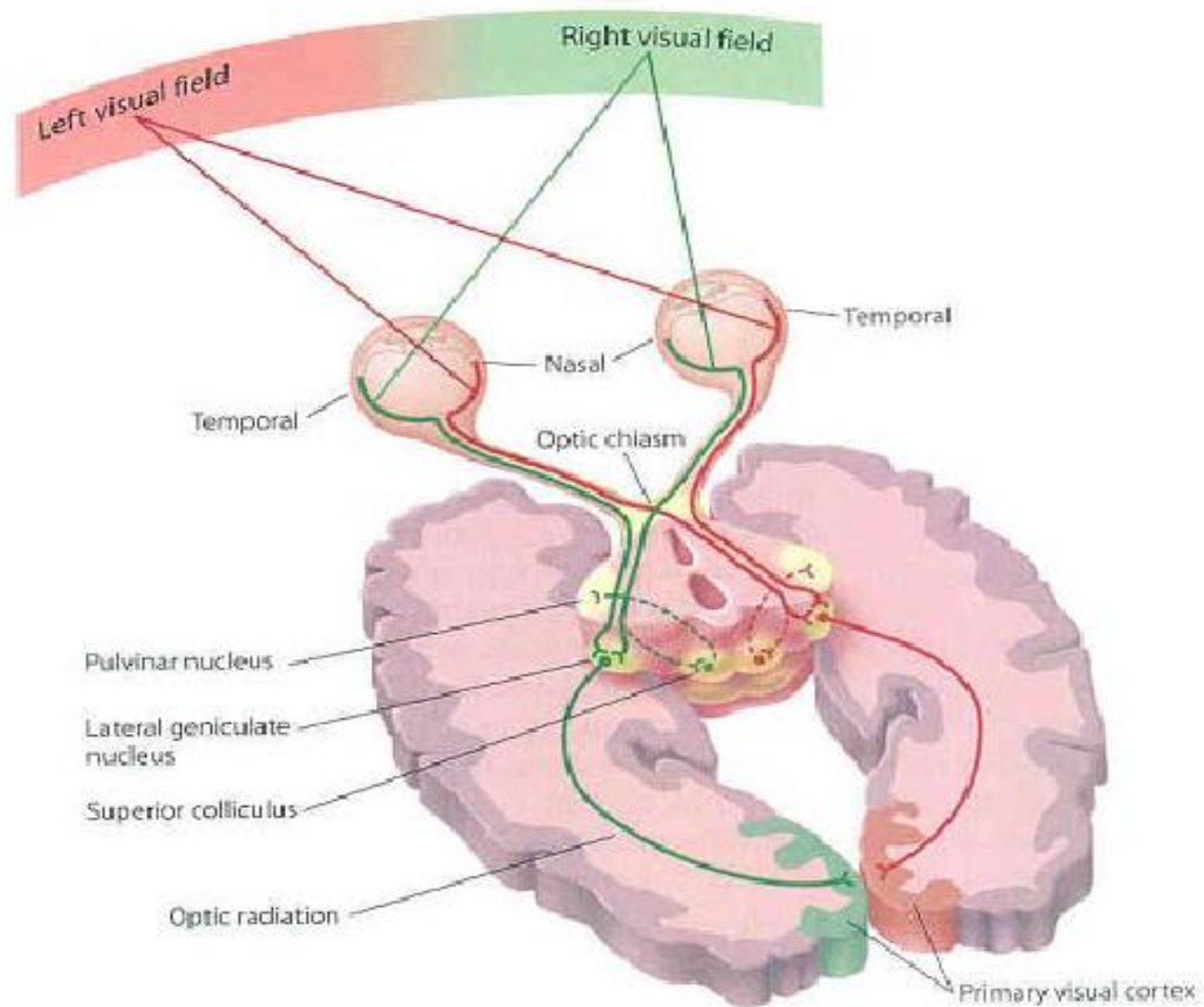


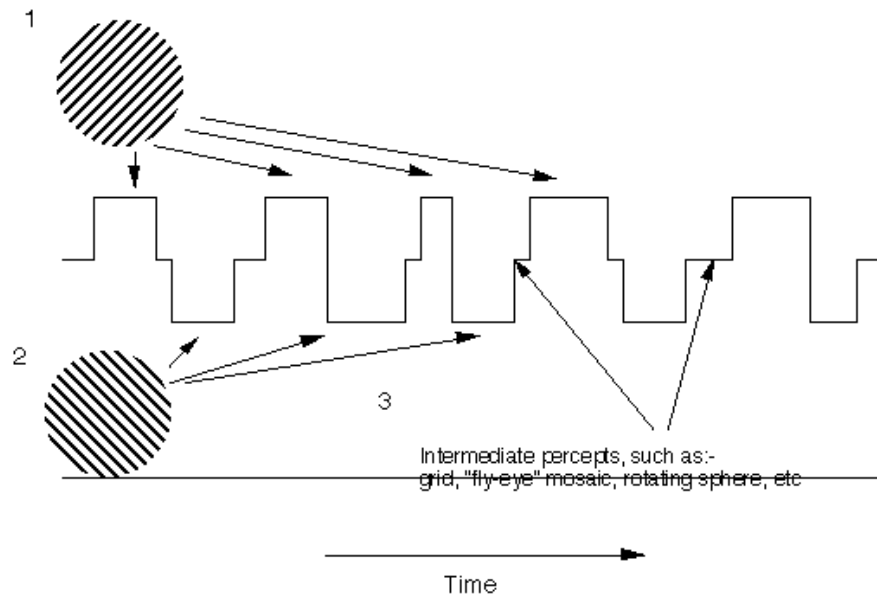
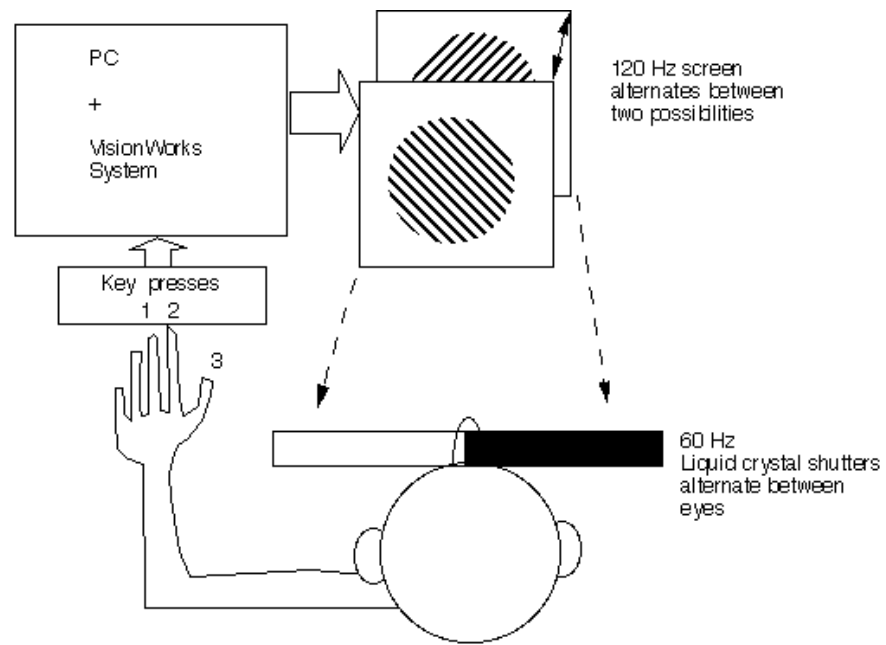
# In search of the NCC: Visual system experiments

