

Fall 2024 Physics Colloquium



Friday, November 8, 2024

3:00 PM

PAS 201 or Zoom

<https://arizona.zoom.us/j/81283840289>

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Structuring Light with Metamaterials

Abstract: To manipulate and tailor light, we need materials. Judiciously designed metamaterials and metasurfaces can be utilized to structure and sculpt light and achieve unconventional light-matter interaction with unprecedented functionalities. The extreme properties of such metamaterials provide novel opportunities in optics and photonics. One category of extreme metastructures is materials that function as analog computing machines when waves interact with them, providing the capability to perform mathematical operations, solve equations (such as integral and differential equations), invert matrices, and conduct vector-matrix multiplication with the near speed of light. Another class of extreme platform for light-matter interaction is four-dimensional (4D) metamaterials, in which the material parameters can rapidly vary with time in addition to their variation in space while waves are propagating in them. These 4D material structures provide additional degrees of freedom for light-matter interaction. The third category includes materials with near-zero refractive indices. Such near-zero-index structures provide unprecedented mechanisms for light-matter interaction with unconventional features and exciting properties. In this talk, I will give an overview of some of the phenomena we have introduced and explored with metastructures, including analog computing with waves, 4D optics, and, if time permits, near-zero-index photonics. I will discuss their salient features and forecast future possibilities.

** Refreshments served in PAS 218 at 2:30 PM – 3:00 PM **

