Parallel nonlinear processing at retinal bipolar-ganglion cell synapses

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Linear models can explain a retinal ganglion cell's (RGC's) coarse response properties to dynamically changing stimuli [1][2]. However, such models cannot capture well-known nonlinear effects such as contrast adaptation [2] and the generation of temporal precision [3]. These nonlinear properties contribute to our understanding of visual computation in general, and also provide constraints in linking functional aspects of the response to underlying physiological mechanisms. Here, using physiologically-based modeling of excitable current inputs to identified RGC types, we provide evidence for a mechanistic basis of nonlinear processing in the retina and demonstrate its possible role in distinguishing functional roles of different RGC types.

Nonlinear processing evident in synaptic currents

Evidence for mechanism underlying suppression

Low luminance models have same nonlinearities

Conclusions

References:

7. Fei et al., Neuron (2001)