Daniel Kiper  
28.9.2023

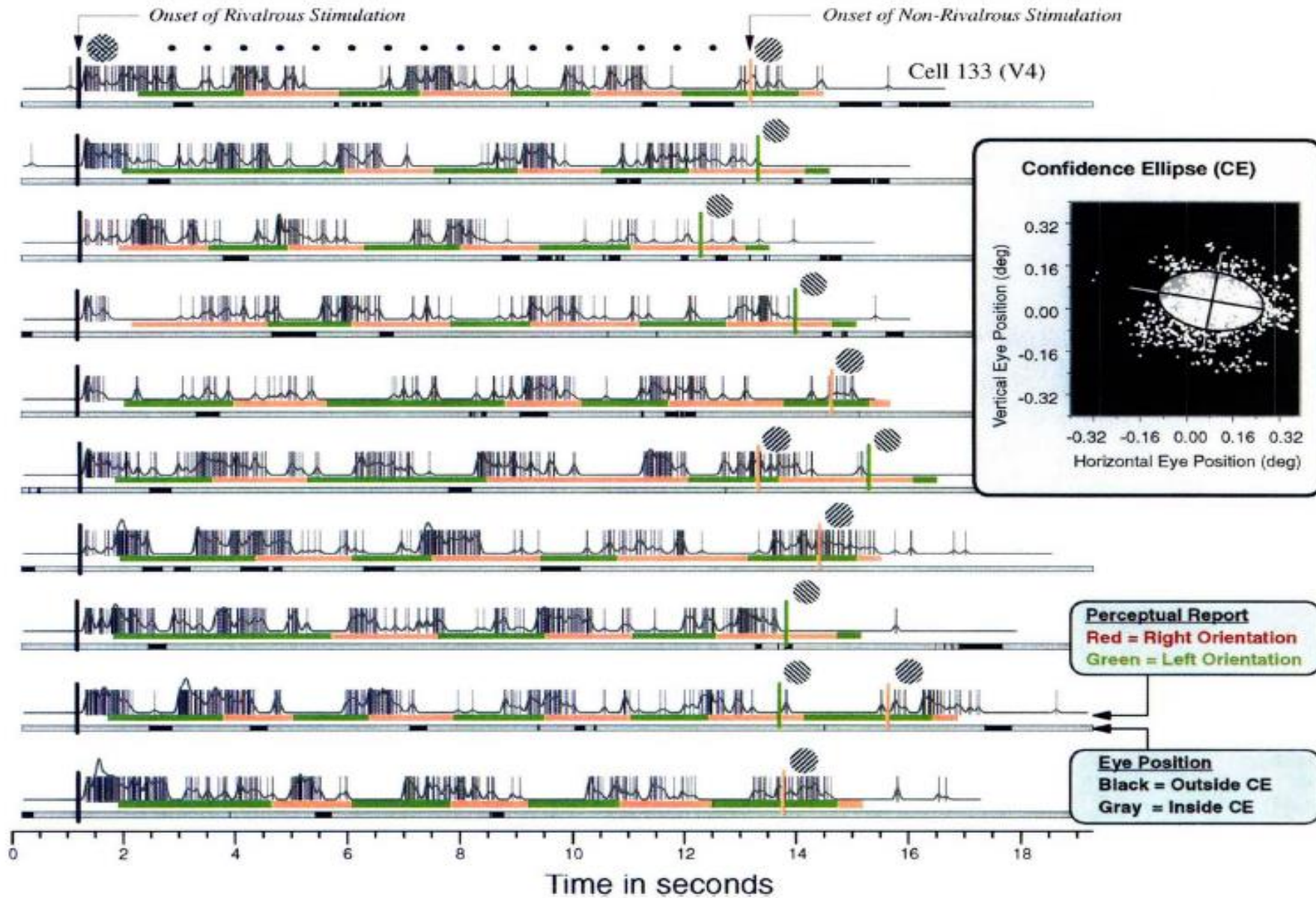
# Visual Pathways



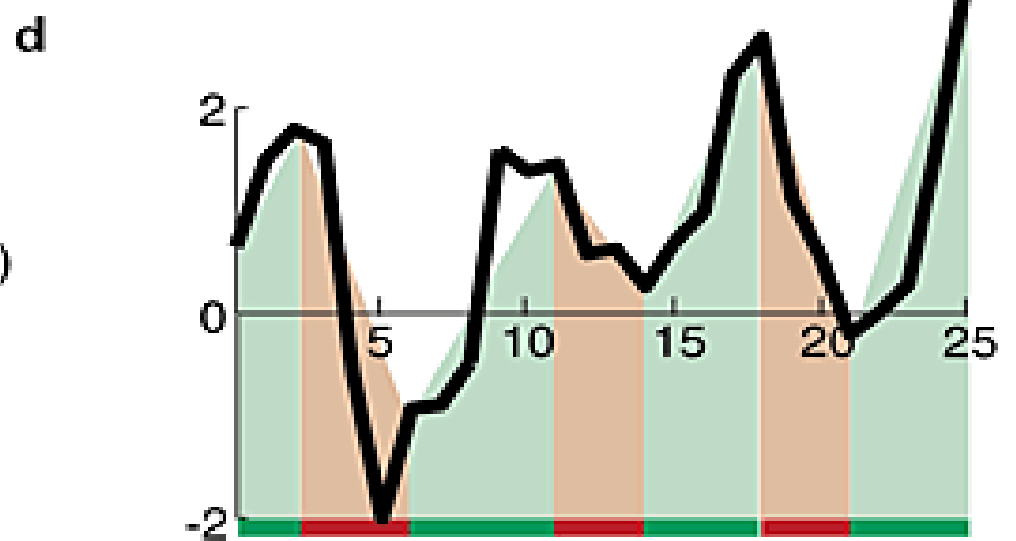
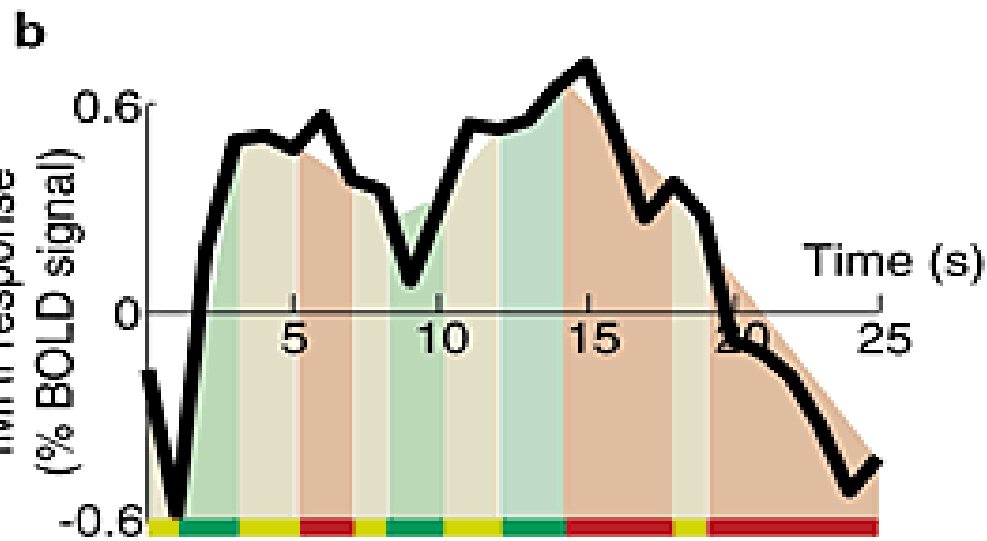
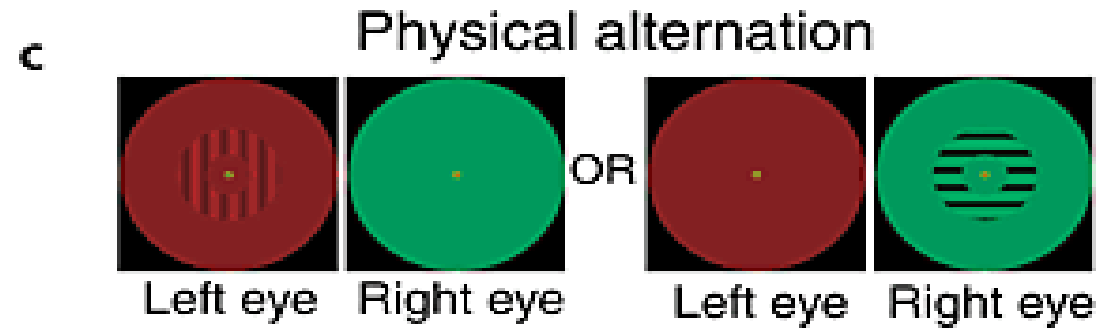
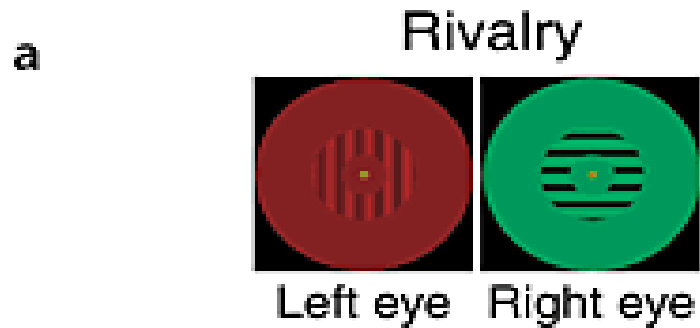
# Binocular Rivalry



