NCN Nanophotonics and Metamaterials

Nanophotonics involves light and matter interacting on the nanoscale; while biophotonics addresses the ways that light and biological matter interact. Nanophotonics is especially relevant to the development of chemical and biological sensors and to new information processing and communications paradigms. The NCN leverages nanophotonics research within the network to address: 1) the fundamental interaction of light and nanoparticles, 2) plasmonic nanophotonics, and 3) metamaterials. With regard to the first topic, research focuses on nanoscale electrodynamics, near field measurements, and biophotonics. With regard to topic 2), we note that the photon is the ultimate unit of information because it packages data in a signal of zero mass and has unmatched speed. Information technologies that were formerly entirely electronic are increasingly exploring light to communicate and provide intelligent control. For example, plasmonic nanostructures can act as nano antennae and thus serve as optical couplers across the nano–micro interface. Plasmonic nanophotonics promises to create entirely new prospects for guiding light on the nanoscale, some of which may have revolutionary impact on present-day optical technologies. Finally, metamaterials are expected to open a gateway to unprecedented electromagnetic properties and functionality unattainable from naturally occurring materials, thus enabling a family of new “meta-devices.” Recently demonstrated possibilities include artificial magnetism at high frequencies, including the visible part of the spectrum, negative-index materials in the optical range, and promising approaches along with challenges in realizing optical cloaking. The NCN seeks to bring new computational approaches, educational resources, and software tools to this emerging field.

This page is a starting point for nanoHUB users. It lists a few resources developed or recommended by the NCN Nanophotonics team. You can find other resources by browsing through the list with the tags nanophotonics or metamaterials, or by using the nanoHUB search box to locate other resources.

Selected Resources

- NCN Nanophotonics: Tutorials
- NCN Nanophotonics: Research Seminars
- Course: Nanophotonics
- NCN Nanophotonics: Simulation Tools for Education and Research

Special Initiatives

- Metamaterials: A New Paradigm of Physics and Engineering
- Excellence in Computer Simulation

Recommended Links

- Photonics and Spectroscopy Lab, Purdue University
- Intel Research: Silicon Photonics
- Northwestern University Center of Cancer Nanobiotechnology Excellence
- Northwestern University Materials Research Science & Engineering Center
- Northwestern University Nanoscale Science & Engineering Center for Integrated Nanopatterning and Detection Technologies
Announcements