



Northeastern University

College of Engineering

Please join us for a
Special Chemical Engineering Seminar
Distinguished Lecture Series

Friday, November 8, 2013
108 Snell Engineering
11:45 a.m. – 1:00 p.m.

“Mapping Myoarchitecture and Mechanics with Magnetic Resonance Imaging”

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ABSTRACT



Our laboratory has developed an imaging and computational framework to study the motion and mechanics of architecturally complex tissues, for example, the tongue, heart, and the gastrointestinal tract. This methodology synthesizes data regarding the orientation of muscle fibers (myoarchitecture) obtained by MRI, intracellular structures, energetics, and mechanics. Our approach considers biological mechanics and motion of tissues in terms of their multi-scale behavior, and is intended to delineate the mechanism by which a tissue's complex array of molecular and cellular components contribute to force generation. To address this goal, our laboratory has evolved several new technologies, including MRI and microscopy methods to image myoarchitecture and mechanics as intermediate-scale (mesoscale) structures, or myofiber tracts, methods to assay myofilament and cell mechanics, and a computational model capable of quantifying mechanical performance across spatial scales. The current presentation will describe the application of this approach in order to assess the basis of the forceful deformation of the deforming tongue during normal swallowing. Moreover, employing these methods to study pathological architectural phenotypes, research will also be presented relating genotypic abnormalities of the myosin binding protein C (MyBP-C), an essential regulator of actin-myosin interactions in striated muscle, to hypertrophic cardiomyopathy, and propose mechanisms of phenotypic regulation related to structural interactions of MyBP-C within the cardiac sarcomere.

BIOGRAPHY: Dr. Gilbert is a Research Professor in the Department of Chemistry and Chemical Biology, Northeastern University, continuing his focus of research at the interface of energy homeostasis and biological engineering. He served first as an assistant professor in the Division of Gastroenterology of the Boston University School of Medicine before transferring his laboratory and clinical practice to Tufts Medical School and St. Elizabeth's Medical Center. Dr. Gilbert moved his laboratory in 1995 to the Department of Mechanical Engineering at the Massachusetts Institute of Technology, and between 1995 and 2009, becoming senior research scientist. He returned to St. Elizabeth's Medical Center in 2009 in order to establish the Bioenergy Research Laboratory. Dr. Gilbert's work in these areas was recognized nationally by his election in 2005 as a fellow to the American Institute for Medical and Biological Engineering, the highest existing honor in the field of bioengineering. Dr. Gilbert holds an MD in 1978 at the New Jersey Medical School, Newark, NJ and completed his internship and residency in Internal Medicine at Hahnemann Hospital, Philadelphia, PA. He completed his first fellowship in Gastroenterology in 1983 at Beth Israel Hospital, Harvard Medical School. He subsequently completed (1986) an NIH research fellowship based in the Departments of Medicine and Pharmacology of the Medical College of Wisconsin, Milwaukee, WI.

Refreshments will be served