# Leopold and Logothetis (1996)

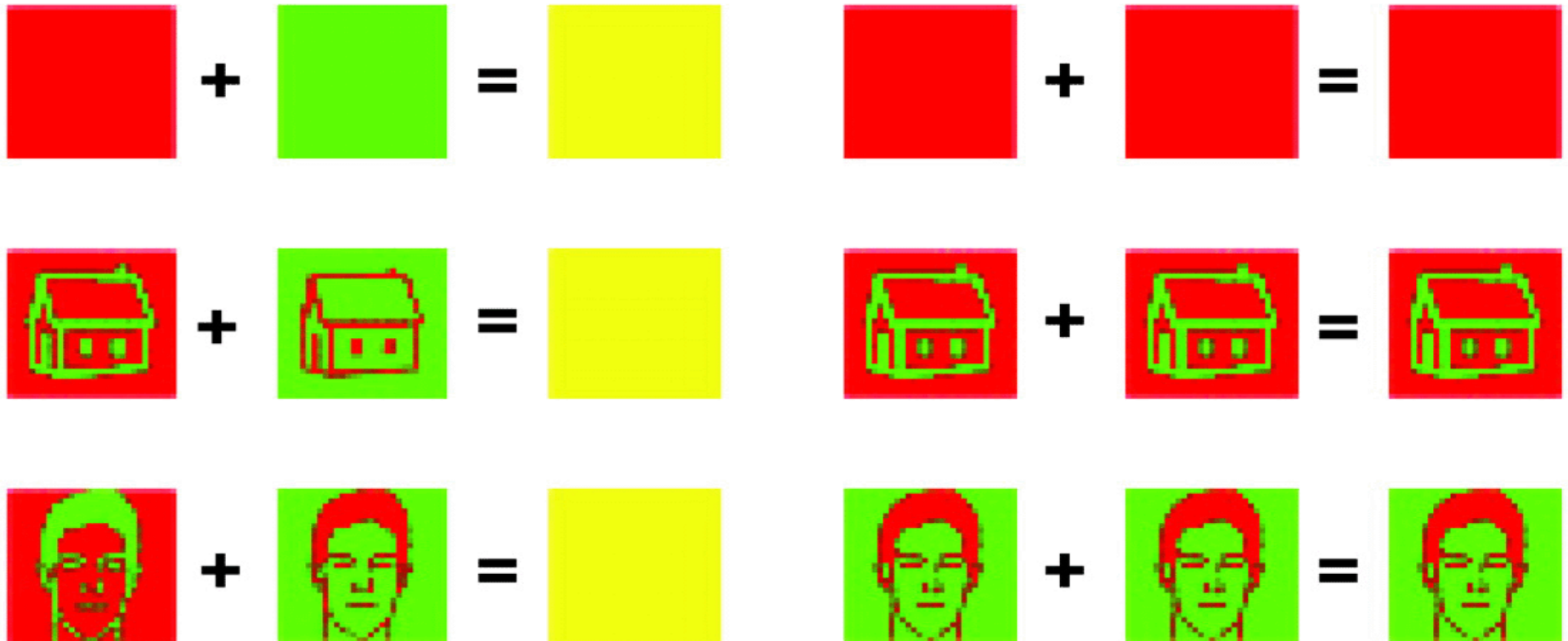


# Polonsky et al. 2000. Binocular rivalry, fMRI



# Binocular fusion

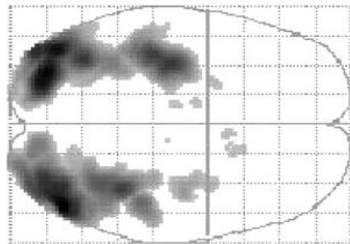
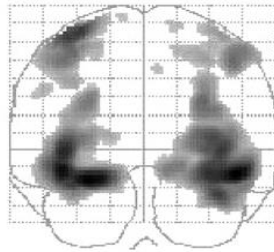
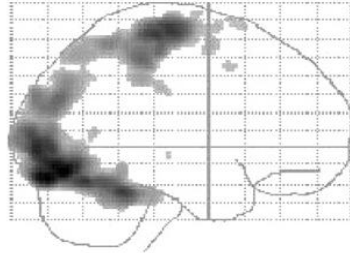
# Stimulus-percept dissociation by binocular color fusion



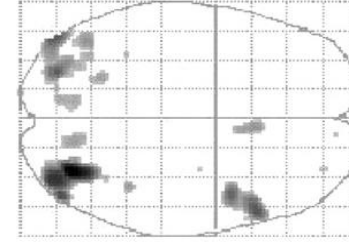
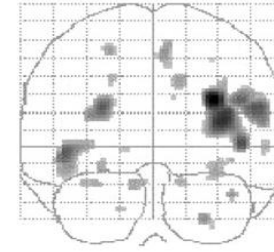
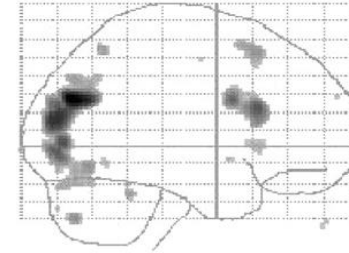


