UCLA Department of Physics & Astronomy

COLLOQUIUM

Thursday, February 29th, 2024 at 4 p.m.
PAB 1-434

Shining New Light on Material Properties: Structure and Dynamics with Ultrafast Electron Microscopes

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In this talk I will describe how combining ultrafast lasers and electron microscopes in novel ways makes it possible to directly 'watch' fundamental processes in condensed matter that occur on the fastest timescales open to atomic motion [1-5]. By combining such measurements with complementary (and more conventional) spectroscopic techniques we can now develop structure-property relationships for materials under very far from equilibrium conditions, explore how we can use light to control the properties of materials [2,3], and unravel the complex interplay between charge, spin, orbital and lattice-structural degrees of freedom that gives rise to a material's emergent macroscopic properties.

These transformative experimental tools are enabling researchers to tackle many critical research challenges at the frontier of our ability to control materials and to develop systems to capture, convert and store energy that will impact sustainability and advanced technologies. I will assume no familiarity with ultrafast lasers or electron microscopes and provide a range of recent examples.

[1] D. Filippetto et al, Reviews of Modern Physics 94 (2022) 045004.
[2] Morrison et al Science 346 (2014) 445
[2] Otto et al, PNAS, 116 (2019) 450
[3] Stern et al, Phys. Rev. B 97 (2018) 165416
[4] Rene de Cotret et al, Phys. Rev. B 100 (2019) 214115
[5] Rene de Cotret et al, PNAS, 119 (2022) e2113967119

Refreshments at 3:30 p.m. PAB Patio. **Undergraduates Welcome!**