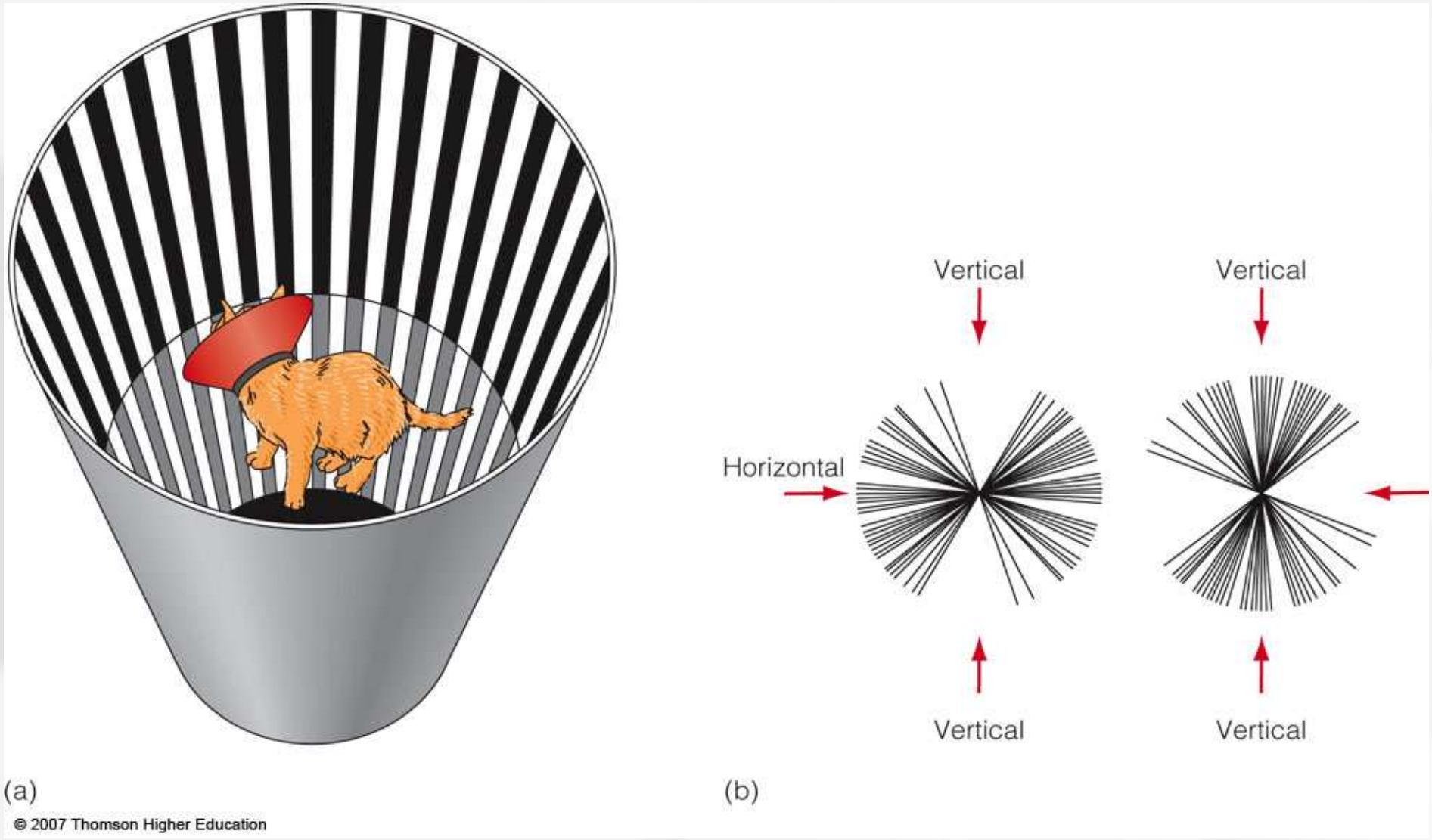
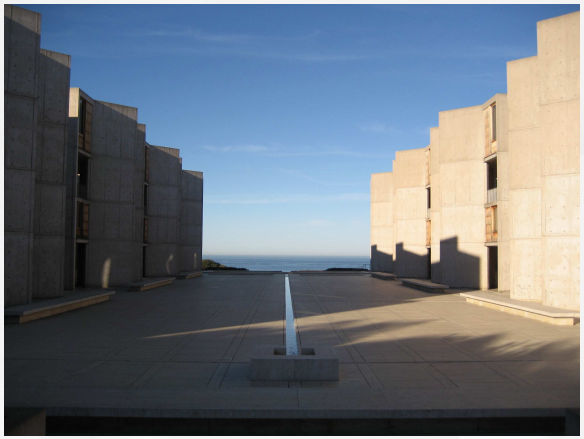
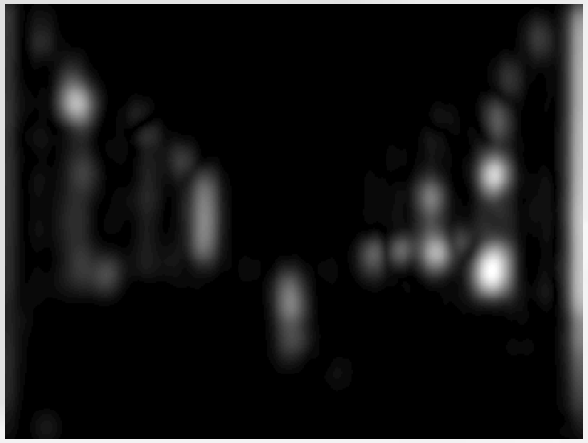
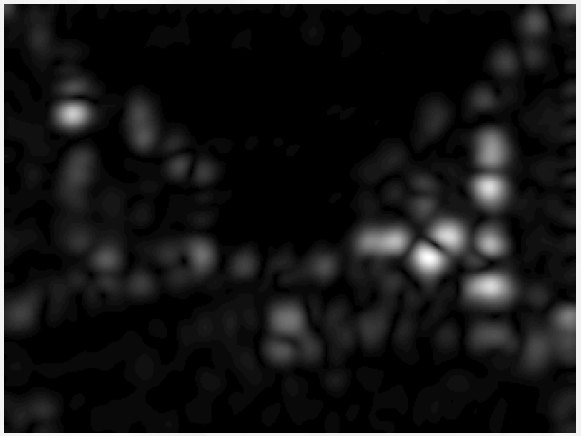


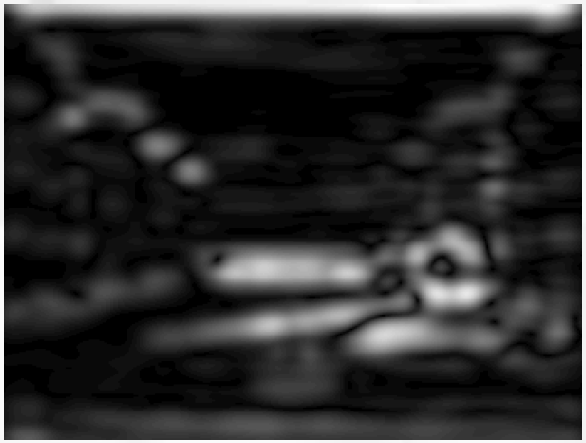
Figure 3.31 (a) Striped tube used in Blakemore and Cooper's (1970) selective rearing experiments. (b) Distribution of optimal orientations for 52 cells from a cat reared in an environment of horizontal stripes, on the left, and for 72 cells from a cat reared in an environment of vertical stripes, on the right. (Blakemore & Cooper, 1970).


Are we more sensitive to vertical
and horizontal edges?