# fMRI contrasts for „same“ and „opposite“ stimulation

same

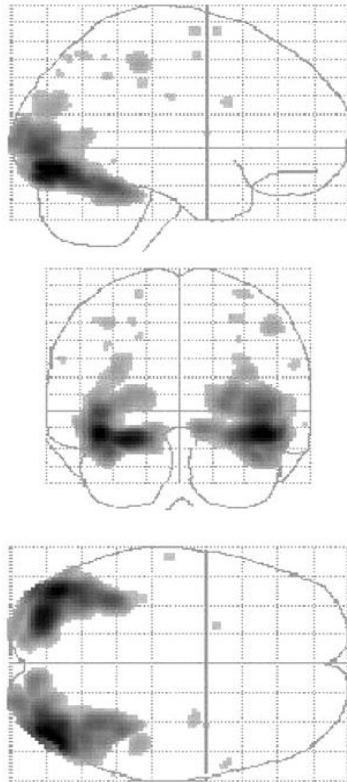


opposite

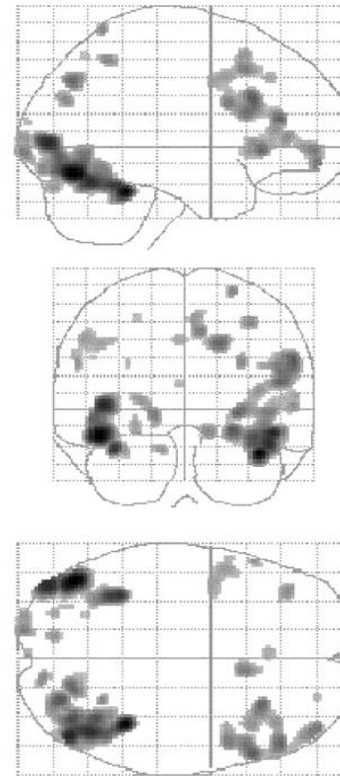


# fMRI contrasts for „same“ and „opposite“ stimulation

same



opposite

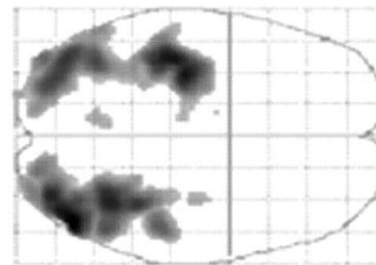
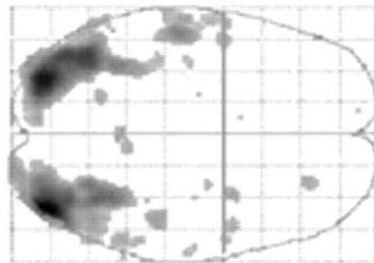
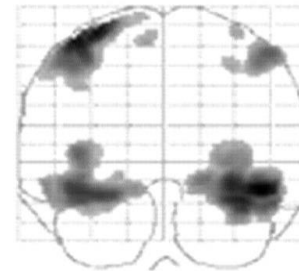
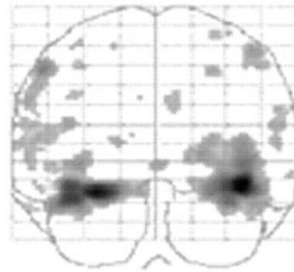
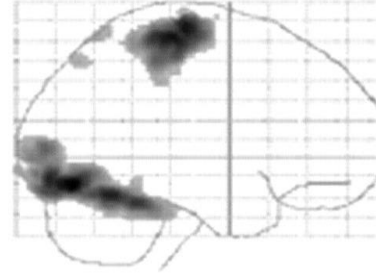
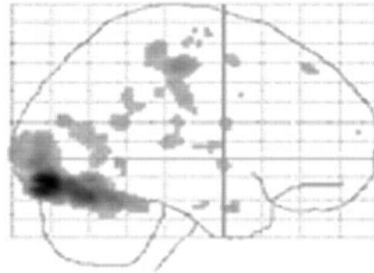


