

Abstract Submitted  
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**Why Internally Coupled Ears (ICE) Work Well<sup>1</sup>** J. LEO VAN HEMMEN, Physik Department T35, TU Muenchen — Many vertebrates, such as frogs and lizards, have an air-filled cavity between left and right eardrum, i.e., internally coupled ears (ICE). Depending on source direction, internal time (iTD) and level (iLD) difference as experienced by the animal's auditory system may greatly exceed [C. Vossen et al., JASA 128 (2010) 909–918] the external, or interaural, time and level difference (ITD and ILD). Sensory processing only encodes iTD and iLD. We present an extension of ICE theory so as to elucidate the underlying physics. First, the membrane properties of the eardrum explain why for low frequencies iTD dominates whereas iLD does so for higher frequencies. Second, the plateau of iTD =  $\gamma$  ITD for constant  $1 < \gamma < 5$  and variable input frequency  $< \nu_o$  follows; e.g., for the Tockay gecko  $\nu_o \approx 1.5$  kHz. Third, we use a sectorial instead of circular membrane to quantify the effect of the extracolumella embedded in the tympanum and connecting with the cochlea. The main parameters can be adjusted so that the model is species independent.

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J. Leo van Hemmen  
Physik Department T35, TU Muenchen

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