

UC San Diego

JACOBS SCHOOL OF ENGINEERING
Aiiso Yufeng Li Family Department of
Chemical and Nano Engineering

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DEPARTMENT SEMINAR

Wednesday, May 21st, 2025

11:00 AM - 12:00 PM

SME 248



Dr. Lisa Poulikakos, PhD

"Nature-Inspired Photonic Surfaces for Next-Generation Imaging and Diagnostics"

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Abstract: Imaging science is a critical enabler of revolutionary scientific advances across disciplines. However, current imaging technologies face prohibitive trade-offs in resolution, penetration depth and experimental complexity. Here, we introduce new classes of micro- and nanostructured photonic surfaces which scale down and enhance light-matter interactions, to overcome existing challenges in imaging science in a miniaturized, on-chip format.

First, we draw inspiration from structural color in nature to develop anisotropic, colorimetric photonic surfaces, which exhibit a polarization-sensitive optical response. We leverage this system to selectively visualize disease-relevant fiber density and orientation in biological tissue. Starting with the example of breast cancer diagnostics, we then expand our view to the rich palette of fiber-affecting diseases where these photonic surfaces hold potential to achieve rapid, precise and low-cost tissue diagnostics with facile clinical implementation.

Next, we introduce "acoustoplasmonic metasurfaces" to enable tunable acoustic wavefront shaping with polarized light. The proposed acoustoplasmonic metasurfaces merge the physics of light and sound in previously unexplored ways, opening new avenues to harness wave-matter interactions. Future applications of acoustoplasmonic metasurfaces include on-chip imaging with simultaneously high spatial resolution and penetration depth, which can enable societally relevant applications ranging from biomedicine to industrial materials, to environmental science.

Bio: Lisa Poulikakos is an Assistant Professor of Mechanical and Aerospace Engineering at UCSD. She received her PhD at ETH Zürich, where she introduced an original theoretical and experimental technique to enable the rational design of chiral nanophotonic systems. Her postdoctoral research at Stanford University focused on developing functional nanophotonic surfaces for all-optical and label-free cancer tissue diagnostics. Her lab at UCSD develops chiral and anisotropic nanophotonic materials for next-generation imaging. She is a recipient of the ETH Medal, awarded to outstanding doctoral theses, the L'Oréal USA For Women in Science Postdoctoral Fellowship, the Swiss National Science Foundation Early Postdoc Mobility Fellowship, the RCSA Scialog Fellowship for Advancing Bioimaging, the UCSD MRSEC New Investigator Award, the Beckman Young Investigator Award, the AFOSR Young Investigator Program Award, the Packard Fellowship for Science and Engineering and the UCSD IEM GEMINI Faculty Mentor Award.

Seminar Host: Zeinab Jahed