

THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT  
SPRING COLLOQUIUM SERIES PRESENTS:

# Robert Schoenlein

Deputy Director for Science, SLAC Linac Coherent Light Source (LCLS) X-ray laser facility and P.I in the Stanford PULSE Institute at SLAC



## *X-ray Free-Electron Lasers are Driving a Revolution in the X-ray Science of Complex Matter*

X-ray free-electron lasers (XFELs) have opened a new era in X-ray science with important applications in materials science, chemistry, physics, and biology. Coherent ultrafast X-ray pulses (femtosecond and sub-femtosecond) from XFELs, with unprecedented peak and average brightness, provide powerful new insight to electronic and atomic structural dynamics and correlations that underpin complex matter. They further offer promising new approaches to understand fluctuations, heterogeneity, and rare events that often determine the functionality of materials. This talk will provide an introduction and overview of the rapidly evolving field of XFEL science, with a particular focus on the world's first XFEL in the hard X-ray range – the Linac Coherent Light Source (LCLS) at SLAC National Accelerator Laboratory. Recent science highlights in the areas of quantum materials, catalysts, materials in extreme environments, and other complex materials will be discussed, along with important results in other science areas.

A major upgrade of LCLS (LCLS-II) is now nearing completion. LCLS-II is being developed as a high repetition rate ultrafast X-ray laser with two simultaneously operating, independently tunable FELs producing uniformly spaced (or programmable) ultrafast X-ray laser pulses at a repetition rate up to ~1 MHz spanning the energy range from 0.25 to 5 keV. A further upgrade (LCLS-II-HE) will extend high-repetition-rate operation to energies above 12 keV. Exciting new science opportunities, enabled by these upgrades, for probing structural dynamics at the atomic scale will be discussed.

**Dr. Schoenlein** is the Deputy Director for Science at the SLAC Linac Coherent Light Source (LCLS) X-ray laser facility, and is a P.I. in the Stanford PULSE Institute at SLAC. His research interests are in the application of ultrafast X-ray spectroscopy and scattering techniques to investigate atomic and electronic structural dynamics in condensed matter including transition-metal complexes, molecular dynamics in solution, and electronic phase transitions in correlated electron systems. Prior to joining SLAC National Accelerator Laboratory in 2015, Dr. Schoenlein was a Senior Staff Scientist at Lawrence Berkeley National Laboratory (LBNL) with research programs in the Chemical Sciences and Materials Sciences Divisions. He also served as the Deputy Director for Science at the Advanced Light Source, and as scientific lead for the Next Generation Light Source Initiative at LBNL. Dr. Schoenlein received S.B., S.M., and Ph.D. degrees from the Massachusetts Institute of Technology, is a Fellow of the American Physical Society, and a recipient of the Adolph Lomb Medal from the Optical Society of America.

**Tuesday, April 13 • 4 PM CST • Zoom**

[Registration is required. RSVP link.](#)

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