



# PERCEPTION

PSY435

# Sensation & Perception

- *What's the difference?*

# Sensation & Perception

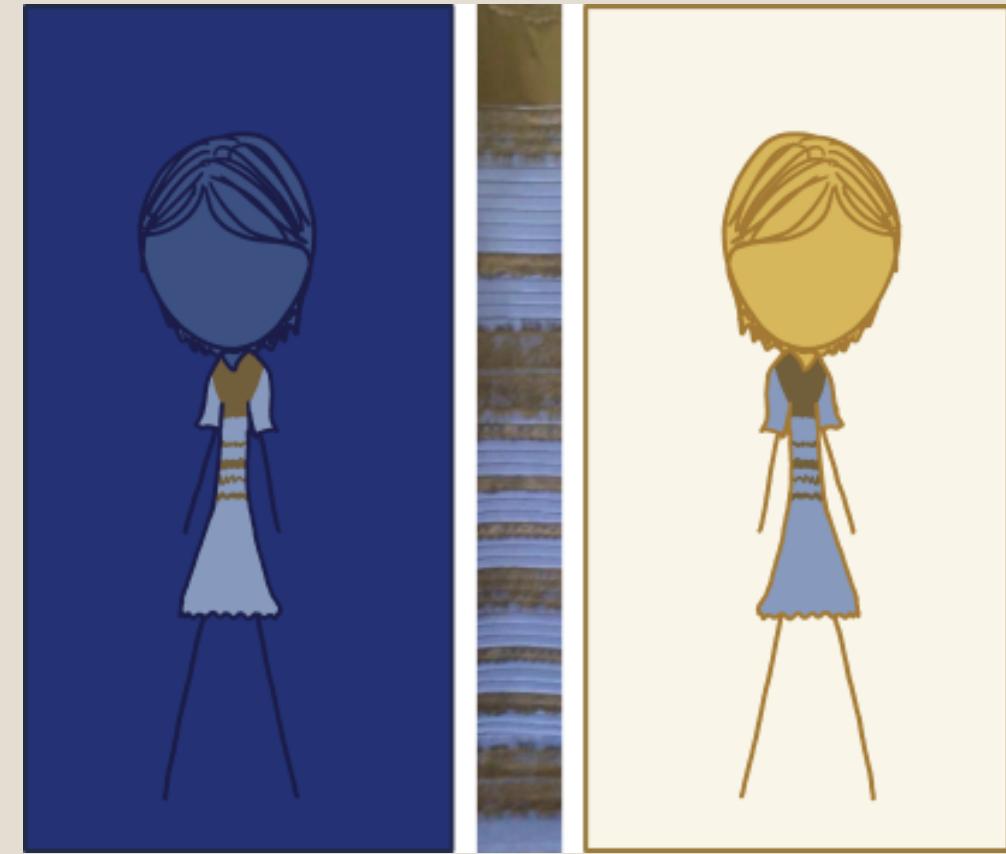
- Sensation is the physical stimulation of bodily organs
- Perception is the conscious experience of different phenomena that are grounded in sensation

# Sensation & Perception

- We never directly experience sensory stimulation from the outside world
- It is always processed, created, and emergent from our being-in-the-world
- This happens in our brains, and our bodies
- Even at the earliest stages



And sometimes not everyone  
perceives the same sensation...



# There are more than just “five senses”

- Perception comes in a number of modalities
- Vision
- Audition
- Somatosensation
- Vestibular
- Gustatory
- Olfactory
- Taste
- Time

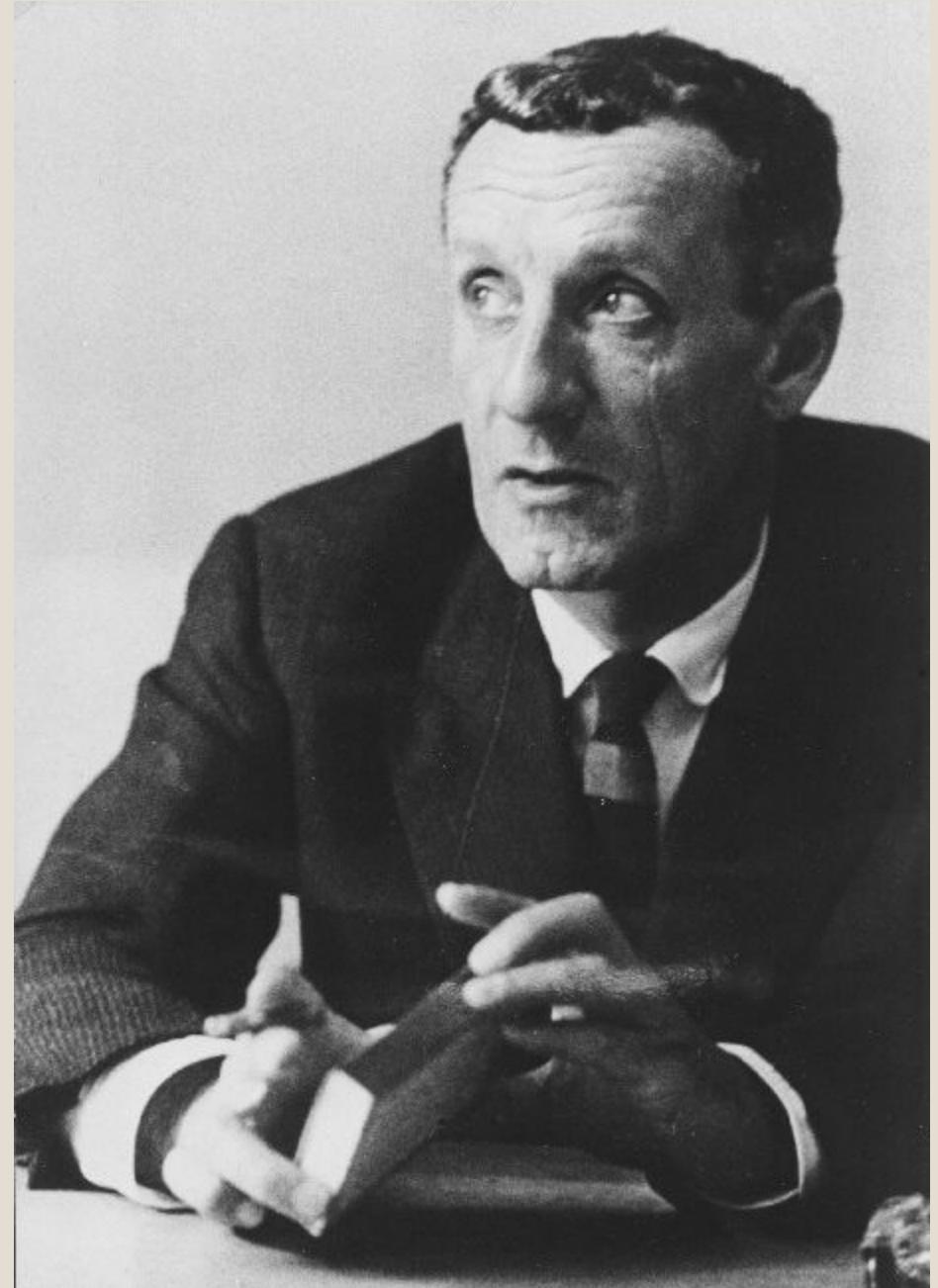
# Integration of Modalities

- We do not experience these as separate, but rather as part of a unified field of experience
- This is substantiated in the brain, and synesthesia is an extreme form of this

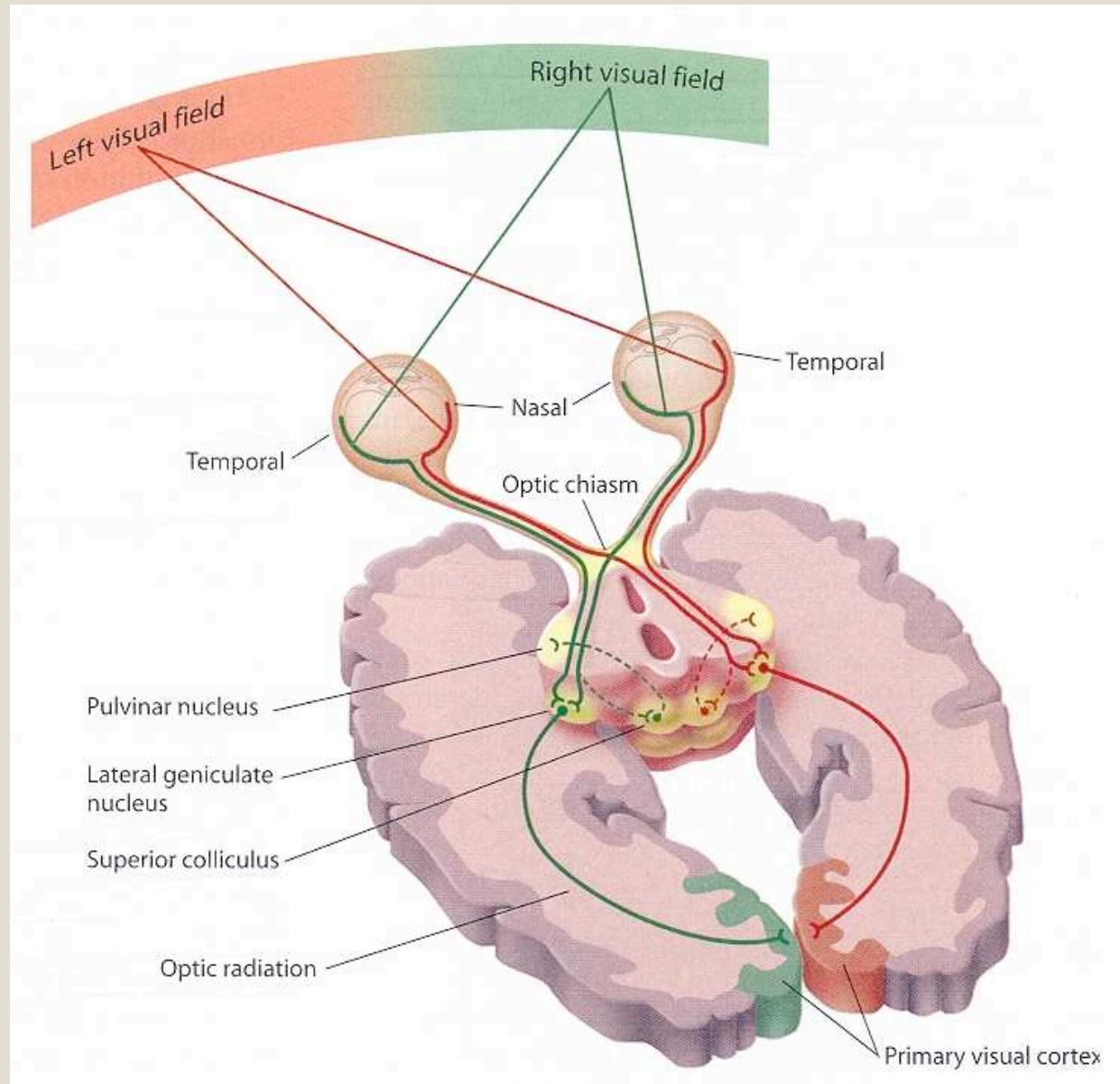


# Merleau-Ponty

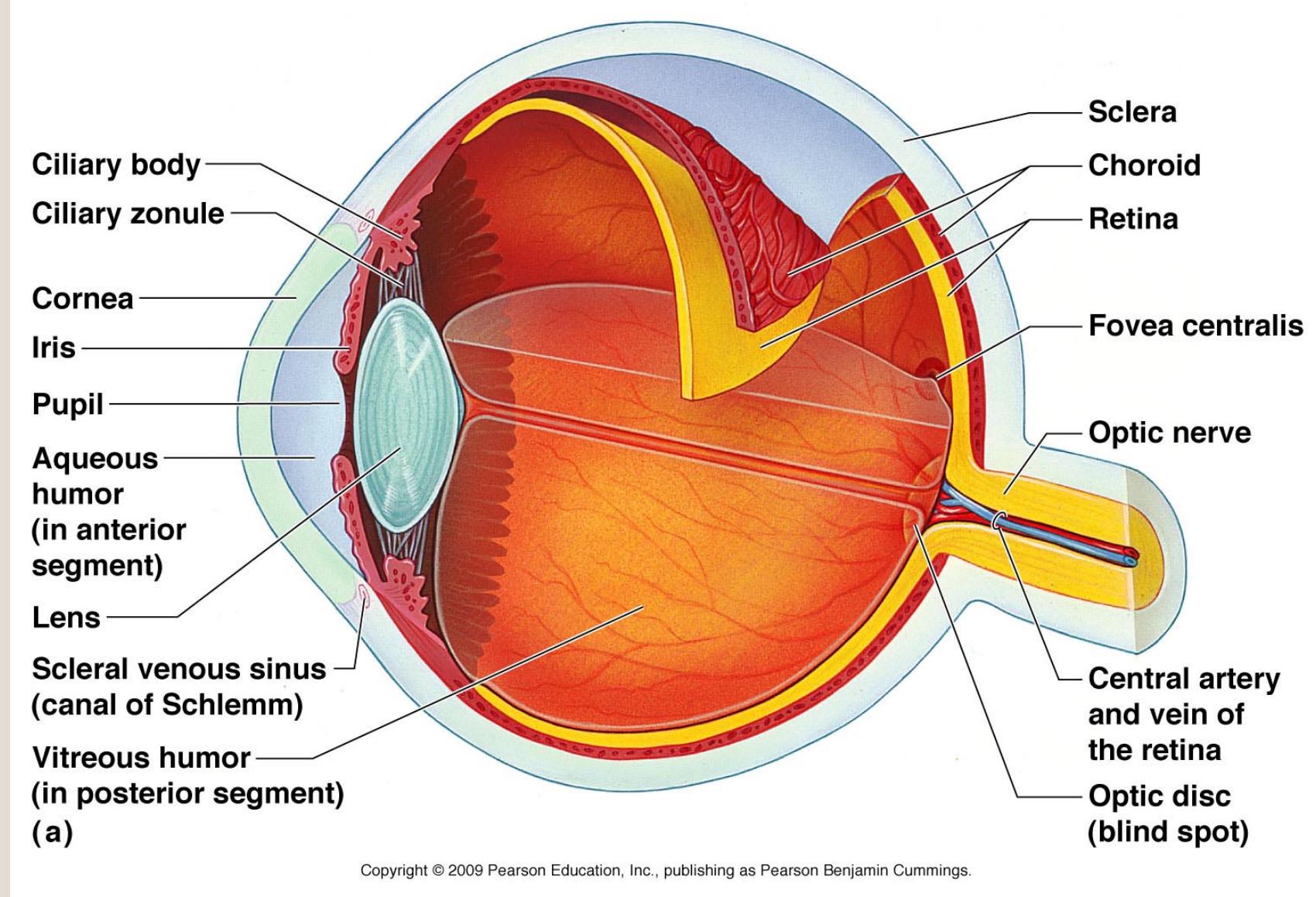
- “For the subject does not tell us merely that he has a sound and a color at the same time: it is the sound itself that he sees, at the place where colors form. This formula is literally rendered meaningless if vision is defined by the visual quale, or sound by the sonorous quale. But it falls us to construct our definitions in such a way as to find a sense for this experience, since the vision of sounds or the hearing of colors exist as phenomena. And they are hardly exceptional phenomena. Synesthetic perception is the rule...”
  - - Phenomenology of Perception

