OAE: Evoking the Future Workshop 2018

Title:
Connecting the dots: Empirical approaches to the OAE inverse problem

Presenter:
Christopher Bergevin
Dept. of Physics & Astronomy, Centre for Vision Research
York University

Additional authors:
Robert Harrison (The Hospital for Sick Children, Toronto, Ontario, Canada)
Jaina Negandhi (The Hospital for Sick Children, Toronto, Ontario, Canada)

Abstract:

As an inverse problem, understanding otoacoustic emission (OAE) generation presents a singular challenge. Various theoretical frameworks have been highly successful in providing explanatory power, yet fundamental questions remain. For example, why do such disparate inner ear morphologies across animal classes, which presumably strongly affect the underlying biomechanics, give rise to relatively similar OAE properties? Or, can one demonstrate empirical confirmation of the notion of morphological "roughness" (i.e., entropic features, such as random variations in hair cell arrangement), an important assumption implicit in many theoretical and computational frameworks? Using the relatively "simple" ear of the lizard, this study seeks to look for correlations between two independent measures from the same individual animal: SOAE spectral characteristics and morphological features quantitatively extracted from electron micrographs of the inner ear (basilar papilla). Anolis lizards are ideal in this regard for several reasons: robust (S)OAE activity, the basilar papilla is relatively easily accessible for extraction & microscopic visualization, the ~150 hair cell bundles of the papilla are (mostly) free-standing and lack a tectorium, and published neurophysiological data can allow us to infer the associated tonotopic map. These latter aspects (potentially) make it easier to quantify morphological features. Preliminary results have allowed us to successfully measure SOAEs and visualize papilla morphology (e.g., hair cell distributions) from the same animal.