# Perception covaries with increased activation

**SAME versus OPPOSITE**

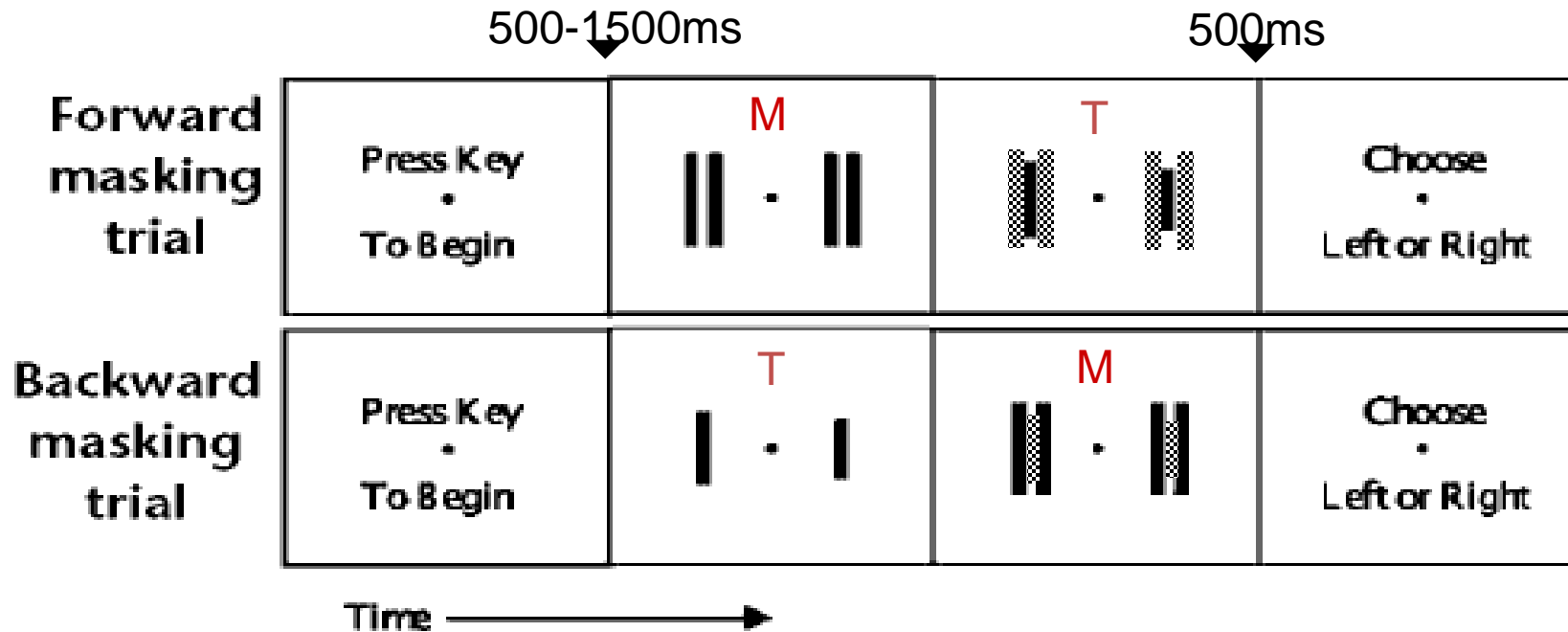
**faces**

**houses**



# Temporal masking

# Experimental design:

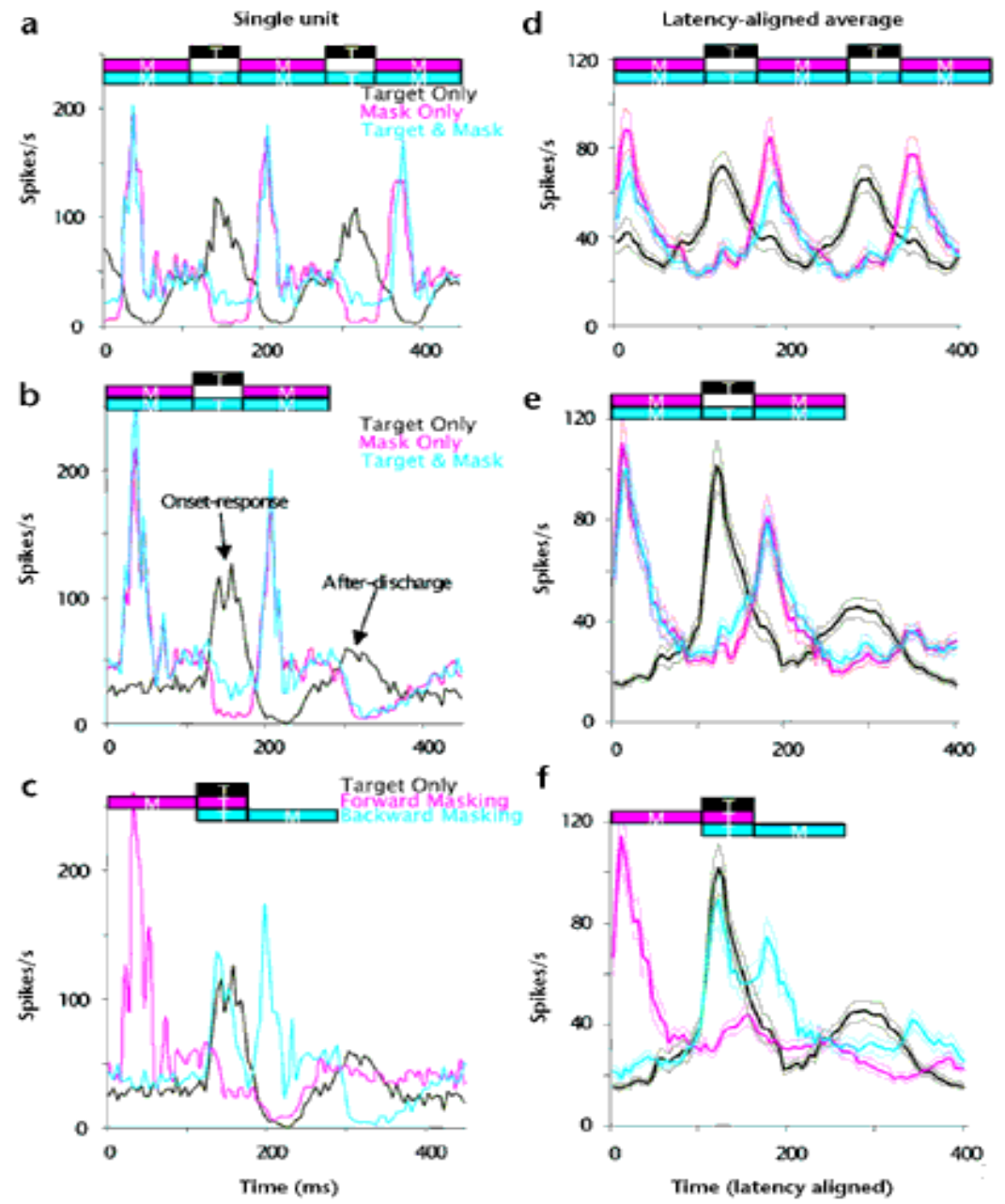


2AFC Task: Which side had longer line?

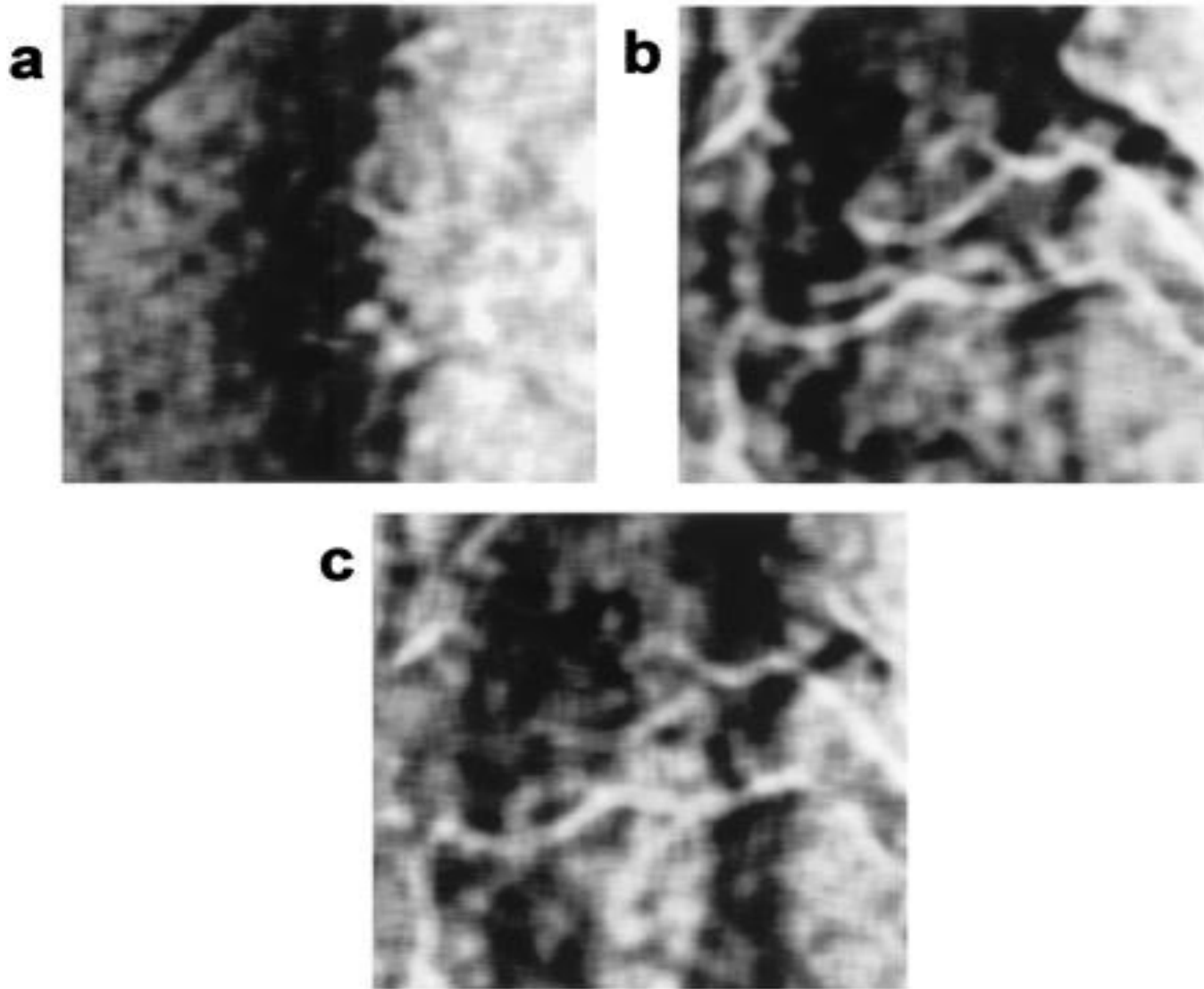
Neural correlates of visual masking:  
“Standing Wave of Invisibility” illusion=  
cyclic alternation of target bar (60ms) with flanking mask bars (110ms).

