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University of Miami, Physics Department Colloquium

Date: Wednesday, Apr 15, 2026
Time: 4:00 pm – 5:00 pm
Location: Physics Library – Rm 335, Knight Physics Building

Metal Halide Perovskite Semiconductors for Photovoltaics and "Beyond"

Dr. Joseph M. Luther
National Lab of the Rockies

Abstract

The overall photovoltaics industry is growing rapidly and moving toward new semiconductor technologies and new approaches to generate and deploy that electricity. In 2020, a terawatt (TW) of total installed capacity from photovoltaics was surpassed, and now the 2nd TW of installed capacity was also rapidly achieved. PV markets are also expanding now as well with many applications from residential, to utility scale (embedded in agriculture, or on water), and satellites in space and more.

This presentation will highlight key history and showcase new PV technologies, involving semiconductors such as perovskites which provide a potential leap forward in terms of higher efficiency and lower cost products. Specifically, we will discuss opportunities for perovskite interface design by using multiple combinations of materials. Interfaces are critical in photovoltaics as well as many other potential applications and represent a major issue in the stability and performance of perovskite devices. Perovskites also have a growing domestic industry and are now reaching commercialization. But photovoltaics are not the only promising avenue for this evolving material platform. There are a variety of applications well beyond PV where perovskites could be exploited for their fascinating properties. I will show a variety of novel spin-based applications where chirality can be imparted leading to new levels of control.

Biography

Joseph M. Luther is a Senior Research Fellow at the National Laboratory of the Rockies (NLR) in Golden, Colorado, where he leads research for next-generation optoelectronics. He received his M.S. in Electrical Engineering from the University of Colorado Boulder (2005) and a Ph.D. in Physics from the Colorado School of Mines (2009).

Following his Ph.D., Luther joined the group of A. Paul Alivisatos at the University of California, Berkeley and Lawrence Berkeley National Laboratory as a postdoctoral researcher, further expanding his expertise in nanomaterials. He returned to NLR as a staff scientist in 2009, where he has since become an internationally recognized leader in solution-processed and emerging photovoltaic technologies.

Luther's research history spans nearly the full spectrum of PV platforms, from III-Vs and silicon to nanocrystal-based cadmium telluride, dye-sensitized, organic, and especially metal halide perovskite solar cells. He has established three world-record efficiency benchmarks on the Best Research-Cell Efficiency Chart and has been named to the Clarivate Highly Cited Researchers list nine times.