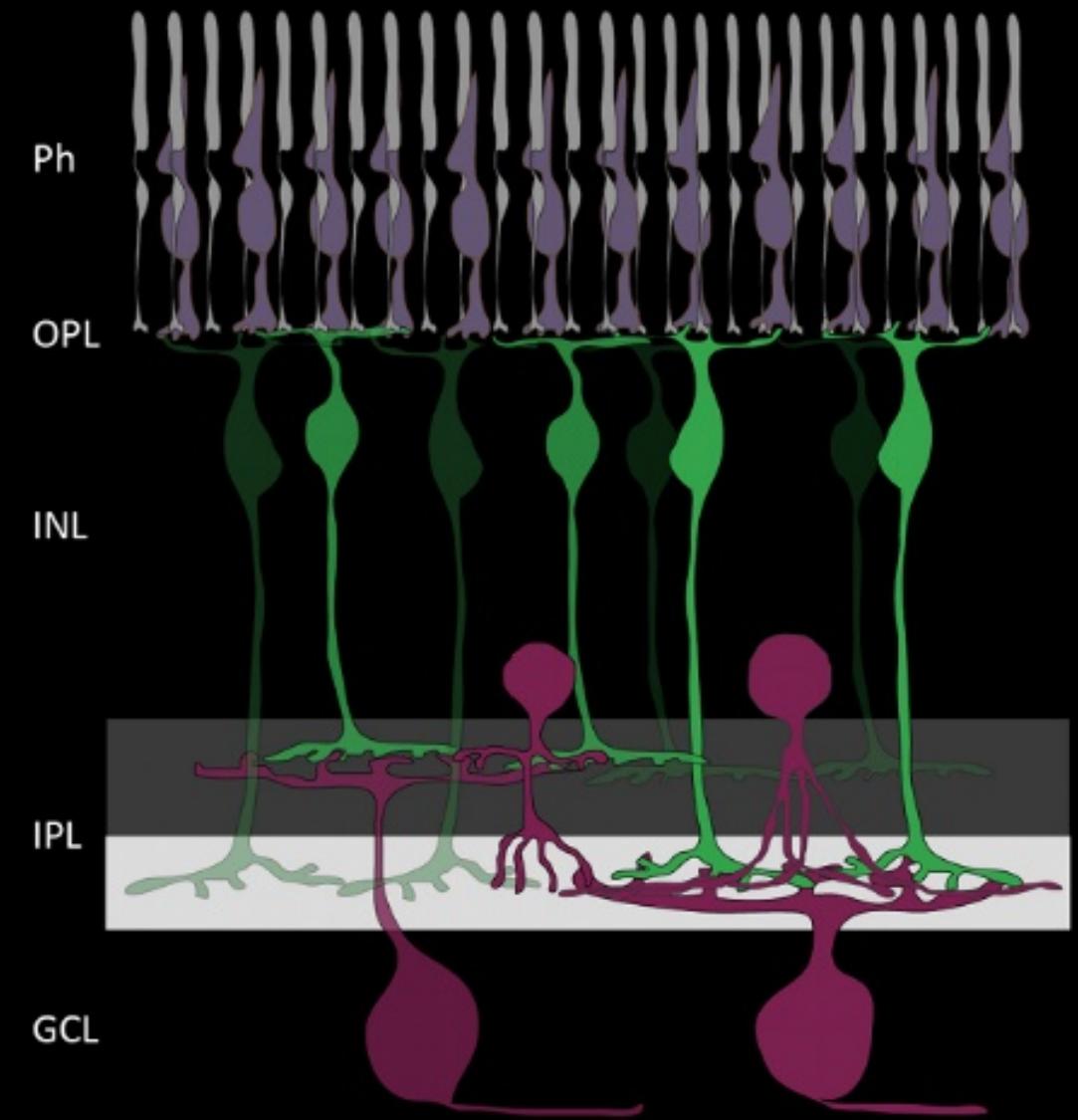
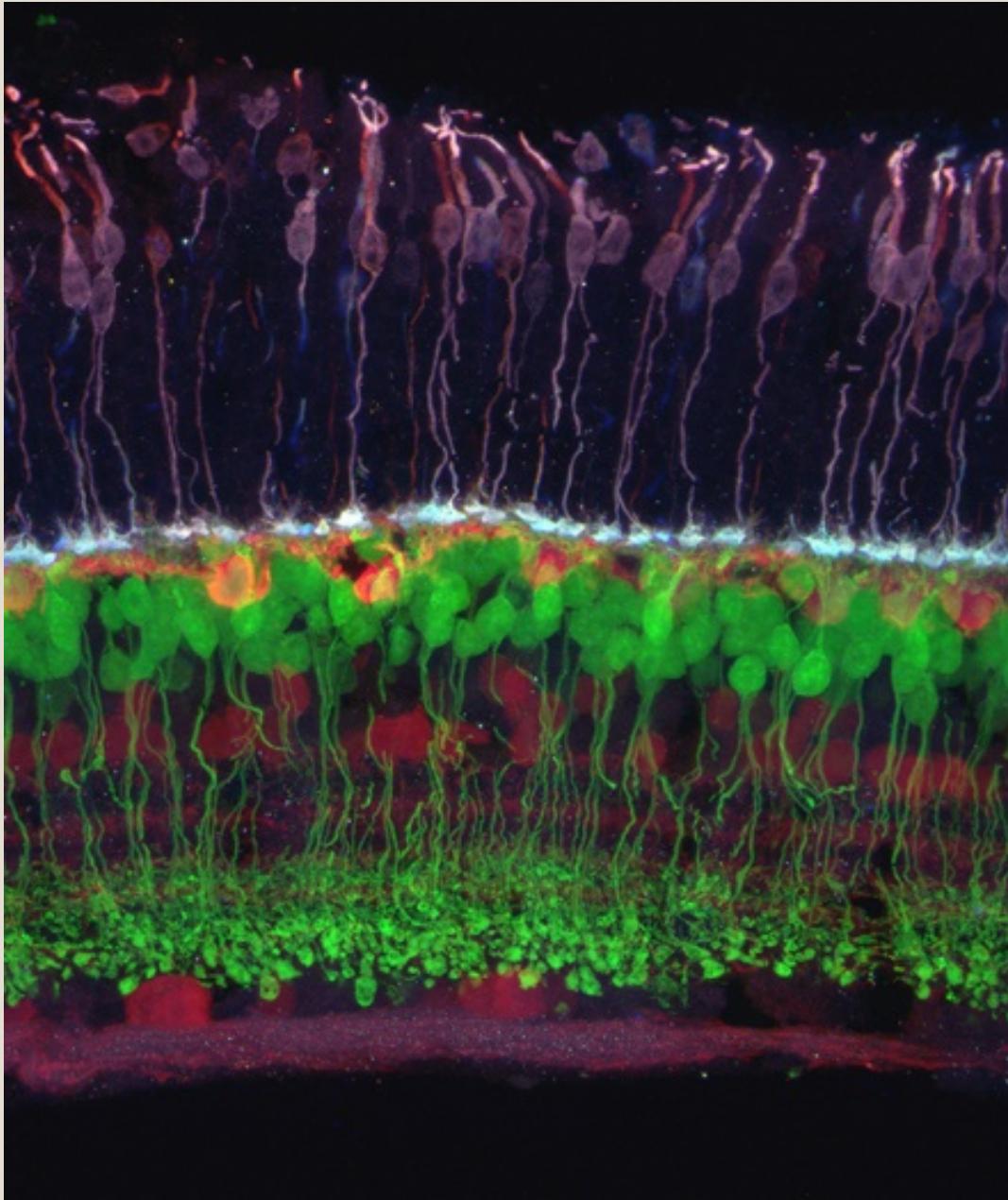


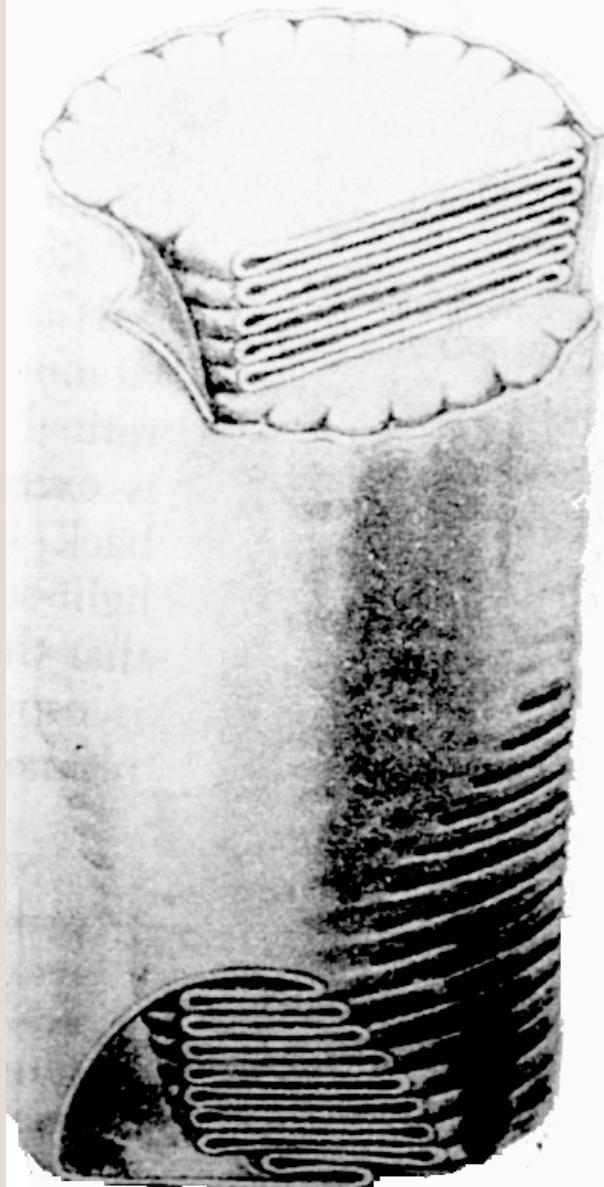
# Visual System



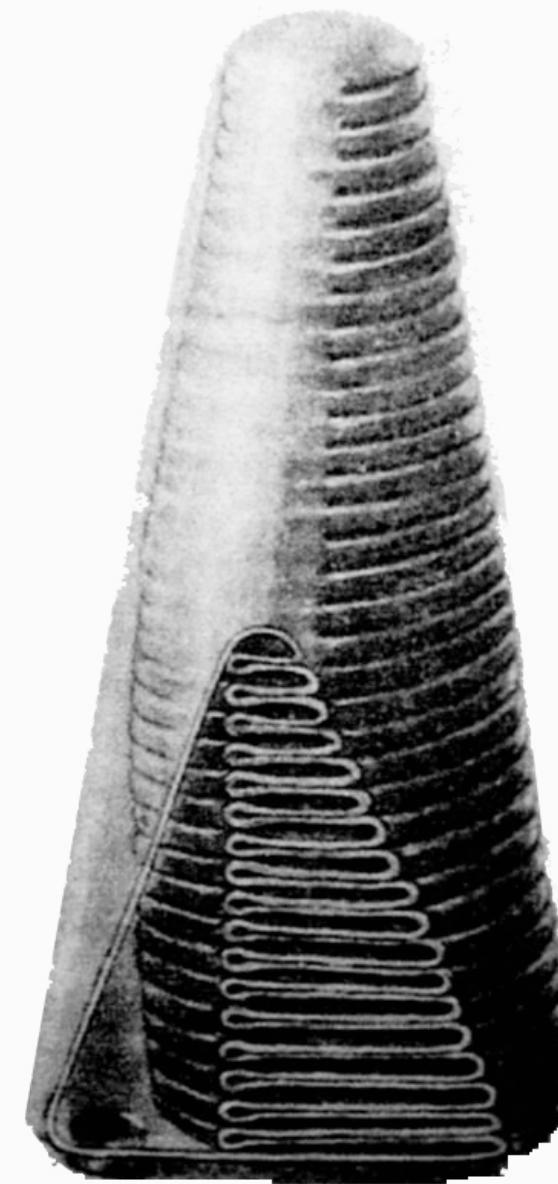
# In the eye...



