MONTANA STATE UNIVERSITY | College of LETTERS & SCIENCE

Physics Colloquium

Friday, January 29, 2016
4:10 – 5:00 PM
EPS103

Optoelectronics at the Nanoscale: Ultrafast Electron Dynamics of Complex Materials

Professor Erik Grumstrup
MSU Department of Chemistry
http://www.chemistry.montana.edu/people/person.php?id=560&s=150
http://www.montana.edu/grumstruplab
and
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http://www.chemistry.montana.edu/image.php?f=Grumstrup-1.jpg&s=110

Abstract:

Materials systems, particularly those produced via "bottom-up" chemical approaches, often exhibit intrinsic structural and compositional heterogeneity on many length scales. To understand how the properties of these systems depend on particle-to-particle differences in chemical makeup and morphology, our group utilizes optical microscopes coupled to ultrafast laser spectroscopy to precisely correlate structure and function. I will present two ongoing projects in our lab. The first, structured pump-probe microscopy, is a recently developed technique that provides sub-diffraction-limited spatial resolution to ultrafast spectroscopic measurements. I'll develop the theory of how to circumvent the Abbe limit on resolution (with a brief foray into Fourier optics), and present some recent experimental results which show an improvement of nearly a factor of two in spatial resolution. In the second portion of the talk, I'll discuss the excited state dynamics of lead-halide perovskite, an organic-inorganic, solution-processed semiconductor that exhibits extraordinary photovoltaic efficiency. Ultrafast time-resolved measurements of perovskite thin films provide a sensitive probe of the many-body effects that determine the band edge dynamics following photoexcitation. I'll also present the spatial and energetic dynamics of photogenerated charge carriers on longer time scales and discuss their implications for next-generation photovoltaic devices.

Host: Rufus Cone

****** Refreshments served in the EPS second floor atrium at 3:45 ******