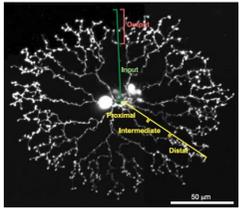


# A Directionally-Selective Neuromorphic Circuit Based on Reciprocal Synapses in Starburst Amacrine Cells

Ko-Chung Tseng, Alice C. Parker, and Jonathan Joshi

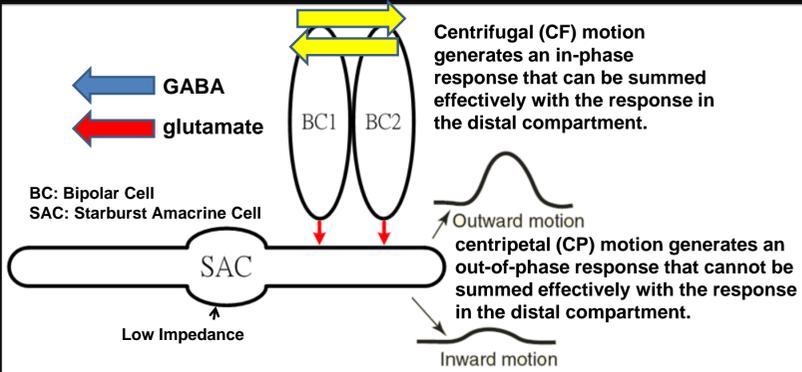
The BioRC Biomimetic Real-Time Cortex Project

## Introduction

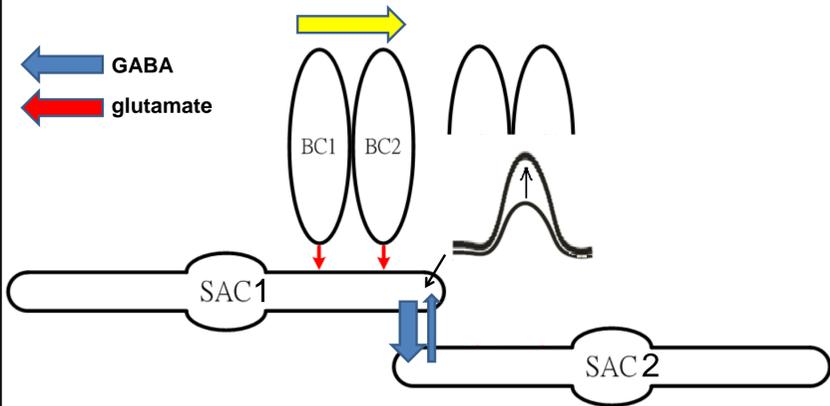


1. Radially-symmetric morphology
2. Directional selectivity
3. Receives glutamate released from bipolar cells
4. Supports motion detection in the mammalian retina

