Motion

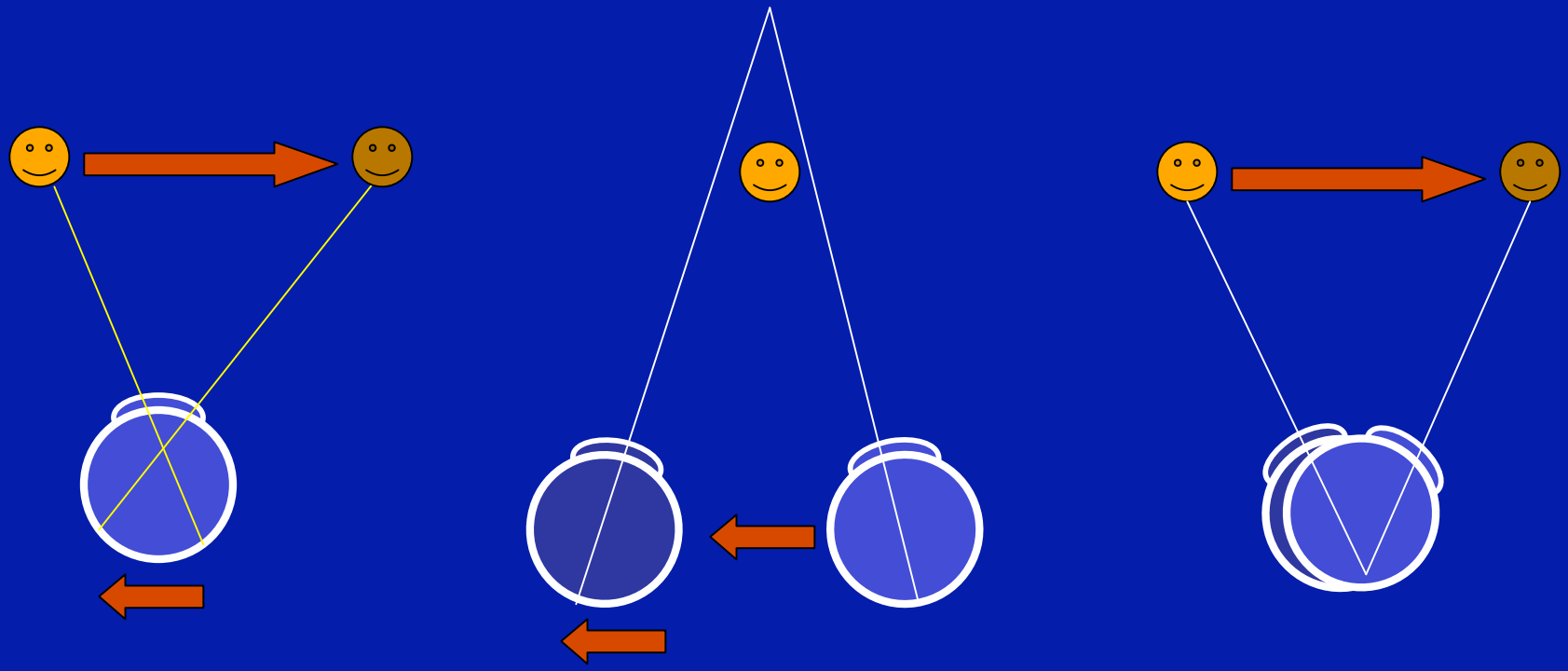
What is motion good for?

Eye movement
Proprioception
Time to collision
3D vision
Image segmentation
Pattern vision
Size and coherent image
Object recognition
Moods and social contexts
Attention
Motion

Motion on the retina

Too ambiguous!

