## Reconfigurable and Coherently Controlled Photonic Metamaterials: A platform for Optical Properties on Demand

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Engaging the changing balance of forces, structural transformations, light confinement and coherent effects at the nanoscale brings about a new generation of photonic metamaterials with unique and useful "on-demand" electromagnetic properties.

Metamaterials, artificial electromagnetic media achieved by structuring on the subwavelength scale, were initially suggested as negative index material for the "superlens" and for transforming electromagnetic space to control propagation of waves.

The research agenda is now shifting to achieving tuneable, switchable, nonlinear, gain and sensing functionalities using metamaterials. We show how engaging the changing balance of forces, structural transformation, light confinement effects at the nanoscale brings about the emerging field of metadevices that we define as devices with unique and useful on-demand functionalities achieved by structuring of functional matter on the sub-wavelength scale.

The main emphasis of this talk will be on photonic metamaterials reconfigurable with microfluidics, Ampere, Lorentz and Coulomb Electromagnetic Forces and light.

We will also discuss a radically new approach to controlling electromagnetic properties of metamaterials using coherent control and examine applications of this new paradigm in photonic devices, data processing and spectroscopy.