

New Light on the Frontier Matter in Extreme Conditions

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The study of matter under extreme conditions is a highly interdisciplinary subject with broad applications to materials science, plasma physics, geophysics and astrophysics. Understanding the processes which dictate physical properties in warm dense plasmas and condensed matter, requires studies at the relevant length-scales (e.g., interatomic spacing) and time-scales (e.g., phonon period). Experiments performed at XFEL lightsources across the world, combined with dynamic compression, provide ever-improving spatial- and temporal-fidelity to push the frontier. This talk will cover a very broad range of conditions, intended to present an overview of important recent developments in how we generate extreme environments and then how we characterize and probe matter at extremes conditions—providing an atom-eye view of transformations and the fundamental physics dictating materials properties. Examples of case-studies closely related to Earth and planetary science relevant materials will be discussed.

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