One of the active areas of research in metamaterials and metaphotonics is exploration of ways to functionalize metastructures for achieving new optical characteristics and functionalities. From the “forms” of metamaterials we may extract desired “functions”. These may include the extreme-parameter metamaterials for novel applications in metaphotonics [1-3], metastructures that function as optical nanocircuits (“optical metatronics”) – a platform for nanoscale optical processing [4-7], graphene metamaterials as one-atom-thick optical devices [8], nonreciprocal metamaterials for unusual flow of photons [9], nanoscale “meta-machines” as metamaterials for wave-based signal processing [10], and metamaterial “bits” and “bytes” as building blocks for digitizing metamaterials [11], to name a few. In my group we are investigating a variety of features and properties of these concepts and directions in functionalizing metamaterials and metasystems, and explore new classes of phenomena and potential applications. I will present an overview of some of these topics.

References

[8] A. Vakil and N. Engheta, Science, 332, 1291 (2011)