Chapter 6: Vision

General Principles of Sensory Processing

The Visual Stimulus

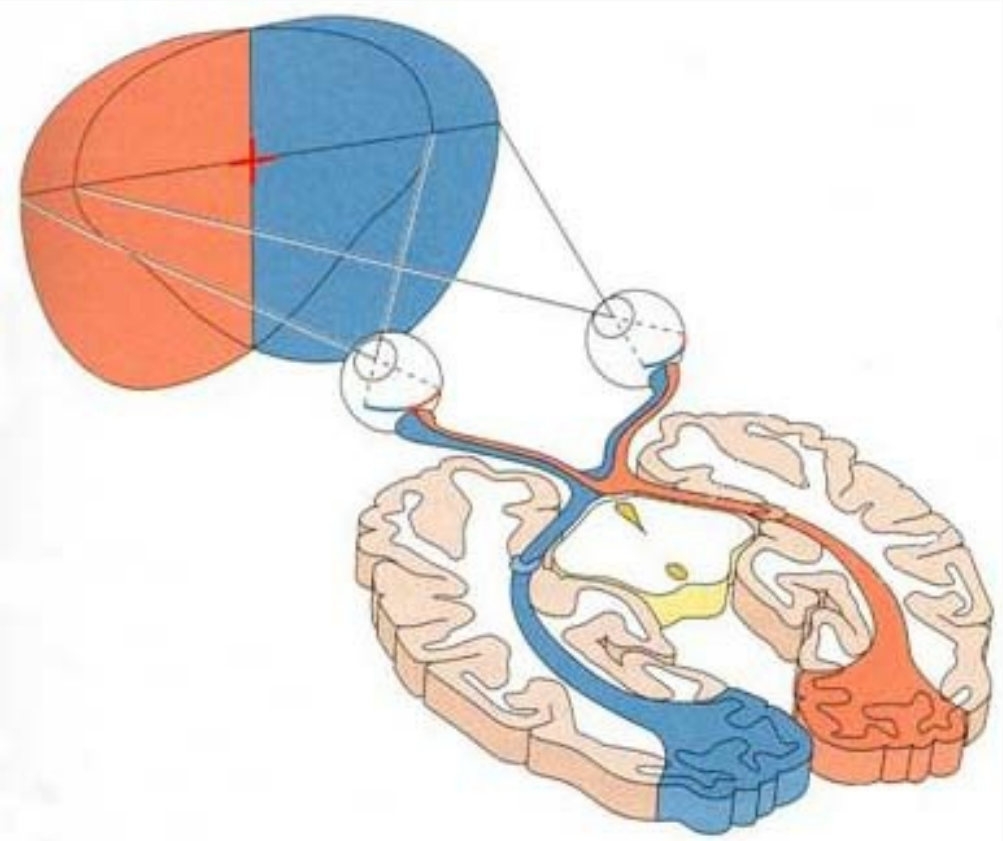
The Anatomy of the Visual System

Coding of Light and Dark

Coding of Color

The Primary Visual Cortex

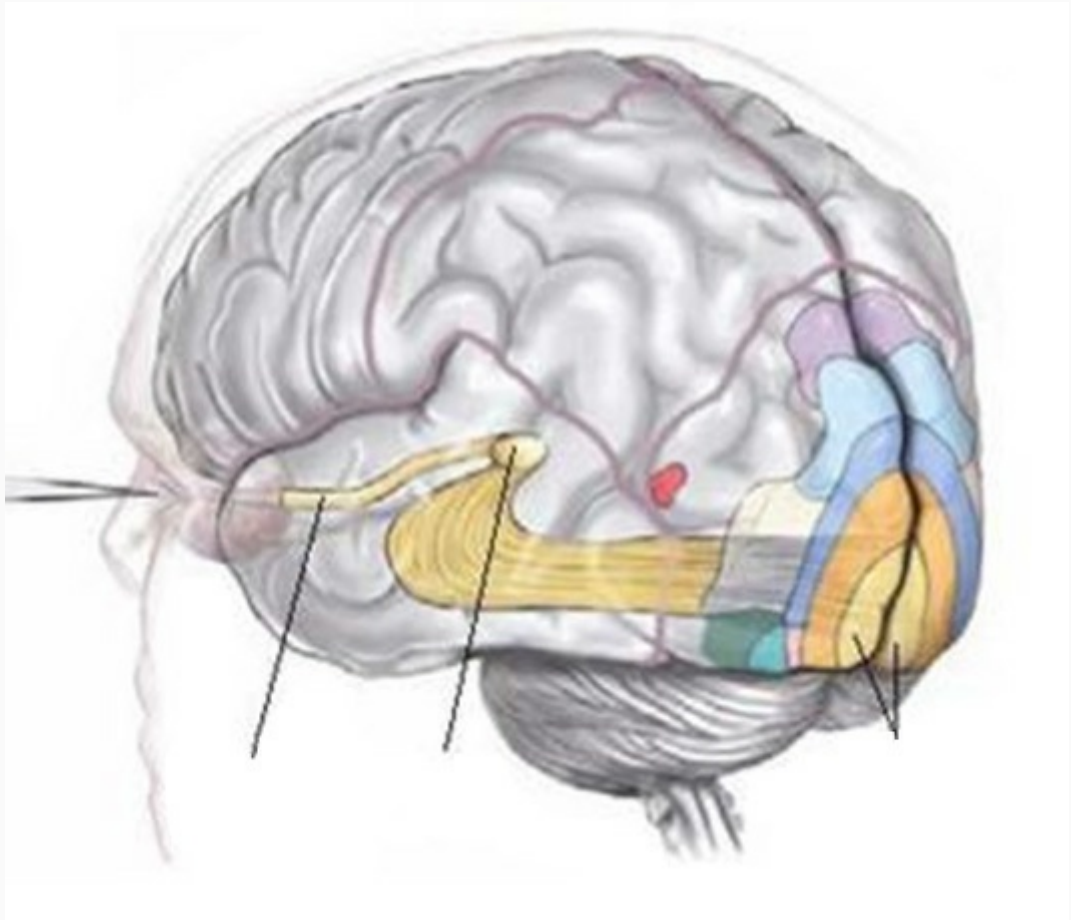
Perception of Visual Information



The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus.