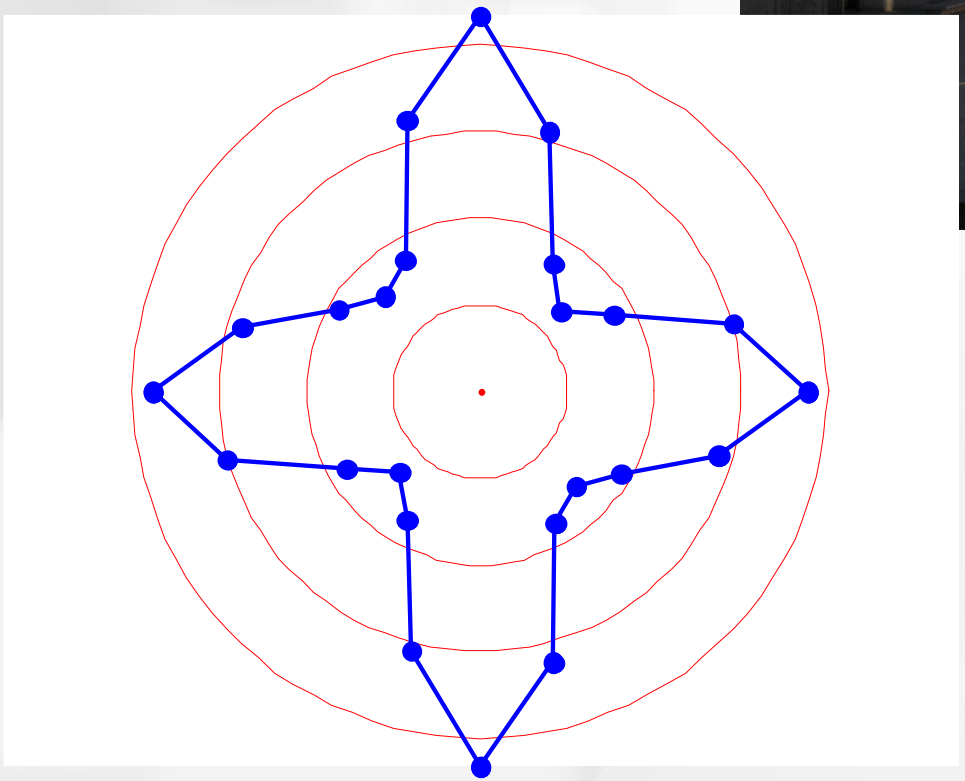


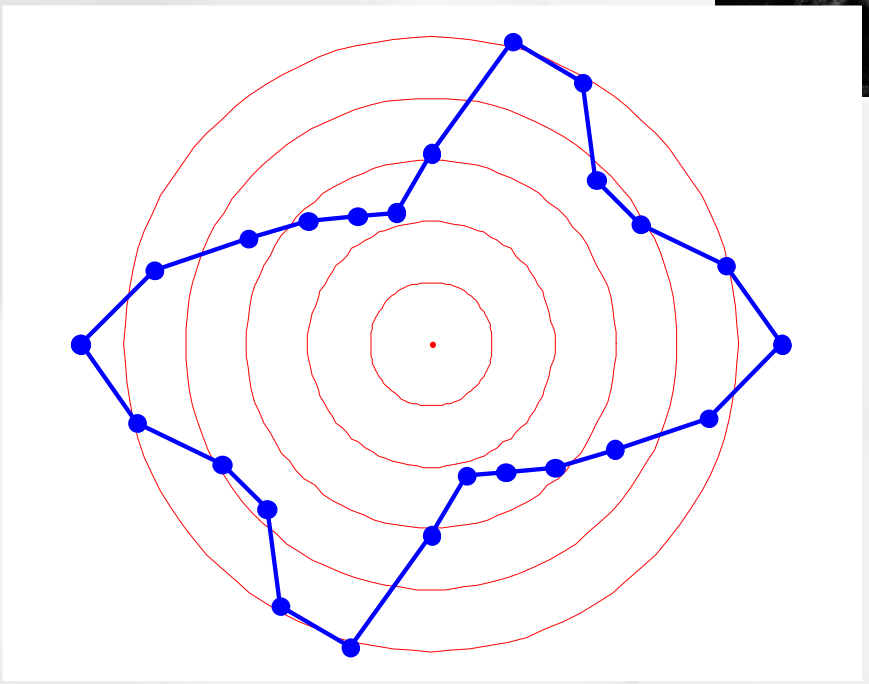




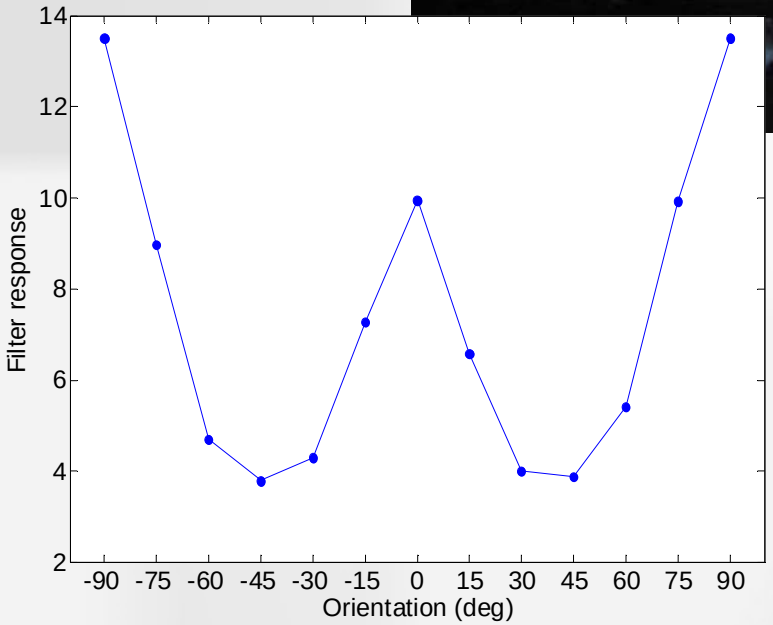


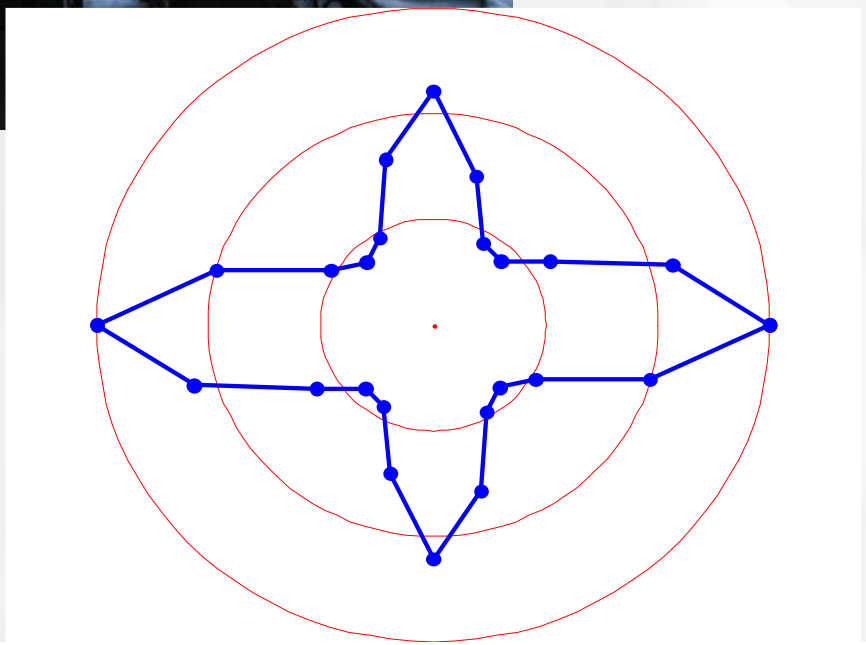
Bias in orientation distribution



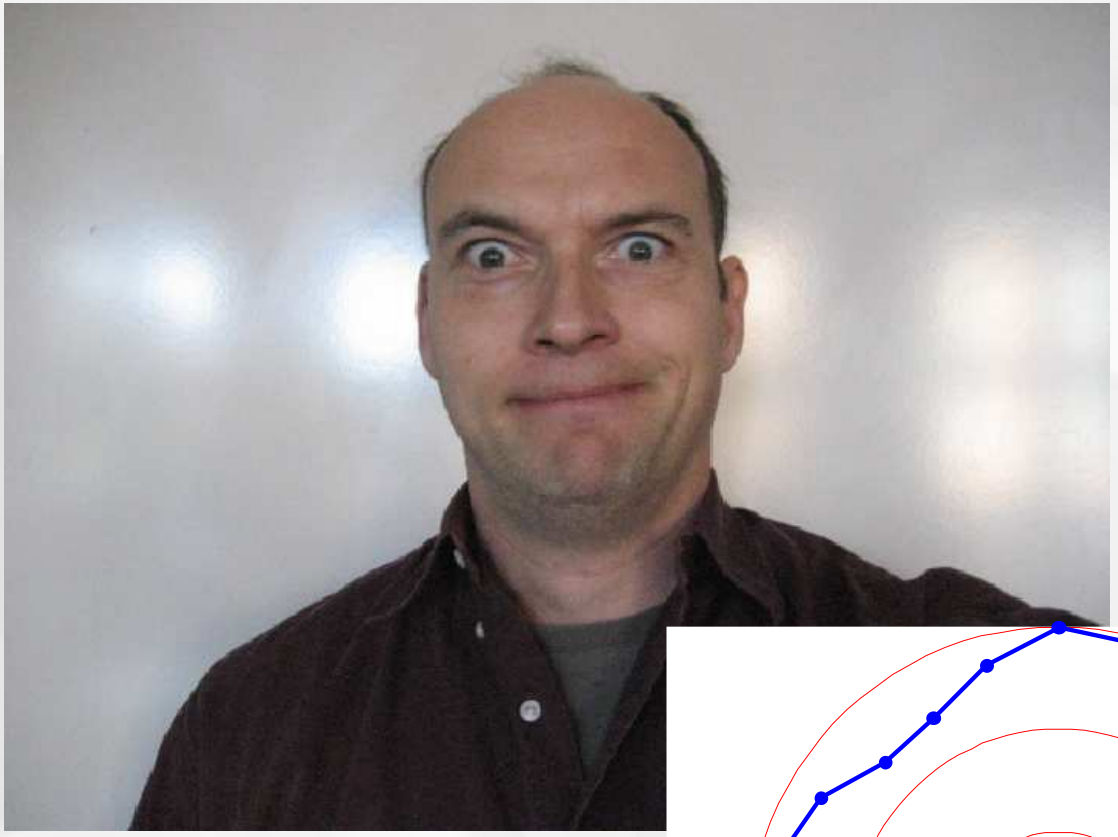


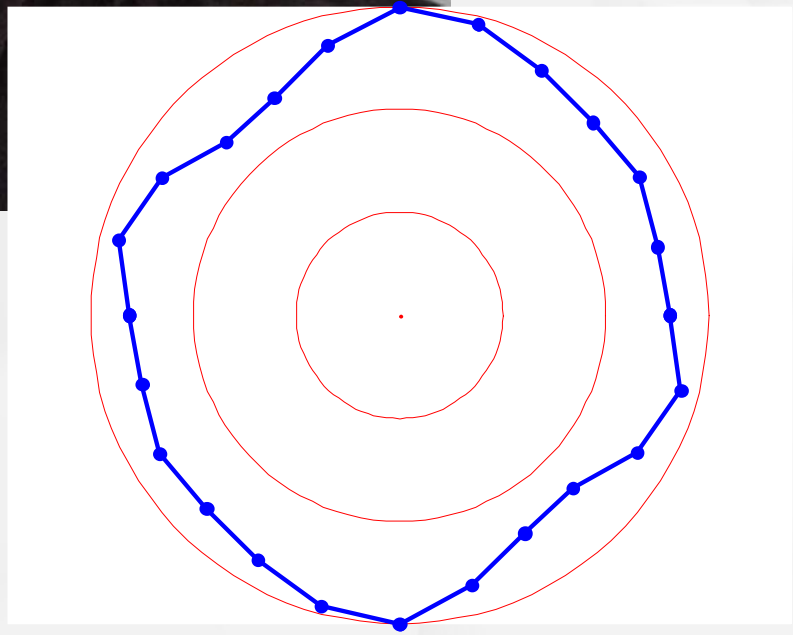
My view of the classroom