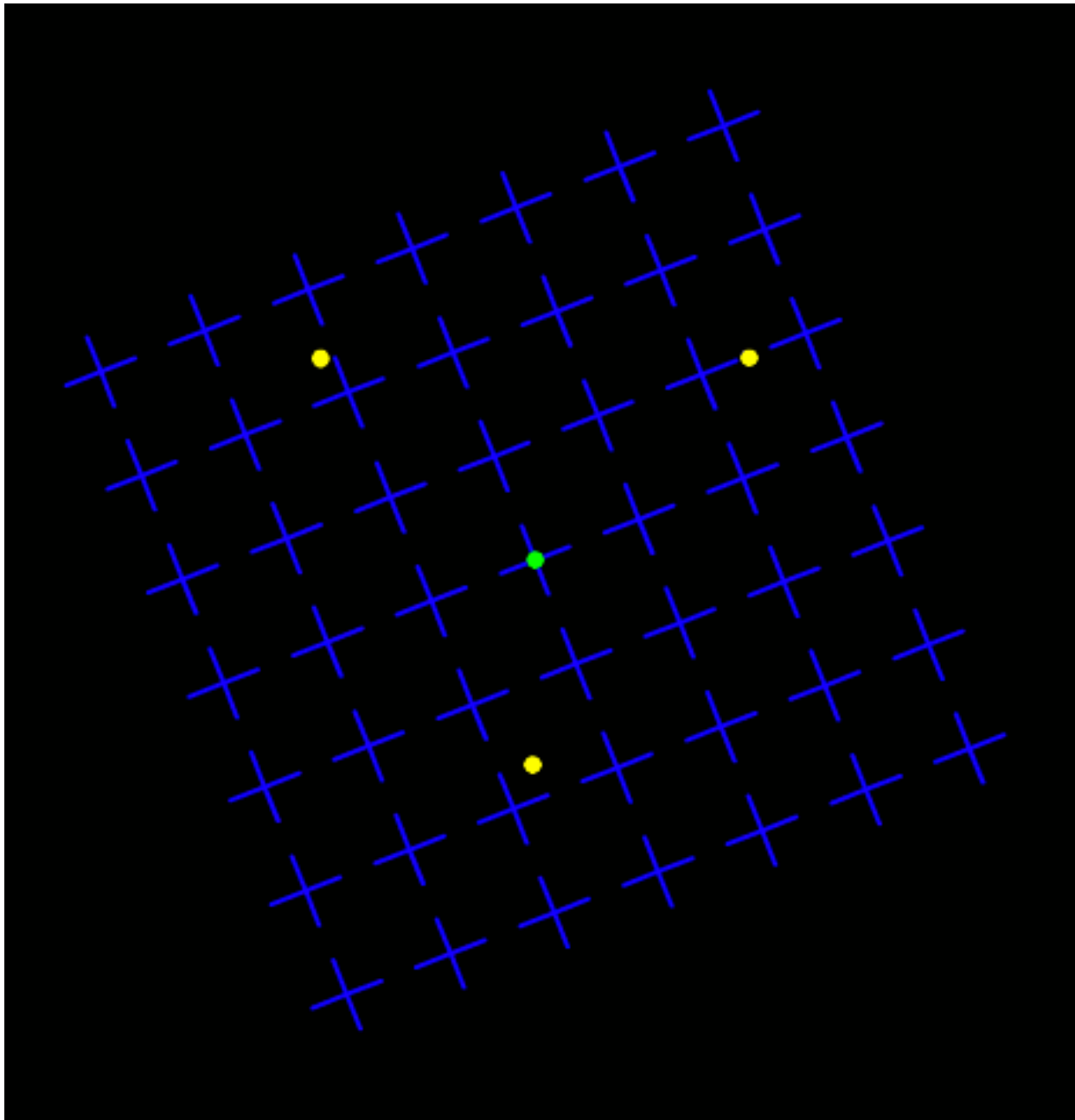


Measured responses in awake monkey V1.