- location in the visual field
- color
- ocular dominance
- orientation

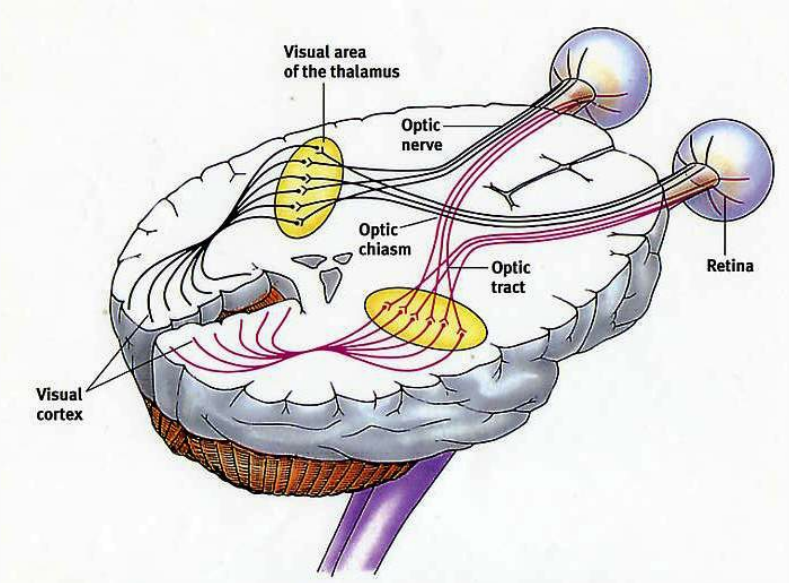


The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Location in Visual Field.

- LGN is retinotopically organized relay to PVC
- parallel processing of magno- and parvocellular inputs
- parallel processing of binocular inputs

lateral geniculate nucleus

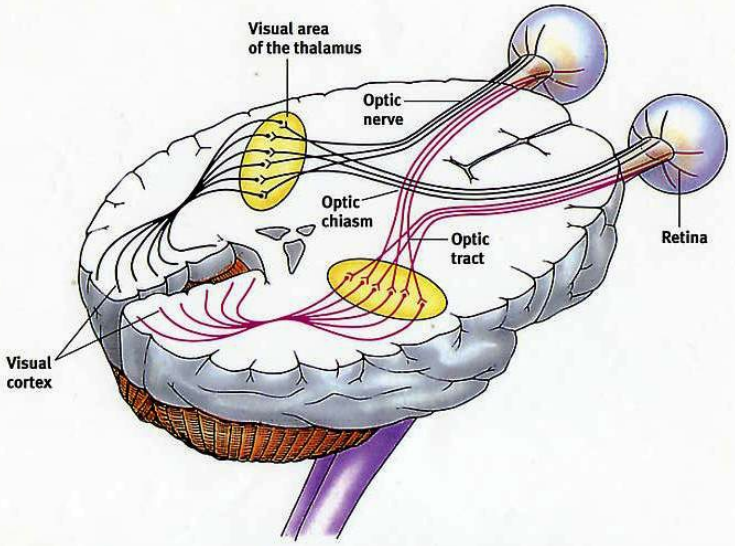


primary visual pathway

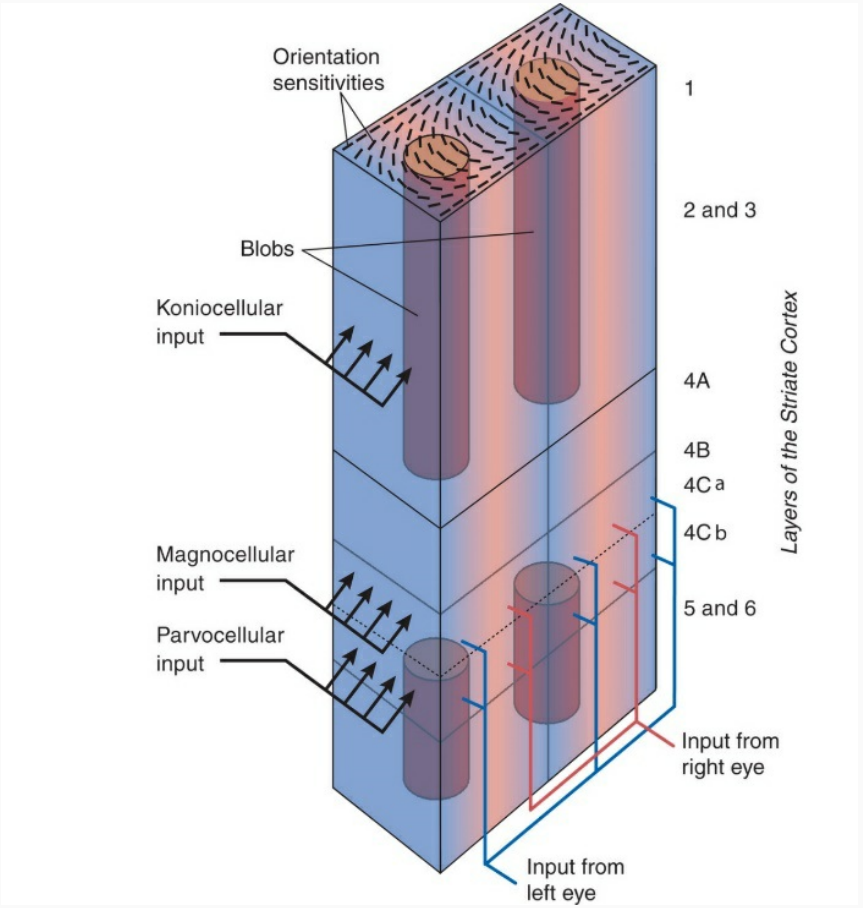
The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Location in Visual Field.

