DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING SEMINAR
UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE

Structural Hierarchies in Cardiac Morpho- and Pathogenesis

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TIME: Thursday, April 24, 2008
PLACE: MEC 341, Mechanical Engineering Building
Refreshments at 3:30PM in MAE Faculty Lounge, MEC 305

ABSTRACT:

Posttranscriptional processes such as translation or signaling pathways contribute to regulation of muscle growth during cardiac organo- and pathogenesis. However, little is known about the mechanisms and signals that potentiate directional muscle growth and the self-assembly of sarcomeres and myofibrils. These structures appear to be optimized for their contractile function. In order to elucidate the hierarchal design strategy that governs contractility, we use microfabrication techniques to build engineered cardiac myocytes and tissues from neonatal rat ventricular myocytes. By controlling only the 2D boundary conditions imposed on the myocyte, we are able to engineer predictable myofibrillar patterns and contractility of individual myocytes and tissues. These experiments have revealed how the extracellular matrix potentiates the self-assembly of the myocyte cytoskeleton architecture which serves as a template for myofibrillar patterning. Our results suggest the post-translational mechanisms that regulate myofibrillogenesis during development and whose perturbation lead to contractile dysfunction in the diseased heart.