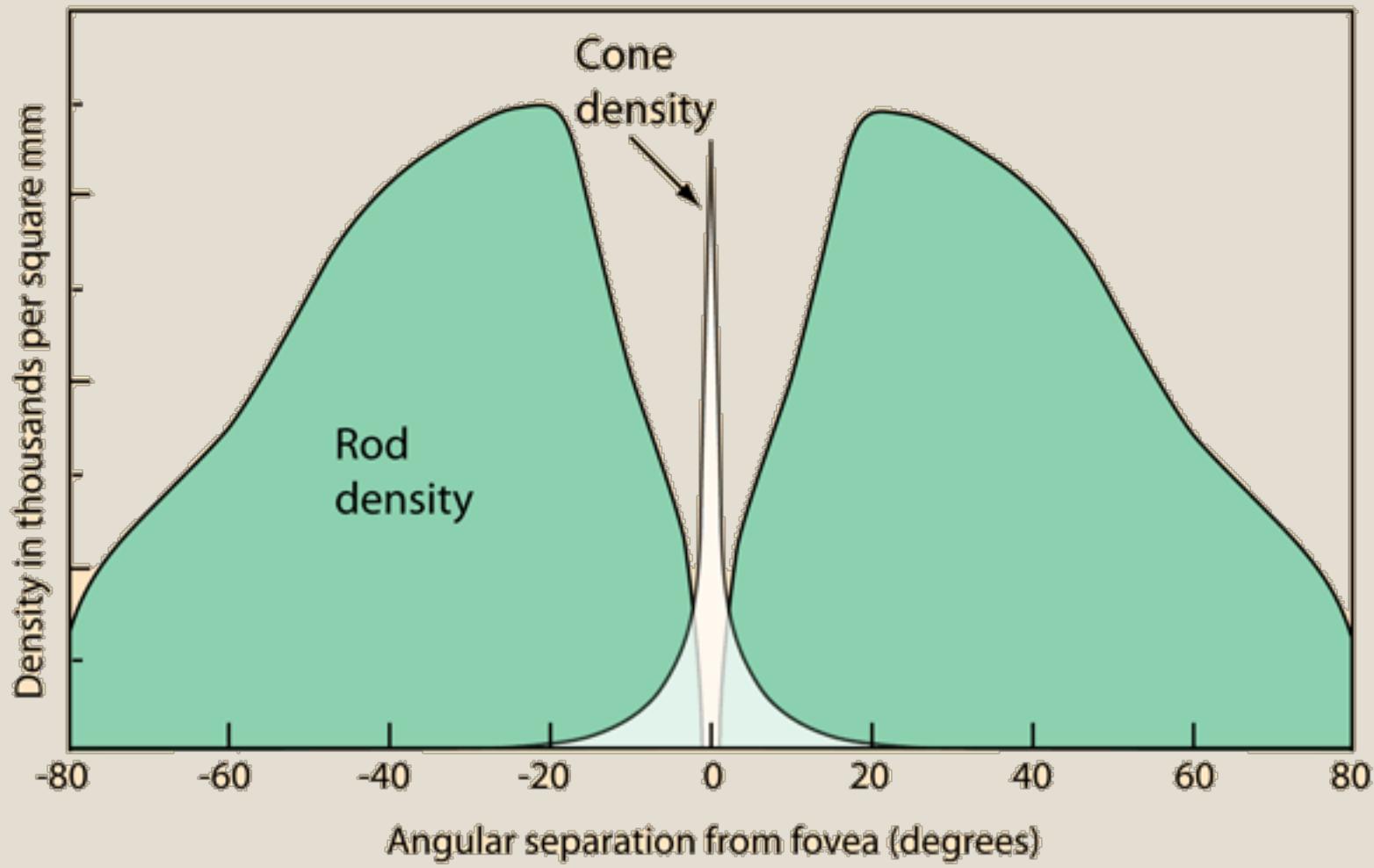


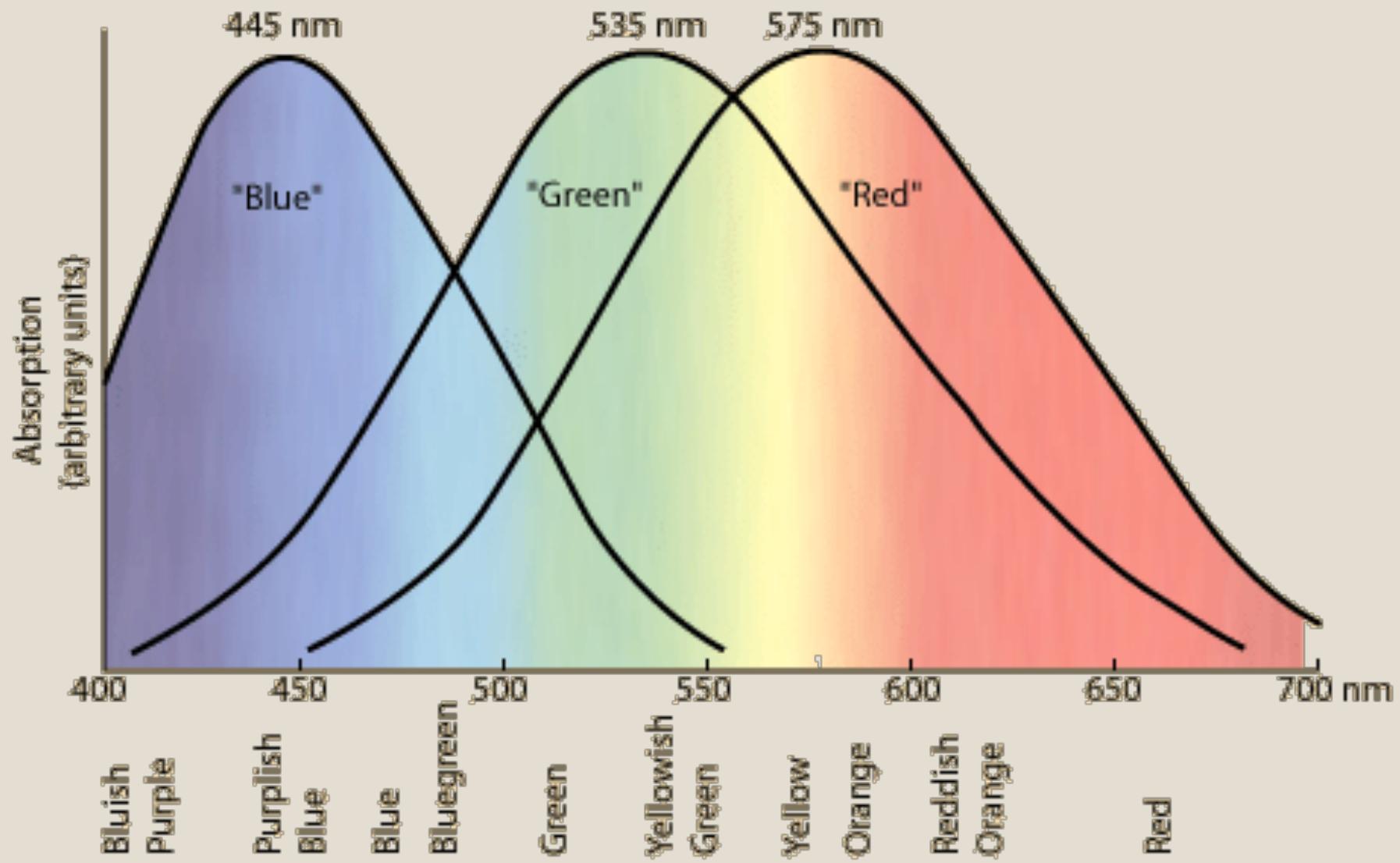


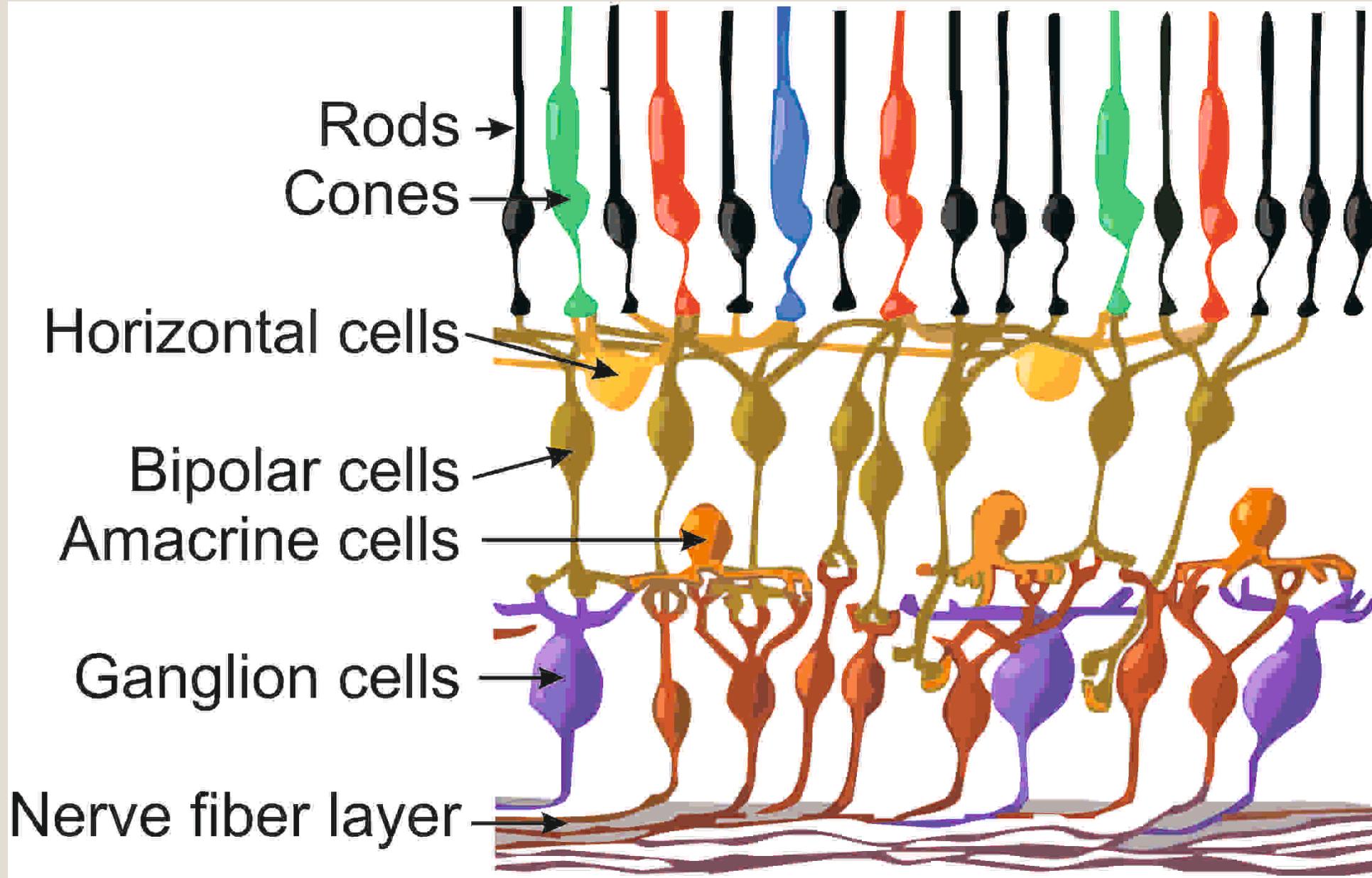
**ROD**



**CONE**

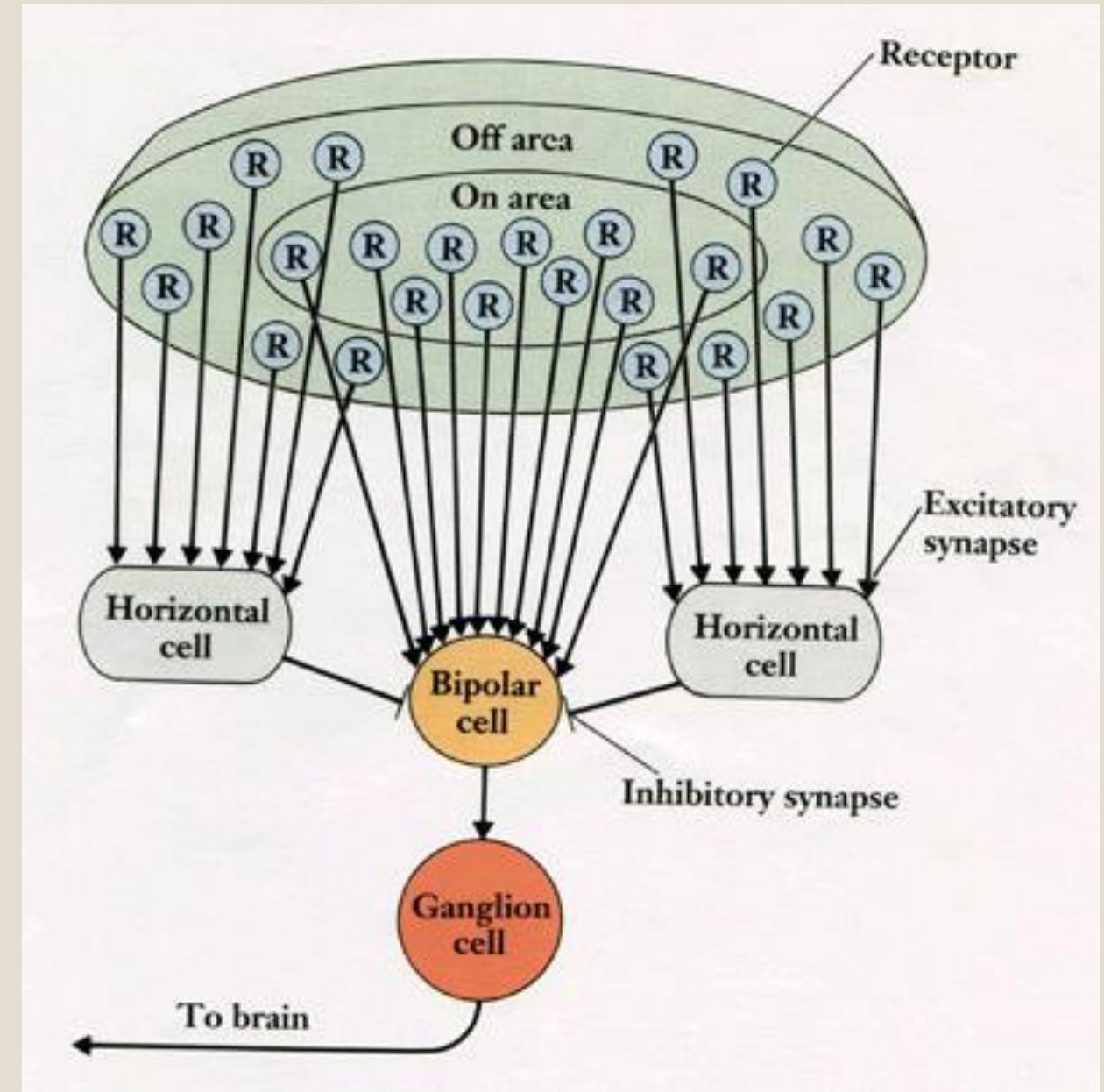


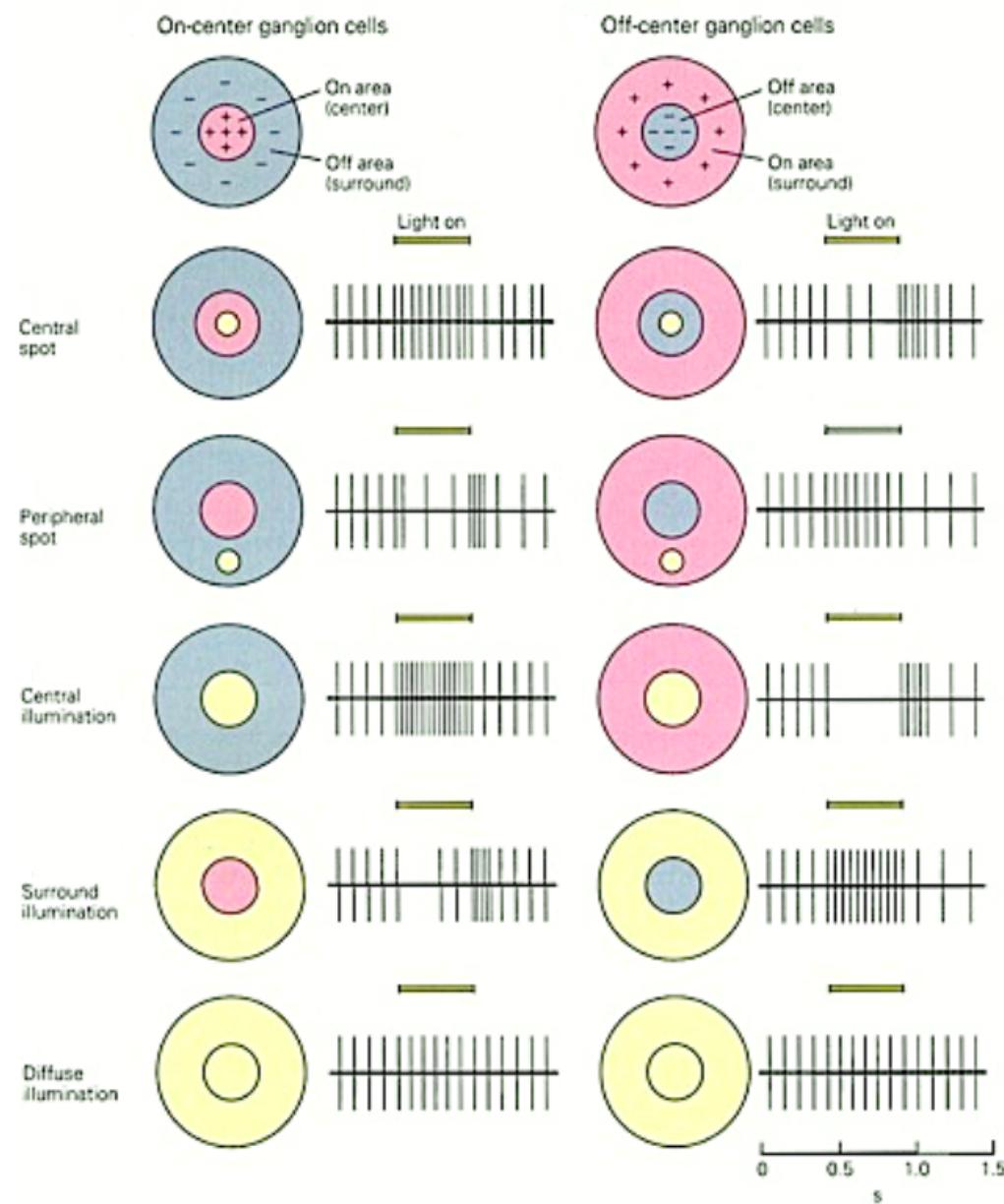
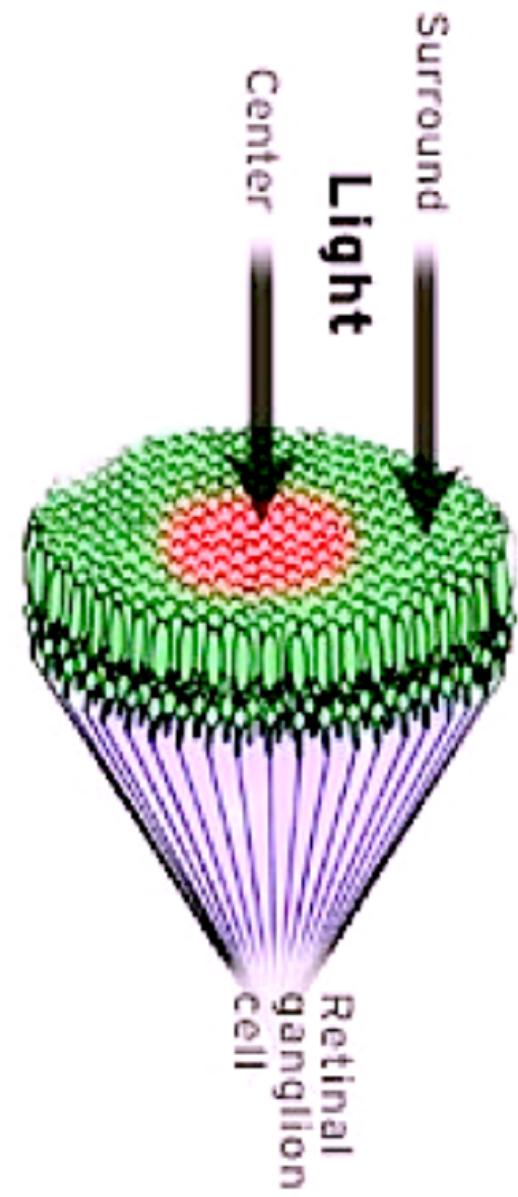




# Receptive Fields

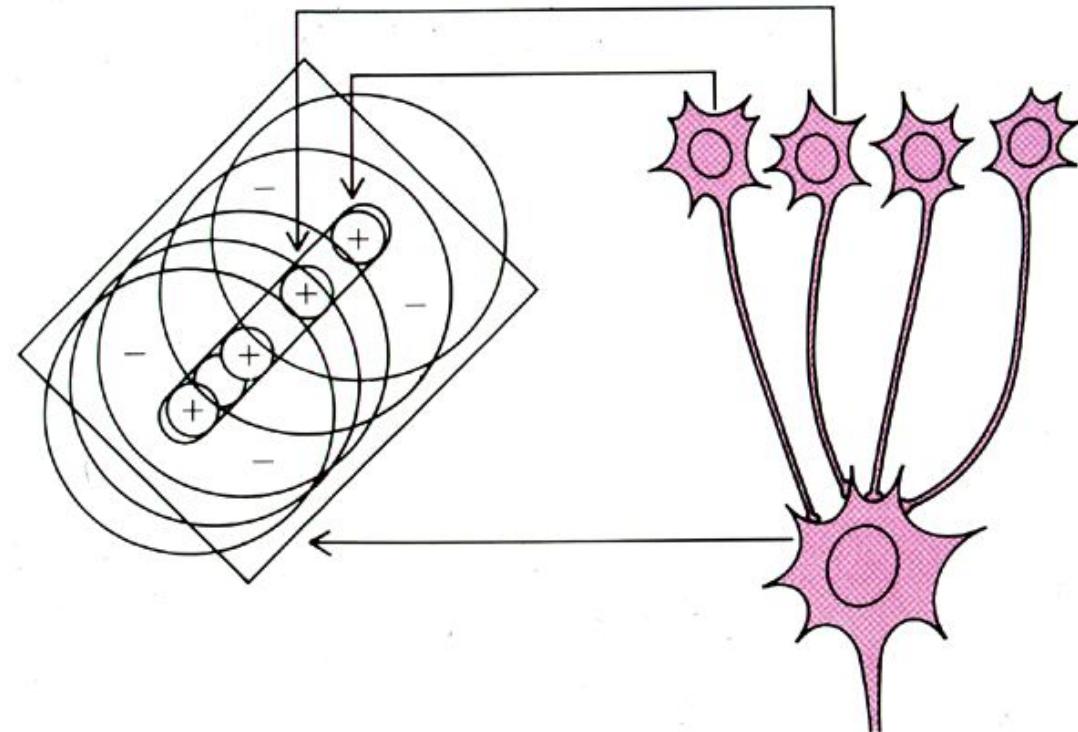
