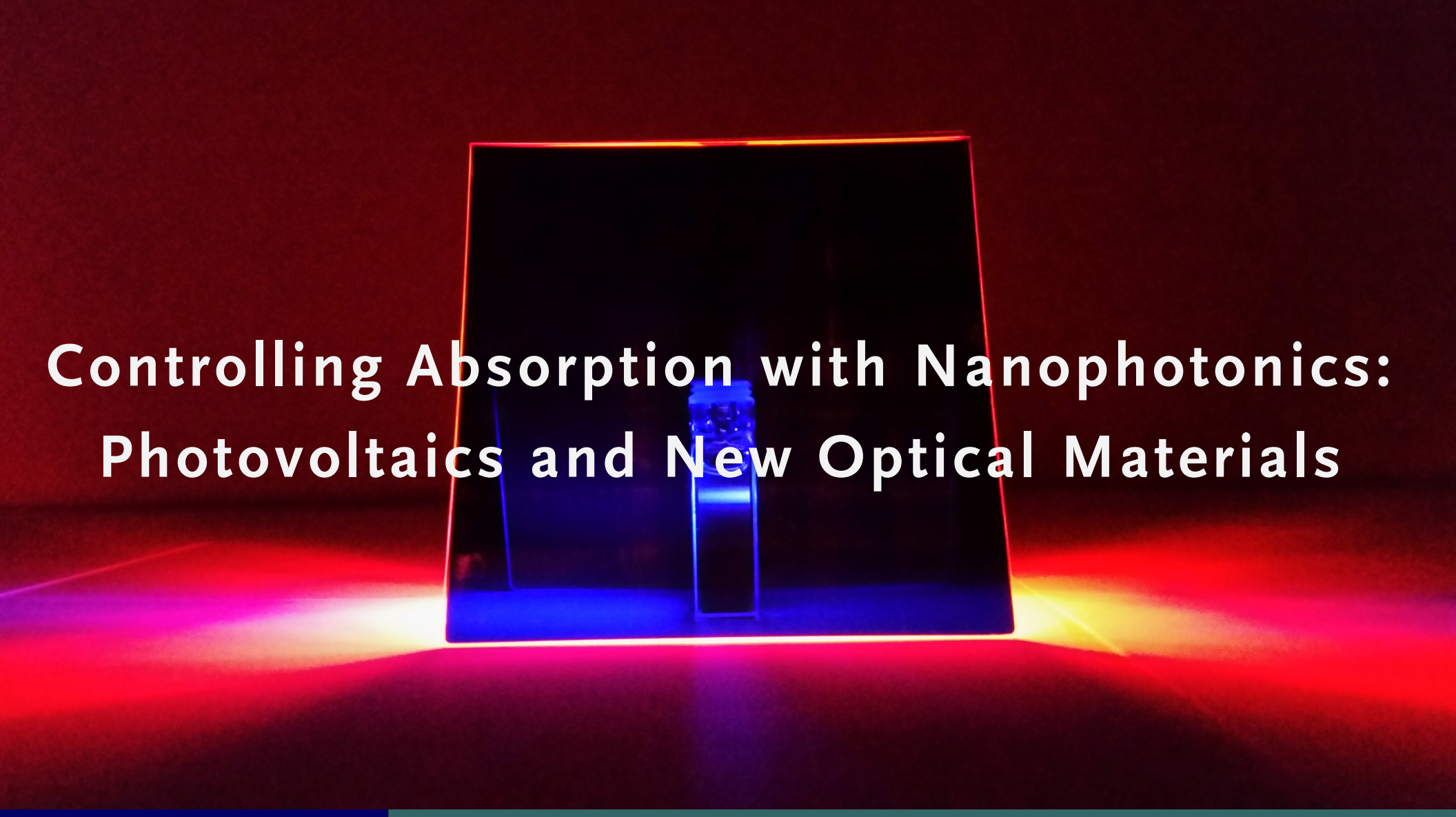

Controlling Absorption with Nanophotonics: Photovoltaics and New Optical Materials

PHYSICS COLLOQUIUM SERIES

Metamaterials have attracted widespread attention as the basis for unusual phenomena such as invisibility cloaks, negative refractive index media, and superlenses. While many of these applications are far from commercialization, the ability to use nanostructures to control the flow of light in nanoscale dimensions is changing perceptions of traditional optics and creating materials with properties not found in nature. In this talk I will discuss the fundamental principles of optical metamaterials, and some of our recent research that extends these concepts to create new, switchable optical materials. I will then discuss how these concepts can be applied to solar light harvesting, and show recent work from our laboratory in enhancing performance of optoelectronic devices by manipulation of light-matter coupling. Finally, I will discuss recent work on creating tunable chiral semiconductor nanocrystals through colloidal synthesis.

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Vivian Ferry earned her S. B. in Chemistry from the University of Chicago, her Ph.D. in Chemistry from the California Institute of Technology, and was a post-doctoral scholar in the Materials Science Division at Lawrence Berkeley National Laboratory and the University of California Berkeley. She is currently an assistant professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota. Her research focuses on light-matter interactions in nanoscale materials, and her work combines synthesis and nanofabrication, optical characterization, and computational modeling. Her specific research interests include light management in solar energy conversion, switchable metamaterials, nanoscale chirality, and self-assembled plasmonic sensors.