

CSU PHYSICS COLLOQUIUM

“Hot’ Optics: Harnessing thermal optical power from near-field hot carrier nanoscopy to a novel far-field thermophotovoltaics”

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Monday, December 4th at 4PM

Abstract

In this talk, I will explore the dynamic intersection of heat transfer and optics, a century-old but surprisingly underexplored domain until recent times. Historically, this field has been associated with the study of far-field blackbody thermal radiation, tracing back to the seminal works of Wien and Planck. This field is now witnessing a resurgence of interest, driven by advances in the study of nanoscale heat transfer and optics, as well as the potential to revolutionize renewable energy technologies through novel thermo-optical interactions. I will discuss our progress in fundamentally understanding hot electron and hot phonon phenomena through near-field thermal microscopy. Additionally, I will highlight our experimental studies on enhancing light emission from nanostructures via localized surface plasmon-induced hot carriers. Finally, I will introduce a new thermophotovoltaic energy conversion scheme which converts radiative thermal energy to electricity that can significantly surpass the far-field blackbody limit in the vacuum.

Biography

Dr. Longji Cui is an Assistant Professor and Anderson Engineering Faculty Fellow of Mechanical Engineering at the University of Colorado Boulder. He is also affiliated with the Materials Science and Engineering Program and the Center for Experiments on Quantum Materials (CEQM) at CU Boulder. He received his Ph.D. in Mechanical Engineering from the University of Michigan in August 2018 and was awarded the J. Attwell-Welch Postdoctoral Fellowship in the Department of Physics and Smalley-Curl Institute at Rice University before officially started at CU in January 2020. He was a recipient of the Richard and Eleanor Towner Award for Outstanding PhD research from the University of Michigan, Graduate Student Gold Award from Materials Research Society (MRS), NSF CAREER Award, and Lab Venture Challenge Award from CU Boulder.