motion perception



Needs…

Interaction with:

the muscular system

and

the vestibular system

Extraocular muscles

- superior and inferior oblique muscles

- superior and inferior rectus muscles

- lateral and medial rectus muscles

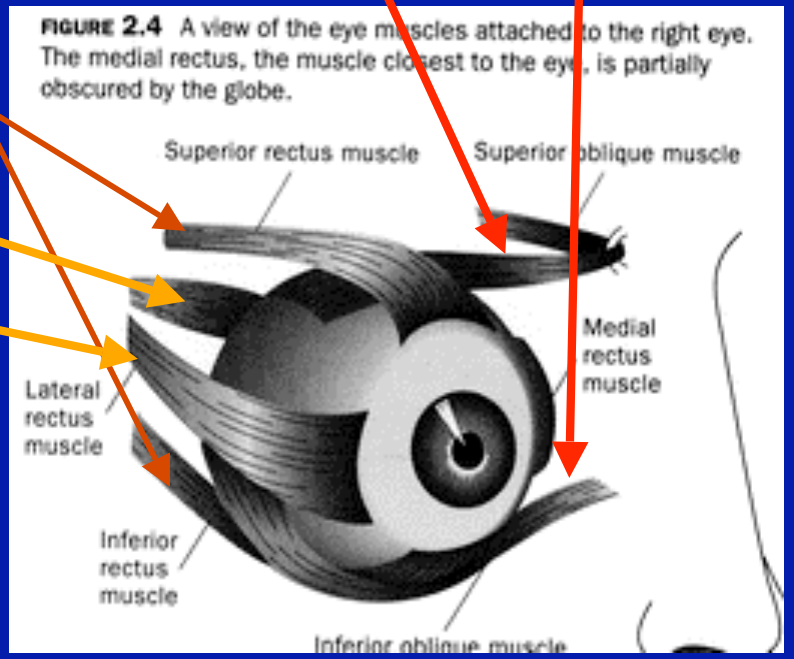
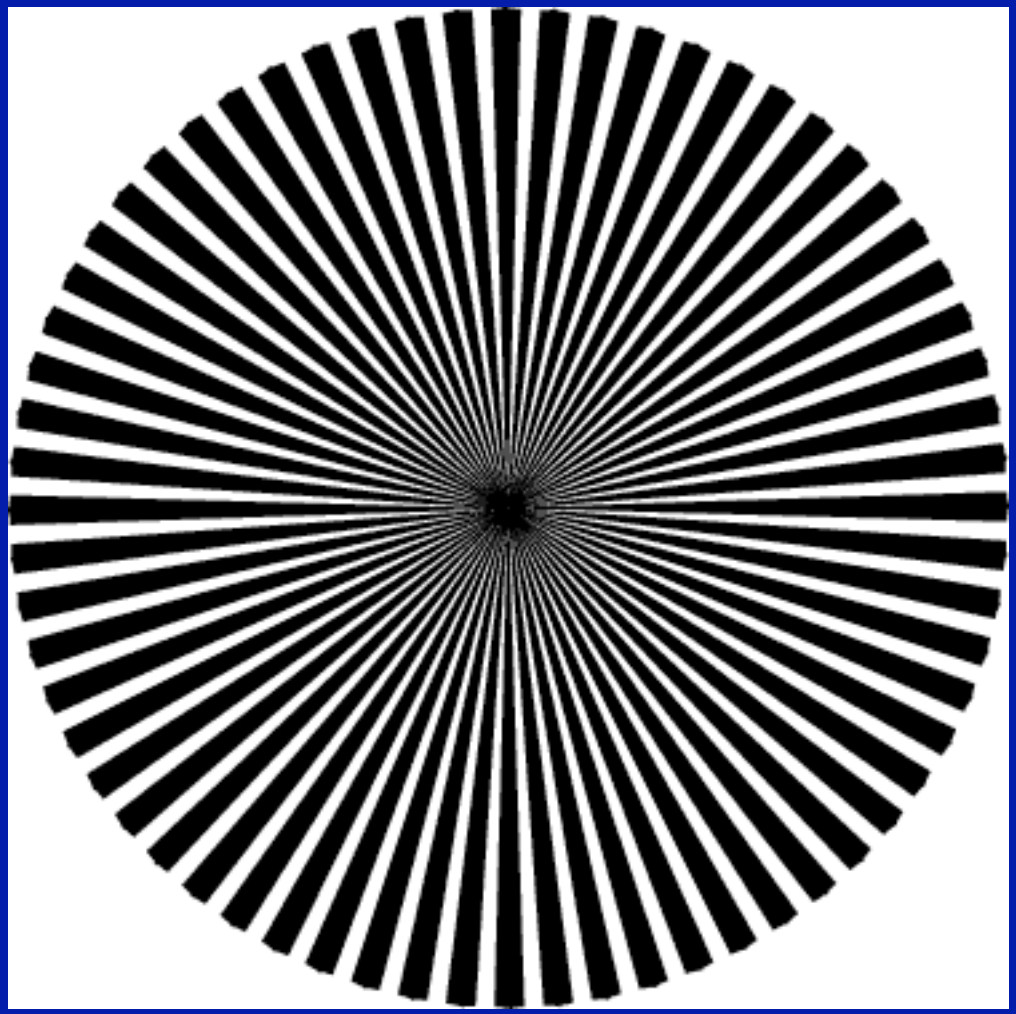


