

WORKSHOP
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Timing computations in the auditory brain stem

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Abstract

Sound localization involves precise temporal processing by neurons in the auditory brain stem. The first neurons in the auditory pathway to receive input from both ears can distinguish interaural time differences (ITDs) in the sub-millisecond range. These cells in the mammalian medial superior olive (MSO) have specialized biophysical features: two dendrites, each receiving input from only one side; very short membrane time constant (less than one ms); specialized ionic channel properties, including a low-voltage activated K⁺ current, I-KLT. This I-KLT contributes to phasic firing (one spike in response to a step of current), precise phase-locking, and extremely timing-sensitive coincidence detection. We will describe the temporal feature-selecting properties of MSO cells based on biophysical (HH-like) modeling, in vitro (gerbil) electrophysiology and application of concepts from dynamical systems theory and coding theory.