

Fall 2013 COLLOQUIUM SERIES
GRANULAR AND MULTIPHASE FLOWS

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October 2, 2013
2:30 – 4:00 p.m.
Mechanical Engineering Center – Room 224

SHEARED GRANULAR MATERIALS

Kinetic theory has been developed since the early 1980's to describe the constitutive behavior of granular materials under shear. The vision has been to provide a mathematical framework, together with rigorous formulation of boundary conditions, to solve numerous problems in industry and in nature. An equivalent hydrodynamic system for sheared granular materials has been the research goal since the start of this field. However, accumulated evidence has shown such an equivalent hydrodynamic system may be a lot more complicated than originally envisioned. For example, the post collision velocity distribution does not satisfy the molecular chaos hypothesis, the radial distribution function may not be isotropic, the assumption of binary collisions is often violated, and particle clusters and force-chains may form. These findings indicate emerging state variables, additional time and length scales that need to be established. In this talk, the assumptions behind the kinetic theory will be briefly examined, followed by some key discoveries that question these assumptions, improvements that have been made, and indications of future modifications.

Dr. Hayley Shen has been a faculty member at Clarkson University all of her professional life. She held visiting professorships at the Luleå University of Technology in Sweden, Otago University in New Zealand, Hokkaido University and Tohoku-Gakuin University in Japan, Inner Mongolia Agriculture University in China, and Nanyang University of Technology in Singapore. Her research covers two fields: granular materials and sea ice. In granular materials she started with theoretical study, expanded into discrete element methods and physical experiments. In sea ice, she studies wave and ice interactions. She uses some of the knowledge obtained in granular materials to solve sea ice problems. <http://people.clarkson.edu/~hhshen>