- PVC is organized in computational columns
- parallel processing of magno- and parvocellular inputs
- convergent processing of binocular inputs
- in any cortical column, all receptive fields have roughly same retinotopic location, and these locations change systematically in nearby columns



primary visual pathway

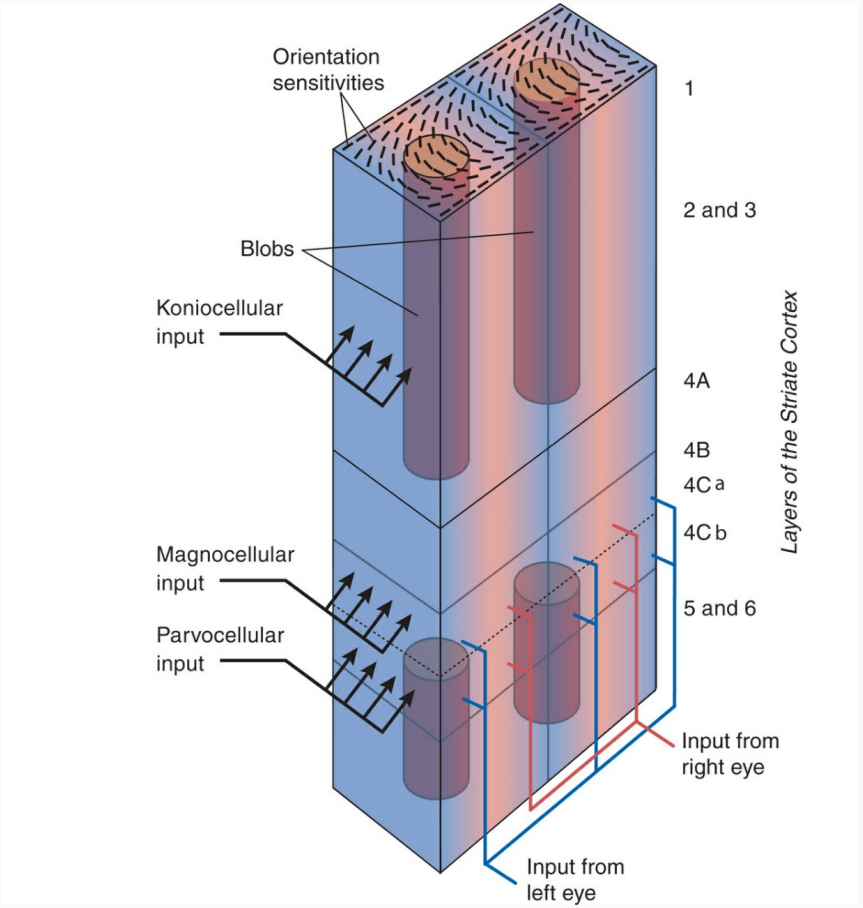


The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Color.

- parvocellular input from medium and long wavelength cones
- koniocellular input from short wavelength cones

