DEPARTMENT OF BIOLOGICAL SCIENCES

SEMINAR SERIES

Gemel Joseph
Biology Graduate Student

"Investigating the role of the Na^+ transporters of Pseudomonas aeruginosa in a fruit-fly infection model"

♦ ♦ ♦ ♦

Stephen Jane
Biology Graduate Student

"Lakes as processors of dissolved organic carbon"

Monday, February 26, 2018
12:00 Noon
CBIS, Bruggeman Room

REFRESHMENTS SERVED 11:45
Spring 2018
Mathematical Sciences
SIAM/RTG Colloquium

A Simple Stochastic Model for El Niño with Westerly Wind

The El Niño Southern Oscillation (ENSO) is the most prominent year-to-year climate variation in the tropics, with dramatic ecological and social impacts. It consists of alternating periods of anomalously warm El Niño conditions and cold La Niña conditions in the equatorial Pacific every 2 to 7 years, with considerable irregularity in amplitude, duration, temporal evolution and spatial structure of these events. Intrasessional atmospheric wind bursts in the tropics play a key role in the dynamics of the ENSO. A simple stochastic dynamical model is proposed that summarizes this relationship and captures major features of the observational record. Within this simple framework, wind bursts evolves according to a stochastic Markov switching-diffusion process that depends on the strength of the western Pacific ocean warm pool, and are coupled to simple ocean-atmosphere processes that are otherwise deterministic and stable.

The present model provides further theoretical and practical insight on the relationship between wind bursts and the ENSO. The state-dependency of wind bursts allows the model to capture the ENSO diversity, including the eastern Pacific moderate and occasional super El Niño, the central Pacific El Niño as well as the La Niña.

Speaker: Sulian Thual
(NYU-Courant Institute)

Monday, February 26, 2018
Time: 4:00 – 5:00 PM
Location: Lally 104

Host: SIAM/RPI
Mitigating Hard Capacity Constraints in Facility Location Modeling

Dr. Kayse Lee Maass
Postdoctoral Research Associate
Department of Health Sciences Research at the Mayo Clinic

Wednesday, February 28, 2018
10am – 11am
CII 5003
(The public is invited to attend. Refreshments will be served)

Abstract:
Hard capacity constraints and aggregated demand parameters have been used for decades in facility location modeling and planning. However, such a framework is unrealistic since it 1) fails to acknowledge that the processing capacity of a facility is a function of operational decisions, 2) does not incorporate operational tools that allow the facility to accept demand in excess of the capacity limit, and 3) neither captures the likelihood that demand exceeds capacity nor any possible temporal correlations among demand generating sites.

We address these issues by using inventory as a short-term mitigation strategy and allow the models to directly utilize disaggregated daily demand data, which inherently capture demand stochasticity. If more demand arrives at a facility than the facility can process in a day, the excess demand is held in inventory and processed at the first available opportunity. We show that the location and allocation decisions obtained from our models can result in significantly reduced costs and improved service metrics when compared to models that do not account for the likelihood that demands may exceed capacity on some days.

Bio:
Dr. Kayse Lee Maass is a Postdoctoral Research Associate in the Department of Health Sciences Research at the Mayo Clinic. She received her Ph.D. from the Department of Industrial and Operations Engineering (IOE) at the University of Michigan in 2017. Dr. Maass is a recipient of the NSF Graduate Research Fellowship Program Award, the Richard and Eleanor Towner Prize for Outstanding PhD Research, the INFORMS Judith Liebman Award, the IOE Outstanding Graduate Student Award, and the Joel and Lorraine Brown Graduate Student Instructor of the Year Award. She also served as president of the University of Michigan INFORMS Student chapter, as the IOE Graduate Student Advisor and as a member of the IOE Graduate Student Advisory Committee.

Her research focuses on the application of operations research methodology to social justice, access, and equity issues within the supply chain management, humanitarian logistics, and healthcare contexts. She is particularly interested in using her analytic background to address human trafficking and mental health issues, and currently leads numerous related transdisciplinary research efforts.
“Mathematical and Computational Formulations for Inverse Problems in the Biomechanical Imaging Field”

Olalekan Babaniyi
Department of Civil and Environmental Engineering
Duke University

Wednesday, February 28, 2018
10:30 AM – 11:30 AM
DCC 330

Abstract
Biomechanical imaging (BMI) is a method used to noninvasively quantify the mechanical properties of tissue. These mechanical properties can be displayed as images and used to visualize the interior of tissue and potentially help diagnose various diseases. The first step in the BMI method is to load and measure the resulting deformation (displacements or velocities) of soft tissue. The measured deformation along with the conservation of momentum equations is then used in an inverse problem formulation to infer the mechanical properties. In this talk, I describe two inverse problem formulations for reconstructing the mechanical properties.

