

**Attentional Selection and Perceptual Organization**

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An important aspect of visual perception is figure-ground segregation. Because the eyes register only 2D images of a 3D world, the visual system needs to detect the contours of objects and assign them correctly to the object side, rather than to the background side. Our recent studies indicate that the assignment of "border ownership" occurs in cortical area V2. In a so-far separate line of work, we have studied selective attention, which is the mechanism by which the nervous system selects the most relevant information at any time. We have found a strong correlation between the attentional state and the temporal structure of neural responses, viz. synchrony between neural spike trains. In the proposed work, we suggest that attention may be viewed as a mechanism that works at a level of intermediate vision and perceptual organization. Specifically, we propose that the neural substrate that is observed to generate the border ownership coding signals may also provide 'handles' for attentional selection. Central processes of selective attention may then rely on the visual data structure provided by this area. Our preliminary results indicate that attentional control may be exerted by employing synchrony structures akin to those seen in our previous work. We will study this hypothesis both by computational modeling and by recording in awake behaving monkeys. The hypothesis generates clear predictions, of which some have been confirmed in preliminary studies and others are to be tested in the proposed work. Understanding the interplay between selective attention and perceptual organization will contribute significantly to understanding the vision process in particular, and the principles of neural information processing in general. Beyond the theoretical interest, understanding the function of the visual cortex is an important goal in view of clinical applications because large parts of the brain are devoted to visual processing, and many neurological diseases are accompanied by central visual disorders.

**Project Website**

[http://www.mb.jhu.edu/vonderheydt/vonderheydt\\_1.asp](http://www.mb.jhu.edu/vonderheydt/vonderheydt_1.asp)