In search of the NCC:
Visual system experiments

Daniel Kiper
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Visual Pathways
Binocular Rivalry
120 Hz screen alternates between two possibilities

Key presses 1 2

Liquid crystal shutters alternate between eyes

Intermediate percepts, such as...
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
fMRI contrasts for „same“ and „opposite“ stimulation
Perception covaries with increased activation
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.
Motion Induced Blindness: Donner, Sagi, Bonneh and Heeger, 2008
Motion Induced Blindness: Donner, Sagi, Bonneh and Heeger, 2008
Blindsight: Weiskrantz et al. 1995
Blindsight: (Cowey 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...
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<th>Possible NCC</th>
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<td>Binocular rivalry in monkeys</td>
<td>Leopold and Logothetis &quot;Activity changes in early visual cortex reflect monkeys' percepts during binocular rivalry&quot;</td>
<td>More V4 than V1/V2 neurons correlate with visual consciousness in monkeys</td>
<td>V4</td>
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<tr>
<td>Binocular rivalry in humans</td>
<td>Polonsky et al. &quot;Neuronal activity in human primary visual cortex correlates with perception during binocular rivalry.&quot;</td>
<td>V1 responds equally strongly to visual consciousness of rivalrous stimuli as V2-V4 in humans</td>
<td>V1-V4</td>
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<td>Binocular fusion</td>
<td>Moutoussis and Zeki &quot;The relationship between cortical activation and perception investigated with invisible stimuli.&quot;</td>
<td>Level of activity in primary and higher visual areas correlates with visual consciousness in humans</td>
<td>V1 and higher (fusiform, Para-HPC)</td>
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<td>Afterimages to filled-in surface</td>
<td>Shimojo et al. &quot;Afterimage of perceptually filled-in surface.&quot;</td>
<td>Cortical neural adaptation responsible for visual consciousness of global afterimage of filled-in surface in humans</td>
<td>Cortex</td>
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<td>Afterimages to invisible stimuli</td>
<td>He and MacLeod &quot;Orientation-selective adaptation and tilt after-effect from invisible patterns.&quot;</td>
<td>Not consciously perceived visual information is represented in the cortex and exerts after-effects on subsequent visual performance in humans</td>
<td>Cortex?</td>
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<td>Split-Brain</td>
<td>Corballis and Corballis &quot;Interhemispheric visual matching in the split brain&quot;</td>
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<td>Blindsight</td>
<td>Weiskrantz et al. &quot;Prime-sight in a blindsight patient&quot;</td>
<td>Conscious visual perception of after-images to not consciously perceived visual stimuli in a blindsight patient</td>
<td>Cortex?</td>
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<td>Visual masking</td>
<td>Macnick and Livingstone &quot;Neuronal correlates of visibility and invisibility in the primate visual system.&quot;</td>
<td>Onset- and offset-transient responses to visual stimuli in V1 correlate with visual consciousness</td>
<td>V1 (higher areas not studied)</td>
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