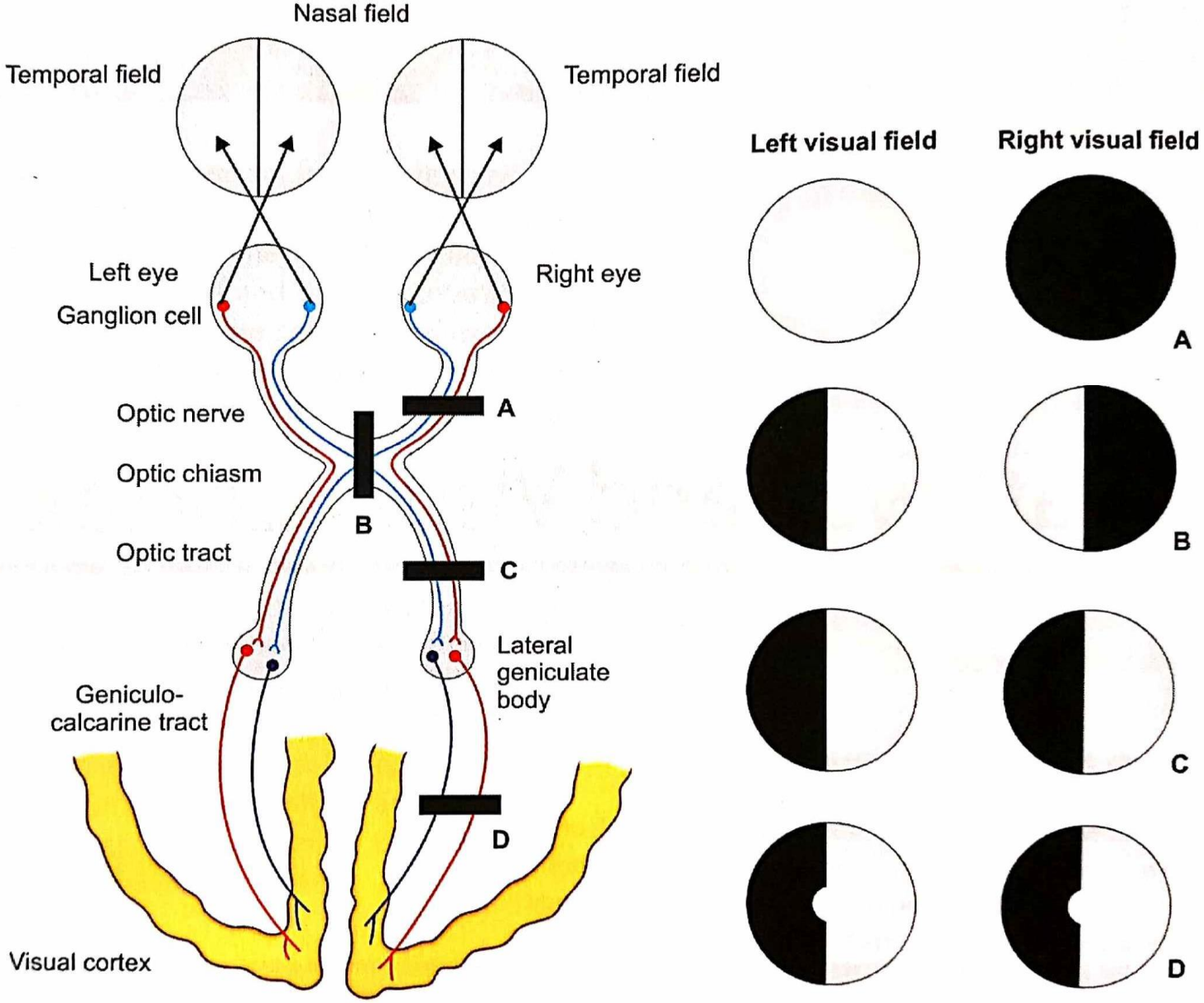
OCCIPITAL AREA

- AREA 17: PRIMARY VISUAL AREA
- AREA 18: VISUAL ASSOCIATION AREA
- AREA 19: OCCIPITAL EYE FIELD

LESIONS OF VISUAL PATHWAY

- ANOPIA: COMPLETE LOSS OF VISUAL FIELD
- HEMIANOPIA: LOSS OF HALF VISUAL FIELD
  1) HETRONYMOUS- BINASAL, BITEMPORAL
  2) HOMONYMOUS- RIGHT, LEFT
- QUADRANTANOPIA: LOSS OF 1/4TH FIELD OF VISION
- SCOTOMA

