

# DEPARTMENT OF MECHANICAL ENGINEERING

## WILLIAM MAXWELL REED SEMINAR SERIES

### Computing mass transport in crystals: Theory, computation, and applications Fine Tuning of Heart Function: Role of Myofilament Mechanics

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**Abstract:** The Frank-Starling relationship provides beat-to-beat regulation of heart function by matching ventricular input and output. This seminar will address the myofibrillar mechanisms by which the ventricle adjusts its output (i.e., stroke volume) by changes in end-diastolic volume. These sub-cellular processes will be placed in the context of the cardiac cycle with emphasis on the sarcomeric properties that mediate the number of force generating cross-bridges recruited during pressure development. Additional molecular mechanistic insight will be provided regarding the factors that regulate myofibrillar loaded shortening velocities and power output, which are paramount for dictating ejection volume. Emphasis will be placed on the interplay between cross-bridge induced cooperative activation of the thin filament and cooperative deactivation of the thin filament induced by sarcomere shortening. The balance of these two properties likely determine systolic hemodynamics and how this balance is modulated by sarcomere length, in at least in part, underlies the Frank-Starling relationship.

**Bio:** Kerry S. McDonald is Professor and Vice Chair of Research in the Department of Medical Pharmacology and Physiology at the University of Missouri. Dr. McDonald's research focuses on understanding the cellular and molecular mechanisms involved in the regulation of striated muscle contraction and ways that these processes are altered by disease and other physiological stresses such as ischemia and exercise training. To address these questions, Dr. McDonald's laboratory takes a multi-faceted approach that examines contractile measurements across the continuum of spatial organization from intact animals to isolated hearts and living or permeabilized single cardiac myocytes. Dr. McDonald's laboratory has investigated several physiological and biochemical factors that regulate the power-generating capacity of cardiac myocytes and the molecular mechanisms underlying length dependent activation of cardiac myocytes; this is especially important since myocyte power and its length dependence ultimately determine ventricular performance. Additional ongoing projects in Dr. McDonald's lab interrogate myofilament changes during aging and the progression of hypertensive heart disease. Dr. McDonald has 50 publications focusing on regulation of striated muscle contractile properties. His research has been supported by NIH and the American Heart Association for over 20 years. He served on NIH Cardiac Contractility, Hypertrophy, and Failure study section from 2006-2014 and has been a member on several NIH Special Emphasis Panels. Dr. McDonald is a member of the Biophysical Society and the American Physiological Society.

**Date: September 1, 2017**  
**Place: CB 118**

**Time: 3:00 to 4:00p**  
**Contact: Dr. Alexandre Martin 257-4462**

Meet the speaker and have refreshments  
Attendance open to all interested persons



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