BIOMEDICAL ENGINEERING DEPARTMENT
and
MECHANICAL ENGINEERING DEPARTMENT
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Applications of Mixture Theory to Cartilage Mechanics and Tissue Engineering

by

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Wednesday, November 1, 2006
3:30-4:30 p.m.
Room 3-180 EE/CS
Refreshments will be available at 3:15 p.m. in Room 3-176 EECS before the seminar

ABSTRACT — Biological tissues are characterized by their heterogeneous composition and porous-hydrated nature. The interstitial fluid of biological tissues typically consists of a solution of electrolytes and a variety of macromolecules. Mixture theory provides a versatile and powerful framework for studying mechanics and transport characteristics in biological tissues. In addition, mixture theory may be extended to incorporate the effects of chemical reactions, providing a framework for studying growth and remodeling of native tissues, as well as tissue engineering, in response to mechano-electrochemical stimuli. This presentation will illustrate various applications of mixture theory to the study of cartilage mechanics and lubrication, chondrocyte response to osmotic loading, and cartilage tissue engineering.

BIO — Gerard A. Ateshian received his Ph.D. in mechanical engineering from Columbia University in 1991. He is currently Professor of Mechanical Engineering and Biomedical Engineering at Columbia. Dr. Ateshian received the Y.C. Fung Young Investigator Award from the Bioengineering Division of the American Society of Mechanical Engineering in 1997, and the Great Teacher Award from the Society of Columbia Graduates in 2002. He became a member of the American Institute of Medical and Biological Engineers in 2003. He is currently the chair of the Bioengineering Division of ASME and serves on the Board of Directors of the Biomedical Engineering Society.

Dr. Ateshian's research interests have evolved from diarthrodial joint kinematics, contact and quantitative anatomy, to the mechanics and tribology of articular cartilage at the macroscopic and microscopic levels, in relation to osteoarthritis and joint degenerative disease. His research combines experimental and theoretical techniques, using the framework of the theory of mixtures. More recently, in collaboration with his colleagues from the Department of Biomedical Engineering, he has extended his research to the field of cartilage tissue engineering, particularly with regard to the effects of dynamic loading on tissue matrix elaboration and solute transport. His latest research includes modeling of chondrocyte response to mechano-electrochemical loading using mixture theory.

Informal Faculty Luncheon: Wednesday, November 1, 2006, 12:00 noon. Meet in 1100 ME and walk to lunch with other faculty. Prof. Gerard Ateshian will be able to attend.