- HOMONYMOUS HEMIANOPIA: LOSS OF SAME HALVES (RIGHT OR LEFT) OF FIELD OF VISION IN BOTH EYES.
- HETERONYMOUS HEMIANOPIA: LOSS OF DIFFERENT HALVES (E.G. RIGHT SIDE OF ONE EYE AND LEFT SIDE OF ANOTHER EYE) OF FIELD OF VISION IN BOTH EYES.
- QUADRANTANOPIA: LOSS OF 1/4TH FIELD OF VISION IN ONE EYE.
- SCOTOMA: LOCALIZED LOSS OF FIELD OF VISION.



Figs. 145.1A to D: Effects of lesions at various levels of visual pathway. (A) lesion of right optic nerve produces blindness in right eye; (B) lesion of optic chiasm produces bitemporal hemianopia; (C) lesion of right optic tract produces left homonymous hemianopia; (D) lesion of right geniculocalcarine tract produces left homonymous hemianopia with macular sparing.

SCOTOMA

- PERIPHERAL– PERIPHERAL FIELD OF VISION IS LOST –RETINITIS PIGMENTOSA.
- CENTRAL –OF VISION IS LOST– OPTIC NEURITIS.
- PATCHY –DIABETES MELLITUS DUE TO DETACHMENT OF RETINA.
- LOSS OF FIELD OF VISION DUE TO LESION IN OPTIC PATHWAY IS CALLED *HEMIANOPIA.*

(A) LESION OF OPTIC NERVE

- CAUSE: INCREASED INTRACRANIAL TENSION, INJURY
- ANOPIA: COMPLETE BLINDNESS ON THE SAME SIDE WITH LOSS OF LIGHT REFLEX

(B) LESION TO CROSSED NASAL FIBERS OF OPTIC CHAISMA

- CAUSE: TUMOUR OF ANTERIOR PITUITARY
- BITEMPORAL HETERONYMOUS HEMIANOPIA

LESION TO LEFT OR RIGHT UNCROSSED TEMPORAL FIBERS

- LESION OF LT. FIBRES: LEFT NASAL HEMIANOPIA
- LESION OF RT. FIBRES: RIGHT NASAL HEMIANOPIA

LESION TO BOTH SIDED UNCROSSED TEMPORAL FIBERS – VERY RARE

- BINASAL HETERONYMOUS HEMIANOPIA

(C) LESION OF RIGHT OPTIC TRACT

- LEFT HOMONYMOUS HEMIANOPIA
- LOSS OF LIGHT AND ACCOMODATION REFLEX

LESION OF LEFT OPTIC TRACT:

- RIGHT HOMONYMOUS HEMIANOPIA
- LOSS OF VISUAL REFLEXES

LESION OF LATERAL GENICULATE BODY

- OPPOSITE SIDED HOMONYMUS HEMIANOPIA

(8) LESION OF OPTIC RADIATIONS

- RIGHT OR LEFT (OPPOSITE) HOMONYMOUS HEMIANOPIA WITH MACULAR SPARING
- LIGHT REFLEX NORMAL
- ACCOMODATION REFLEX LOST

LESION OF OCCIPITAL CORTEX AREA 17

- QUADRANTANOPIA: LOSS OF 1/4TH FIELD OF VISION

LESION OF VISUAL ASSOCIATION AREAS (18 OR 19)

* VISUAL AGNOSIA

THANK YOU