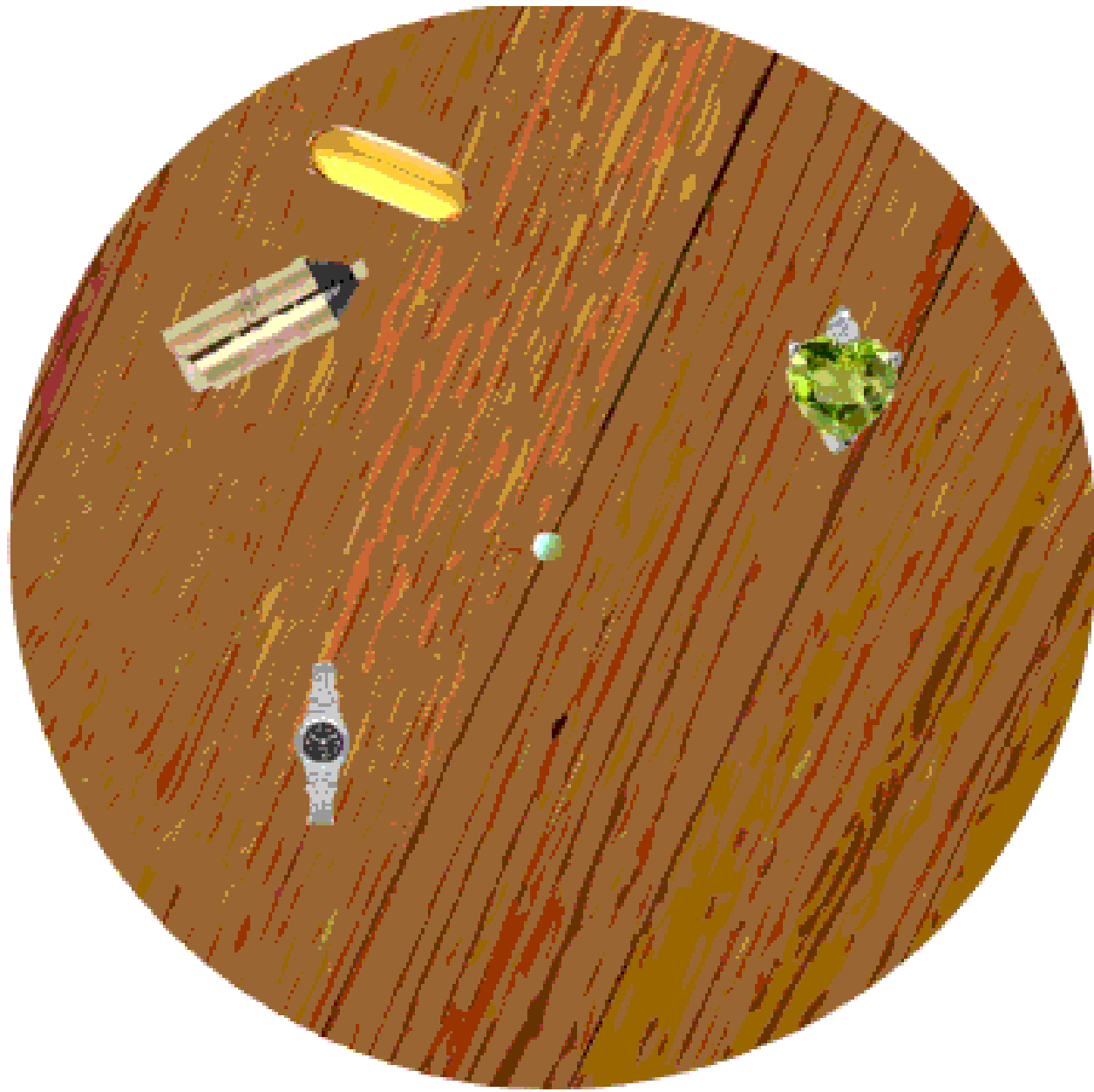


Macknik and Haglund, 1999



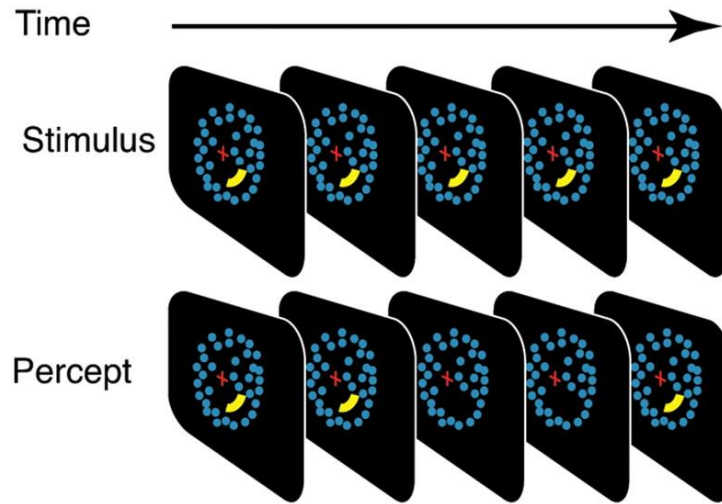




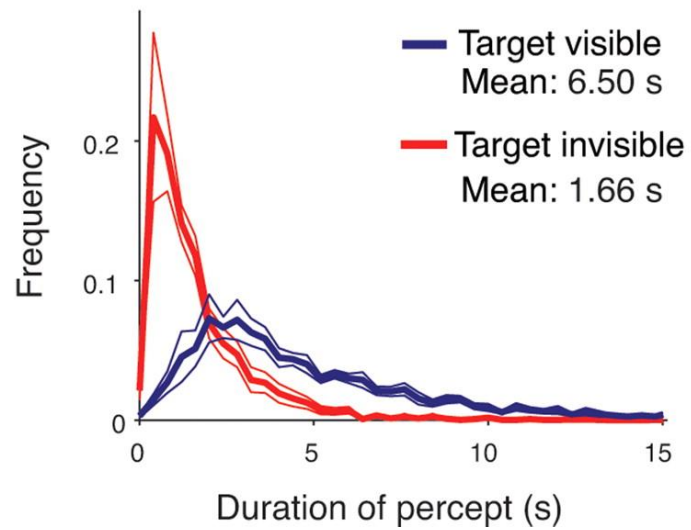


# Motion Induced Blindness: Donner, Sagi, Bonneh and Heeger, 2008

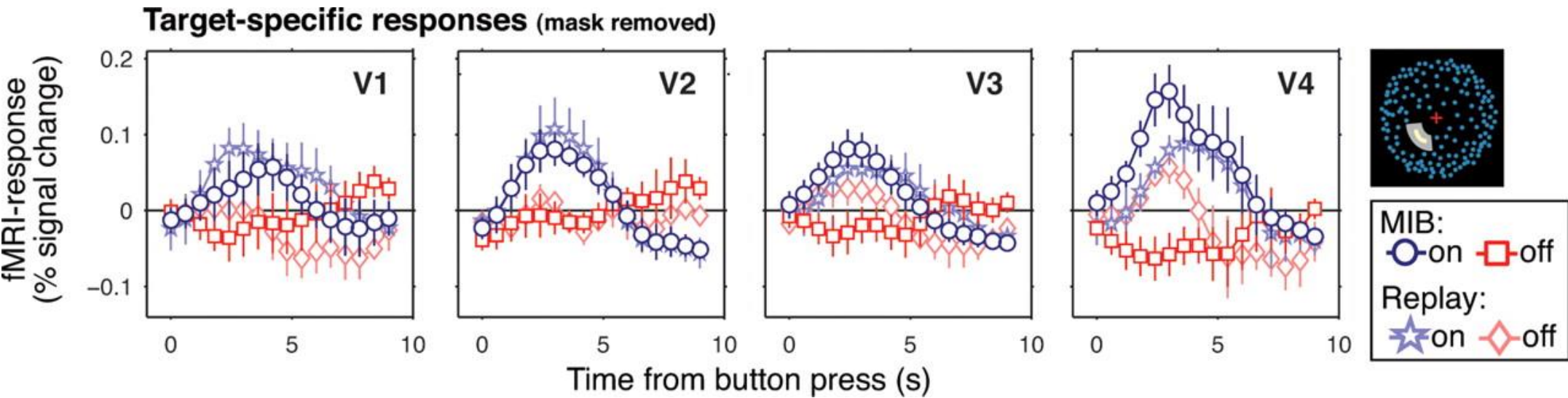
**A**



**B**

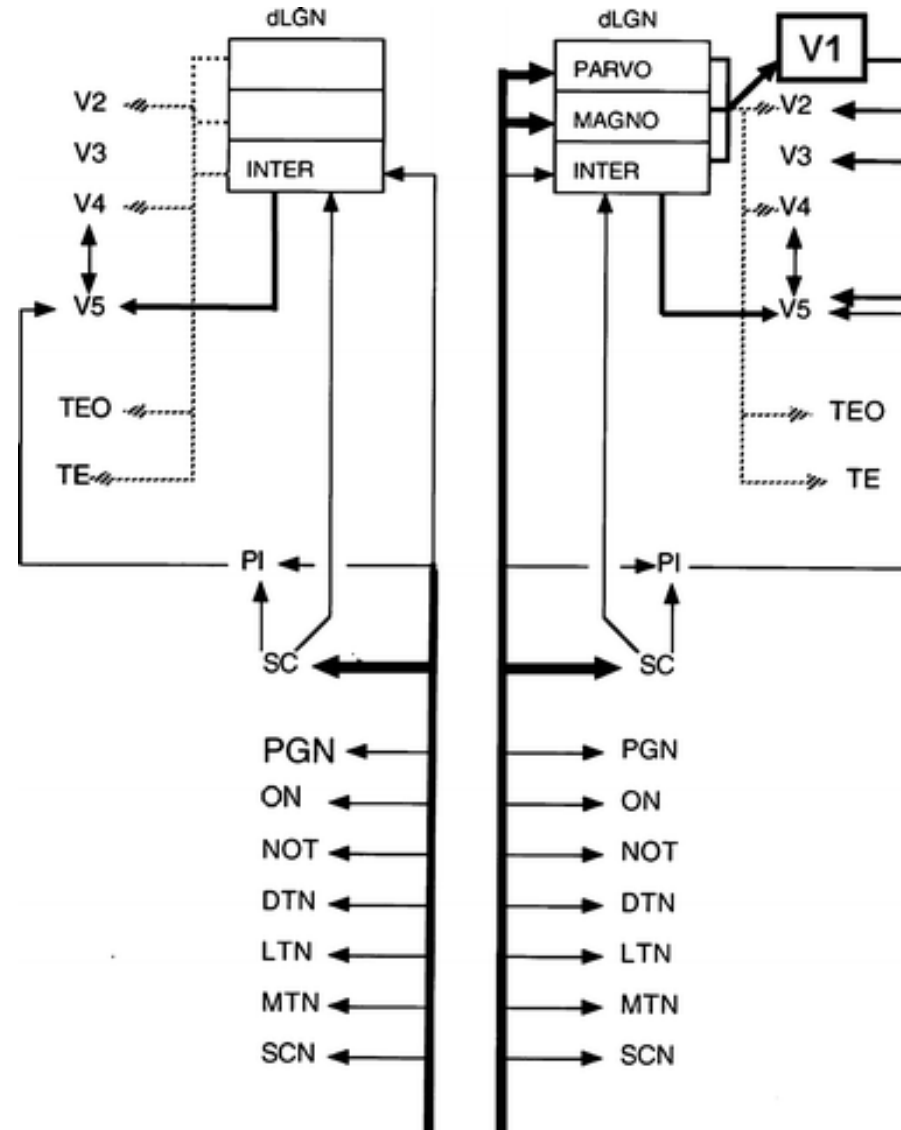


# Motion Induced Blindness: Donner, Sagi, Bonnef and Heeger, 2008



# Blindsight: Weiskrantz et al. 1995

# Blindsight: (Covey 2010)

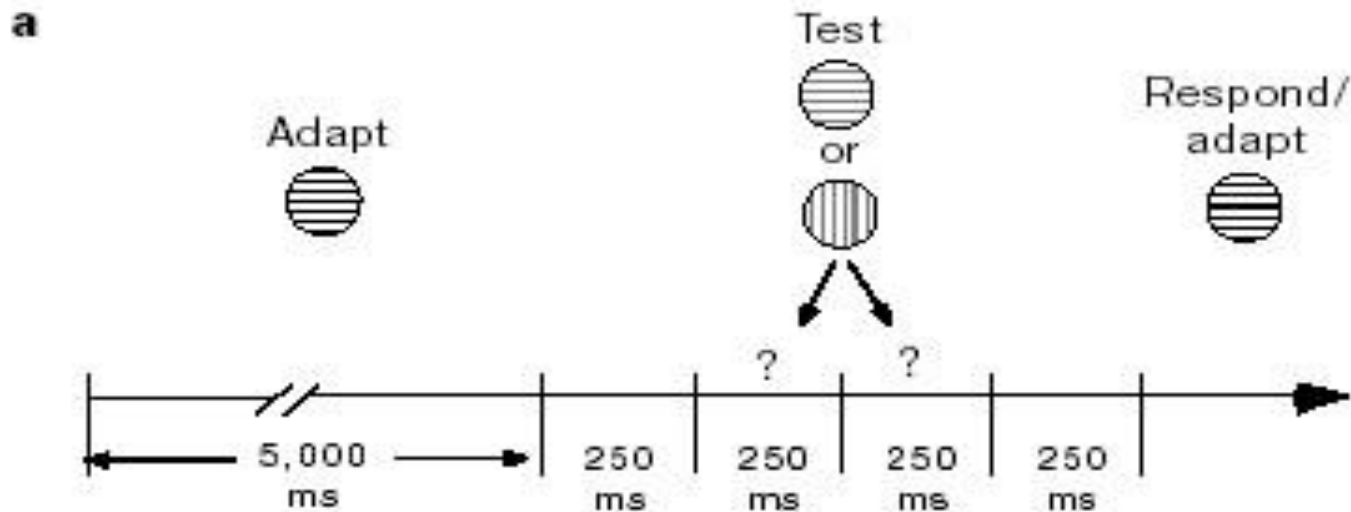


Aftereffect to invisible stimuli

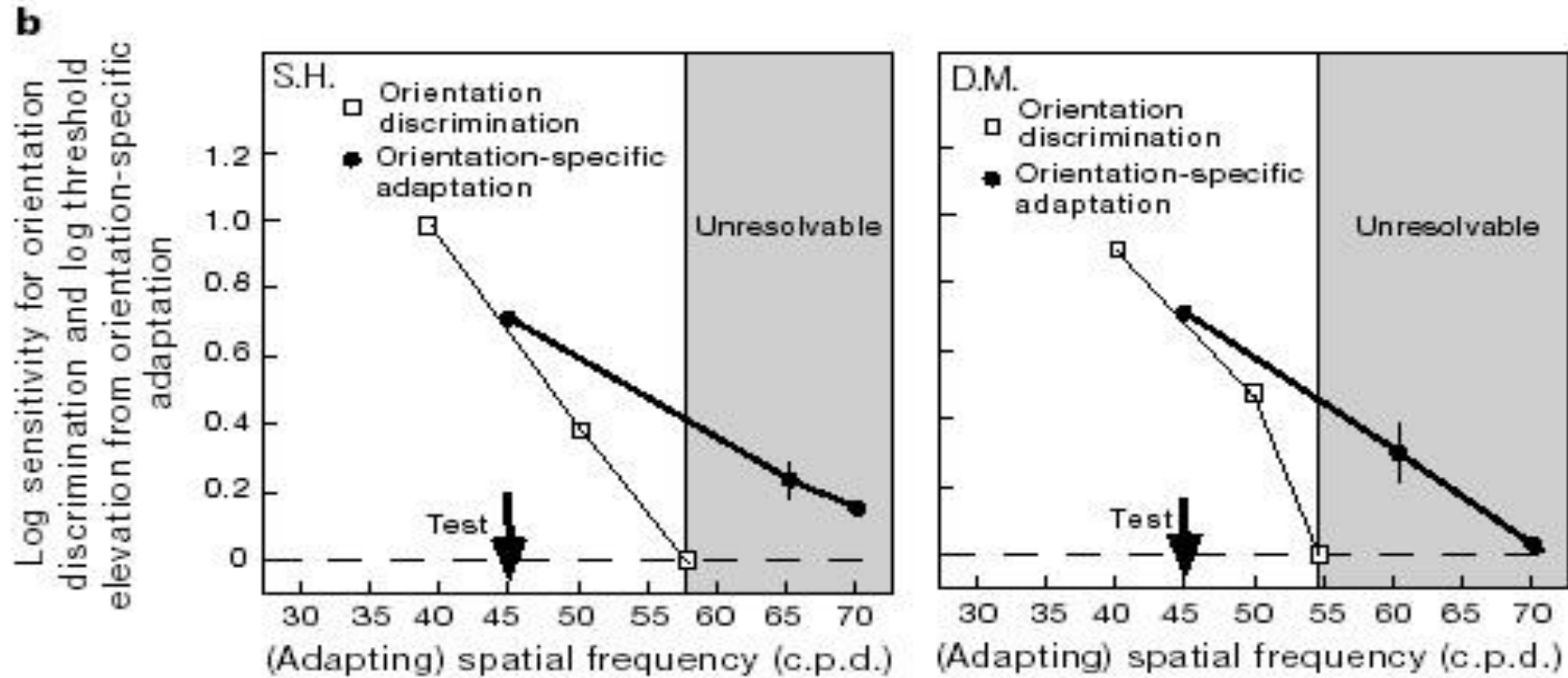
# Experimental Setup:

- Laser Projection of an either horizontal or vertical adapting grating onto the retina for 5 seconds (different resolutions)
- Test grating (various contrast, to determine threshold contrast)

The after-effect in this case is a reduced threshold contrast for gratings with the same orientation as the adaptation grating



# Results:



- Even invisible gratings had a measurable after-effect above 55 cpd: inability to tell the orientation in a forced choice test

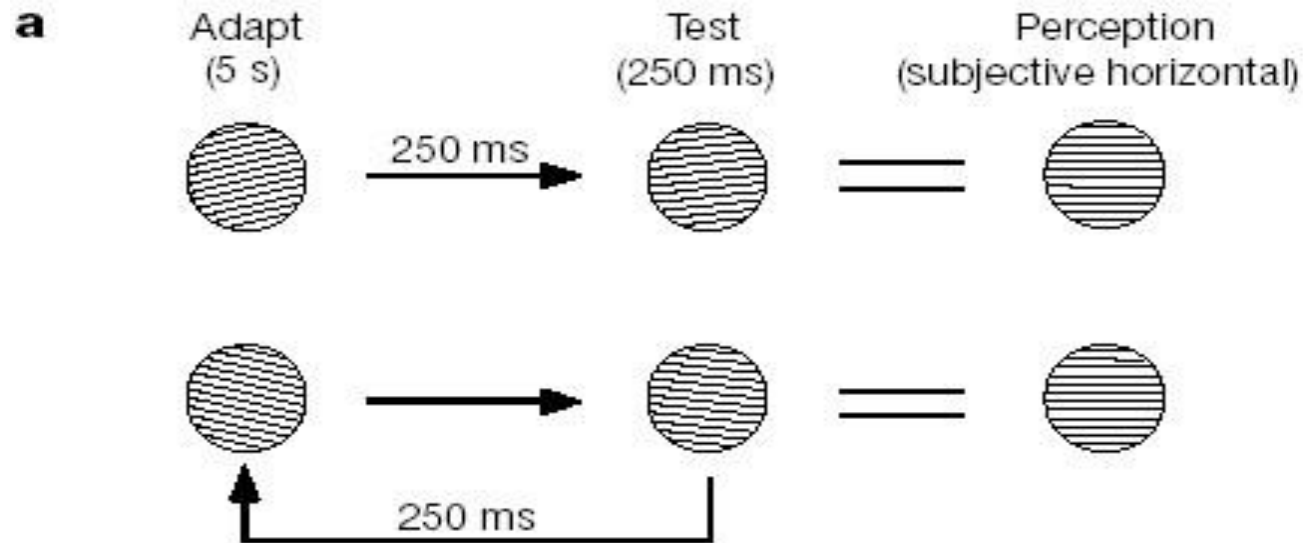


# Their conclusions:

Stimuli too fine to be resolved can activate orientation selective neurons in cortex.

## Second Experiment:

Tilt after-effect with invisible gratings:



This also worked...

<b>Study topic</b>	<b>Study</b>	<b>Main findings</b>	<b>Possible NCC</b>
Binocular rivalry in monkeys	Leopold and Logothetis "Activity changes in early visual cortex reflect monkeys' percepts during binocular rivalry"	More V4 than V1/V2 neurons correlate with visual consciousness in monkeys	V4