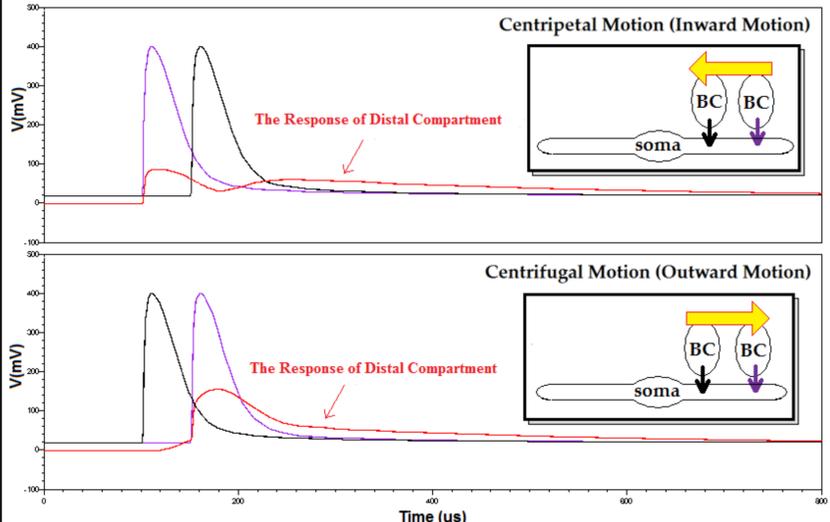
## Mechanisms: Intrinsic Properties



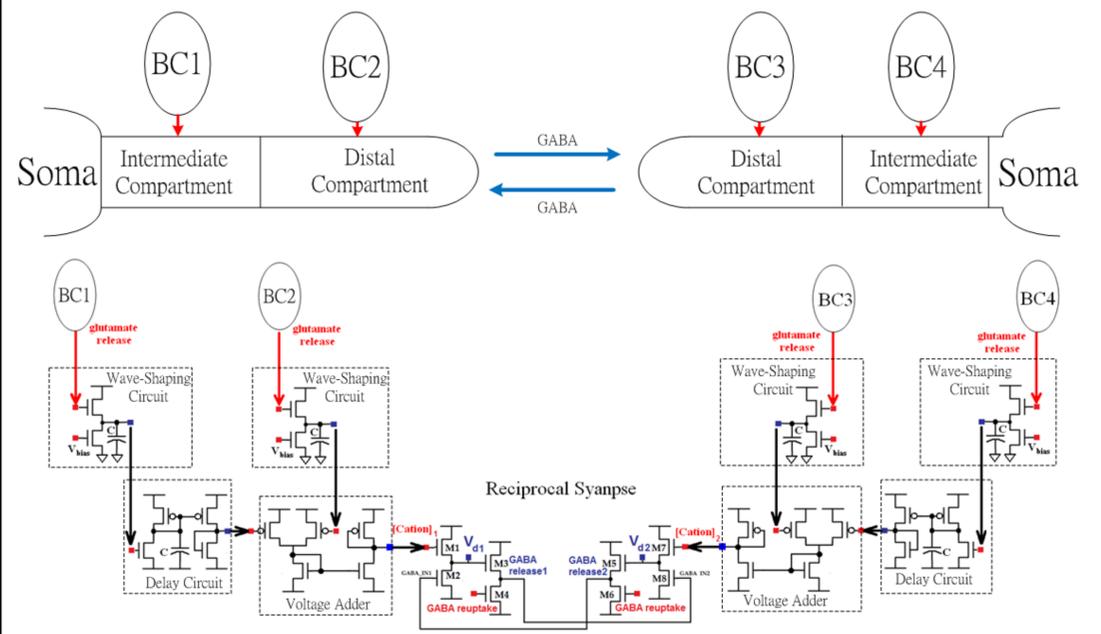
## Mechanisms: GABA Interaction



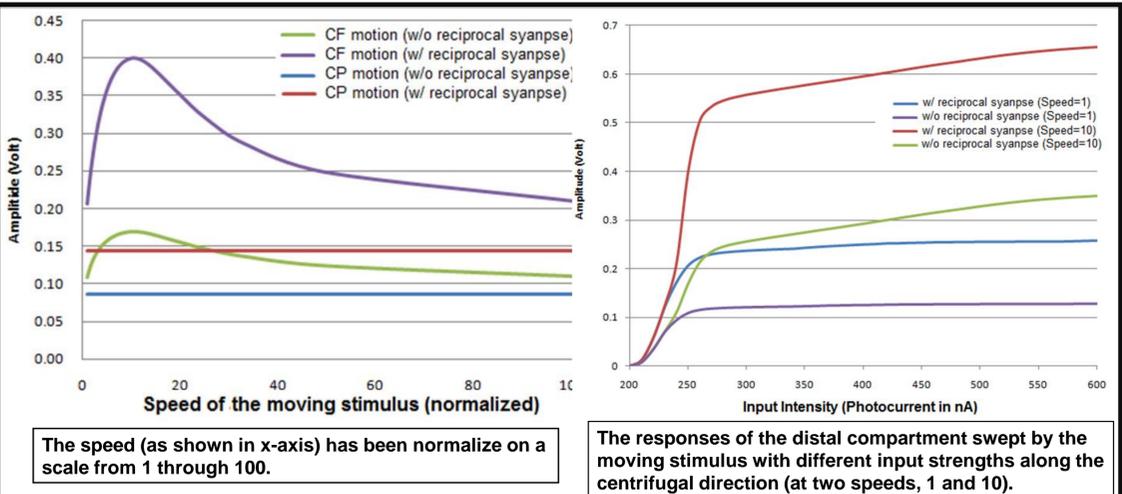
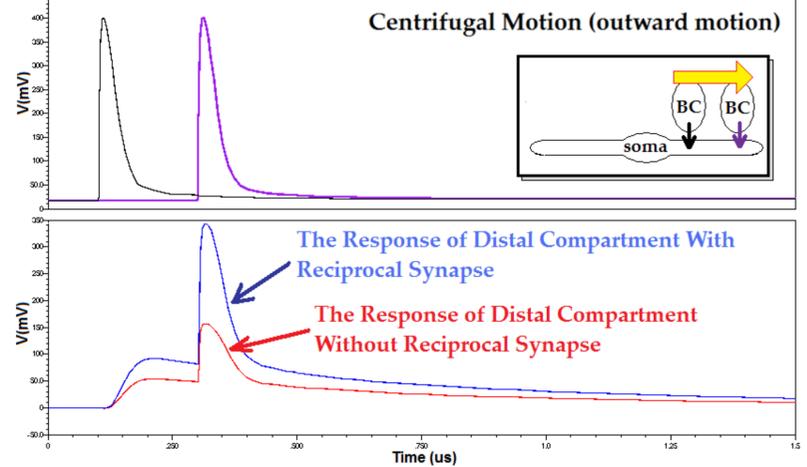
## Without a Reciprocal Synapse



## Circuit Implementation



## With a Reciprocal Synapse



## Summary

1. An important mechanism to support motion detection in the mammalian retina has been modeled in a neuromorphic circuit and simulated.
2. Lateral and feedback communications play a major role in retinal processing.
3. The importance of the SAC lateral communications in strengthening responses has been shown in a neuromorphic circuit simulation.

Reference:  
A Directionally-Selective Neuromorphic Circuit Based on Reciprocal Synapses in Starburst Amacrine Cells, Ko-Chung Tseng, Alice C. Parker, and Jonathan Joshi, Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Sept, 2011.

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