MSEE | MATERIALS SCIENCE IN EXTREME ENVIRONMENTS UNIVERSITY RESEARCH ALLIANCE

Seminar: Two Decades of Shock Wave Experiments on Cerium

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Abstract: Our ability to understand the response of matter at extremes requires detailed knowledge of a materials' multiphase properties including the location of phase boundaries, details of the phase transitions and their kinetics, and the equation-of-state of the various phases. Although there has been much success in relating the details of the shock-wave profile (shape and evolution) to the material response, traditional diagnostics are limited to interface measurements such as particle velocity and longitudinal stress which have difficulty when the processes and/or materials are heterogeneous. Developments in advanced light sources, X-ray detection methods, and optical radiance methods are all providing unique opportunities for ultrafast, high-resolution, spatially resolved measurements to examine materials during impact loading. An overview of the dynamic compression work on cerium will be presented that was conducted over the last two decades with a focus on more recent X-ray diffraction and optical radiance measurements that are providing invaluable insights into the microstructure and temperature during shock loading. The talk will include a brief discussion of our capabilities at the Institute for Shock Physics (WSU, Pullman WA) and the Dynamic Compression Sector (APS, Argonne IL) designed to probe material deformation dynamically across length scales.

Bio: Prof. Brian Jensen has more than 25 years of experience in the field of dynamic high pressure physics using powder and gas gun systems, explosives, and lasers to examine the dynamic response of condensed matter subjected to high pressures. He graduated from Knox College in 1997 with a B.A. in Physics and Classics, and later from Washington State University in 2003 with a doctorate in Physics. In 2004, he joined the Dynamic Experiments Division at Los Alamos National Laboratory as a technical staff member working in the Shock and Detonation Physics group where he spent nearly 20 years studying the response of matter at extreme conditions. During those years, he served in many roles included as the team leader for the historic Shock Physic team, the Los Alamos lead for the Dynamic Compression Sector, and as the High-Z Project Leader for actinide science in the Office of Experimental Science's Dynamic Materials Properties Program. Central to his efforts has been the development of diagnostics and facilities dedicated to dynamic compression science including Los Alamos Laboratory's new Dynamic Equation of State Facility (DEOS) that modernized and consolidated historic shock physics capabilities. He has served as the Chair of the APS topical group on Shock Compression of Condensed Matter (GSCCM), as a member of the Los Alamos Laboratory Scientific Advisory Panel, elected as a Fellow of the American Physical Society, and was awarded the Los Alamos Fellow's Prize in 2022. In September of 2023, Dr. Jensen joined the Department of Physics and Astronomy at Washington State University as Professor and became the next Director of the Institute for Shock Physics.

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