On-center / Off-surround





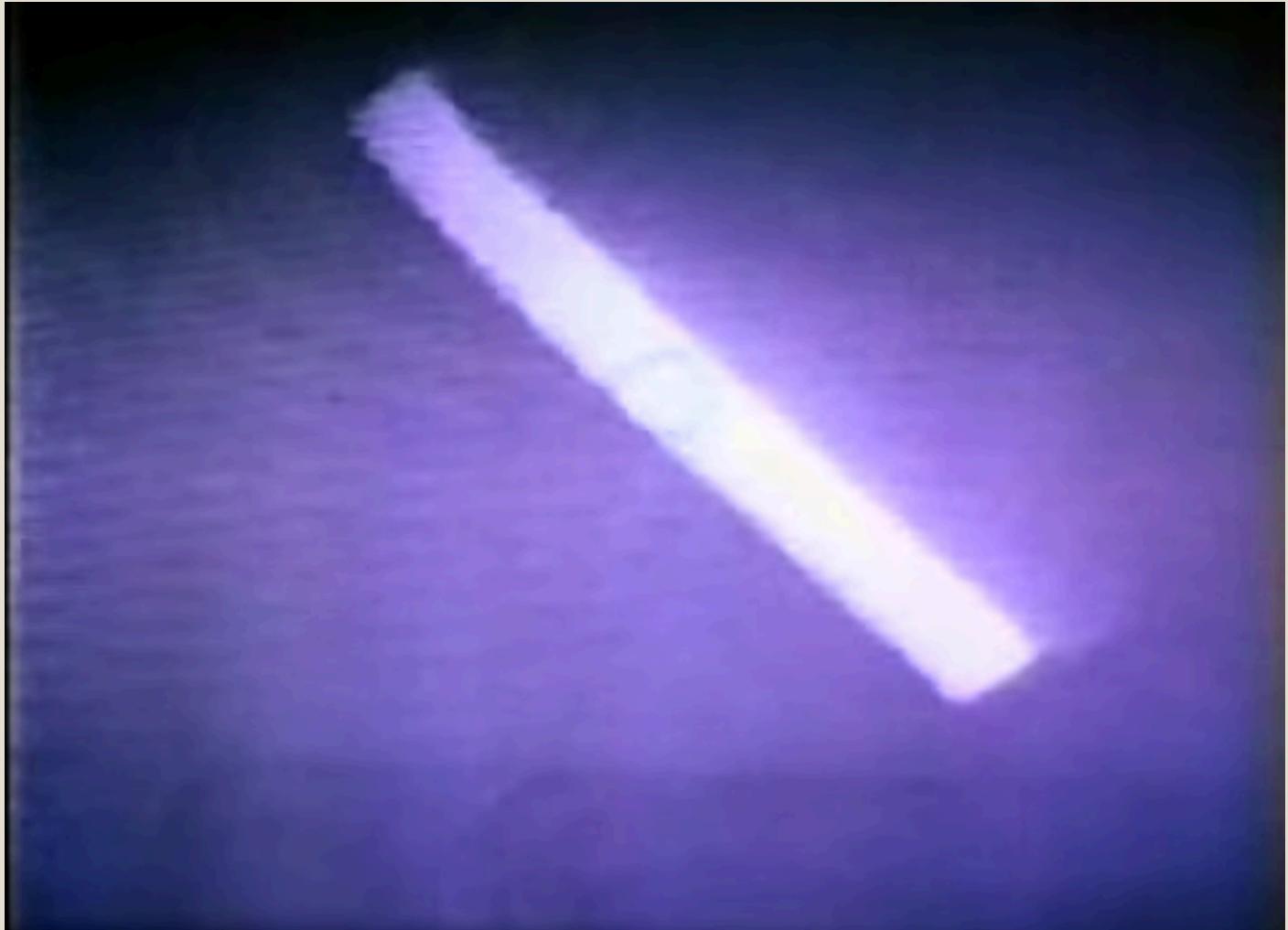
# Beams of light

Simple cell sums LGN inputs



Hubel &  
Wiesel

[https://www.  
youtube.co  
m/watch?v=  
KE952yueVLA](https://www.youtube.com/watch?v=KE952yueVLA)



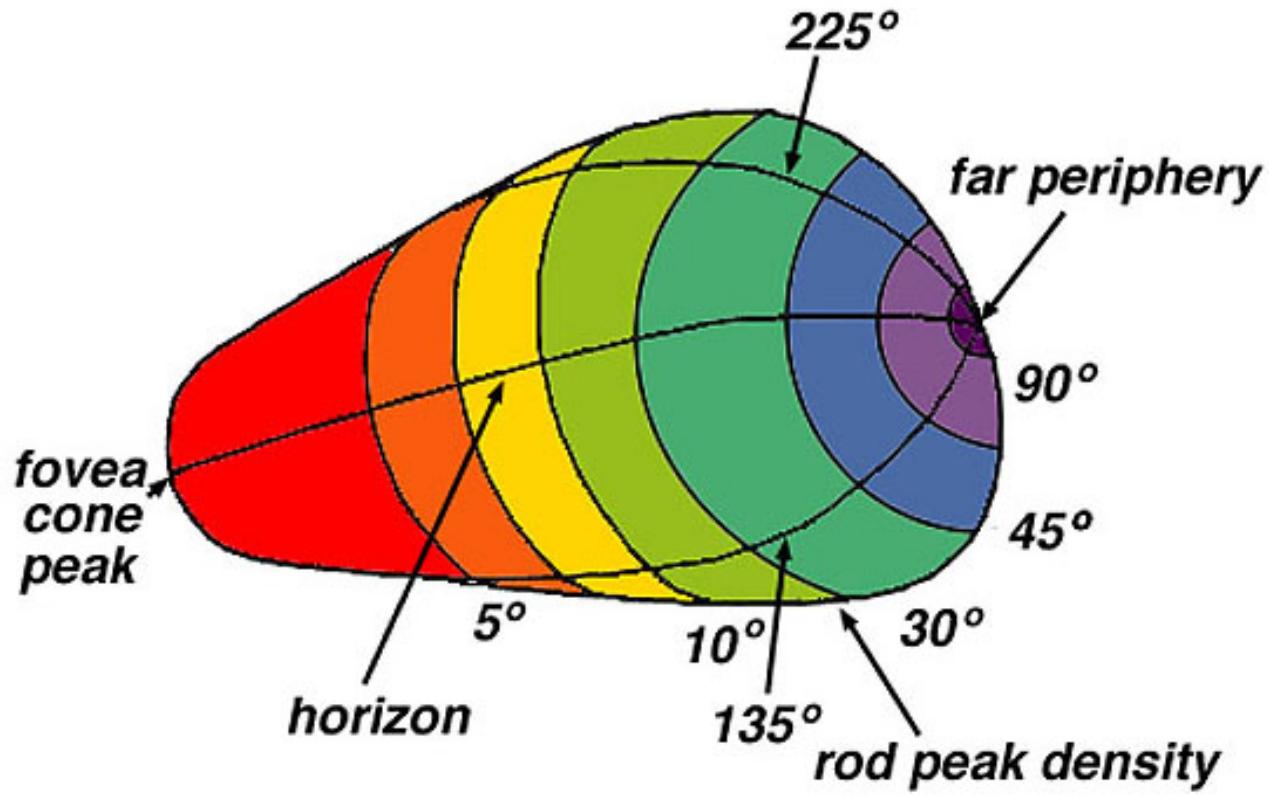
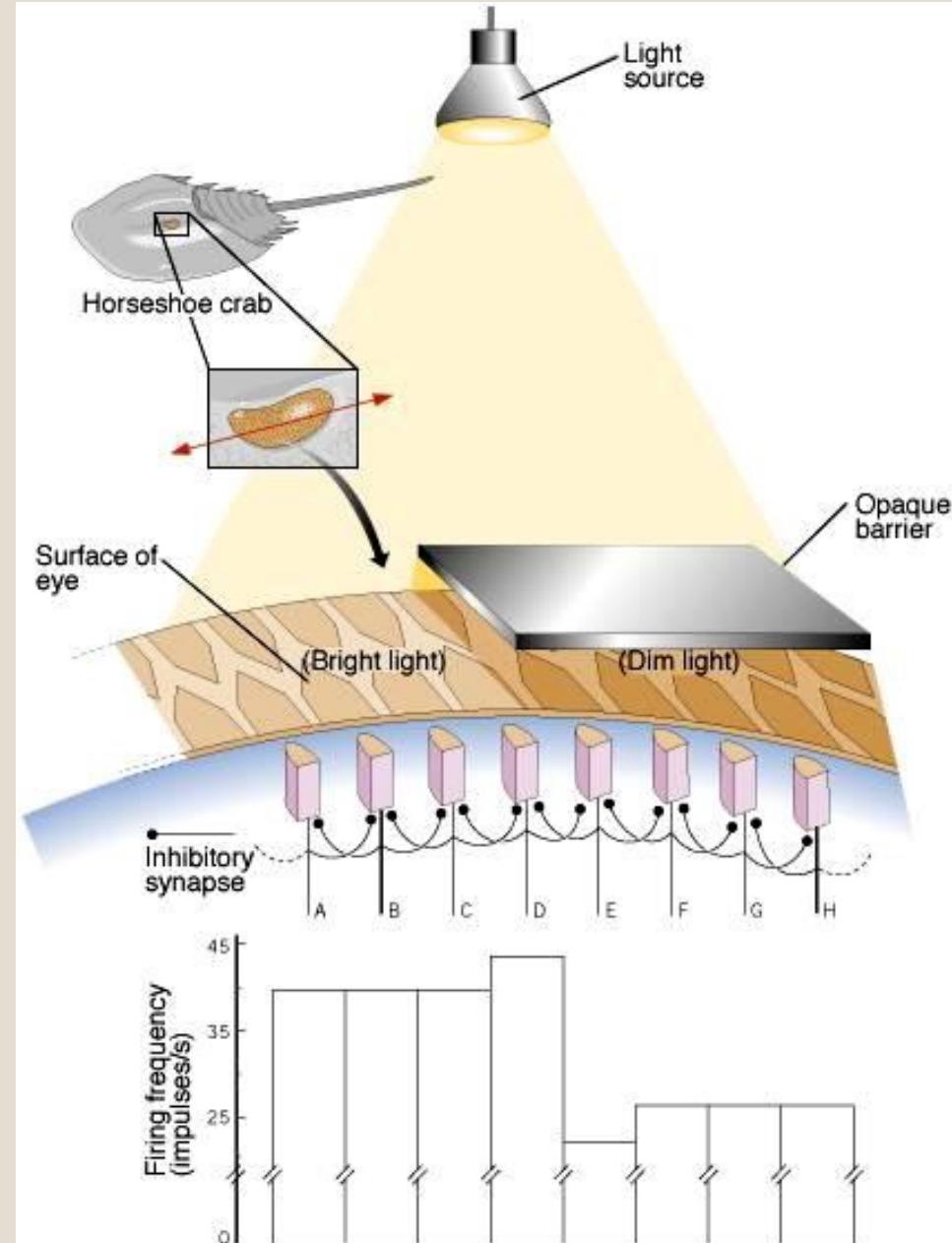


