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Creating, Diagnosing, and Controlling High Energy Density Matter with the National Ignition Facility

The National Ignition Facility (NIF), at Lawrence Livermore National Laboratory (LLNL), is the world's largest laser. NIF houses 192 beams delivering >1.8 MJ of UV energy and peak powers of 500 TW to a small target (<< cm^3). Depositing this energy in a small volume creates extreme radiation environments and large pressures that have been used to create unique conditions for studying matter at high energy densities. High energy density (HED) matter is defined as having pressures > 1,000,000 atm. Understanding the behavior of matter at high energy densities is important for our national security, many astrophysical questions, and obtaining inertial confinement fusion ignition. In this talk, I will provide an overview of the NIF and some of the technology that enables it, discuss progress in HED science and inertial confinement fusion, and talk about the challenges and opportunities for future research.

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About the Speaker: Dr. Mark Herrmann is the director of the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory. He has responsibility for the 600 person team that operates, maintains, and develops new capabilities for the NIF. Dr. Hermann returned to LLNL to become the NIF Director in October 2014 after 9 years at Sandia National Laboratories, where he performed research on the Z facility. While at Sandia, Dr. Herrmann held a series of staff and management positions, including Director of the Pulsed Power Sciences Center. He has been awarded a Presidential Early Career Award for Scientists and Engineers, the American Physical Society Award for Outstanding Doctoral Dissertation in Plasma Physics, three NNSA Defense Programs Awards of Excellence, and the Fusion Power Associates Excellence in Fusion Engineering Award. Dr. Hermann is a fellow of the APS. He received his undergraduate degrees from Washington University in St. Louis, and his Ph.D. in Plasma Physics from Princeton University.