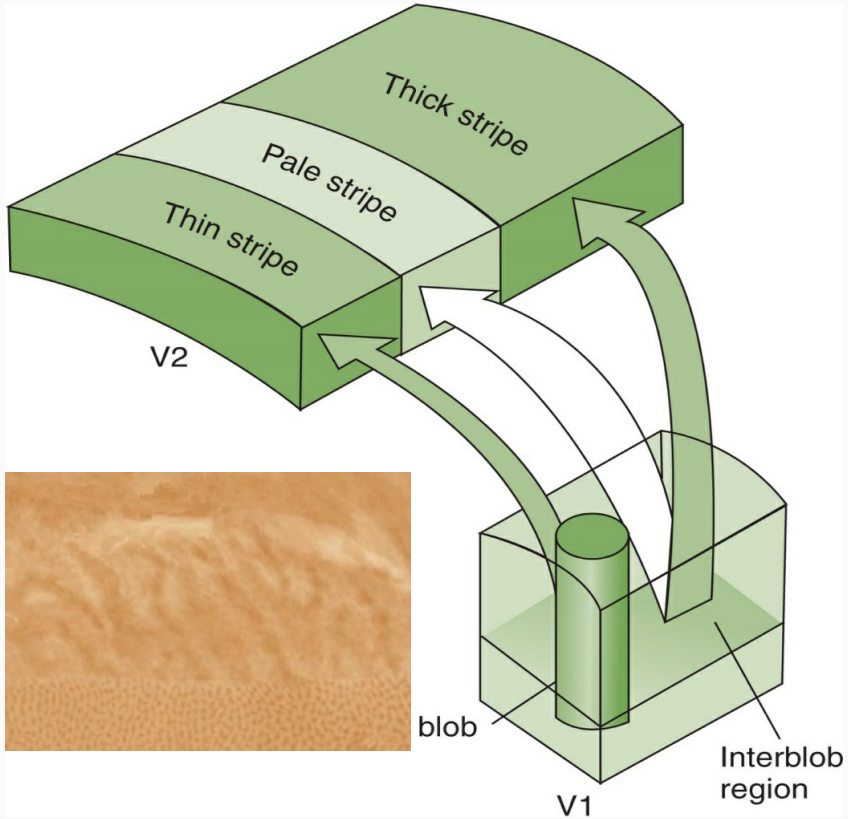
lateral geniculate nucleus

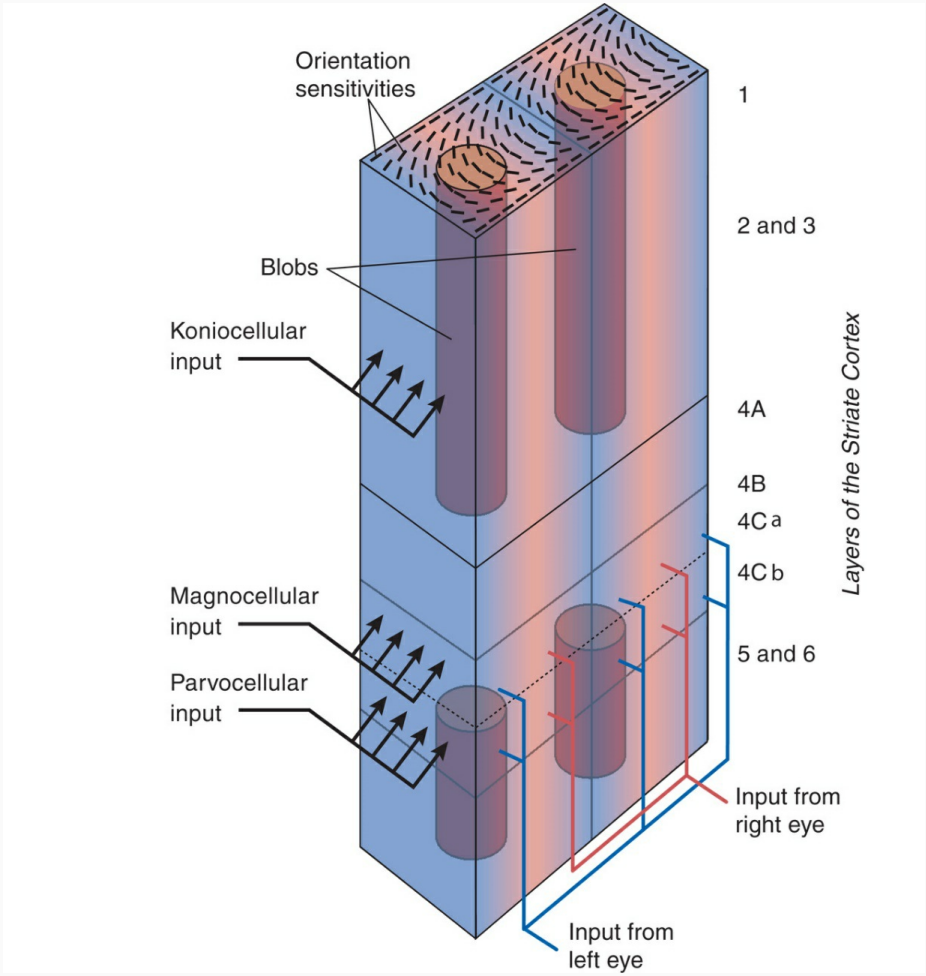


The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Color.

- colour-sensitive cells in CO blobs of V1
  send color input to thin stripes of V2

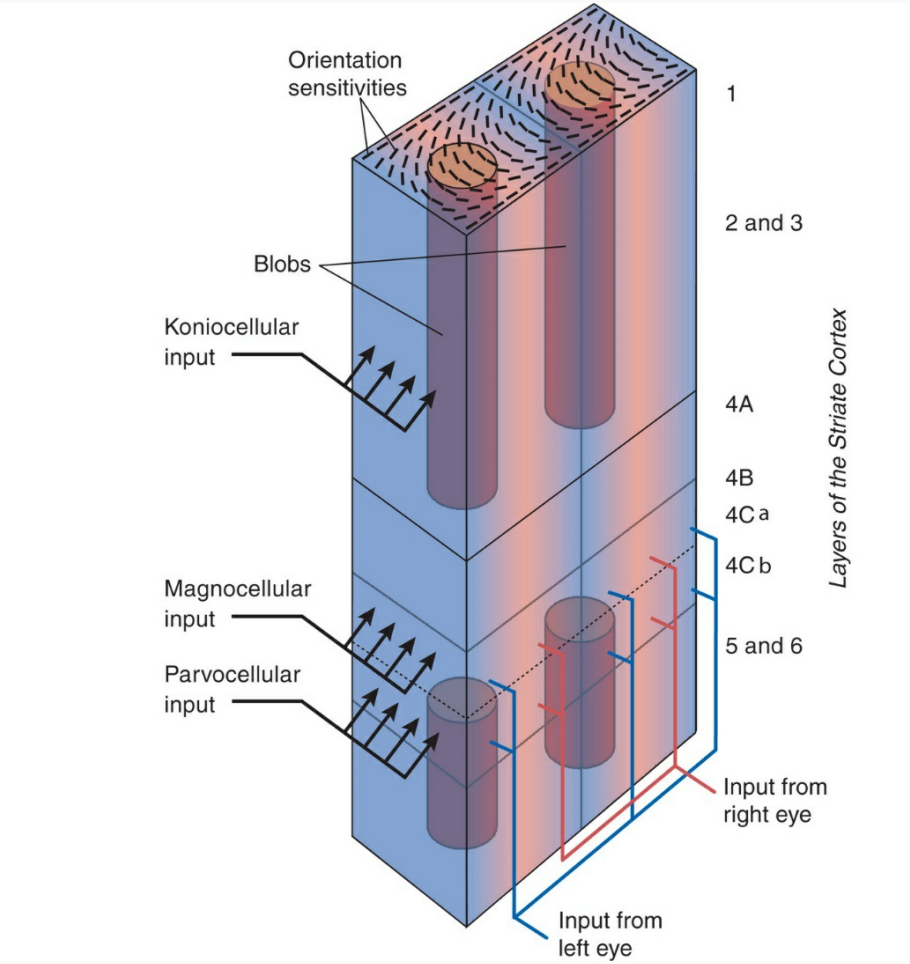




The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Ocular Dominance.

