Special CEAFM Seminar: Fall 2015

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Date:	**Thursday, December 3, 2015** (Special Date)
Time:	12:00 p.m. Noon (Special Time)
Location:	Latrobe Hall 106 (Special Location)
Speaker:	**Prof. Snezhana I. Abarzhi** (Carnegie Mellon University)
Title:	***"Rayleigh-Taylor Instability and Interfacial Mixing"***

Abstract

Rayleigh-Taylor instability (RTI) develops when fluids of different densities are accelerated against their density gradient. Extensive interfacial mixing of the fluids ensues with time. Rayleigh-Taylor (RT) mixing controls a broad variety of processes in fluids, plasmas and materials, in high and low energy density regimes, at astrophysical and atomistic scales. Examples include formation of hot spot in inertial confinement, radial compression of imploding Z-pinches, supernova explosion, stellar convection, flows in atmosphere and ocean, reactive and supercritical fluids, material transformation under impact and light-material interaction. In some of these cases (e.g. inertial confinement fusion) RT mixing should be mitigated; in some others (e.g. turbulent combustion) it should be enhanced. Understanding the fundamentals of RTI is crucial for achieving a better control of non-equilibrium processes in nature and technology.

Traditionally, it was presumed that RTI leads to uncontrolled growth of small-scale imperfections, single-scale nonlinear dynamics, and extensive mixing that is similar to canonical turbulence. The recent success of the theory and experiments in fluids and plasmas suggests an alternative scenario of RTI evolution. It finds that the interface is necessary for RT mixing to accelerate, the acceleration effects are strong enough to suppress turbulence even on the large scales, and the RT dynamics is multi-scale and well correlated.

This talk presents a physics-based consideration of fundamentals of RTI and RT mixing, and summarizes what is certain and what is not so certain in our knowledge of RTI. The focus question — Is RT interfacial mixing a disordered process indeed? We also discuss new opportunities for improvements of predictive modeling capabilities, physical description, and control of RT mixing in fluids, plasmas and materials.