



Synchronized firing and visual signaling in the primate retina

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Friday, May 23, 2008
2:00 pm – 3:00 pm
COOK 31 18 A&B

*Video-cast will be available in the
Ward Building, room 5-230, Chicago Campus

ABSTRACT:

Synchronized firing has been hypothesized to play a role in the function of many neural circuits. In the retina, synchronized firing has been observed in several species, but its impact on visual signals remains unclear. First, no previous studies have examined synchronized firing in the retina of primates, the dominant model for human visual system function. Second, synchronized firing has been studied almost entirely on the basis of recordings from pairs of cells, but may occur at a much larger scale. Third, capturing the full structure of synchronized firing and its impact on visual processing presents substantial analytical challenges. As a consequence, the overall structure of synchronized firing and its impact on visual signals remains unclear. Using large-scale recordings from the primate retina in vitro, we have characterized the full structure of synchronized firing in populations of hundreds of retinal ganglion cells. Using two novel analysis methods, we find that the large-scale structure of synchronized firing can be explained by simple interactions between neighboring cells in the network. Further, accounting for this structure in decoding the retinal signal can yield up to 20% improvement in visual performance. Thus, synchronized firing in the primate retina may be understood with simple models and may represent a significant aspect of visual signaling to the brain.