Binocular rivalry in humans	Polonsky et al. "Neuronal activity in human primary visual cortex correlates with perception during binocular rivalry."	V1 responds equally strongly to visual consciousness of rivalrous stimuli as V2-V4 in humans	V1-V4
Binocular fusion	Moutoussis and Zeki "The relationship between cortical activation and perception investigated with invisible stimuli."	Level of activity in primary and higher visual areas correlates with visual consciousness in humans	V1 and higher (fusiform, Para-HPC)
Afterimages to filled-in surface	Shimojo et al. "Afterimage of perceptually filled-in surface."	Cortical neural adaptation responsible for visual consciousness of global afterimage of filled-in surface in humans	Cortex
Afterimages to invisible stimuli	He and MacLeod "Orientation-selective adaptation and tilt after-effect from invisible patterns."	Not consciously perceived visual information is represented in the cortex and exerts after-effects on subsequent visual performance in humans	Cortex?
Split-Brain	Corballis and Corballis "Interhemispheric visual matching in the split brain"	?	?
Blindsight	Weiskrantz et al. "Prime-sight in a blindsight patient"	Conscious visual perception of after-images to not consciously perceived visual stimuli in a blindsight patient	Cortex?
Visual masking	Macnisk and Livingstone "Neuronal correlates of visibility and invisibility in the primate visual system."	Onset- and offset-transient responses to visual stimuli in V1 correlate with visual consciousness	V1 (higher areas not studied)

What/where, or conscious/unconscious pathways ?

