AEROSPACE & MECHANICAL ENGINEERING

2012 COLLOQUIUM 2013
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UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

MIDWEST MECHANICS SEMINAR

SPEAKER: **Professor Juan C. Lasheras**
Interim Dean of the Jacobs School of Engineering
University of California, San Diego
La Jolla, California

TOPIC: **THE ROLE OF MYOSIN II MOTORS AND F-ACTIN DYNAMICS IN THE MECHANICS OF CELL MIGRATION AND INVASION**

DATE: Wednesday, April 24, 2013

TIME: 3:30 p.m.

PLACE: Lower Level Auditorium, Geddes Hall

RECEPTION: 3:00 – 3:30 p.m. – Coffee House, Geddes Hall

ABSTRACT

Eukaryotic cells move in response to external stimuli by remodeling their cytoskeleton and their adhesions to the extracellular matrix. The production and spatio-temporal organization of the traction forces exerted by the cell during migration are determined by the orchestrated interactions of actin-directed motors, F-actin regulation, actin crosslinking, motor-protein contractility and adhesion proteins. This process is controlled by a complex network of signaling pathways that drive a relatively simple repetitive sequence of mechanical actions coordinated in space and time. We present detailed characterization of the traction stresses' phenotypes of wild-type cells and various mutant cell lines, providing new insights into the role that Myosin II and F-actin polymerization play in the spatiotemporal regulation of cell substratum interactions and traction stresses required for amoeboid cell motility. We use conditional and phase statistics as well as Principal Component Analysis (PCA) to integrate all the biochemical and mechanical measurements to obtain the quantitative information needed to connect specific biochemical processes to each of the mechanical events in the motility cycle. We demonstrate that Myosin II is essential not only to the contractility phase of the motility cycle but also to the pseudopod protrusion phase. Furthermore, the spatiotemporal organization of the traction forces is shown to depend not only on the contractile action of Myosin II, but more importantly in its actin crosslinking effect. We have also investigated the role of Arp2/3-mediated dendritic polymerization of F-actin at the cell's leading edge, a process regulated through the evolutionarily conserved SCAR/WAVE complex. We have measured and compared the traction stresses exerted by cells lacking the SCAR/WAVE complex proteins PIR121 (pirA-) and SCAR (scrA-) with those of wild-type cells. We show that the existence of periodic oscillations in the spatiotemporal distribution of traction forces and the length of the cell are regulated by dendritic actin polymerization.

NOTE: ***If you are interested in meeting individually with Prof. Lasheras please contact Linda at 631-5431.***