



MATERIALS SCIENCE and ENGINEERING SEMINAR



Aseema Mohanty, Clare Boothe Luce Assistant Professor

Electrical and Computer Engineering
Tufts University

Visible photonic integrated circuits: From neuroscience to quantum applications

**MSEG
SEMINAR**
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Reconfiguring, modulating and processing light at visible wavelengths typically requires complex and bulky table-top optics. High resolution optical applications such as optogenetic neural studies, fluorescence microscopy, and quantum information systems have a growing need for compact and efficient platforms that can control and readout large numbers of optical channels. However, in the visible wavelength range, where key optical transitions lie, this is a significant challenge because the traditional silicon photonics chip-scale platforms cannot be leveraged due to fundamental material absorption limits. Silicon nitride has been demonstrated as a foundry-compatible, low-loss photonic platform operating down to 400 nm wavelength through optimized fabrication processes and mode engineering. The platform's recent demonstrations in switching networks, optical phased arrays, and active modulation show its potential as an excellent interface between light and optically addressable atoms or cells. This talk will highlight recent work in silicon nitride visible photonic integrated circuits on mode-multiplexing structures for high resolution beam shaping and structuring from multimode waveguides and compact on-chip apertures.

BIOGRAPHY

Aseema Mohanty is the Ankur and Mari Sahu Assistant Professor in Electrical and Computer Engineering at Tufts University. She received her B.S. degree from the Massachusetts Institute of Technology and Ph.D. from Cornell University. During her postdoctoral work at Columbia University, she developed an implantable neural probe based on visible photonic integrated circuits for sub-millisecond and single-cell neural stimulation and readout. Her research focuses on using nanophotonics and engineered light-matter interactions to create miniaturized high performance optical circuits to control, shape, and sense light. Her interest in chip-scale optical devices broadly span the fields of neuroscience, implantable and wearable biomedical sensors, 3D optical beam shaping, quantum information and emerging computing and communication systems. Her work has been published in *Nature Photonics*, *Nature Biomedical Engineering*, *Nature Communications* and received the NSF CAREER in 2025.



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