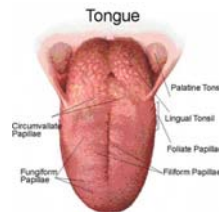


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## *MAE SEMINAR SERIES*

### STUDYING A COMPLEX BIOLOGICAL SYSTEM: THE HUMAN TONGUE

**Dr. Maureen Stone**  
Departments of Biomedical Sciences and Orthodontics  
University of Maryland Dental School  
Thursday, October 12, 2006, 10am  
Phillips Hall 6<sup>th</sup> Floor Conference Room, #640



The human tongue is a volume preserving structure composed almost exclusively of muscle. The tongue contains connective tissue and fat, but no bones or joints. As a result its motion is accomplished through local deformation. These deformations are extensive as some of the world's languages have as many as 150 distinct sounds. Moreover, swallowing, chewing and breathing require additional motions and control mechanisms beyond that of speech. Studying the tongue is quite challenging as it is fairly inaccessible and direct transducers impede its motion. Imaging techniques have been used for the last 25 years and our knowledge of the tongue has increased as these techniques have developed. We have addressed questions about the tongue's degrees of freedom during deformation, and the nature of speech production using ultrasound images of the 2D tongue surface contour and reconstructed 3D surfaces. We have studied muscle to surface relationships using velocity fields and strain measurements made from tagged Cine-MRI. This talk will explore tongue motion and the features revealed by imaging techniques.

**Dr. Maureen Stone** [[mstone@umaryland.edu](mailto:mstone@umaryland.edu)] is a Professor in the Departments of Biomedical Sciences and Orthodontics at the University of Maryland Dental School in Baltimore, MD. She is also the Director of the Vocal Tract Visualization Laboratory. She developed the lab in 1991 at the Johns Hopkins University, Department of Electrical and Computer Engineering, followed by six years at the University of Maryland Medical School, Division of Otolaryngology, and now at the UM Dental School. Prior to 1991 she spent 10 years at the National Institutes of Health, where she helped establish the NIH Speech and Swallowing Ultrasound Laboratory. The Vocal Tract Visualization Lab studies speech acoustics and speech physiology using a variety of techniques (ultrasound, MRI, acoustics, electropalatography). Dr. Stone has written numerous articles on the application of ultrasound and MRI to vocal tract research, and the use of a multi-instrumental approach to create and examine models of tongue function. Her research interests include accurately and simply representing 3D tongue motion and its underlying muscular control. She is also interested in the relationship between 3D vocal tract motion and the resulting acoustic signal. Three techniques used to measure tongue physiology are ultrasound, which provides 2D real-time images of the tongue surface; tagged Cine-MRI, which provides strain information for material points in the tongue and can be used to infer muscle compression; and electropalatography, which provides real-time information on tongue-palate contact. Dr. Stone is a Fellow of the Acoustical Society of America.