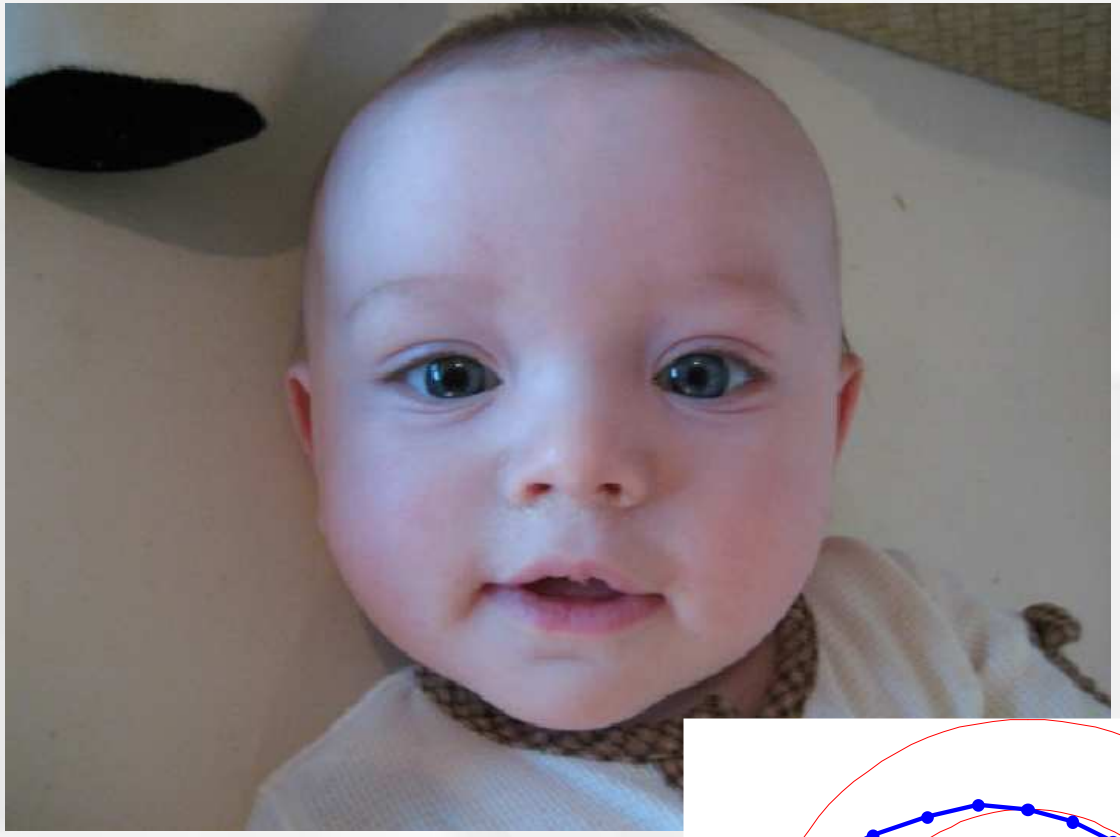


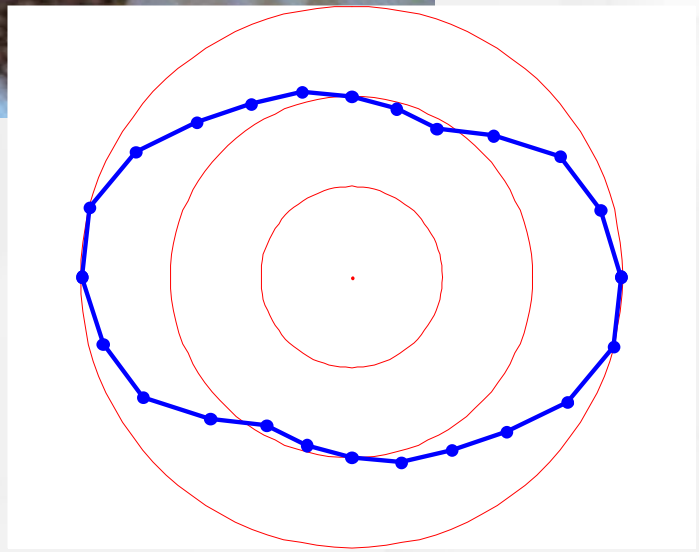
Your view of the classroom





Gratuitous photo from home



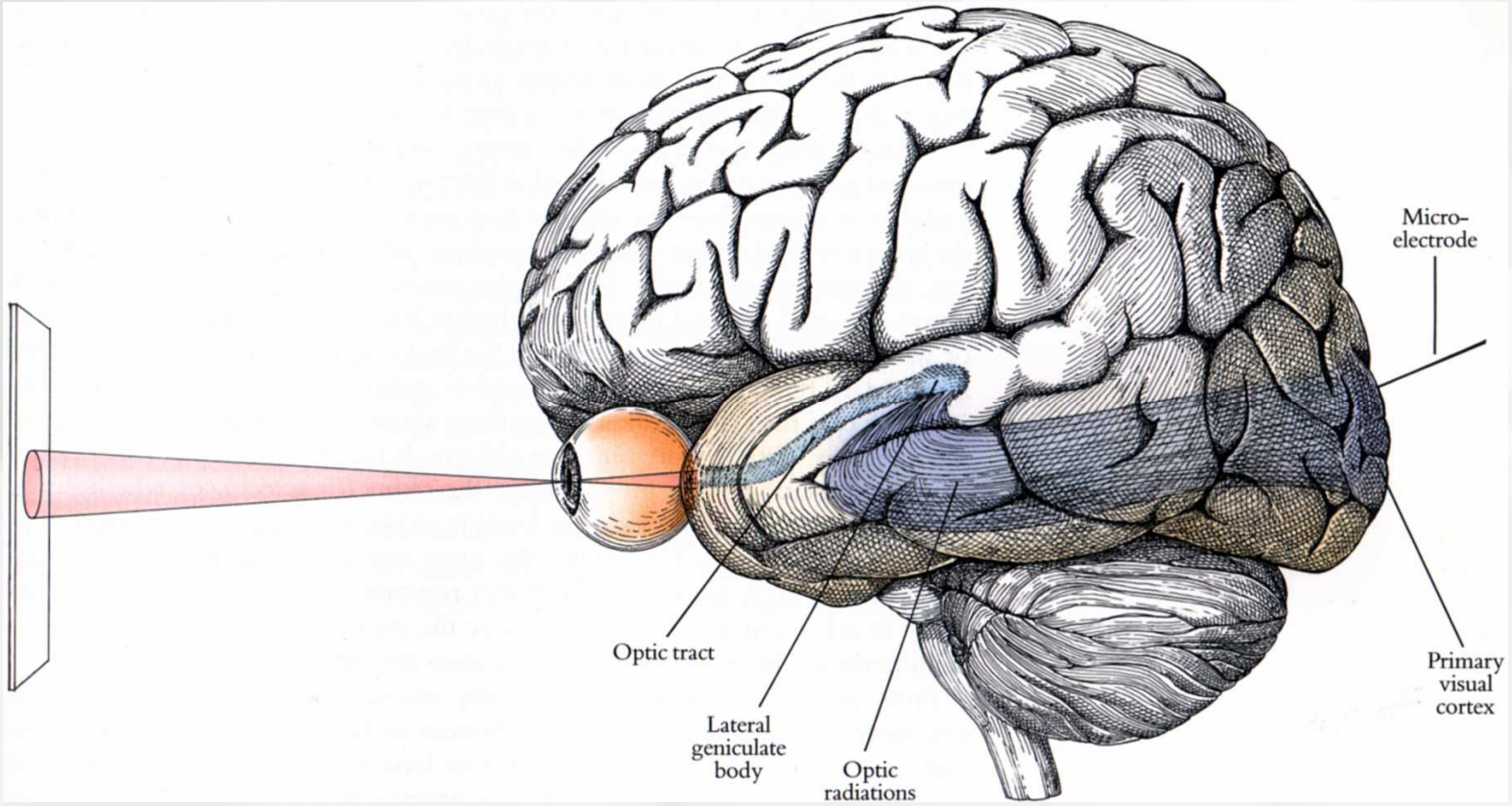


“Oblique Effect”

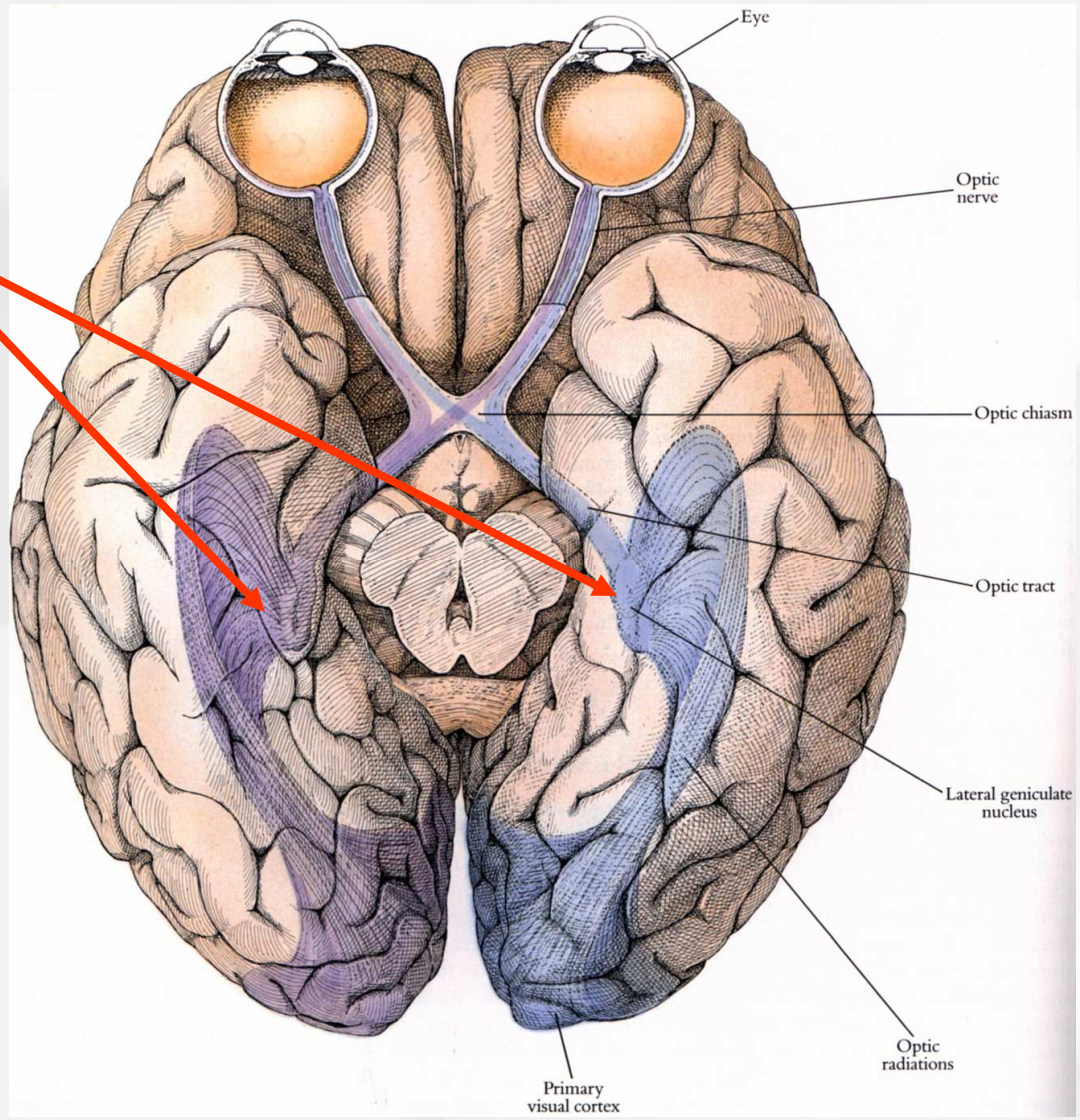
Our visual systems are more sensitive to vertical and horizontal orientations than oblique orientations.

