

סמינר מדעי היסוד

יום חמישי 29.1.2009 בשעה 11:00-12:00 בפיקוס 202
Thursday 29.1.2009 on 11:00-12:00, Fikus 202

Dr. Edward Givelberg

A Comprehensive Three-Dimensional Computational Model of the Cochlea

Abstract

The human cochlea is a remarkable device, able to discern extremely small amplitude sound pressure waves, and discriminate between very close frequencies. Simulation of the cochlea is computationally challenging due to its complex geometry, intricate construction and small physical size.

We have constructed a comprehensive three-dimensional model based on cochlear geometry obtained from physical measurements which includes a detailed description of the elastic material components immersed in the cochlear fluid. The basilar membrane is modeled by fourth-order partial differential equations of shell theory and the interactions between the elastic components and the fluid are computed using the immersed boundary method.

In this talk I will review the basic mechanics of human hearing, describe the construction of the model using large-scale parallel computers and present results from a series of numerical experiments carried out with the model. Our results reproduce the basic well known characteristics of cochlear mechanics.

Part of this work was carried out in collaboration with Julian Bunn.

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