FIGURE 2.4 A view of the eye muscles attached to the right eye. The medial rectus, the muscle closest to the eye, is partially obscured by the globe.

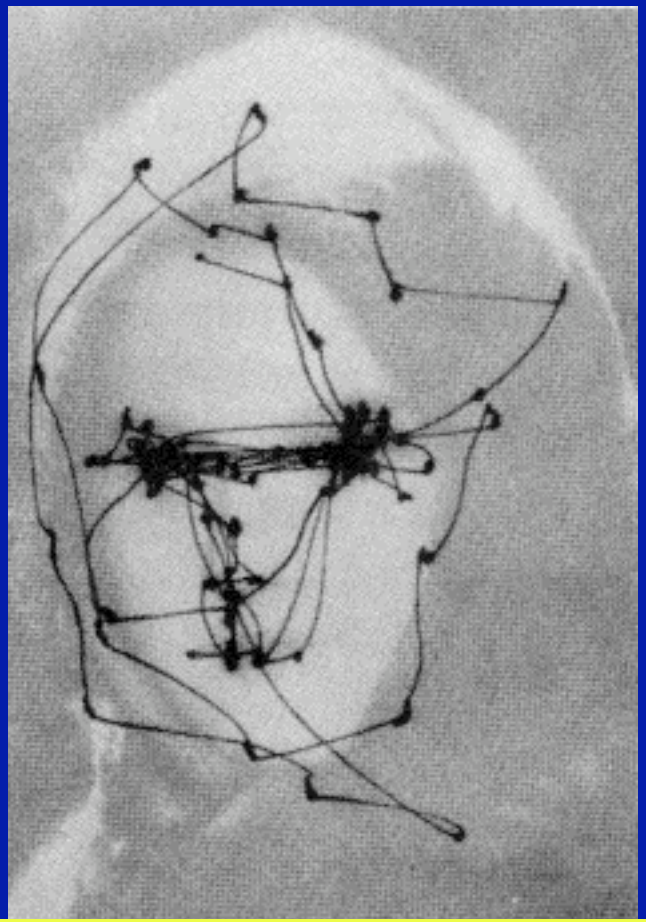
Eye movements

Tremors
Saccade
Pursuit eye movement
Convergence
Nystagmus

Tremors



Saccadic Eye Movements



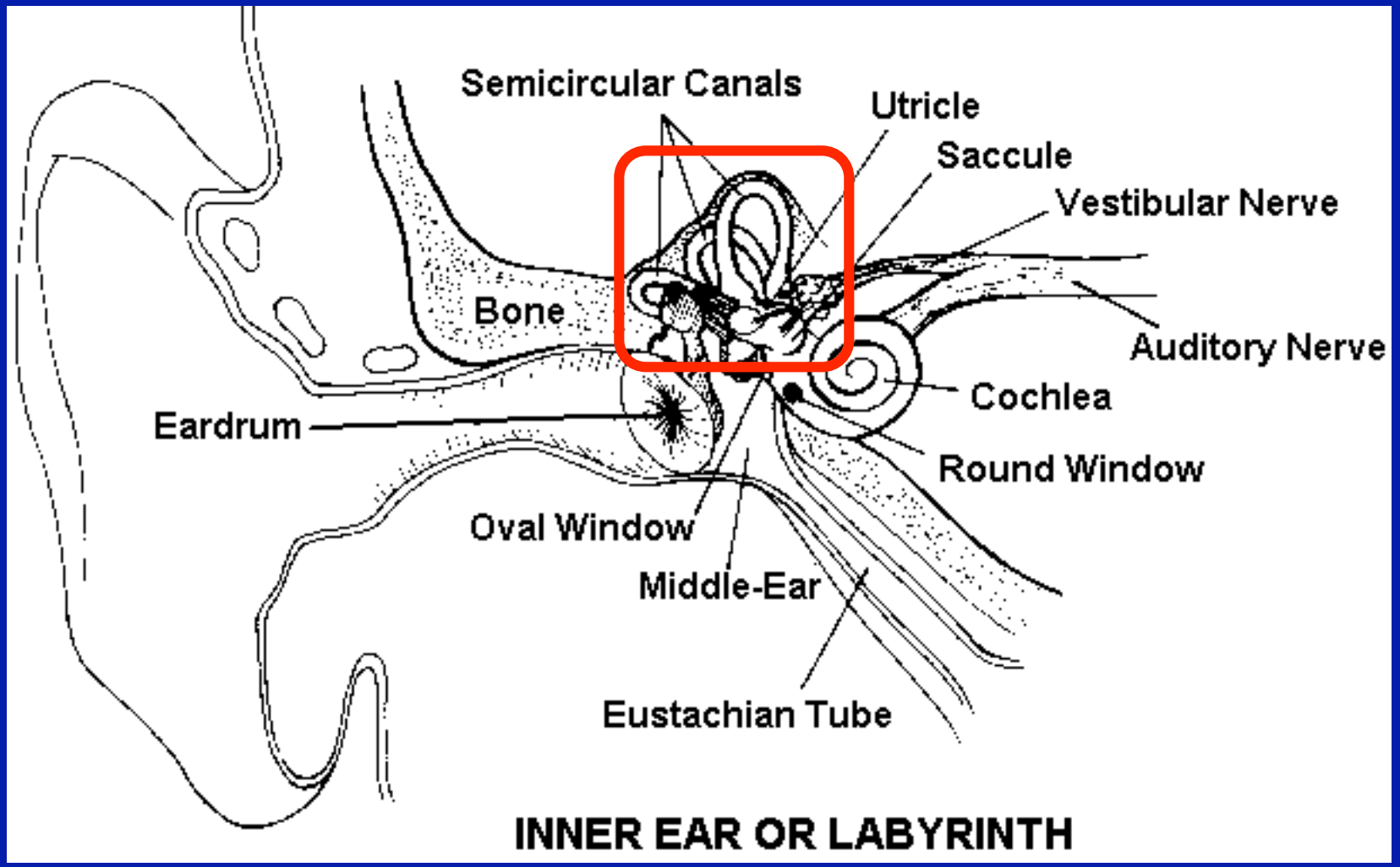
These two pictures are taken from the works of the Russian psycho-physicist *Yarbus*, dating back to the 1950s. The picture on the right shows the trace of the gaze of a subject exploring the portrait on the left. Yarbus demonstrated that human beings, as these pictures show us, do not scan a scene in a raster-like fashion. They rather perform *jumps*, known as **saccades**, between the different points of interest, on which **fixation** is maintained for a short period.

Eye movements

Tremors
Saccade
Pursuit eye movement
Convergence
Nystagmus

Vestibular system: inner ear

- utricle and saccule
- 3 semicircular canals


Semicircular Canals
Utricle
Saccule
Vestibular Nerve
Bone
Auditory Nerve
Cochlea
Eardrum
Round Window
Oval Window
Middle-Ear
Eustachian Tube
INNER EAR OR LABYRINTH