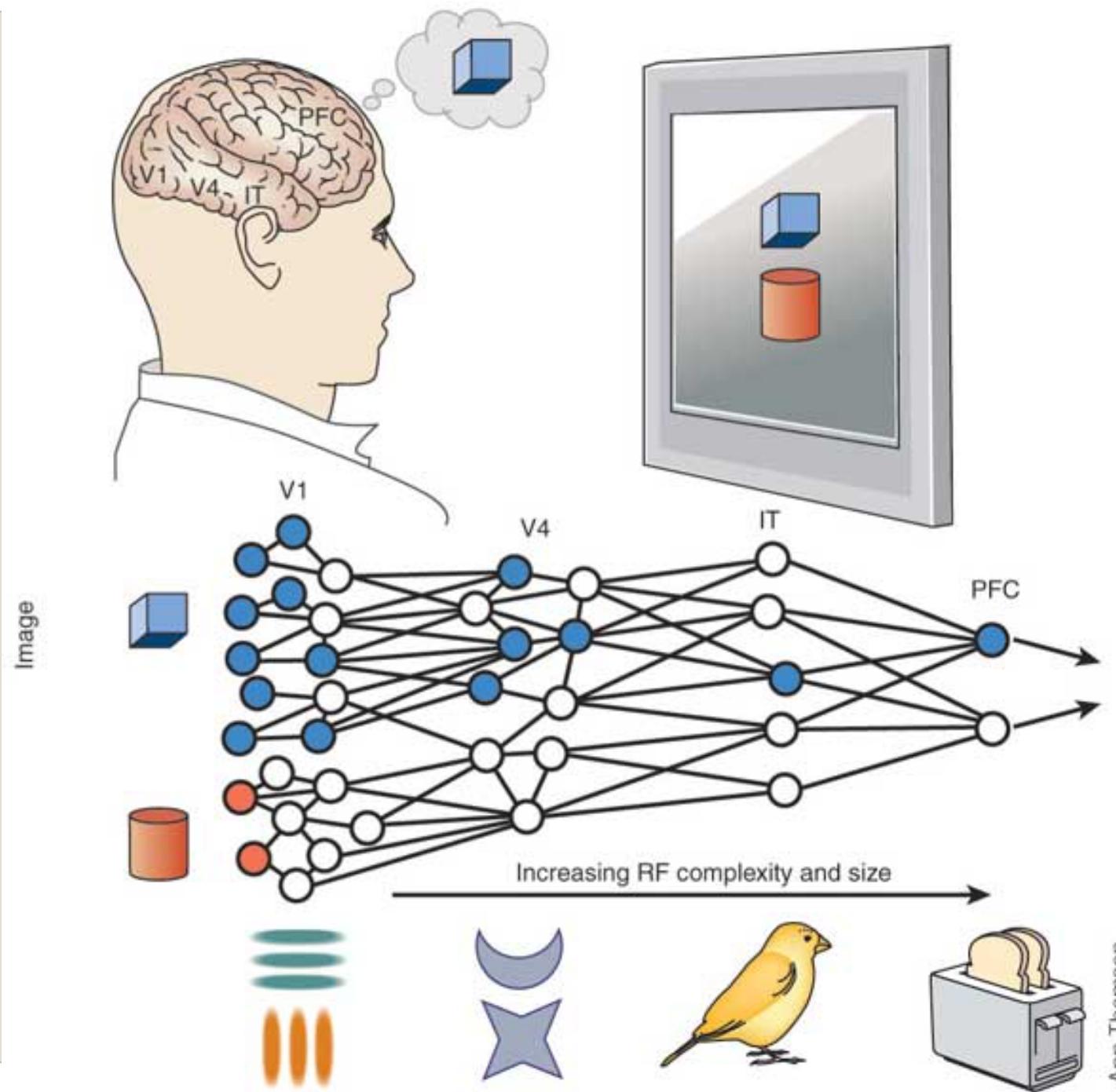
Figure 20. The unfolded striate cortex has a shape like a pear. It would be a quarter sphere if the visual fields were equally represented everywhere, but instead it is greatly distorted by the disproportionate representation of parts near the center of gaze (fovea), a feature termed "cortical magnification". In contrast, the far periphery is greatly underrepresented.

# Detecting Contrast

- Light hits cells and activates them (++)
- Cells that activate inhibit neighboring cells (-)
- Cells that don't activate don't inhibit either (=)
- Cells at the edge between light and dark get enhances

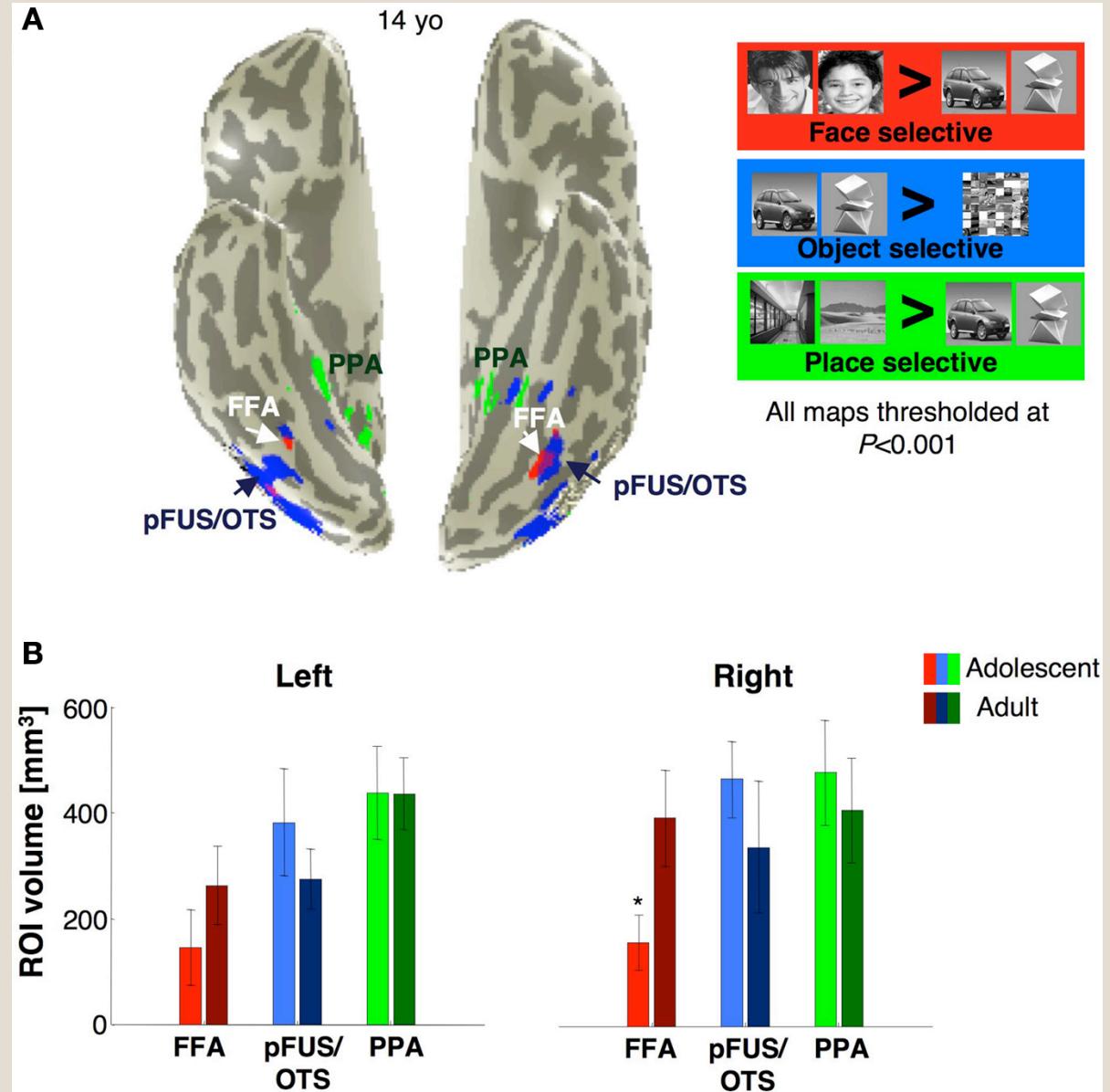


# Detecting more complex objects



# Perception of Things in The World

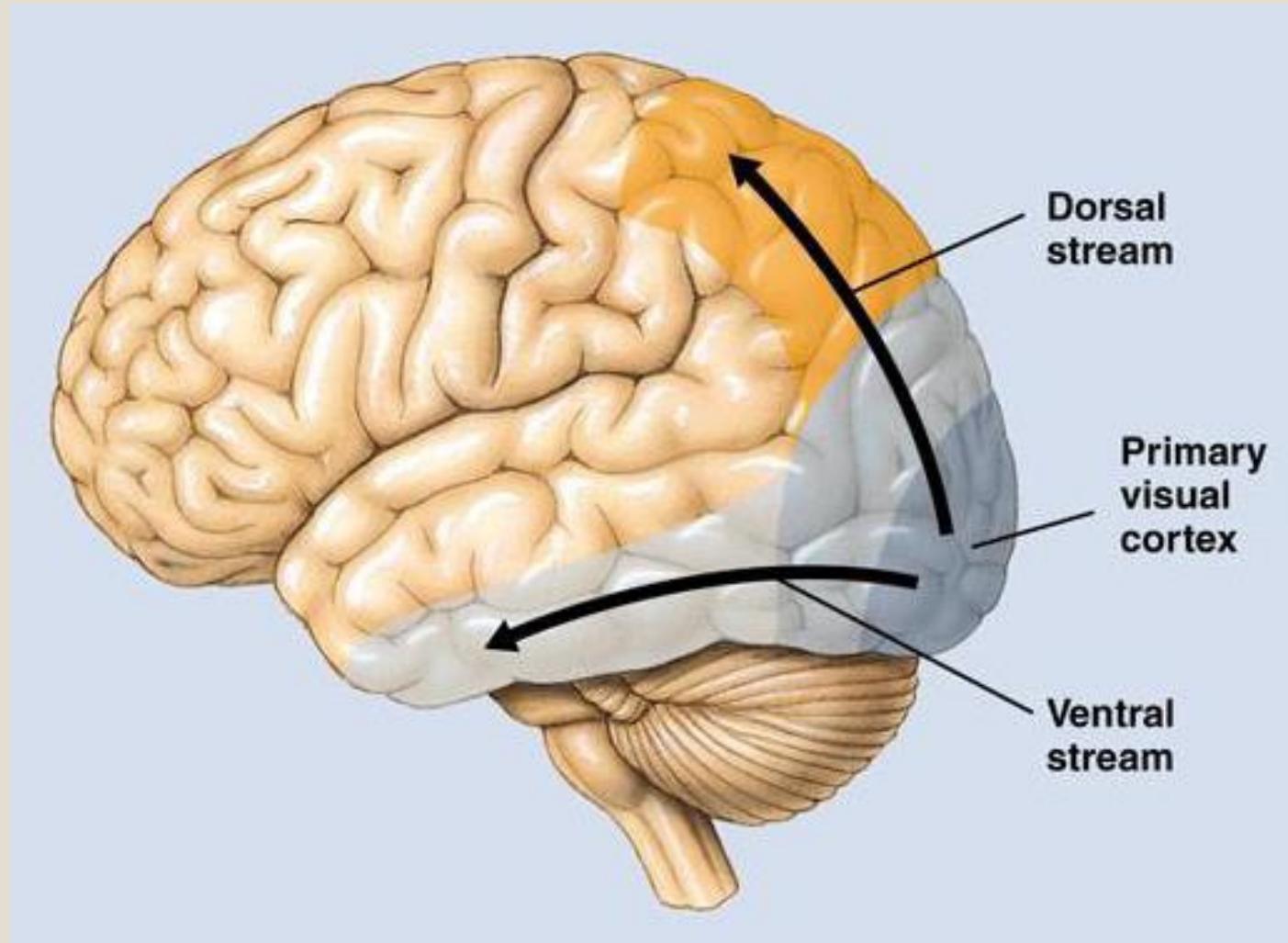
Object areas  
Face areas (FFA)  
Place areas (PPA)



