SPEAKER

Thomas Folland

Prof. Folland is part of the Condensed Matter and Materials Physics research area in the Department of Physics and Astronomy at the University of Iowa, focusing on mid- and far-infrared nanophotonics and quantum materials research. He did his undergraduate degree in physics and PhD in nanoscience at The University of Manchester, UK. His doctoral work, under Dr. Subhashish Chakraborty and Prof. Kostya Novoselov, involved the development of frequency tunable terahertz lasers implemented using graphene plasmonics. After his doctoral work, he took a postdoc position in the lab of Prof. Joshua Caldwell in the school of Mechanical Engineering at Vanderbilt University, TN. At Vanderbilt he developed new approaches to infrared spectroscopy for the study of nanophotonics systems, including 2D materials and semiconductors. He started his faculty position at the University of Iowa in the Department of Physics and Astronomy in Fall 2020. At Iowa, Prof Folland is working on developing novel nanophotonic materials, infrared optoelectronics, and sensors. He has recently been awarded an NSF CAREER award to study light propagation in the lowest symmetry crystals, and is part of a MURI team funded by ONR developing a new class of twisted optics. This research is highly interdisciplinary, encompassing elements of physics, materials science, electrical engineering, and chemistry.

CCEM Seminar

June 7, 2023

10:30 AM to 11:30 AM

Squeezing light into small spaces - Polaritonics in low symmetry materials

Abstract: Optical technologies are a key in a wide range of fields – from observing the universe, to biosensing and telecommunications. A fundamental challenge for optical technologies is that light waves cannot be squeezed into a space smaller than its wavelength. This limits our ability to couple light to small objects – whether this be to semiconductor quantum wells, atomic defects, or molecular systems. To beat the diffraction limit one can create a polariton – a quasiparticle which forms when light couples to charge in a material. This quasiparticle exists with dimensions much smaller than the free space wavelength, allowing strong light-matter interactions at the nanoscale. In my talk I will describe how polaritons form by coupling to materials, and how the properties of the material determine the properties of the polariton. In particular, we will explore how exploiting materials with low crystalline symmetry can give rise to a phenomenon known as hyperbolicity, and how this can be leveraged to enhance light matter interactions. Finally, we will briefly highlight some of our recent results showing how the lowest symmetry materials give rise to unique optical phenomena.

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