

Winter 2023 Joint Colloquium

Materials Department & Materials Research Laboratory

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and Engineering

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11:00 am | ESB 1001



Non-equilibrium dynamics in functional materials

A significant challenge in modern materials science is characterizing processes at relevant time and length scales under operating conditions. Nanoscale phenomena are essential in manipulating energy (ionic systems) and processing information (electronic systems). X-rays are excellent probes of matter, and developments of an x-ray microscope date back to Röntgen and Bragg, who attempted to focus x-rays more than a century ago. However, it was not until the past decade that x-ray microscopy finally matured, combining superb spatial (sub-100 nm) and temporal (sub-1 ps) resolution. I will present recent developments in x-ray science and discuss how we apply advanced x-ray scattering and imaging techniques to a wide range of systems – spanning from “real” materials and devices in-operando to studies of fundamental interactions in strongly correlated electron systems. I will discuss nanoscale phenomena in driven systems measured in-situ and operando, including emergent nanoscale periodicities in a Mott insulator, photoinduced phase transformations in quantum materials, and electrochemically driven processes.

Bio

Andrej Singer received his Ph.D. (2012) in Physics from the University of Hamburg and worked as Postdoc in the lab of Prof. Oleg Shpyrko at the University of California, San Diego. Dr. Singer is interested in understanding the fundamental properties of energy materials and quantum materials out-of-equilibrium, and his group uses coherent x-ray scattering techniques at synchrotrons and free-electron lasers to study a wide range of materials, spanning from quantum materials to applied energy materials in operando devices.

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Hosted by Ram Seshadri and Raphaële Clément.