

Prize Talk

PRV I Mon 13:00 HSZ/0002

Driven Quantum Materials: Controlling Emergent Phenomena away from Equilibrium — ●ANDREA CAVALLERI — Max Planck Institute for the Structure and Dynamics of Matter — Laureate of the Stern-Gerlach-Medal 2026

I will discuss how coherent electromagnetic radiation, when tuned to collective modes in quantum materials, can be used to induce unex-

pected dynamical phenomena. The core idea is that when uncoupled normal modes are driven nonlinearly, complex correlations are created that are absent in equilibrium. Emergent dynamical orders, which include superconductivity, magnetism, ferroelectricity and other functional phenomena, are created in this way, with both fundamental and applied ramifications. I will touch on the crucial importance of modern ultrafast X-Ray Free Electron Lasers, and novel THz sources that are matched to these.