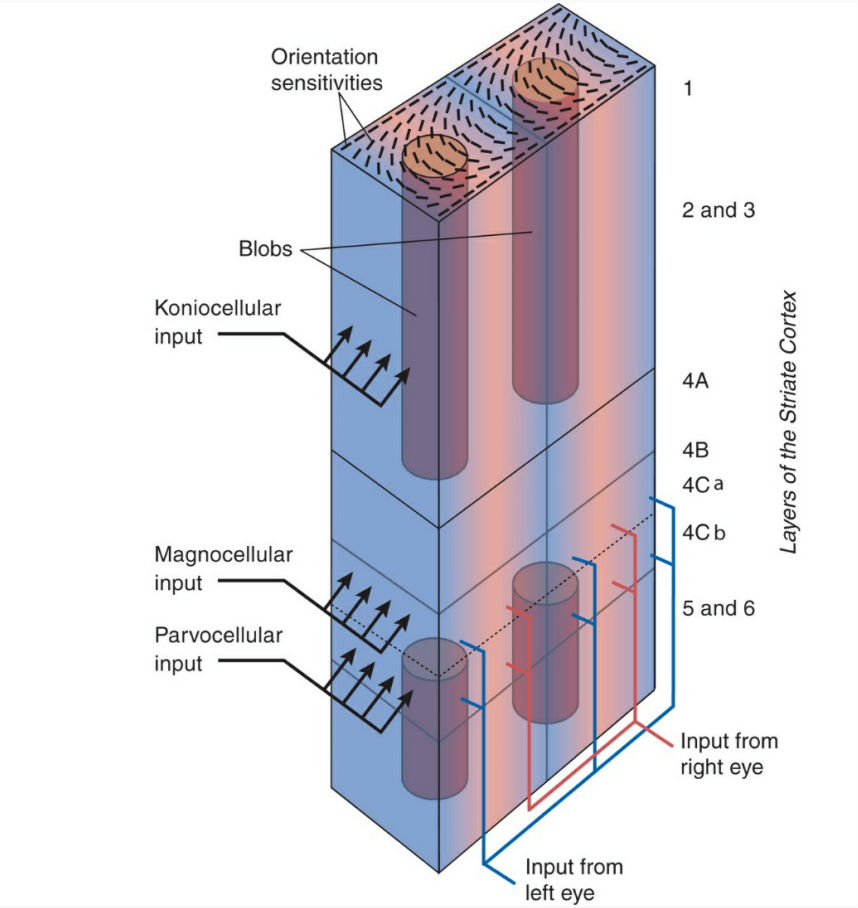
- most PVC cells are binocular, but respond more for one eye's input relative to the other
- if electrode advanced through interblob column, all neurons will have same ocular dominance
- if electrode advanced tangentially, ocular dominance dominance switches back and forth



The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

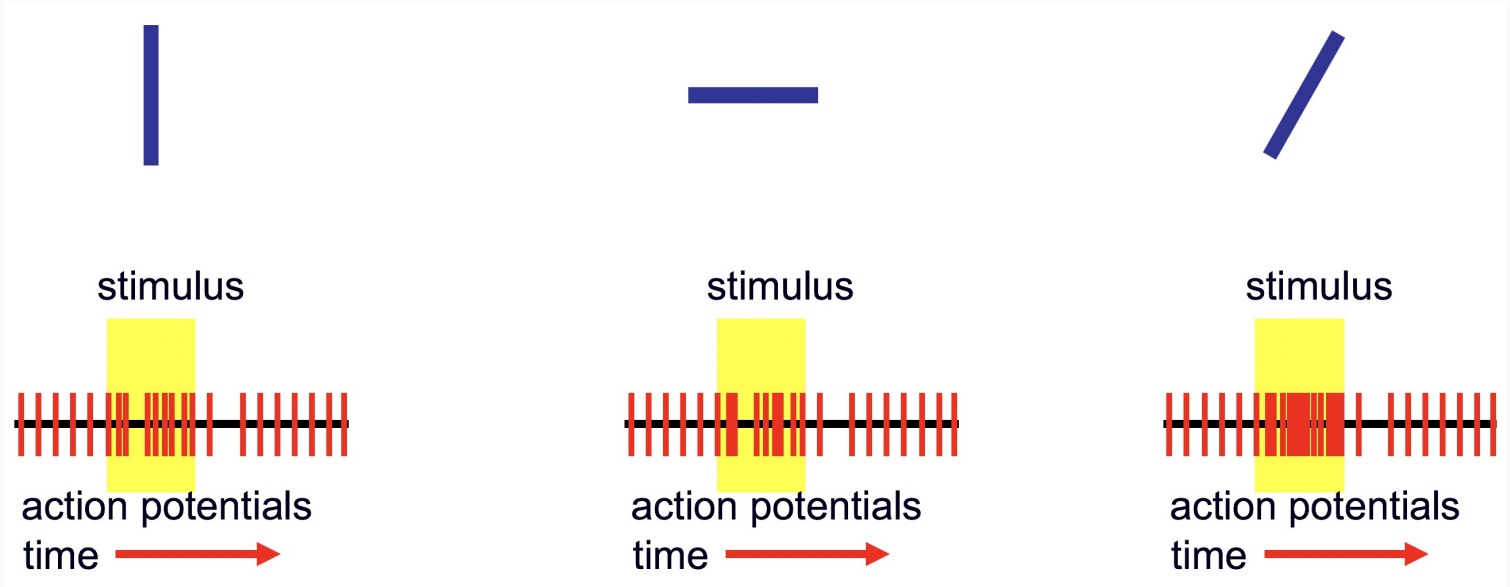
- most PVC cells are spatially tuned to respond best to stimulation in a particular orientation
- if electrode advanced through interblob column, neurons will have same similar orientation tuning
- if electrode advanced tangentially,orientation changes systematically



The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

- magnocellular inputs to area V1
- if line is in simple cortical cell's RF, and rotated around its center, the cell will only respond when the line is in a particular range of orientation