Ventral - The  
“What” pathway

Dorsal - the  
“Where/How”  
pathway

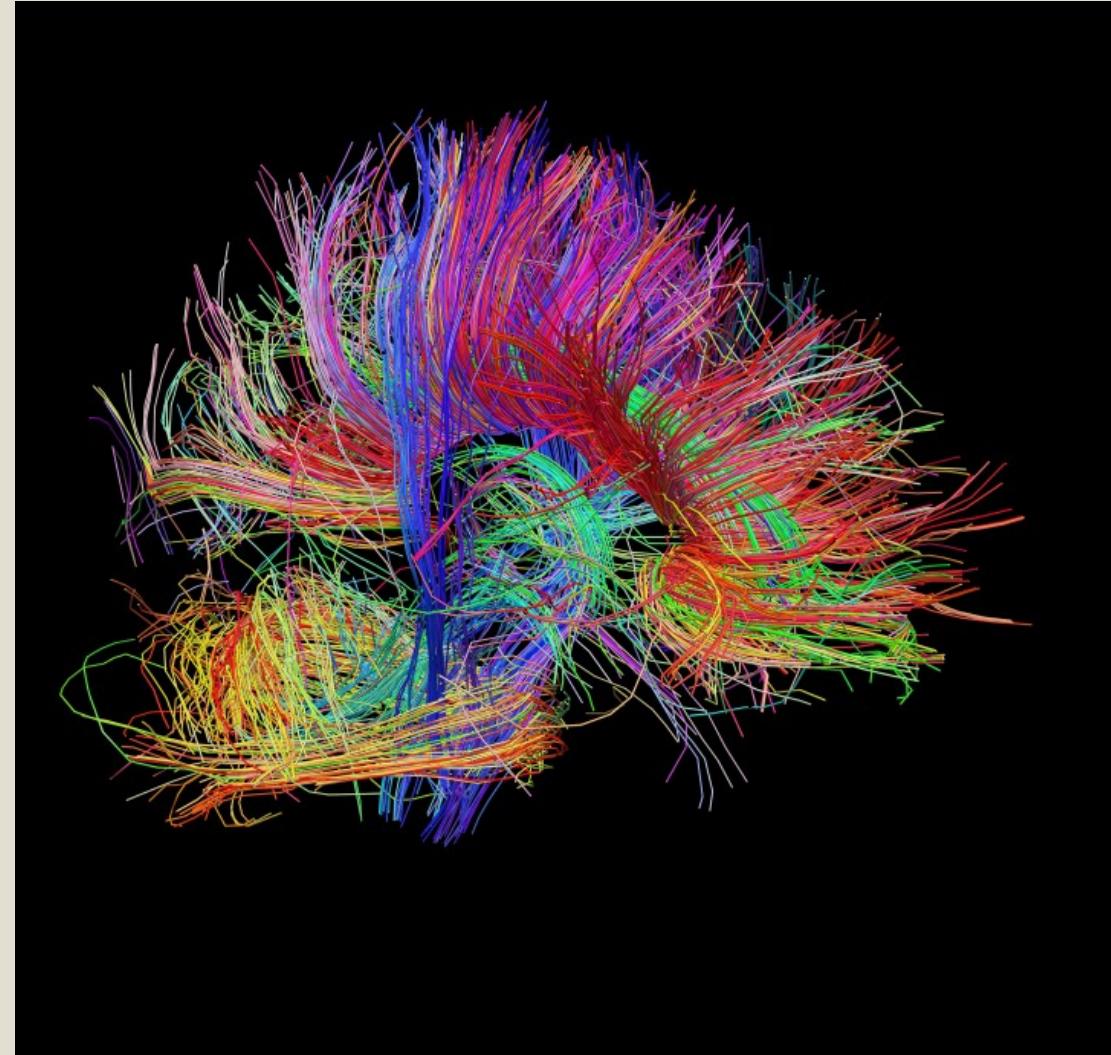
Example...



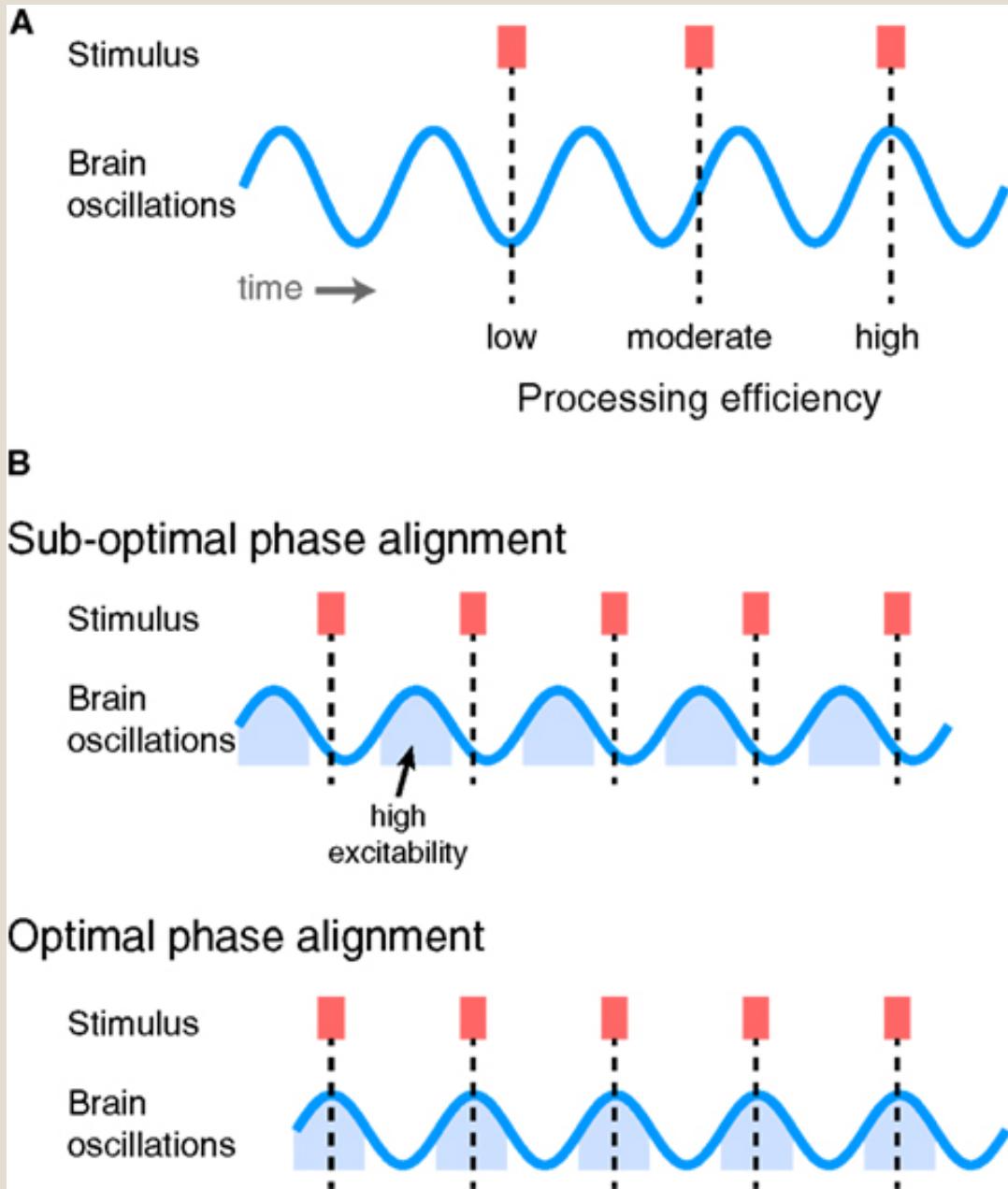


# The binding...problem?

- The binding problem is the question of how separate areas of brain activity combine into stable perceptions of the world
- The answer is through synchronization and massive interconnectedness.



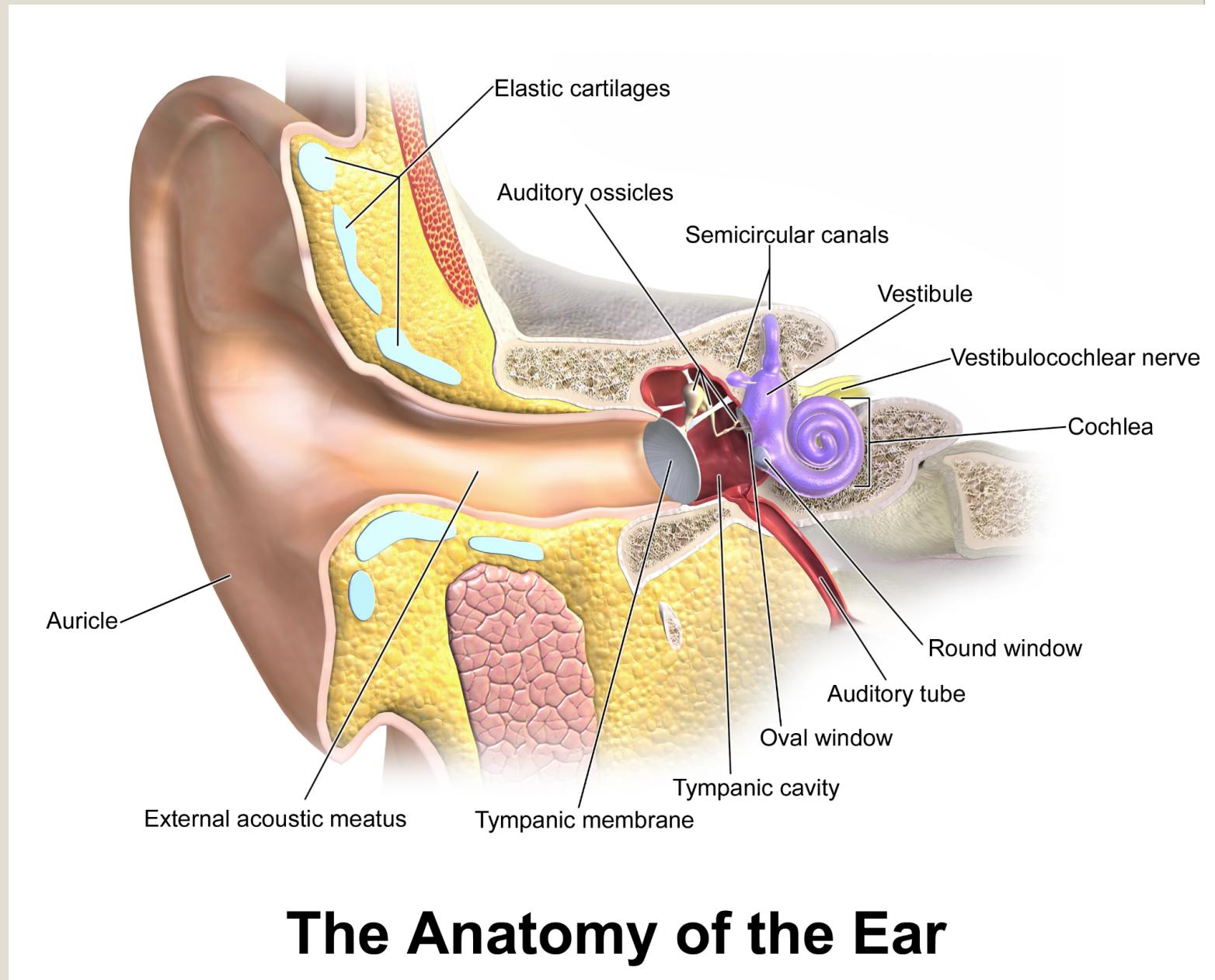
# Synchronizing Oscillations



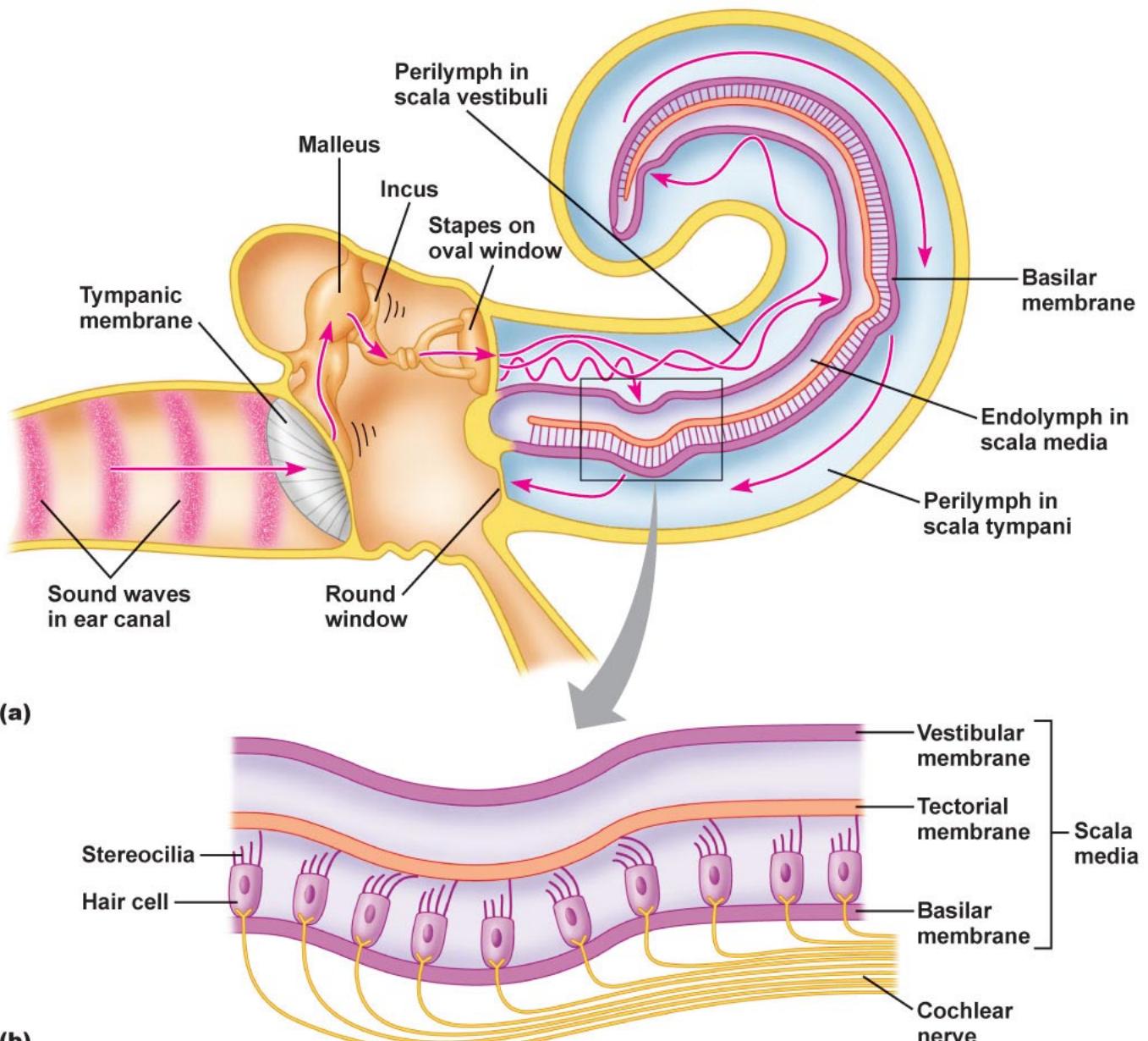
# Auditory Processing

- Similar to vision in many ways
- There is an organ (ear) that gets sensation from world
- It is then processed in both ear and auditory cortex and rest of brain

