Abstract Submitted
for the MAS14 Meeting of
The American Physical Society

Modeling Bengalese finch syllable sequence generation with auditory feedback SETH HULSEY, DEZHE JIN, Department of Physics, Pennsylvania State University, University Park, Pennsylvania — The song of the Bengalese finch consists of variable sequences of discrete syllables. Auditory feedback is required for normal singing behavior. Disruption of auditory feedback significantly altered syllable sequencing and timing. Deafening led to the emergence of novel transitions and more complex syllable sequences. Here we construct a computational model of variable sequence generation in Bengalese finch that can explain these results. The model is based on the branched chain network of projection neurons in the premotor song nucleus HVC (proper name). Chains of HVC projection neurons are associated with song syllables. Feedback inhibition from inhibitory interneurons ensures that spiking activity propagates along a single chain at a time. Auditory feedback is provided by projections from NIf neurons to HVC neurons. Different sets of NIf neurons respond to different syllables and have distinctive connection patterns to the HVC chains. Auditory feedback in our model provides sequence-dependent feedback inputs to the HVC network that can control syllable transitions. Alteration of auditory feedback temporarily suppresses NIf input, altering syllable sequencing. Deafening leads to random activations of NIf neurons, encouragingnovel syllable transitions and randomizingsyllable sequences. Our model explains the neural mechanism underlying the effects of altered auditory feedback and deafening on Bengalese finch song sequencing.

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Date submitted: 28 Aug 2014 Electronic form version 1.4