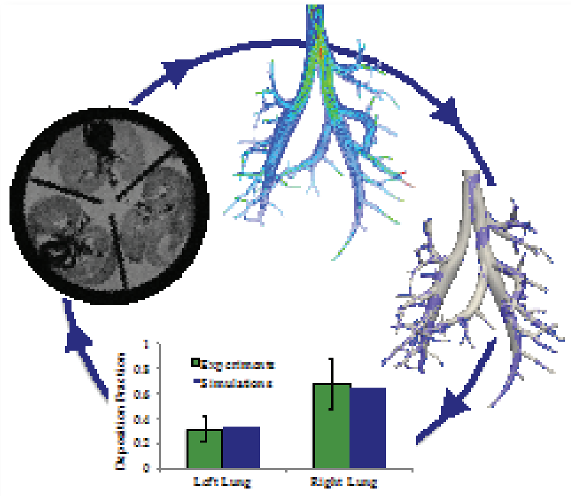
MECHANICAL & AEROSPACE engineering

UNIVERSITY OF CALIFORNIA, IRVINE



SEMINAR SERIES

FRIDAY, OCTOBER 30, 2015

MDEA, #311 ON THE UCI CAMPUS MAP

10:30AM-11:30 AM

PRESENTED BY:

PROF. JESSICA OAKES

PRESIDENTIAL POSTDOCTORAL FELLOW

MECHANICAL ENGINEERING

UNIVERSITY OF CALIFORNIA, BERKELEY

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Physiologically Based Simulations of Airflow and Particle Transport in the Lung

Pulmonary diseases are typically caused by inhalation of toxic airborne materials over a long period of time. Diseases such as asthma and chronic obstructive pulmonary disease cause a substantial medical and financial burden worldwide. The coupling of multi-physics simulations with animal or human experiments is necessary to validate model predictions and to improve emerging medical technology. While recent advances in computational resources have enabled sophisticated simulations of airflow and particle transport in the pulmonary airways, it is not currently feasible to simulate airflow and transport for all length and time scales of the lung. To address this challenge, the computational domain may be split into sections, where lower-dimensional models of the small airways may be connected to the three dimensional (3D) models of the large airways. In this seminar, experimentally parameterized 3D-0D and 3D-1D finite element simulations of airflow in the lung will be introduced. Differences in extent and location of deposited particles between inspiration and expiration will be shown. Excellent agreement was found when comparing regional deposition to image-based experimental data in rodent lungs. In addition to these findings, future directions in optimizing drug delivery in asthmatic patients and potential health consequences to electronic cigarette aerosol exposure will be discussed.

Jessica is a University of California Presidential Postdoctoral Fellow at UC Berkeley in Mechanical Engineering. She received her PhD from the University of California, San Diego in June of 2013, mentored by Professors Alison Marsden and Chantal Darquenne. After completing her degree, Jessica traveled to France for a one-year postdoctoral appointment at INRIA Paris-Rocquencourt with support from a Whitaker Scholarship. Recently, Jessica was awarded an American Lung Association Senior Research Training grant to predict the health consequences of electronic cigarette exposure. She is interested in developing and applying fundamental numerical and experimental methodologies to investigate clinically relevant health problems.

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