DEPARTMENT OF BIOLOGICAL SCIENCES
SEMINAR SERIES

Dr. Leo Wan
Rensselaer Polytechnic Institute

“Cell Chirality in Development and Disease”

Monday, January 22, 2018
12:00 Noon
CBIS, Bruggeman Room

REFRESHMENTS SERVED 11:45
“Precise Polyethylenes that Control Nanoscale Morphologies & Properties”

Abstract

Acid- and ion-containing polymers have specific interactions that produce both acid- or ion-rich aggregates arranged in hierarchical nanoscale morphologies and remarkable bulk properties. Untangling the correlations between the primary structure of such associating polymers and their morphologies and properties has long been a challenge in polymer physics, because most acid- and ion-containing polymers have random sequences of polar and non-polar monomeric units. New synthetic methods increasingly produce polymers with greater molecular precision that provide greater uniformity of and control over the hierarchical morphologies and even yield new morphologies. This talk will focus on how one of these structures exhibits well-controlled chain folding in a precise sulfonated polyethylene to produce a highly uniform morphology with high proton conductivity.

Biography

Karen received her B.S. from Cornell University in materials science and engineering and her Ph.D. in polymer science and engineering from the University of Massachusetts, Amherst. Following a postdoctoral position at AT&T Bell Laboratories, she joined the faculty of the University of Pennsylvania in 1992. Karen characterizes and manipulates nanoscale structures in ionomers and associating polymers to develop materials with improved mechanical and transport properties. Recently, she discovered new structures in several acid- and ion-containing precise polyethylenes. Karen also designs and fabricates polymer nanocomposites to understand and improve their mechanical, thermal, and electrical properties, particularly transparent conductors. Across these research areas, Karen couples experimental studies with simulation and theory, either within her group or with collaborators. Karen has numerous honors including Fellow of the American Physical Society (2003), George H. Heilmeyer Faculty Award for Excellence in Research (2012), Fellow of the Materials Research Society (2013), Visiting Miller Research Professor at the University of California, Berkeley (2014), and Fellow of the PMSE Division within the American Chemical Society (2016).
“Failures, Dynamics, Evolution and Control in the Global Risk Network”

Risks that threaten modern societies form an intricately interconnected network, so it is important to understand how risk activations in distinct domains influence each other. We study the global risks network defined by World Economic Forum experts. Risks are modeled as Cascading Alternating Renewal Processes (CARP) with variable intensities driven by hidden values of exogenous and endogenous failure probabilities. We use maximum likelihood evaluation to find the optimal model parameters based on the expert assessments and historical status of each risk. This approach enables us to analyze risks that are particularly difficult to quantify, such as geo-political or social risks in addition to more quantitative risks such as economic, technological and natural.

In the talk, we describe model dynamics and discuss how to use the model to provide quantitative means for measuring interdependence and materialization of risks in the network. We also talk about limits of the predictability of the system parameters from historical data and model ability to recover hidden variable. Then, we describe how the network evolved recently by comparing steady state which would be reached if the risks were left unabated at different time points. Finally, we also analyze the model resilience and optimal control. Our findings elucidate the identity of risks most detrimental to system stability at various points in time. The model provides quantitative means for measuring the adverse effects of risk interdependence and the materialization of risks in the global risk network.

Bio of the Presenter: Dr. Boleslaw K. Szymanski is the Claire and Roland Schmitt Distinguished Professor and the Director of the ARL Social and Cognitive Networks Academic Research Center at the Rensselaer Polytechnic Institute and the Rensselaer Network Science and Technology (NeST) Center. He received his Ph.D. in Computer Science from Institute of Informatics of National Academy of Science in Warsaw, Poland, in 1976. He published over 300 scientific articles, is a foreign member of the National Academy of Science in Poland and an IEEE Fellow and was a National Lecturer for the ACM. In 2009, he received the Wilkes Medal of British Computer Society and in 2003, William H. Wiley 1866 Distinguished Faculty Award from RPI. His current research interests focus on computer networks and technology-based...