

AEROSPACE & MECHANICAL ENGINEERING



**2012 COLLOQUIUM 2013
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UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

MIDWEST MECHANICS SEMINAR

- SPEAKER:** **Prof. Kaliat T. Ramesh**
Decker Professor of Science & Engineering
The Johns Hopkins University
Baltimore, Maryland
- TOPIC:** **ROCKS, SHOCKS AND ASTEROIDS**
- DATE:** Wednesday, April 03, 2013
- TIME:** 3:30 p.m.
- PLACE:** Lower Level Auditorium, Geddes Hall
- RECEPTION:** 3:00 – 3:30 p.m. – Coffee House, Geddes Hall

ABSTRACT

Recent events (such as the Chelyabinsk meteoroid and asteroid 2012 DA14) have demonstrated the need to understand major impact and fragmentation events. Many of the fundamental problems of current interest in national security also involve impact and fragmentation, typically studied through large-scale computational simulations. We attempt to address these issues through fundamental high-strain-rate experiments, high-speed visualization, and theoretical and computational modeling of failure processes, and simulations of asteroid damage and disruption.

We use ultra-high-speed photography (exposure times as short as 20 nanoseconds) to observe the dynamic failure processes in brittle solids, and correlate the high-speed photographs with time resolved measurements of the stresses in the specimen. Next, we use similar experiments to examine the strength and failure of meteorites. Based on these results and analytical models for dynamically interacting cracks, we construct a scaling model for the strength and failure of brittle solids under impact loading. We explore the implications of this model for armor ceramics, impact cratering (e.g. the simple to complex crater transition on Mars and Mercury), and the disruption of incoming asteroids.