The Primary Visual Cortex

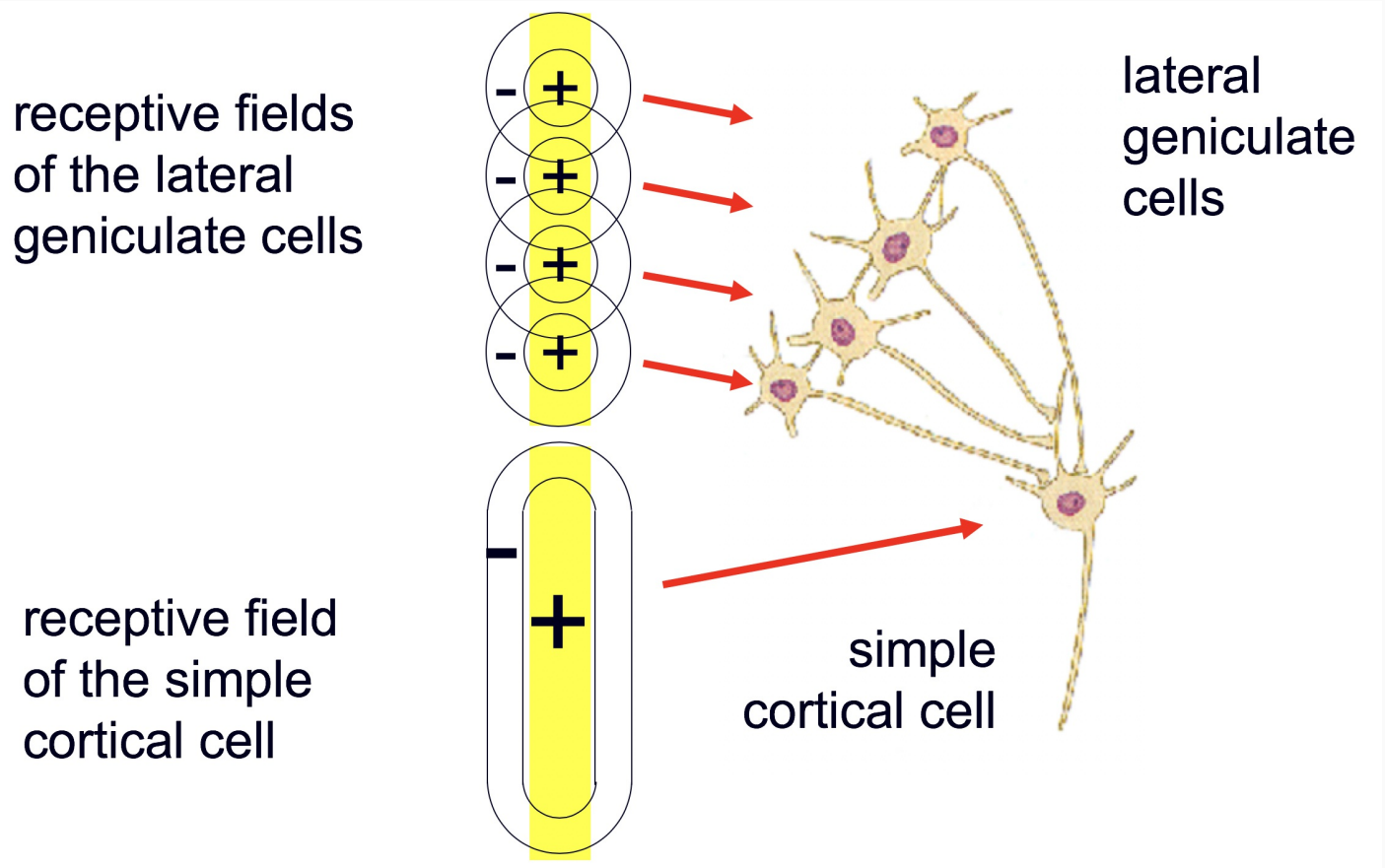
Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

- all simple cells exhibit tuning curves

The Primary Visual Cortex

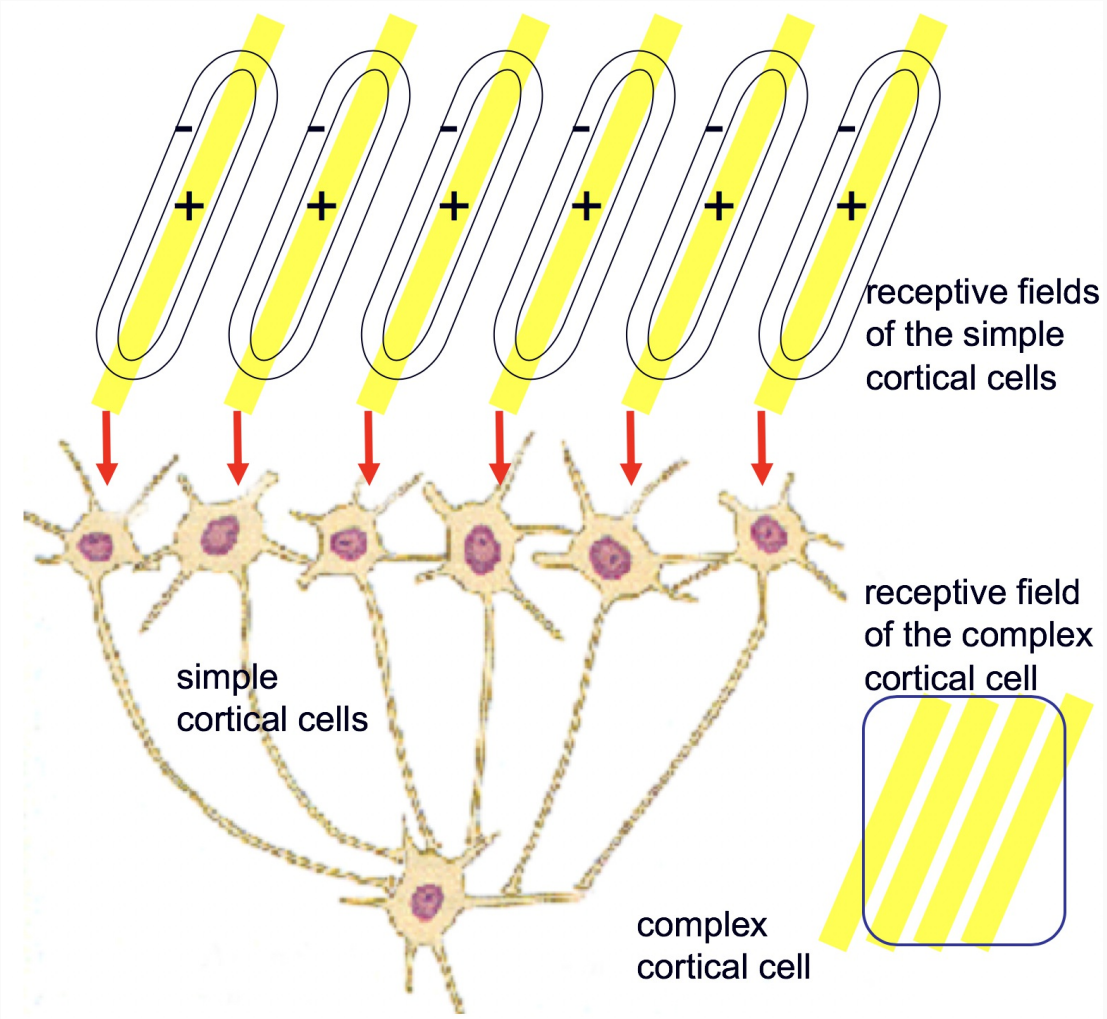
Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