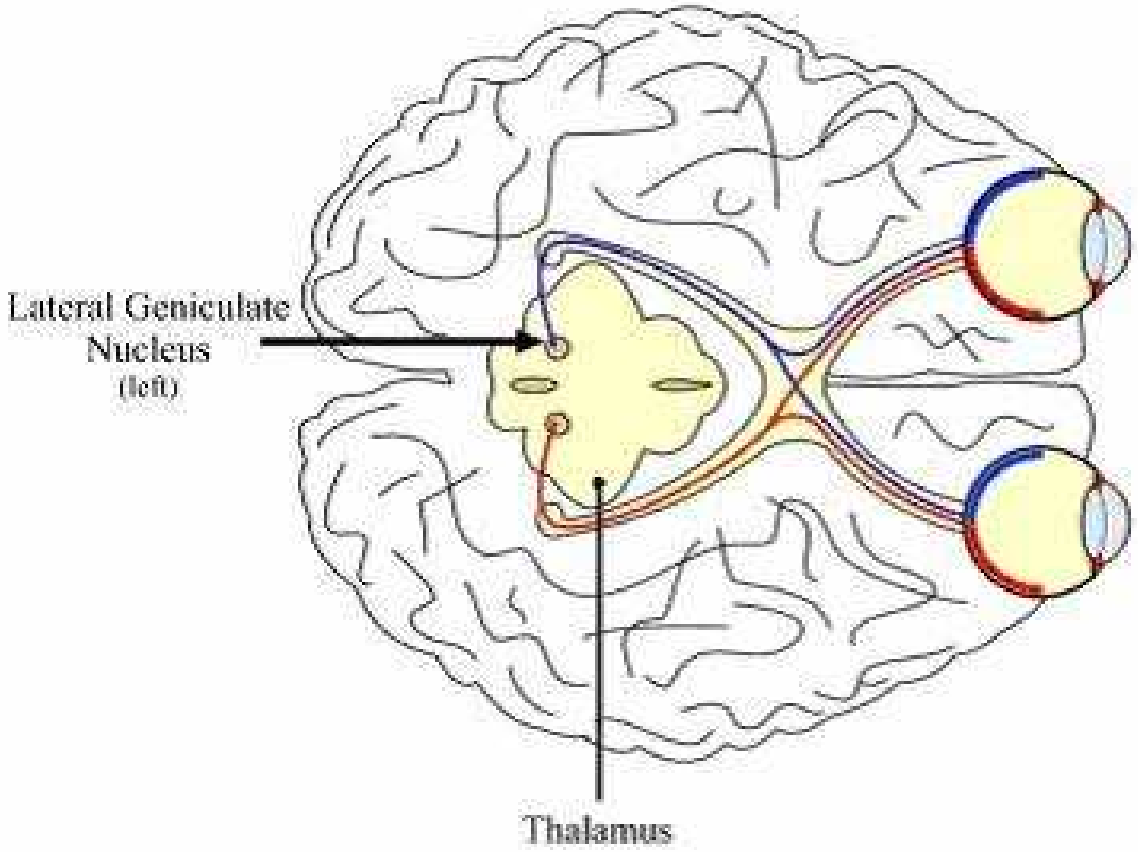
This effect has been found using electrophysiological responses in monkeys: More neurons are found that are selective to vertical and horizontal orientations.

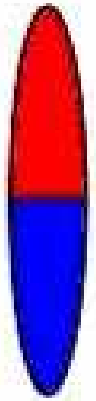
Chapter 4: The Organized Brain



LGN

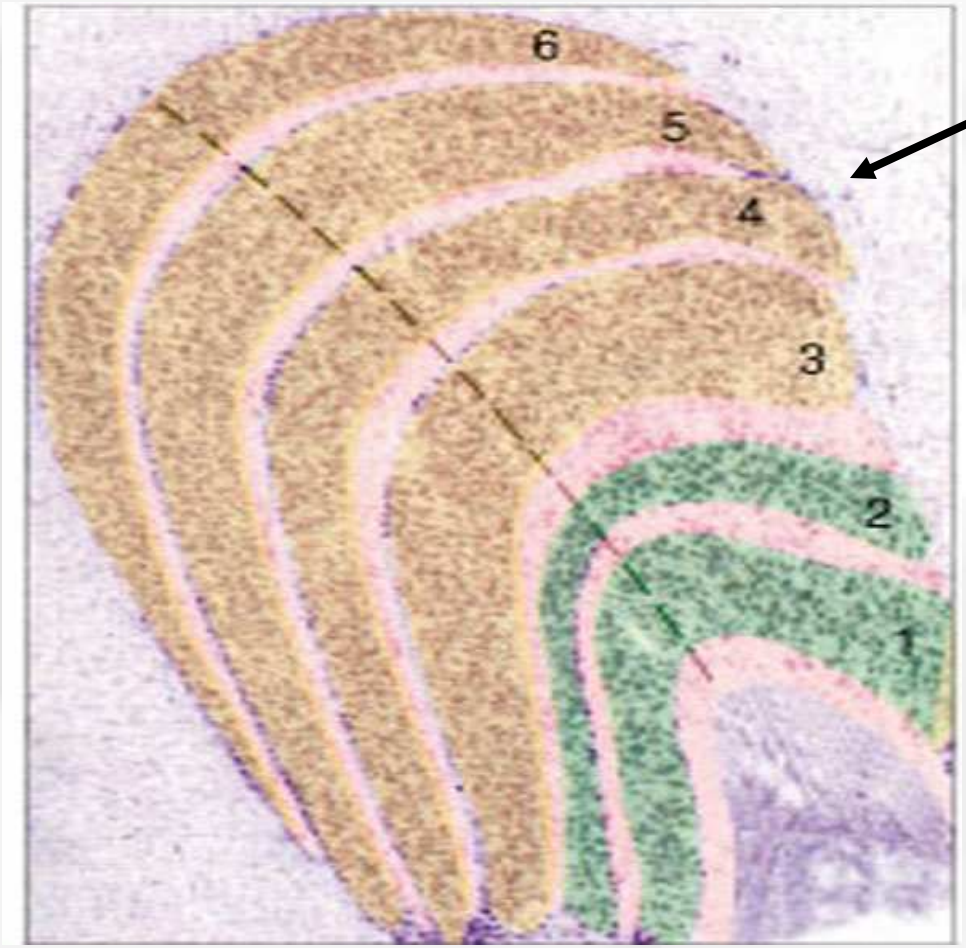

Eye
Optic nerve
Optic chiasm
Optic tract
Lateral geniculate nucleus
Optic radiations
Primary visual cortex


Lateral Geniculate
Nucleus
(left)
Thalamus


Left
Right


LGN Layers

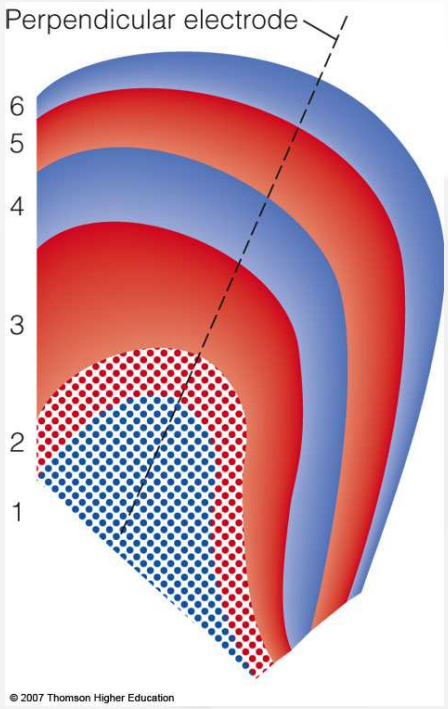
Parvocellular layers
(3-6)



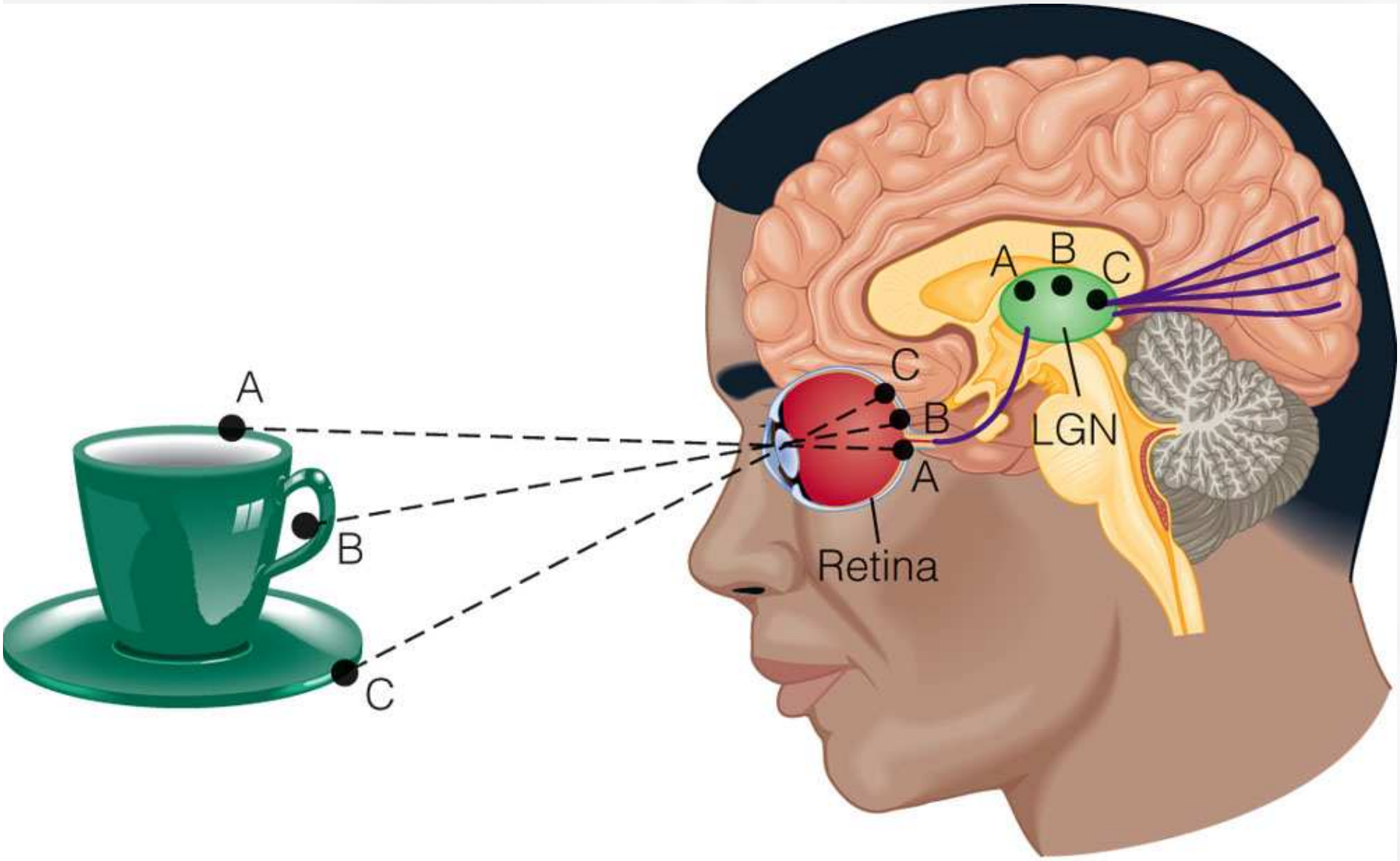
Magnocellular layers
(1 & 2)