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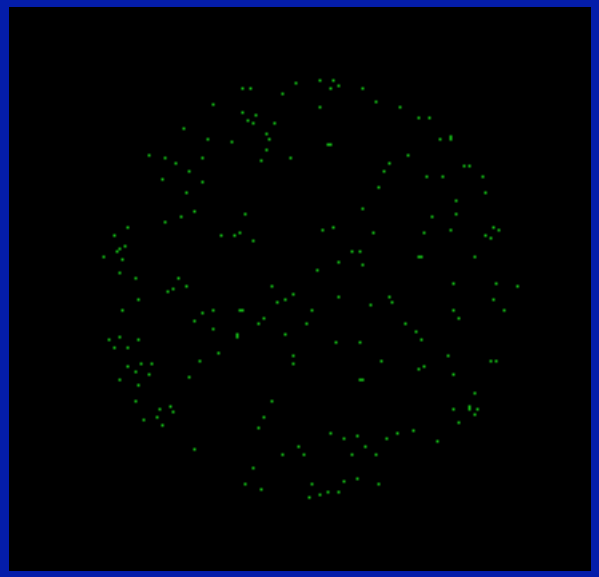
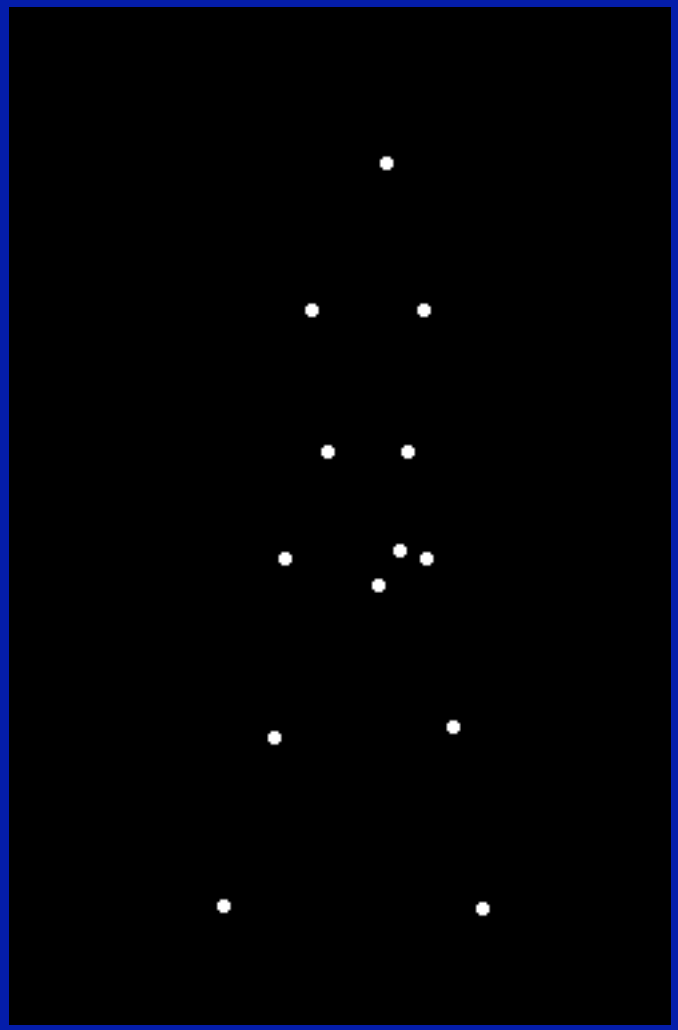
Motion

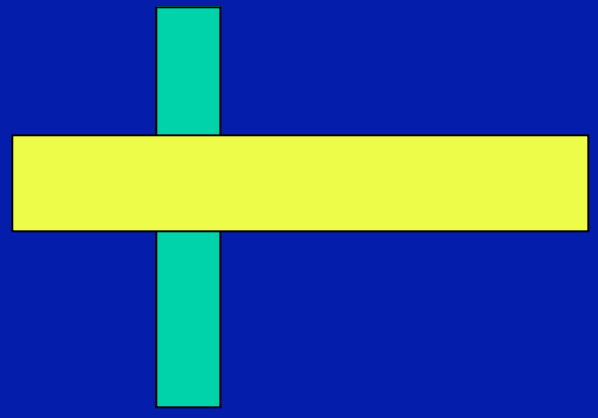
3D vision

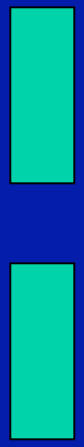


Object recognition
Moods and social contexts



Kellman & Spelke (1983)





