Weekly CEAFM Seminar: Fall 2016

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, October 7th, 2016**

Time: 11:00 AM

Location: Gilman Hall # 50

Speaker: **Dr. Susanne J. Sterbing-D'Angelo** (University of MD at College Park)

Title: ***"Role of Tactile Sensing For Flight Performance in Bats"***

Abstract

Bat wings are highly adaptive airfoils that enable demanding flight maneuvers, which are performed with astonishing robustness under turbulent conditions, and stability at slow flight velocities. The bat wing is sparsely covered with microscopically small, sensory hairs that are associated with tactile receptors. Bat wing hairs are involved in sensing airflow for improved flight maneuverability in behavioral tasks. We report physical measurements of these hairs and their distribution on the wing surface of the big brown bat, Eptesicus fuscus, based on scanning electron microscopy analyses. The wing hairs are strongly tapered, and are found on both the dorsal and ventral wing surfaces. Laser scanning vibrometry tests of 43 hairs from twelve locations across the wing of the big brown bat reveal that their natural frequencies inversely correlate with length, and range from 3.7 to 84.5 kHz. Young's modulus of the average wing hair is 4.4 GPa, indicating stiffness comparable with rat whiskers or arthropod airflow-sensing hairs.

Bio

Dr. Sterbing's research at the University of Maryland investigates the neural basis of sensorimotor integration and spatial perception, and she currently study echolocating bats, as these animals actively probe the environment with sonar signals that can be recorded and directly tied to behavioral state. Having a background in biology (sensory neuroscience) she am interested in the multisensory components of orientation and navigation of animals in space. Echolocating bats exhibit an extraordinary array of solutions to the challenges of maneuvering in cluttered environments, pursuing evasive prey, taking food from water surfaces, and landing on the ceiling or walls of confined spaces. Somatosensory signaling of airflow along the wing membrane contributes to this exquisite flight control, but successful navigation in the dark must also engage multisensory processes that guide a suite of adaptive motor behaviors. Sensory-motor specializations and biomimetic solutions of multisensory processing for autonomous robotic platforms are of particular interest to me. In addition to bats, she have worked with primates and rodents to study sound localization using real and virtual acoustic environments for over 25 years. She served as PI (2012-2017) on an AFOSR BAA grant, and Co-PI on an AFOSR Center of Excellence "Nature Inspired Flight Technologies and Ideas". In 2014, she got a secondary appointment as Assistant Research Professor at the Johns Hopkins University in the Department of Psychological and Brain Sciences. Her work has been featured in Nature News, Science News, Forbes.com, Popular Mechanics, The British Broadcasting Corporation (BBC), and Discovery News, among others.