Organization in Columns

- LGN receives signals for right and left eyes
  - Layers 2, 3, and 5 receive input from the ipsilateral eye
  - Layers 1, 4, and 6 receive input from the contralateral eye
- Electrodes inserted perpendicular to the surface show that receptive fields along the track are in the same location in the retina



The Retinotopic Map in the LGN



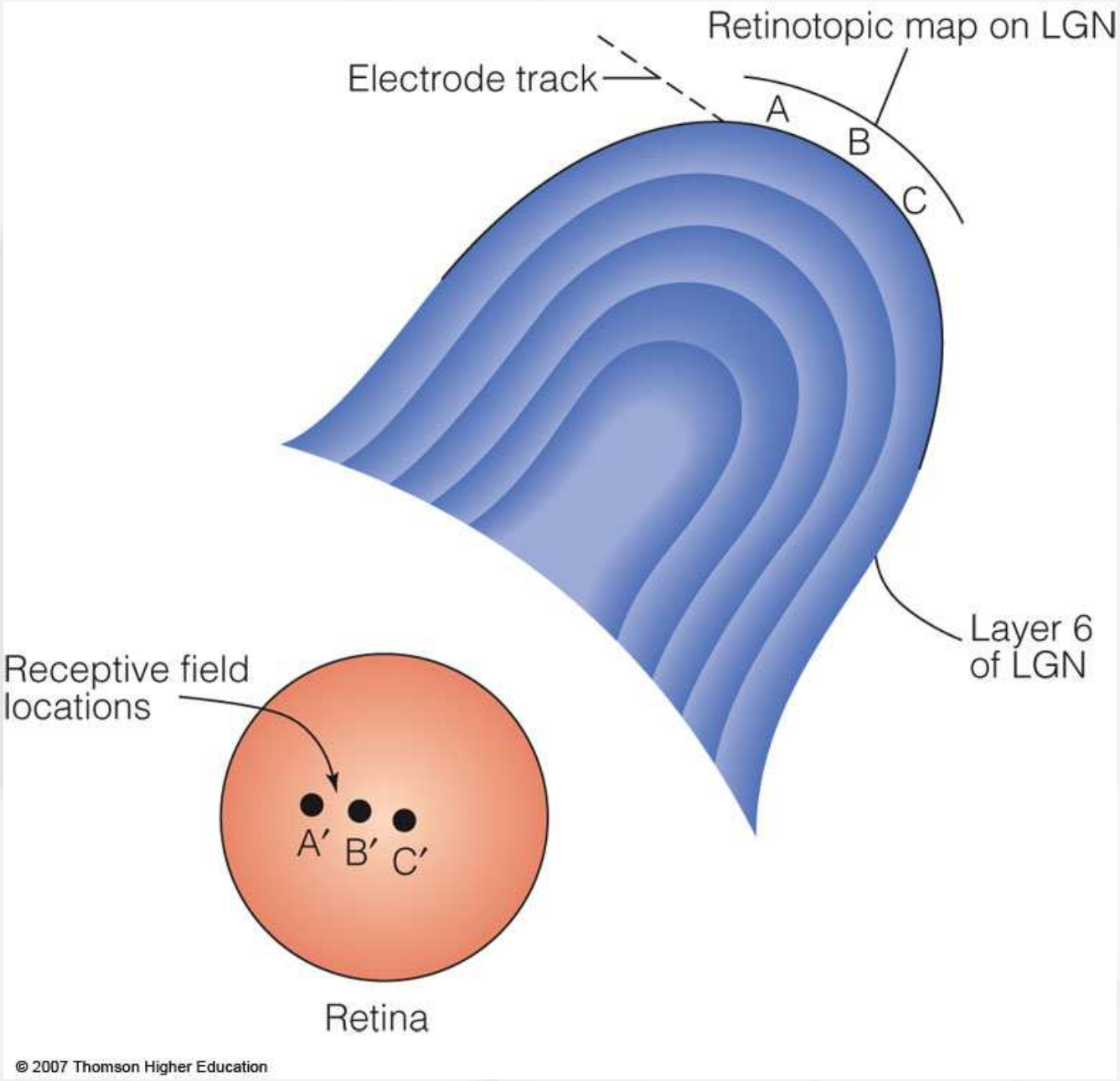
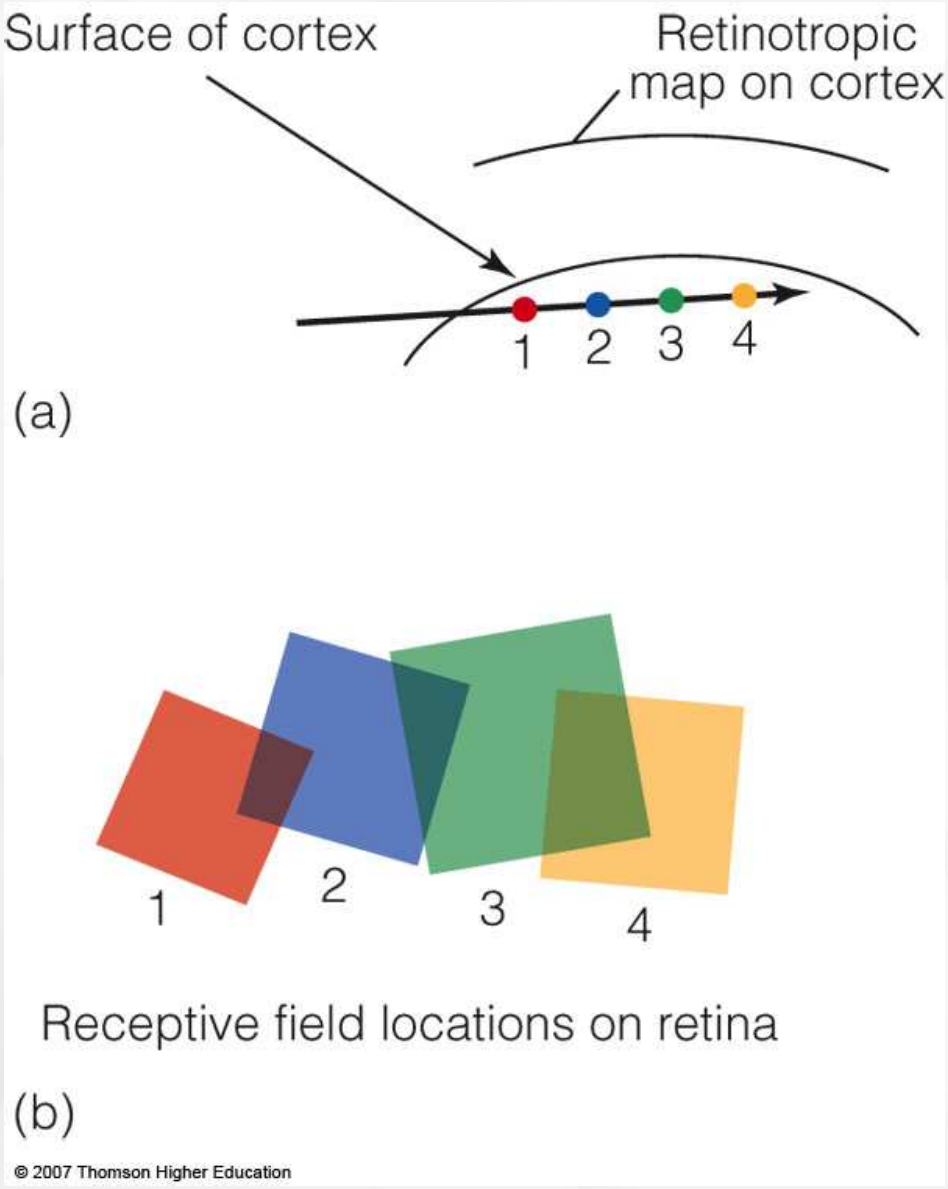


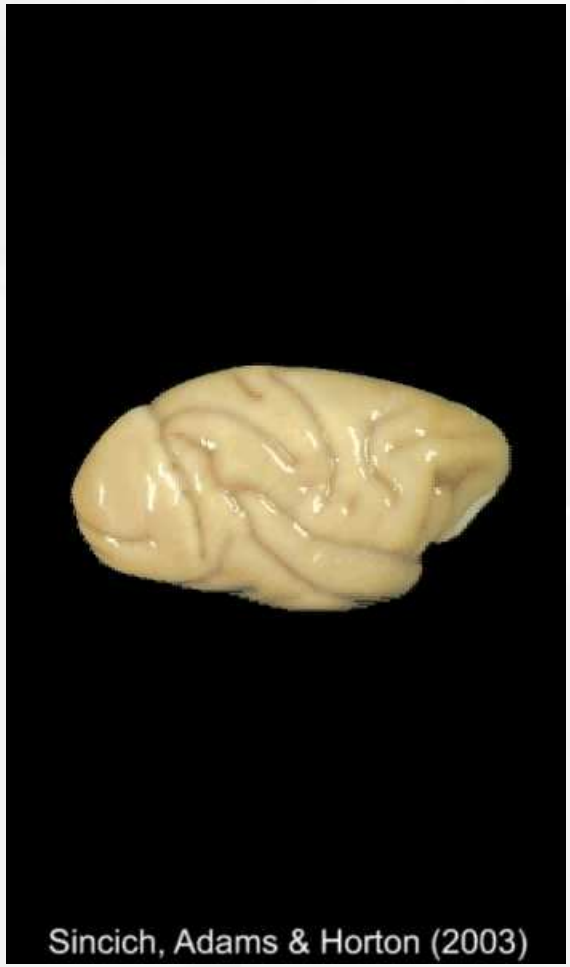
Figure 4.2 Retinotopic mapping of neurons in the LGN. The neurons at A, B, and C in layer 6 of the LGN have receptive fields located at positions A', B', and C' on the retina.

