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NEBRASKA CENTER FOR MATERIALS AND NANOSCIENCE
2014 SEMINAR SERIES PRESENTS

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Livermore, CA

Materials research challenges in construction and operation of the world's largest laser

A number of advanced high-power laser systems have been or are being constructed to support cutting edge research on the behavior of matter at high energy densities (HED), particularly hot, dense plasmas that exist in stellar cores or during fusion and fission nuclear reactions. An example of one high power laser system is the recently completed Nd-glass laser at Lawrence Livermore Laboratory: the National Ignition Facility (NIF). The NIF is the world's largest laser and optical system and is housed together with a target chamber and control room in a facility that approximates the size of Husker's memorial stadium. NIF is comprised of 192 separate laser beam-lines that collectively generate energies up to 2MJ and peak-powers up to 500TW at 351nm in a nominal 3.6ns pulse width. All 192 beams converge in a 10-meter dia. target chamber where they simultaneously come to focus on a complex target approximately 1cm in size. Some of the targets contain cryogenic solid DT fuel with the goal of generating thermal-nuclear ignition and burn (fusion).

The first half of the seminar provides a brief description of the NIF and the associated R&D in developing and manufacturing the optics and optical materials that comprise the laser system. The second half addresses the current materials and processing challenges in making complex cm-scale laser targets with micro-to-nano scale precision. Included is a discussion of the joint work with UNL (Prof. Yongfeng Lu's group) on 2-photon-polymerization and laser-induced-forward-transfer (LIFT) as new target fabrication tools.

John "Jack" Campbell is founder of Material Science Solutions (MSS), a small high-tech company specializing in advanced materials and materials processing research and development. MSS serves private-sector clients in aerospace, laser processing, optical materials and micro/nano fabrication.

Prior to starting MSS, Jack was a member of the senior scientific staff at Lawrence Livermore National Lab where he spent more than 20 years developing optical materials for use in high-energy /high-peak-power lasers. He was lead scientist for optical materials and optical fabrication for the 10MJ, 500TW Nd-glass laser system of the

Host:
Prof. Yongfeng Lu
Department of
Electrical Engineering

Please Post

Wednesday, November 5, 4:00 pm
Room 136 Jorgensen Hall

3:45 pm—Refreshments served in Jorgensen Atrium area