- LGN cell's concentric receptive fields input to V1 simple cells to determine orientation selectivity



The Primary Visual Cortex

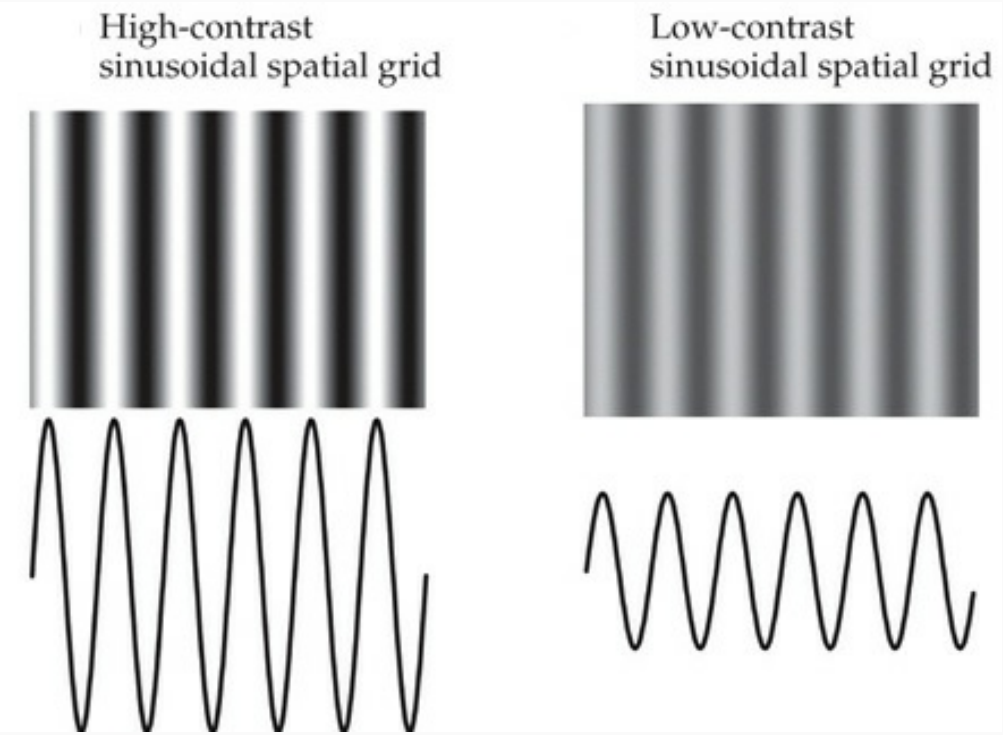
Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.



The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

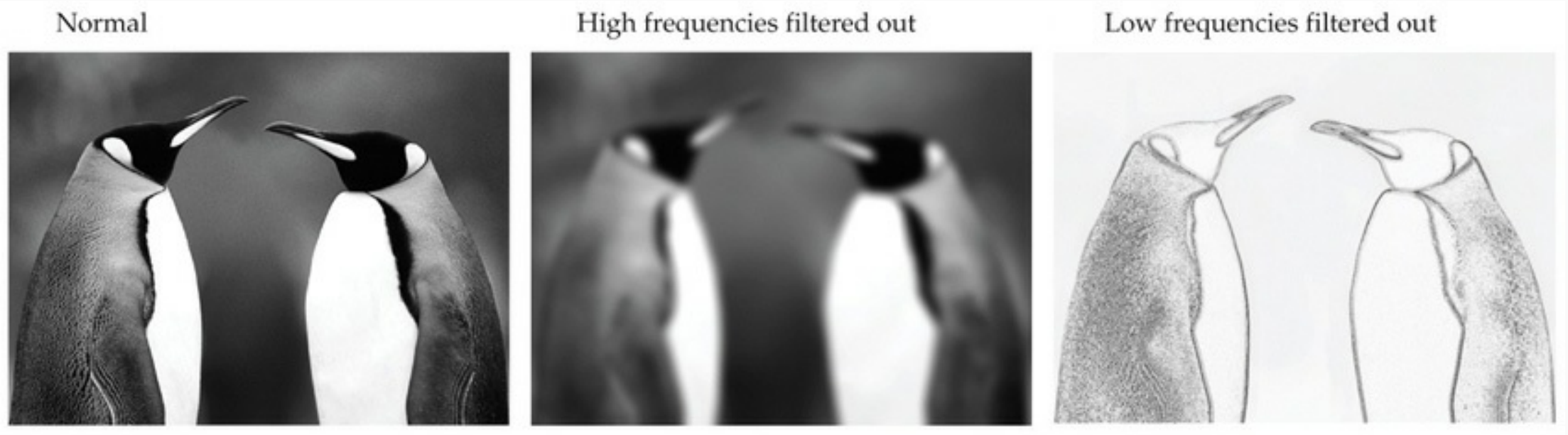
- Eyes are in constant motion
  - even when fixed on object
-
  - contrast between lighter and darker parts of stimulus
  - yields patterns of high or low contrast grids