The Retinotopic Map on the Cortex

- Cortex shows retinotopic map too
  - Electrodes recording from a cat's visual cortex shows:
    - Receptive fields on the retina that overlap also overlap in the cortex
    - This pattern is seen using an oblique penetration of the cortex

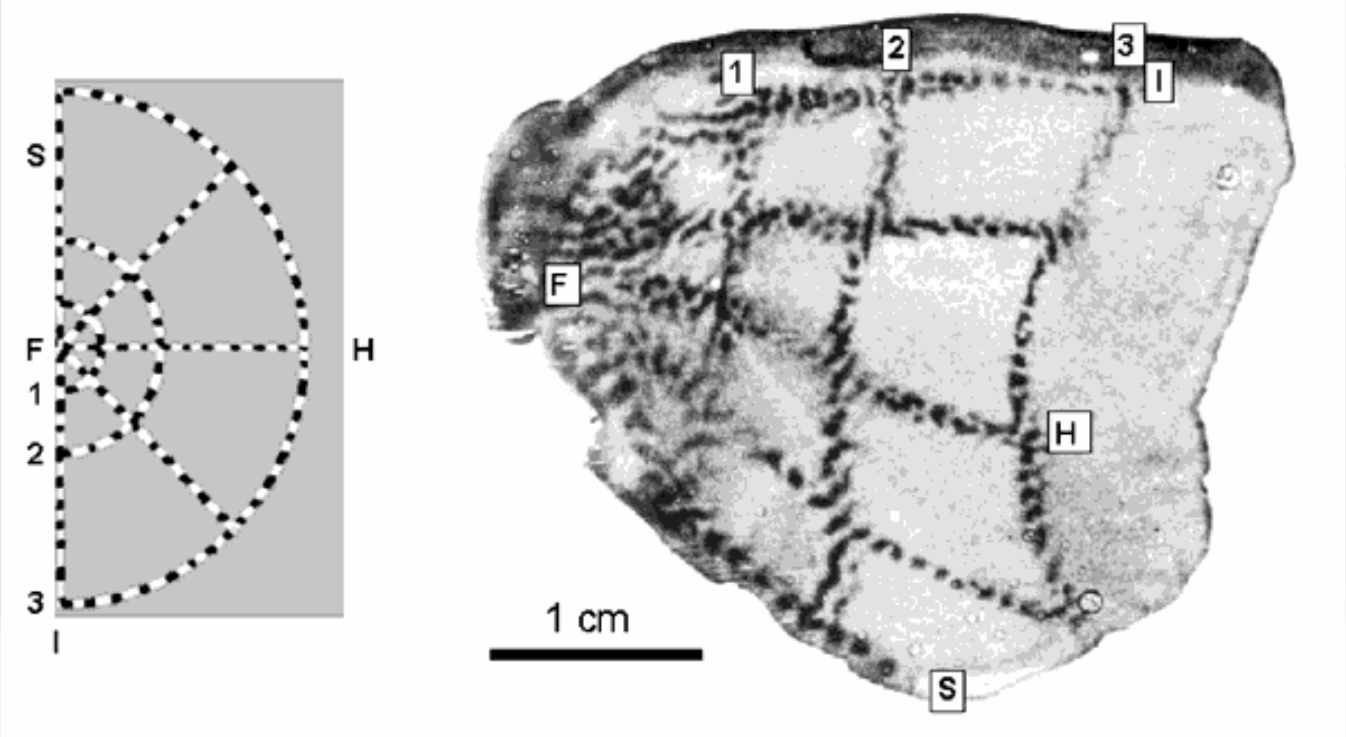


Retinotopic maps are best visualized on a flattened cortex



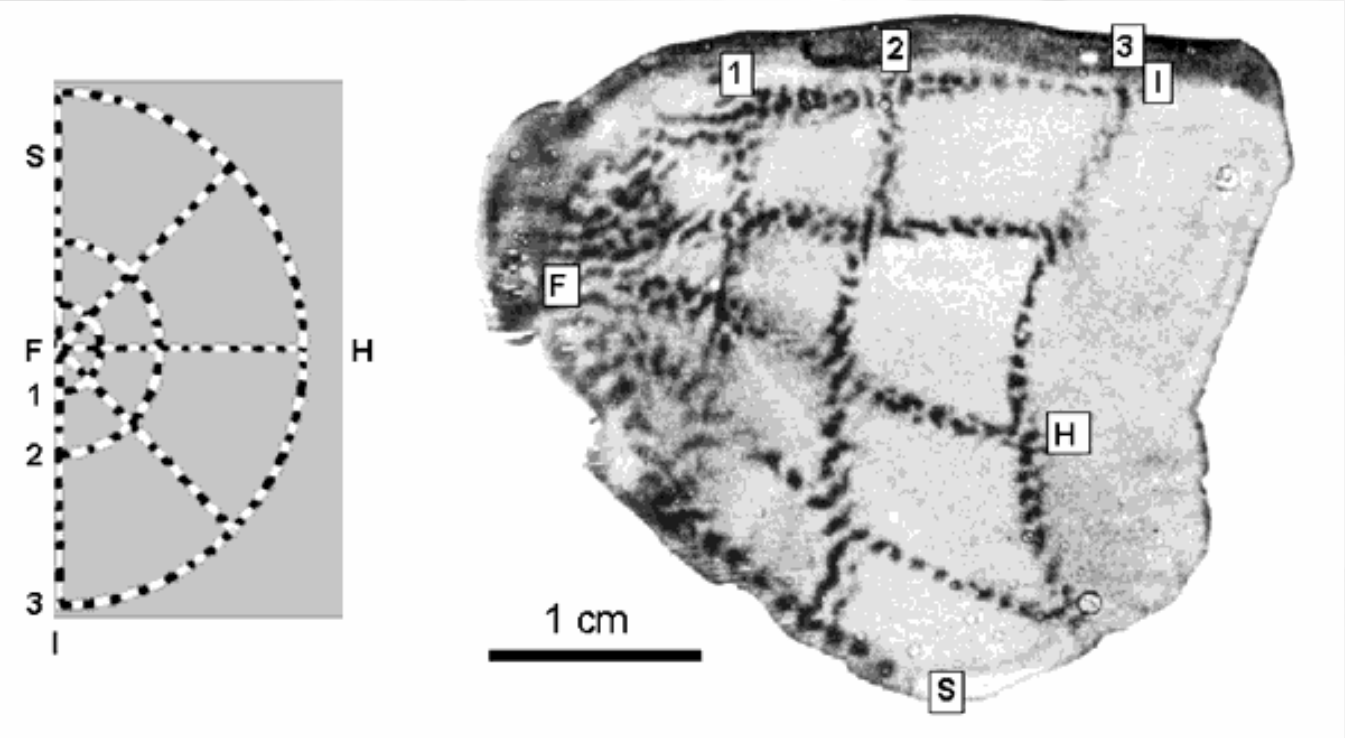
Retinotopic maps are best visualized on a flattened cortex

Macaque primary visual cortex



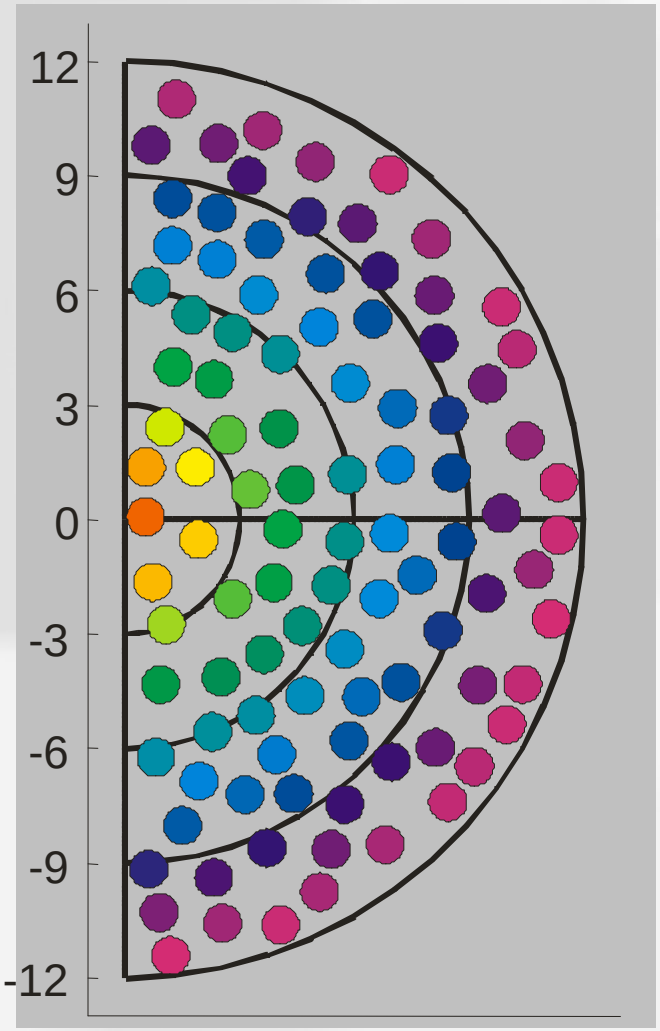
The Map on the Cortex - continued

- **Cortical magnification factor**
  - Fovea has more cortical space than expected
    - Fovea accounts for .01% of retina
    - Signals from fovea account for 8% to 10% of the visual cortex
    - This provides extra processing for high-acuity tasks