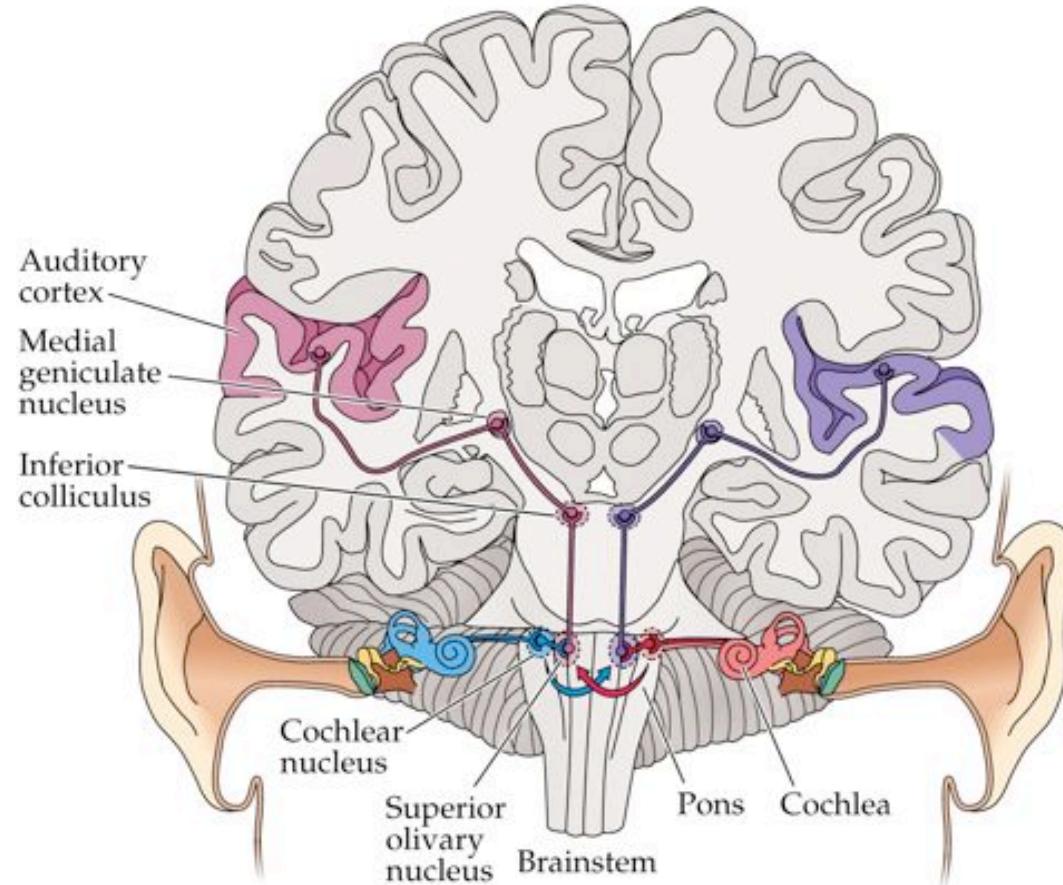
# In the ear...



# Cochlear membrane

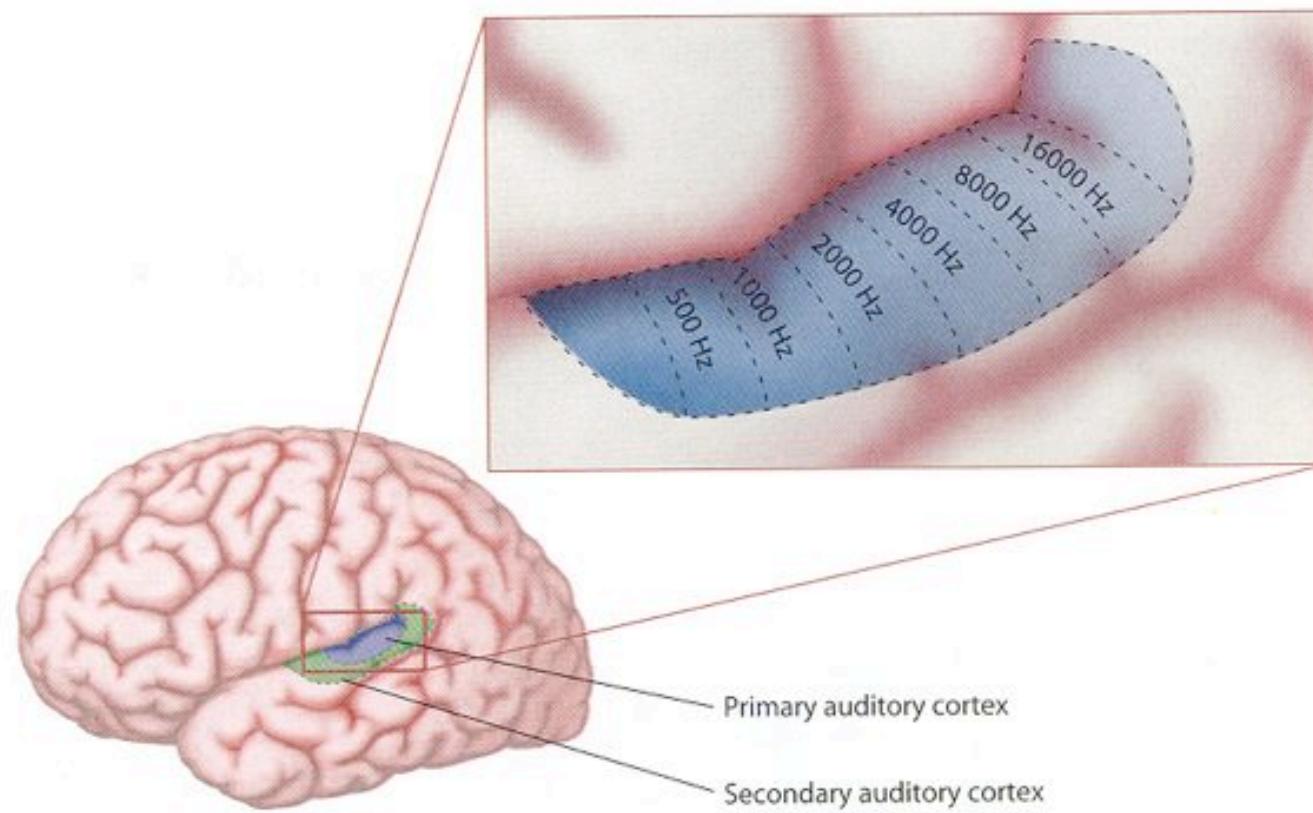


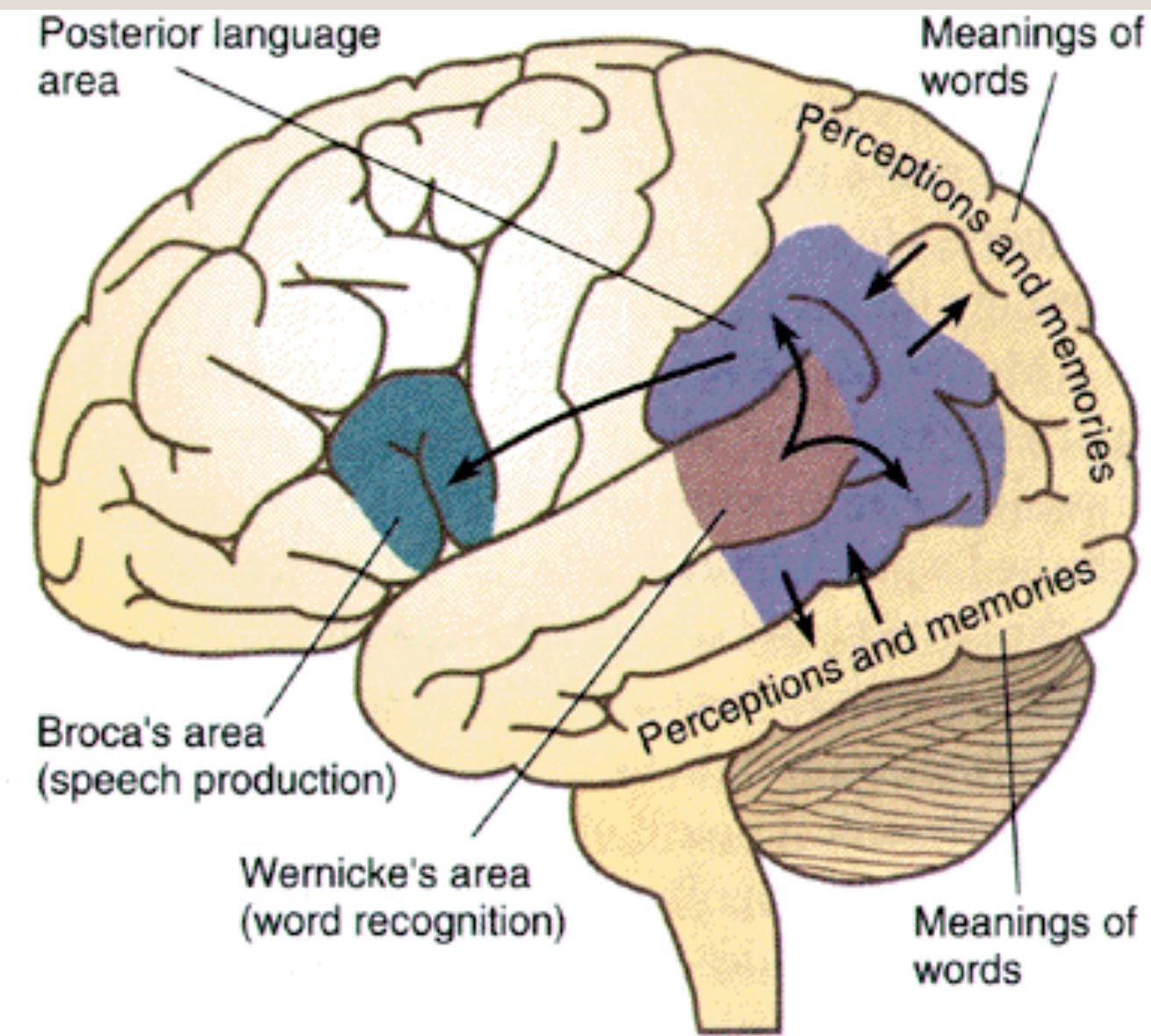
# Ascending auditory pathways



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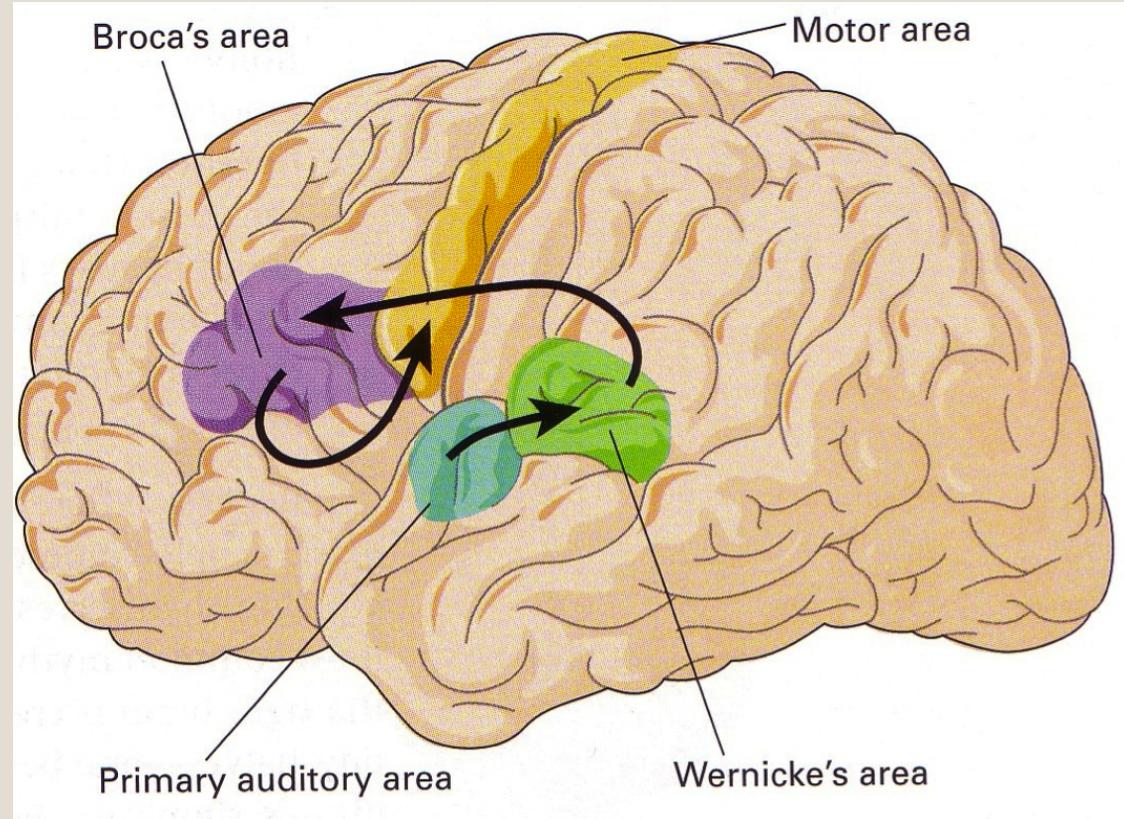
# Cortical tonotopy