Biography
Olalekan Babaniyi is currently a postdoctoral associate in the Civil and environmental engineering department at Duke University. Before coming to Duke, he was at Boston University where he received his Bachelors, Masters, and PhD degree in mechanical engineering. His research work is focused on developing methods to solve inverse problems in the biomechanical imaging field with the goal of noninvasively characterizing the mechanical properties of soft tissue.
Universal And Non-Universal Aspects Of Crystal Plasticity

Robert Maass, PhD
Assistant Professor, Department of Materials Science and Engineering
University of Illinois at Urbana-Champaign

ABSTRACT
Even though it was recognized almost 100 years ago that plasticity is discrete in both space and time, deformation models were/are primarily based on homegnizing flow. Driven by novel experimental techniques, intermittent plasticity has received renewed interest because it seems to have a lot in common with entirely different physical processes, such as magnetic domain switching or earth quakes. At the bulk scale, the signature of intermittent flow is generally not seen in stress-strain data, but it is directly visible as strain-discontinuities in flow curves of small-scale crystals. Statistical investigations of intermittent deformation reveal indicate scale-invariance, which is a paradigm shift away from traditional concepts that homogenize plastic flow and rely on well-defined average quantities. Many investigations have shown scale-free distributions of slip-size magnitudes that all seem to have the same power-law exponent and therefore allow to place plasticity into a general universality class with many other intermittently evolving systems. In this talk we will present recent observations made during mechanical characterization that trace plastic instabilities in small-scale crystals in real time, allowing to assess the underlying collective dislocation dynamics, that is dislocation avalanches. We will discuss results from fcc and bcc single crystals, and in particular focus on slip-size magnitude distributions, their involved time scales, slip-velocity distributions, and avalanche shapes. Assessing the avalanche velocity-relaxation reveals unexpected differences between lattice types, giving first insights into non-universal aspects of plasticity. We furthermore discuss the appearance and disappearance of discrete plastic behavior at the small scale, and what implications this may have for macroscopic bulk plasticity.

BIO
Robert Maass received a triple diploma in Materials Science and Engineering from the Institut National Polytechnique de Lorraine (INPL-EEIGM, France), Luleå Technical University (Sweden) and Saarland University (Germany) in 2005. In 2009, he obtained his PhD from the Materials Science Department at the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. During his doctoral work, Robert designed and built an in-situ micro-compression set-up that he used to study small-scale plasticity with time-resolved Laue diffraction at the Swiss Light
Humboldt postdoctoral scholar to continue his research on plasticity of metals. After working as a specialist management consultant for metals at McKinsey & Co., he transferred to the University of Göttingen as a junior research group leader. He joined the faculty of the University of Illinois at Urbana-Champaign as Assistant Professor of Materials Science and Engineering in 2015. His research interests include microstructure-property relations, size effects, strain localization and defect structures of amorphous and crystalline metals, defect dynamics, mechanical properties, microplasticity, glass transition phenomena, and test system development. His honors include the Young Scientist Award by the German Materials Society, an Alexander von Humboldt Fellowship, the prestigious Emmy Noether award from the German Research Foundation, the NSF Career Award, and the TMS Young Leaders Award.

Department of Physics, Applied Physics & Astronomy

Colloquium

Wednesday, February 28, 2018

CII 3051, 4:00PM - 5:00PM

Host: Professor Heidi Newberg

Guy Consolmagno

Director of the Vatican Observatory
President of the Vatican Observatory Foundation

"Vesta and the Chaotic Formation of Planets"

The recent Dawn mission was sent to asteroid 4 Vesta to inspect, close up, an intact protoplanet from the origin of the solar system. Except... Vesta's overall density is too low, and its core and crust too big, to fit anything like what we expect an intact protoplanet to look like. Was it ripped apart and re-assembled? It looks like Vesta is giving us new clues to planet formation and evolution in a violent early solar system.