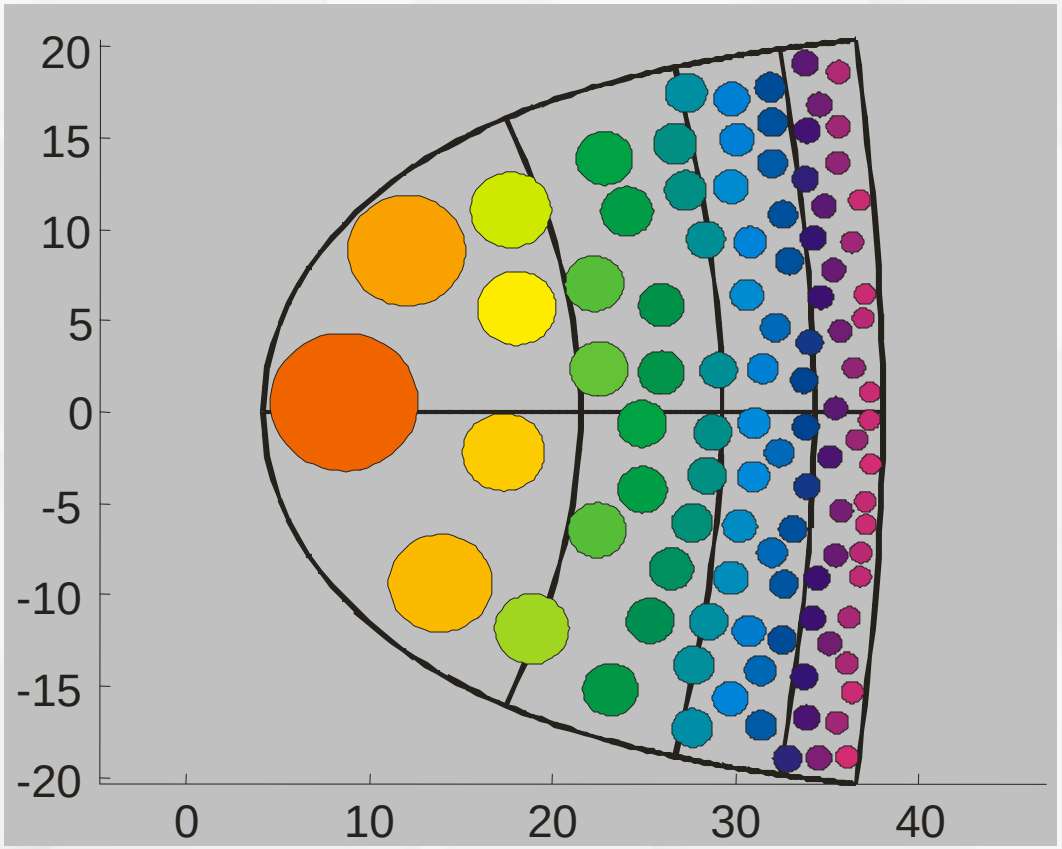


Cortical magnification

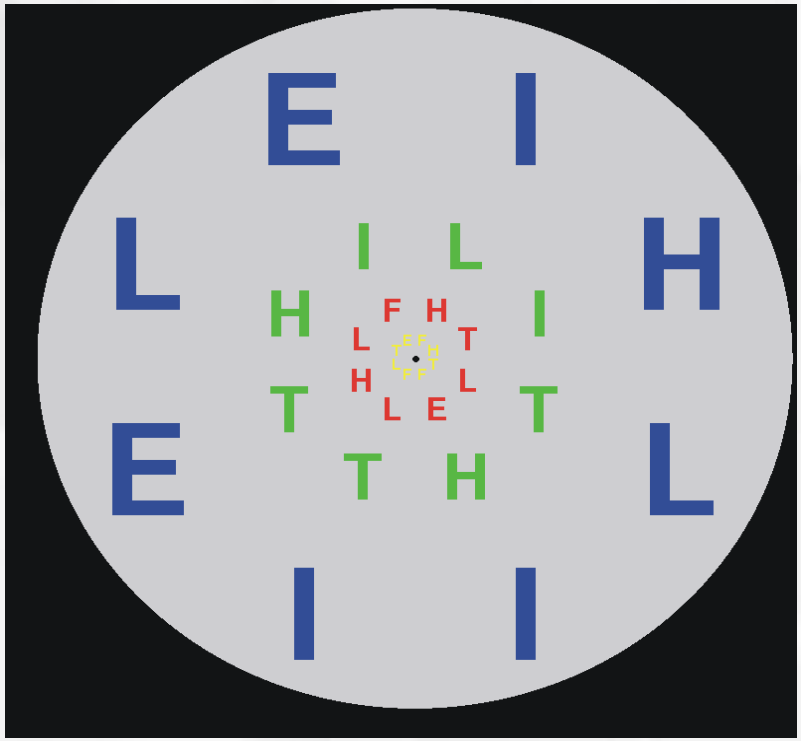
Visual Space



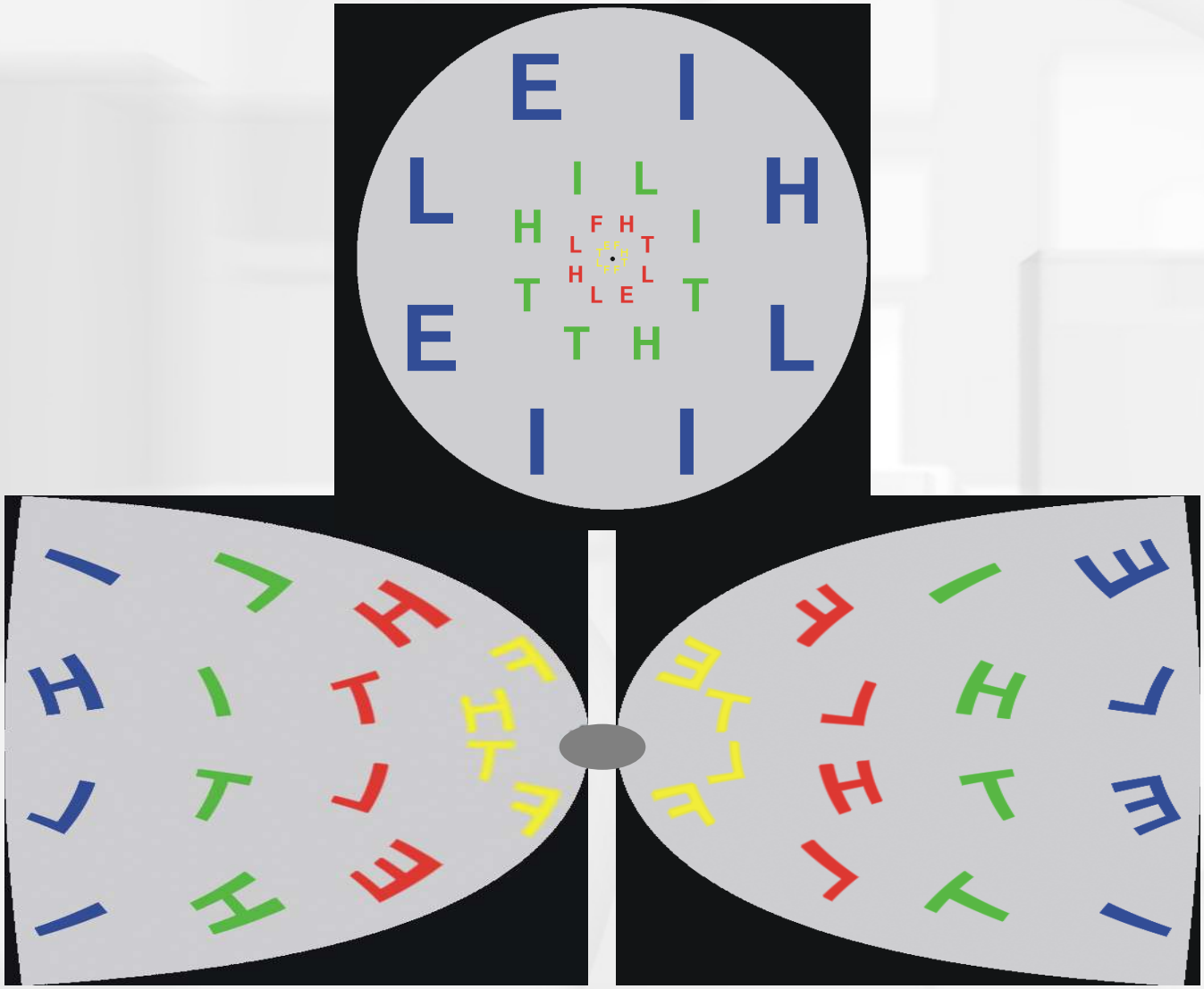
Primary Visual Cortex



Visual acuity is much better toward the fovea

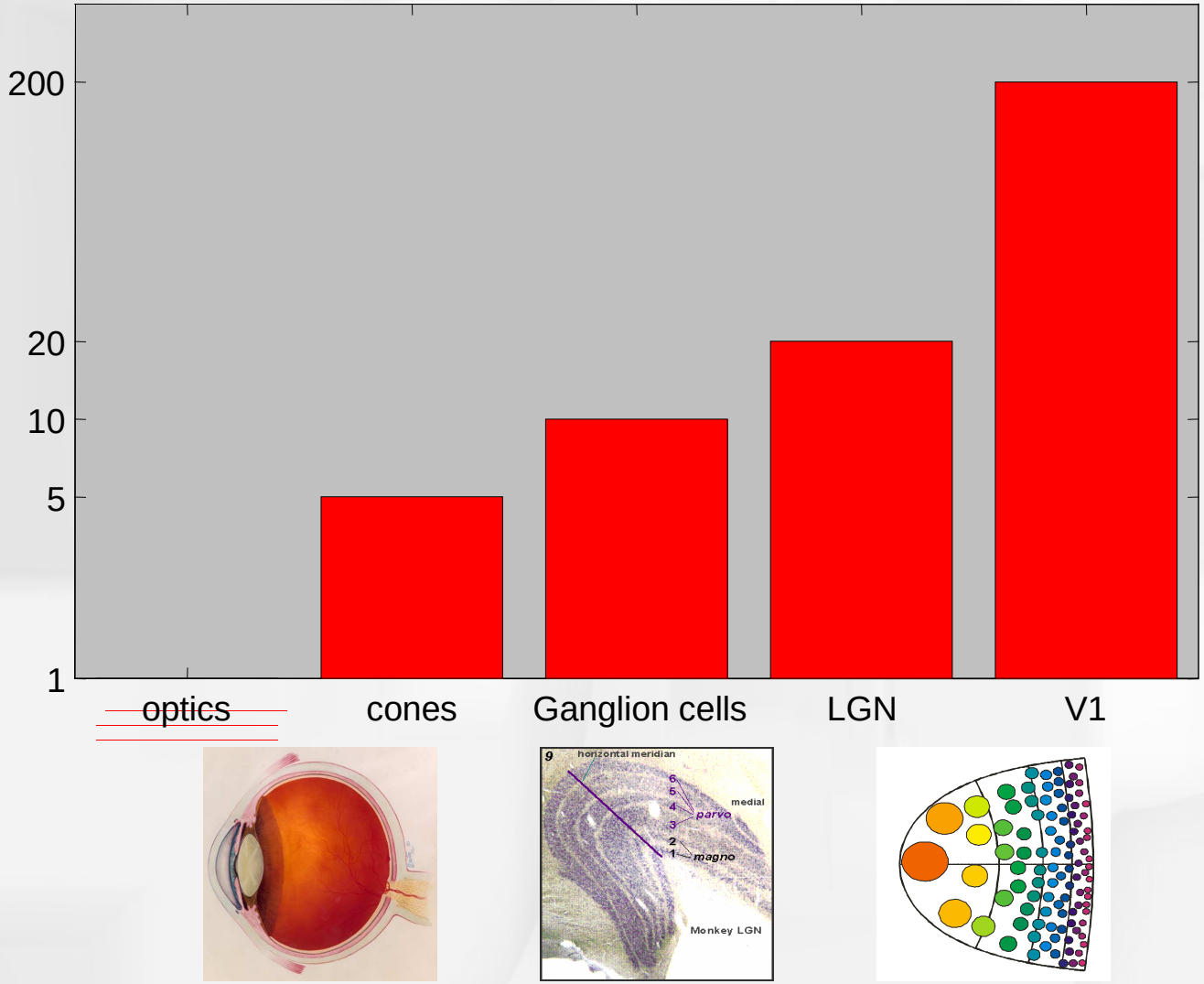


Cortical Magnification: Representation of letters stay the same size across eccentricities in V1.

