Dr. Victor Barocas will present work on the mechanical behavior of engineered tissues. A particular question has been the subject of Barocas's research for some time: How can one model the mechanical behavior of a tissue, which is typically centimeters in length scale, based on information about its underlying structure and composition, which are measured on the nanometer to micrometer scale? Towards answering this question, the Barocas group has developed a multi-scale model in which the average stress is balanced on the continuum scale, with the average based on a fiber network model at the structural scale. In this talk, Dr. Barocas will discuss the modeling scheme and then continue with a discussion of methods to inform and specify the model based on polarized-light images and, to a lesser degree, scanning electron micrographs. He will then provide an example of how imaging techniques can be used to specify and test the model on a cell-compacted collagen gel.

Dr. Barocas is a Professor of Biomedical Engineering at the University of Minnesota. He earned a B.S. degree in Chemical Engineering (1988) and an M.S. degree in Chemical Engineering Practice (1989) from MIT, after which he worked for MIT's School of Chemical Engineering Practice in Midland, MI, for two years. He then completed his Ph.D. in Chemical Engineering (1996) at the University of Minnesota. After staying on for a year as a post-doc, he joined the faculty of Chemical Engineering at the University of Colorado, where he stayed for three years before moving to the Department of Biomedical Engineering at Minnesota in 2000, and he has been at Minnesota ever since. His diverse research interests include soft-tissue biomechanics, engineered-tissue remodeling and biomechanics, ocular biomechanics, basement membrane, microfluidics, and numerical methods.