

Talk 1.4

The dynamical basis of hearing

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We have 200 million photoreceptors, 20 million olfactory receptors, and 10 million tactile/thermal/nociceptive receptors, yet we only have sixteen thousand inner hair cells, our primary auditory sensors. This indicates that each inner hair cell transduces more information per unit of time than any other sensory receptor, and indeed a heavy burden is placed on the accuracy and fidelity of the first few steps of auditory encoding: mechanical amplification of the signal by an active process, its detection, and its first discretization into neural impulses. This grant concerns itself with these first steps: to model the active process and its environment, to understand the interaction between them, and to model the early neural coding of sound. In this past year we've made progress in all of these aims.

I'll describe our results in understanding the micromechanics of hair bundles; data analysis and modeling of the ribbon synapse; and timing-code-based time-frequency representations.