

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Bio-Inspired Micromechanical Directional Acoustic Sensor¹

WILLIAM SWAN, Naval Postgraduate School, FABIO ALVES, Alion Science and Technology, GAMANI KARUNASIRI, Naval Postgraduate School — Conventional directional sound sensors employ an array of spatially separated microphones and the direction is determined using arrival times and amplitudes. In nature, insects such as the *Ormia ochracea* fly can determine the direction of sound using a hearing organ much smaller than the wavelength of sound it detects. The fly's eardrums are mechanically coupled, only separated by about 1 mm, and have remarkable directional sensitivity. A micromechanical sensor based on the fly's hearing system was designed and fabricated on a silicon on insulator (SOI) substrate using MEMS technology. The sensor consists of two 1 mm² wings connected using a bridge and to the substrate using two torsional legs. The dimensions of the sensor and material stiffness determine the frequency response of the sensor. The vibration of the wings in response to incident sound at the bending resonance was measured using a laser vibrometer and found to be about 1 $\mu\text{m}/\text{Pa}$. The electronic response of the sensor to sound was measured using integrated comb finger capacitors and found to be about 25 V/Pa. The fabricated sensors showed good directional sensitivity. In this talk, the design, fabrication and characteristics of the directional sound sensor will be described.

¹Supported by ONR and TDSI

Gamani Karunasiri
Naval Postgraduate School

Date submitted: 05 Nov 2015

Electronic form version 1.4