



Mechanical Engineering Colloquium

December 10th, 2015

Macdonald Engineering Building (MD) 267 from 3:30-4:30pm

Dr. Jacob Hundley

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HRL Laboratories LLC

Lightweight Microlattice Materials: Processing and Simulation

Abstract:

Demanding mission requirements and increasingly stringent consumer regulations have driven recent interest in lightweight structural materials for military and commercial vehicles. One promising solution to meet the needs of these platforms are low-density (<1 g/cc) open-cellular lattice materials, which consist of a periodic array of interconnecting truss members. When applied as the core of a sandwich structure or as a standalone energy absorber, lattice materials can significantly reduce vehicle mass without compromising performance. Despite their technical advantages, practical implementation of these materials has been hindered by high manufacturing costs, integration challenges, and limited material options.

This seminar will present a unique process for rapid, scalable manufacturing of structurally-efficient polymer, metallic and ceramic lattice materials. This approach utilizes a self-propagating waveguide effect to achieve fabrication times several orders of magnitude faster than comparable additive manufacturing processes such as stereolithography (e.g. 30-60 seconds for polymer lattices). This process also affords a high degree of control over the lattice architecture, opening up the design space for lightweight, multi-functional structures. Complementing this rapid manufacturing process, two unique computational tools have been developed at HRL to simulate the formation and non-linear deformation of microlattice materials. Case studies validating these tools will be presented to highlight potential application areas for microlattice materials.

Biography:

Jacob (Jake) Hundley is the manager of the Architected Materials Department and a member of the research staff at HRL Laboratories LLC. in Malibu CA. He received his B.S., M.S., and Ph.D. from the University of California, Los Angeles (UCLA) all in Mechanical Engineering. His research is focused on novel manufacturing processes, structural mechanics, and wave propagation in cellular and composite materials. Prior to joining HRL, he worked at Northrop Grumman Aerospace Systems in the areas of survivability analysis and durability/damage prevention for manned and unmanned fixed wing aircraft including the X-47B UCAS, MQ-4C Triton UAS, F-35 Joint Strike Fighter, and F/A-18E/F Super Hornet.