

**SEMINAR**  
**CENTER FOR APPLIED MATHEMATICS AND SCIENCE**  
**DEPARTMENT OF MATHEMATICS**  
**UNIVERSITY OF WEST GEORGIA**

**12:00 PM, TUESDAY, MAY 22, 2018, VENUE: BOYD 307**

**Speaker: Roger B. Sidje, Professor of Mathematics, University of Alabama, Tuscaloosa, Alabama**

**Title: Solving the chemical master with inexact and adaptive reduction methods.**

**Abstract:** The chemical master equation (CME) allows us to model and simulate the stochastic behavior of biochemical reactions that take place within a biological cell. The mathematical framework is a continuous time Markov chain with a discrete state space that describes the composition of molecules inside the cell. Computing the probability distribution of this Markov chain allows us to track the composition over time, and this has important practical applications. However, solving the CME is challenging because the state space is very large or even countably infinite. Truncation and approximation techniques such as the finite state projection and inexact Krylov subspace techniques lead to reduce-sized problems that capture enough of the cell dynamics. But these problems can still be quite large. We show how striking improvements can be further achieved by novel reduction techniques, and we are investigating further improvements with tensor decompositions.

**Bio:** Prof. Roger Sidje is Associate Dean in the College of Arts and Sciences at the University of Alabama, where he manages diversity and multicultural programs for the College. He is also a Professor in the Department of Mathematics and his research interests include computational mathematics with applications in Markov chains, computational biology, and computational engineering. He earned his doctorate from the University of Rennes, France, and before joining the University of Alabama, he worked at the University of Queensland, Australia, and at the University of Minnesota. He has published more than 50 papers, including one that has nearly 700 citations.

Everyone is welcome.