or

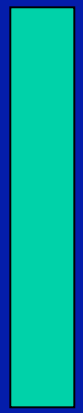


Image segmentation

Anatomy & physiology

Motion aftereffect

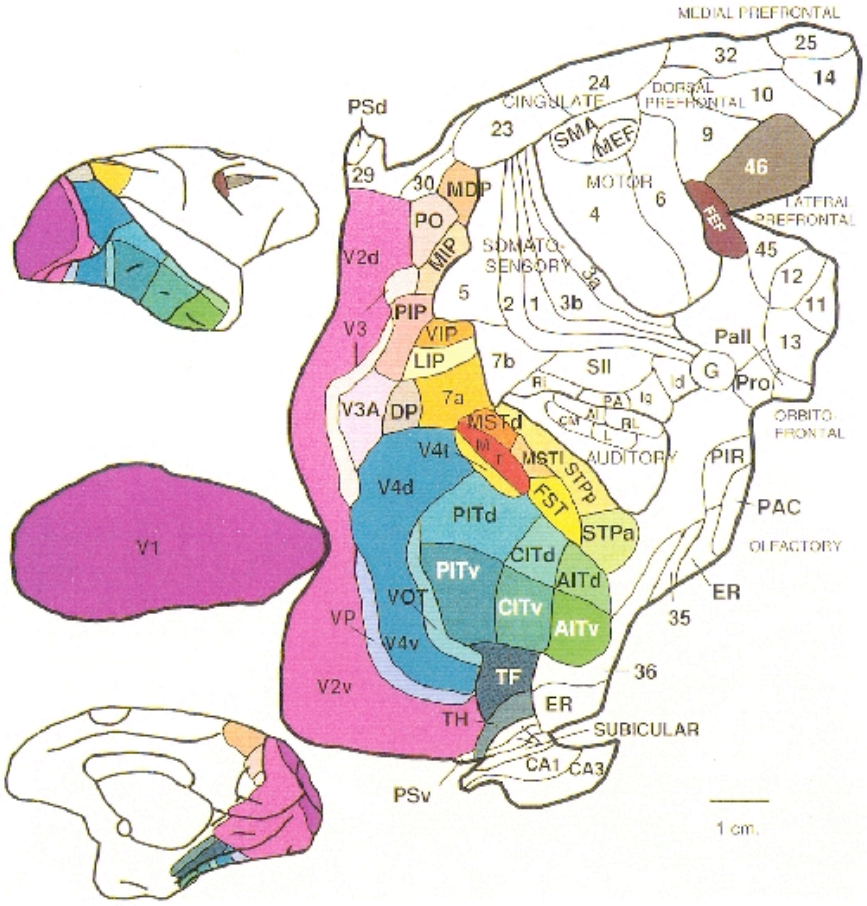
Cells

- excitation model
- inhibition model

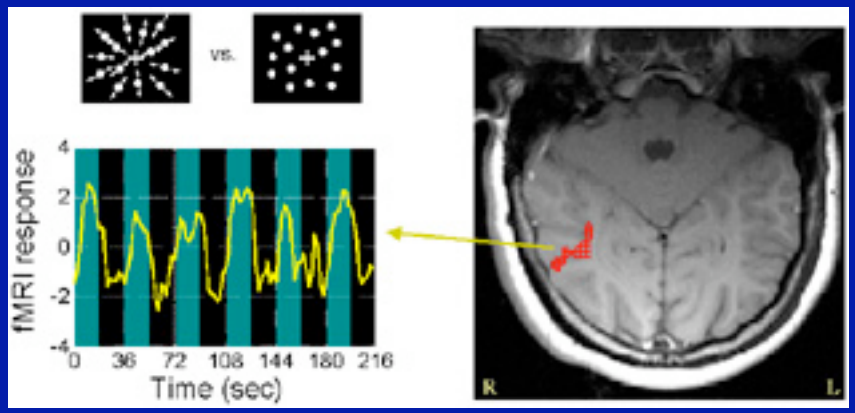
MT (Middle Temporal area):

- Newsome's experiment
- Zilh's patient

Cortical areas of macaque



Motion sensitivity in Middle Temporal Area (MT)



Motion aftereffect

The waterfall illusion

Newsome's experiment

1. Find the motion threshold of some MT cells (eye movements recording)

2. Motion coherence below the found threshold

3. Stimulate cells selective to a given motion direction

Results: eye movements in the same direction as the stimulation.