**Broca's area –**  
speech  
production

**Wernicke's area –**  
speech  
comprehension



# Broca's Aphasia

- <https://www.youtube.com/watch?v=f2liMEbMnPM>



# Wernicke's Aphasia

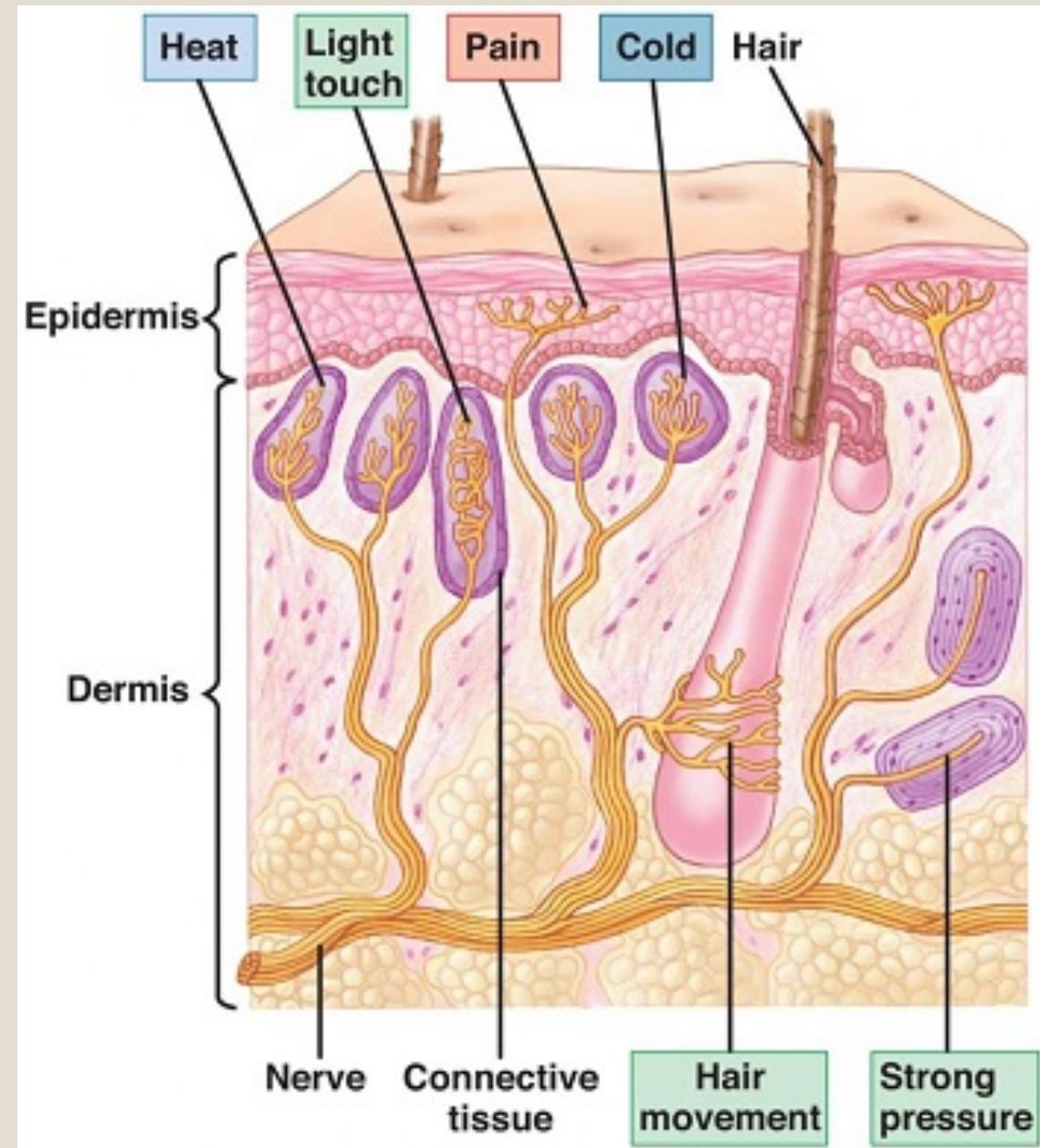
- <https://www.youtube.com/watch?v=dKTdMV6cOZw>



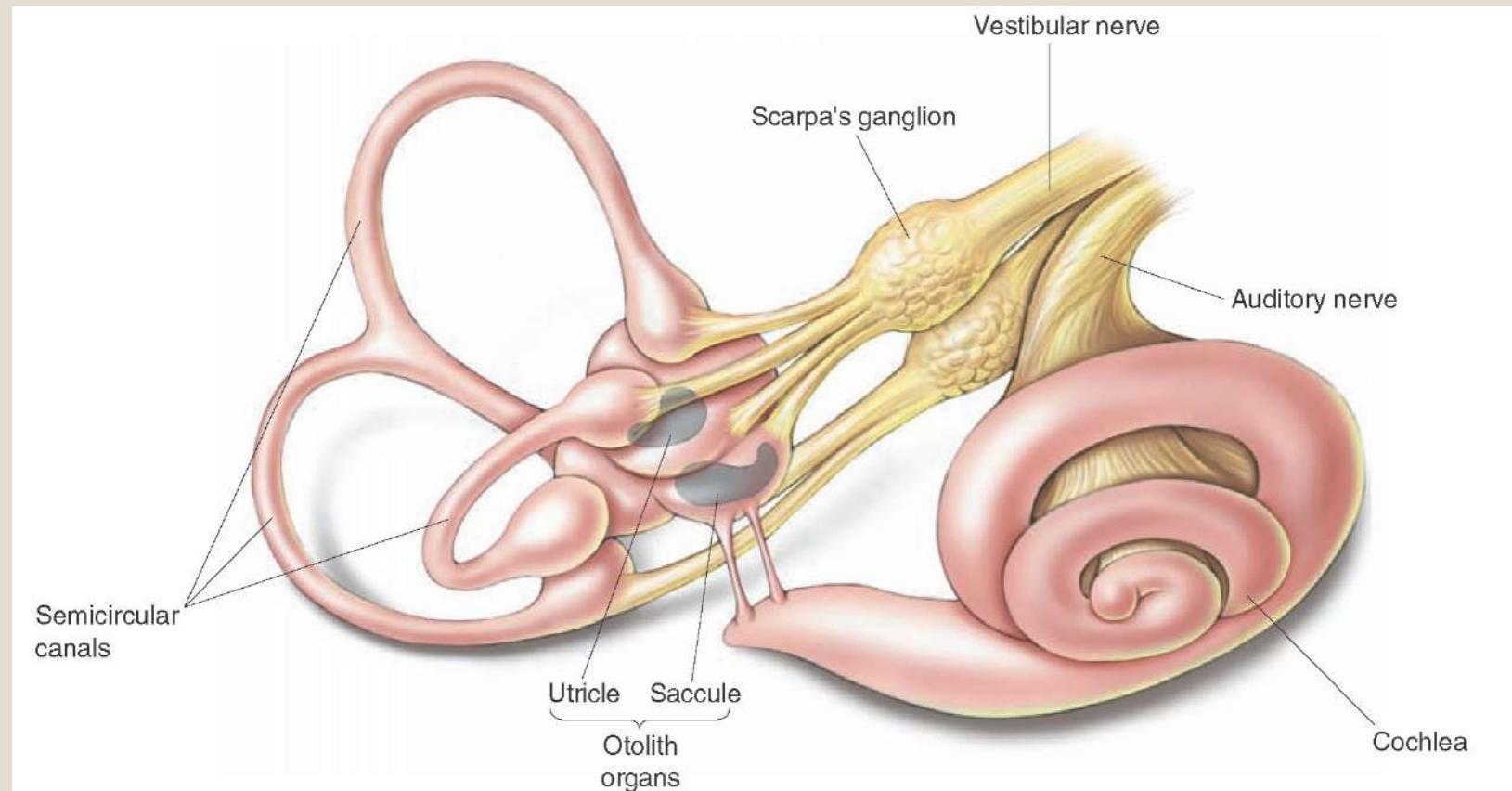
# Bodily Sensation

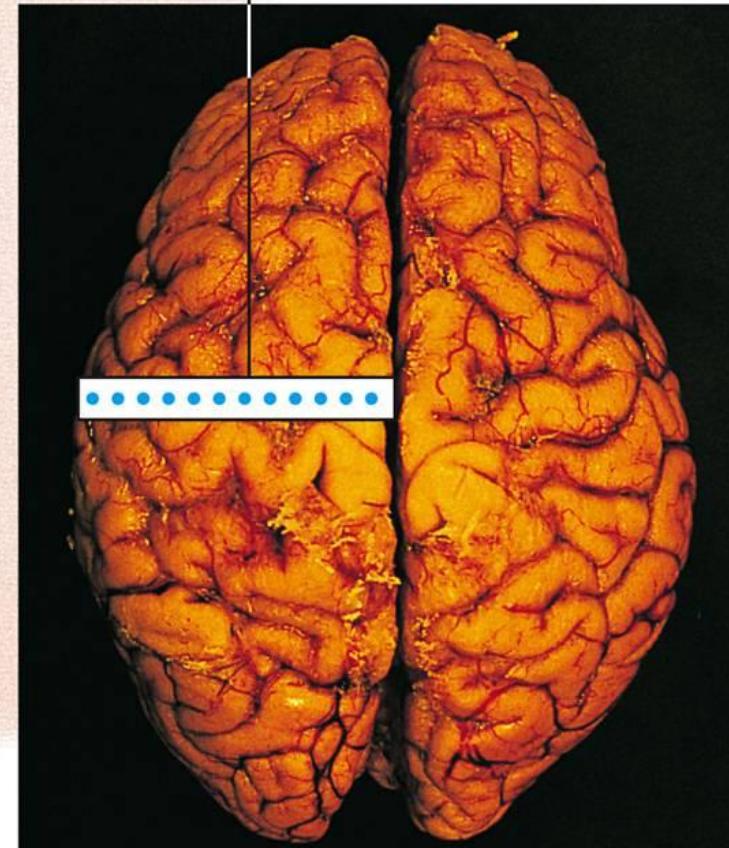
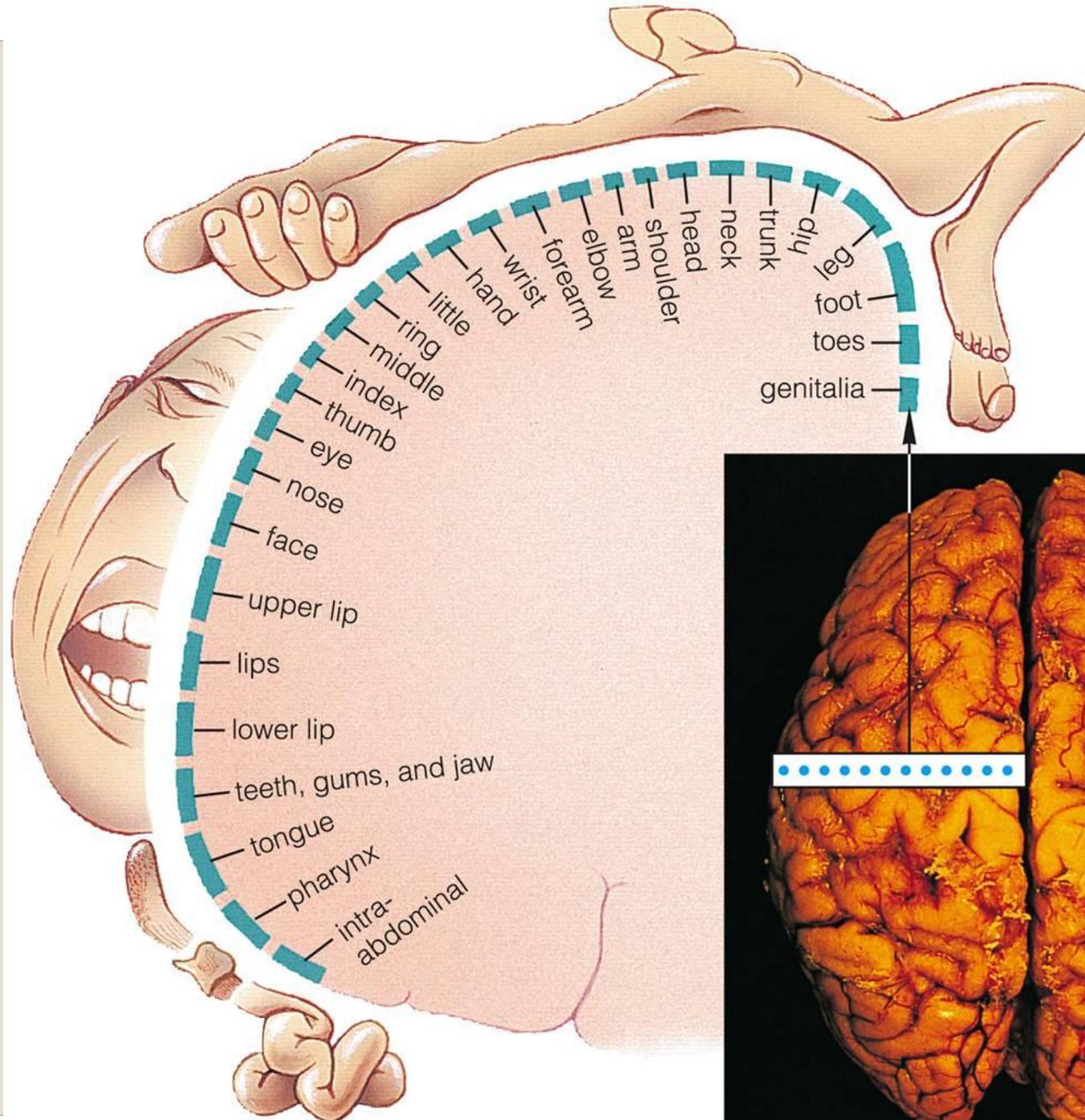
- Somatosensation (On the skin)
  - Temperature
  - Pressure
- Vestibular (Balance)
- Integrated sense of bodily image

# Skin sensation



# Vestibular Organ





# Phantom Limb

- <https://www.youtube.com/watch?v=1mHlv5ToMTM>



# Other sensory modalities

- Follow largely the same pattern
  - Organ of sensation processes physical information
    - Tongue processes food particles
    - Nose processes air particles
  - Information is sent through nervous system to primary cortex for sensory perception
  - Then information is integrated with rest of brain and body in perception

# Perception and action

- Always within a feedback loop
- Perception -> Action -> Perception
- Cognition happens in the spaces between these two things.

