Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Noise-enhanced periodicity in hair cells and primary afferent neurons[1] ALEXANDER NEIMAN, Department of Physics and Astronomy, Ohio University, MICHAEL ROWE, Department of Biological Sciences, Ohio University
— We study oscillatory responses of a primary auditory unit composed from a hair cell and a primary afferent neuron to a broad-band mechanical noisy stimuli using a biophysical model. The model contains two compartments: the hair cell possessing electrical resonance properties and an excitable Hodgkin-Huxley type afferent neuron, coupled with the hair cell through an excitatory synapse. The model predicts the existence of an optimal noise level that maximizes the quality factor of a resonance peak in the power spectrum of the afferent neuron, demonstrating thus a maximal coherence of oscillations (coherence resonance). It also predicts a shift of the peak frequency towards lower frequencies with the increase of noise level. Our experimental results on turtle saccular units support model predictions, demonstrating both the frequency shift and the coherence resonance.

[1]Supported by NIH, R21DC005468

Alexander Neiman
Department of Physics and Astronomy, Ohio University

Date submitted: 01 Dec 2004 Electronic form version 1.4