

## **New *Ormia*-inspired Directional MEMS Microphone Operating In A Low Frequency Band**

Directional MEMS microphones inspired by the parasitoid fly *Ormia ochracea* have been studied since the discovery that the micro-scale tympana structure of this female fly can amplify and locate narrow band mating calls from its host. This presentation will concentrate on the first piezoelectric *Ormia*-inspired MEMS microphone that operates in a low range of frequency bands overlapping with human vocal frequencies, and as such is suitable for hearing aid applications. Including two plates performing as *Ormia*'s two tympana, the entire region in motion in our microphone is about 3.2mm×1.42mm×10μm. Compared to other piezoelectric *Ormia*-inspired designs, our design transfers the working frequency band from over 10 kHz to below 3 kHz due to its asymmetric structure and an S-type rotational cantilever. Furthermore, it provides a unidirectional response around two resonance frequencies below 3 kHz. The open-circuit acoustic response of the device is approximately 3.9 mV/Pa at 464 Hz which is close to human vocal frequencies, with a maximum value of 9.9 mV/Pa at 2275 Hz, which is near the frequency region where the human auditory system is most sensitive. The new microphone, coupled with a custom-built preamplifier, has a noise floor of 10 μV/√Hz at 1 kHz.