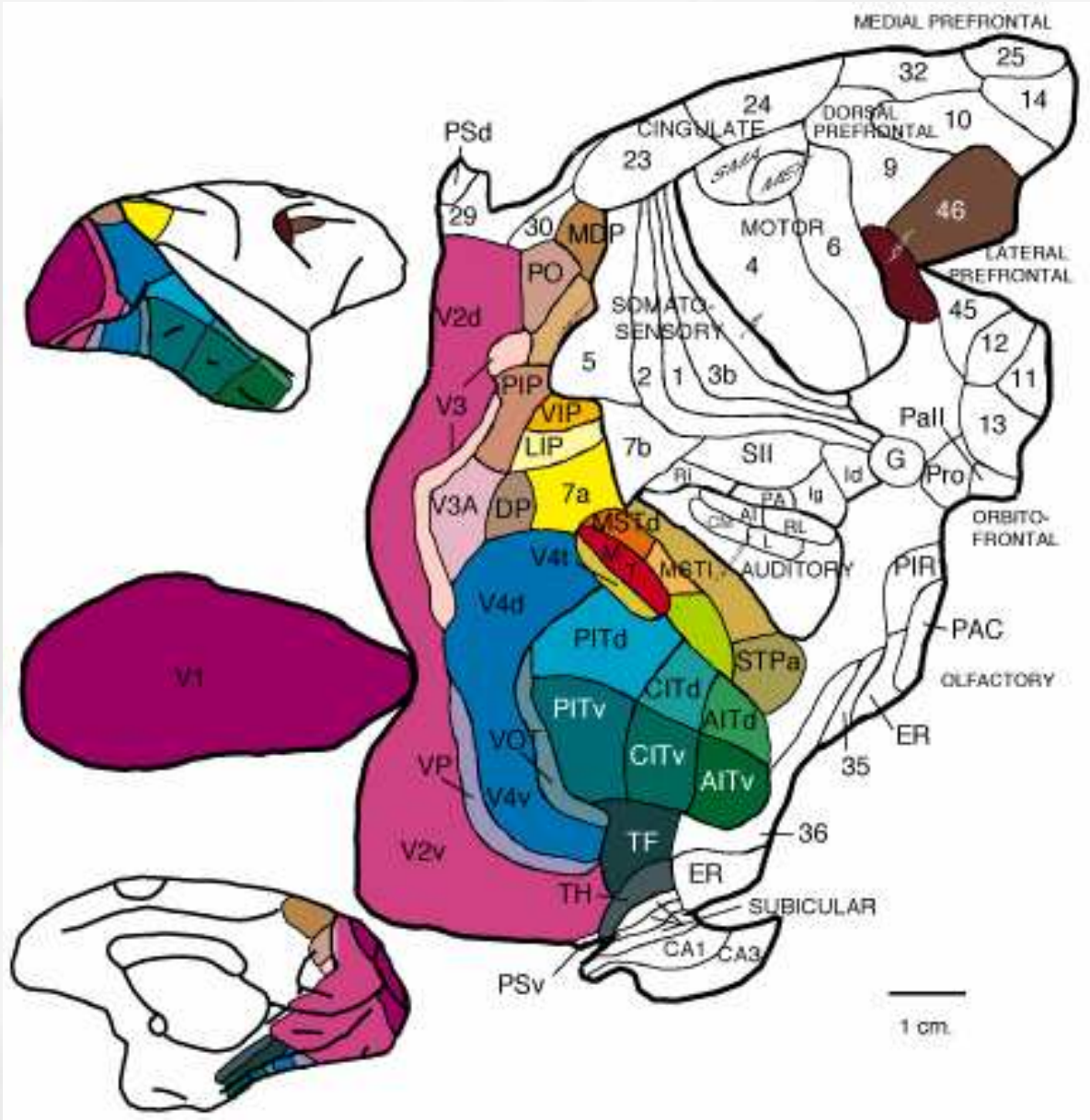


Cortical Magnification

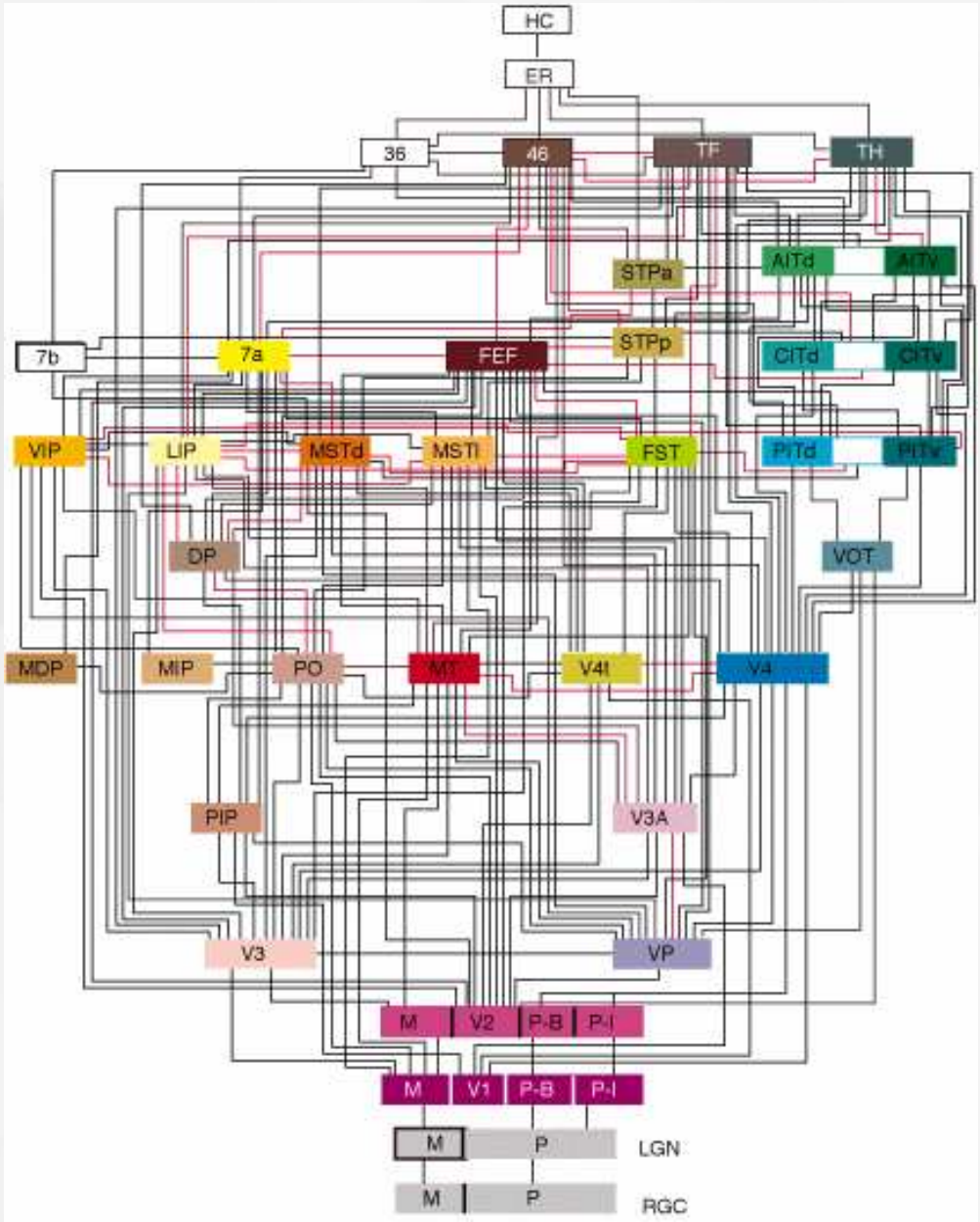
Ratio of spatial sampling at fovea vs. 10 deg eccentricity



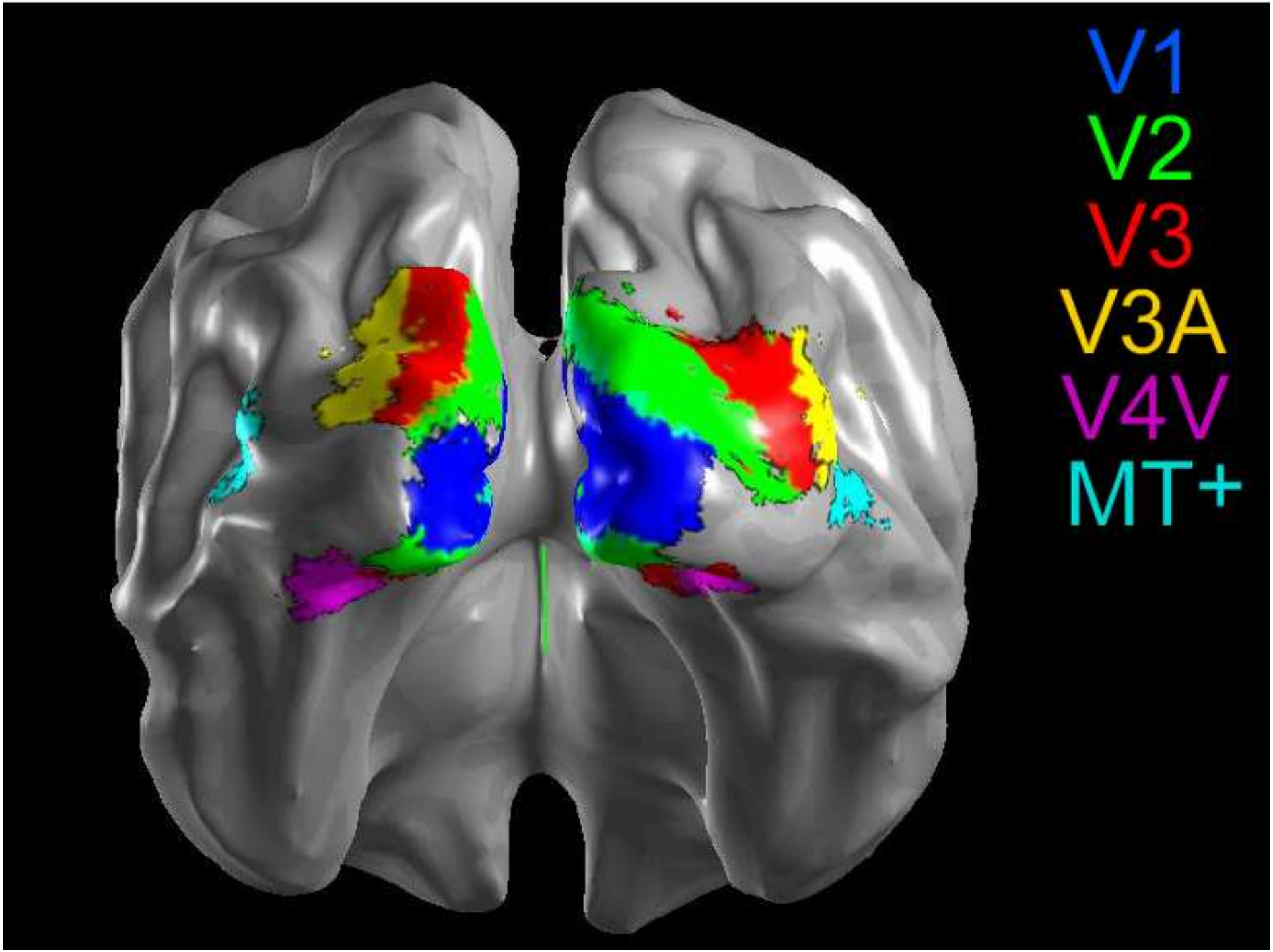
There are many retinotopic maps in the primate visual cortex.



There are many connections between these maps.



from Felleman and Van Essen (1991)


V1
V2
V3
V3A
V4V
MT+

functional MRI (fMRI)

Traditional MRI relies on the differences in magnetic susceptibility of tissue, such as gray matter, white matter, CSF etc.