

# Spring 2015 COLLOQUIUM SERIES

# GRANULAR AND MULTIPHASE FLOWS

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**The Granular Science Laboratory**  
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**Prof. Surajit Sen**  
*Department of Physics*  
*State University of NY at Buffalo*  
*Buffalo, NY*

**March 25, 2015**  
2:30 – 4:00 p.m.  
Mechanical Engineering Center – Room 221

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## **Newton's Cradle, the Fermi, Pasta, Ulam problem and the Nonlinear Many Body Physics Frontier**

The study of nonlinear waves is more than 400 years old! The likes of Newton, Euler, Lagrange and others worked on problems associated with nonlinear waves. The modern era of studying nonlinear waves began in 1955 with Fermi, Pasta and Ulam's unpublished report on the lack of thermalization in simple mass spring chains connected by linear and nonlinear springs. This is a problem where statistical and nonlinear physics, pure and applied mathematics, areas such as oceanic and atmospheric sciences and materials sciences and engineering meet. The talk shall focus on "simple" systems comprised of an alignment of grains (such as the famous toy, the Newton's cradle) and mass-spring chains and work its way up to two specific realizations of nonlinear waves, namely, solitary waves which are moving compact non-dispersive bundles of energy and breathers which are extremely long lived localized excitations. We will close with a discussion on the quasi-equilibrium state, which is a generalized equilibrium state with large energy fluctuations that exist in these systems.

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Surajit Sen earned his BSc (Hons), Physics, from Presidency College, Calcutta in 1982 and his PhD in Physics from The University of Georgia in 1990. After postdocs at the University of Minnesota and Michigan State University he joined SUNY Buffalo in 1993 where he is a professor. He is an elected Fellow of the American Physical Society and of the American Association for the Advancement of Science and an editor of International Journal of Modern Physics B and Modern Physics Letters B. His background is in theoretical non-equilibrium statistical physics and nonlinear dynamics of many body systems.

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