

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Otoacoustic emissions from the cochlea as a convenient model for investigation of convectively unstable nonlinear systems DAVID MILLS, University of Washington — Two tones introduced into the ear canal result in acoustic emissions at distortion product frequencies. Evidence suggests that the nonlinearity responsible for these distortion product otoacoustic emissions is the saturating response of hair cell transducer channels. Emissions from the normal mammalian cochlea are particularly strong and can be detected at very low sound levels. This, and other evidence, suggests the existence in mammals of a “cochlear amplifier” involving physical amplification of the traveling wave/basilar membrane motion driving hair cell transduction channels. A feed-back or feed-forward process equivalent to a convective instability seems required. The nonlinearity is essential in limiting amplification at high sound levels, thereby providing necessary range compression. Analysis focuses on observed input-output, or “growth,” functions, defined by the measurement of the amplitude of emission components as a function of varying stimulus levels with fixed stimulus frequencies. Typical growth functions demonstrate the complexity of the response, and restrict potential models of the system.

David Mills
University of Washington

Date submitted: 06 Jan 2005

Electronic form version 1.4