The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Orientation.

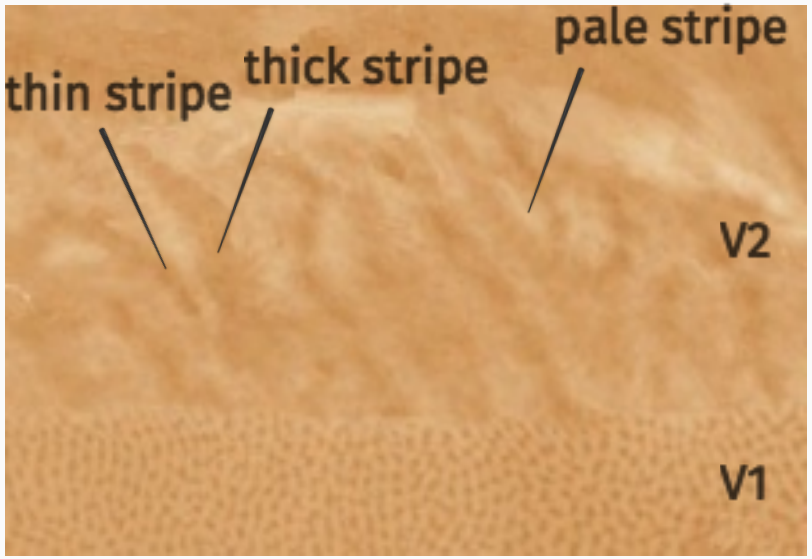
- simple cells tuned to specific frequencies at correct angle of orientation
- contributes to feature detection

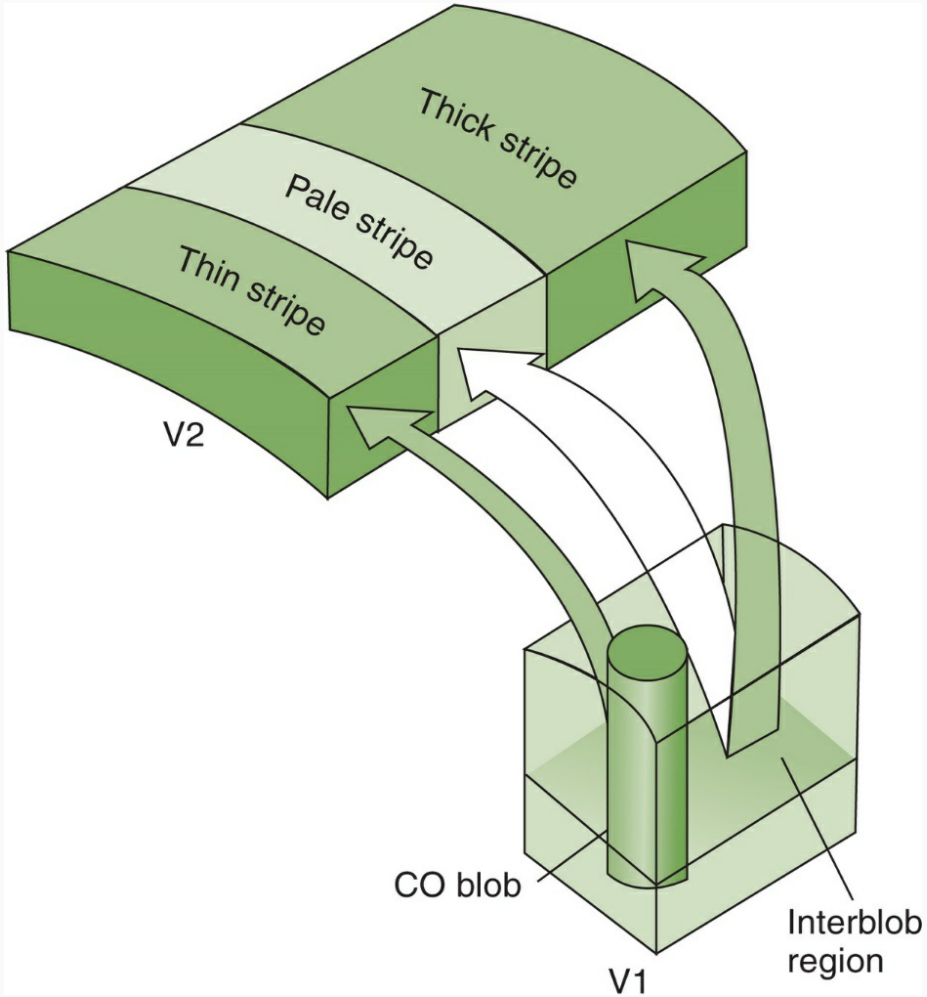


The Primary Visual Cortex

Primary Visual Cortex Represents Four Aspects of Visual Stimulus - Ocular Dominance and Orientation.

- interblob regions of V1 input to thick stripes and pale stripes to provide information about:
  - ocular dominance,
  - orientation,
  - movement...





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