

The Ohio State University Biophysics Program

11th Annual Robert Ross Lectureship

A. James Hudspeth

Rockefeller University

Thursday, April 27

1:30-3:00 in 170 Davis Heart &
Lung Research Institute
473 W 12th

3:00-4:00 Students meet speaker
159 DHLRI



How hearing happens

Mechanical amplification by ion channels and myosin molecules in the inner ear

Human hearing is enhanced by an active process that amplifies the ear's mechanical inputs several hundredfold, sharpens frequency tuning to allow the discrimination of tones differing in frequency by less than 0.2%, and compresses six orders of magnitude in the amplitude of sounds into only two orders of magnitude in neural output. In addition, spontaneous otoacoustic emissions emerge from ears in a very quiet environment, an indication that the active process can be so exuberant as to become unstable. Cooperativity between mechanoelectrical-transduction channels confers negative stiffness on the hair

bundle, which together with myosin-based adaptation motors elicits a dynamical instability that underlies the active process. Experiments on individual hair bundles indicate that the bundle's operation near this instability, a Hopf bifurcation, accounts for the four characteristics of the active process.

