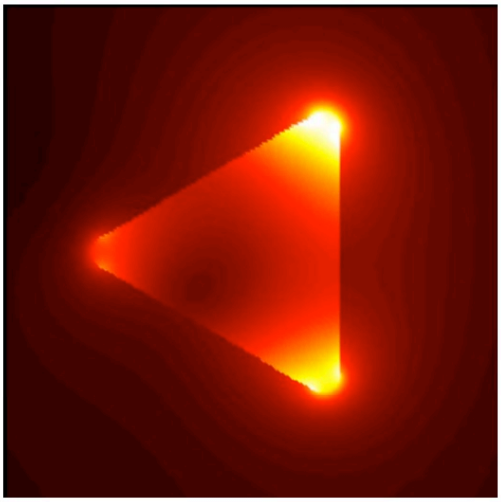
AES

Advanced Electrodynamics Seminar

PURDUE UNIVERSITY Discovery Park

Host: Dr. Zubin Jacob
(zjacob@purdue.edu)

# Lightning-fast solution of scattering problems in nanophotonics: an effortless modal approach



**Dr. Parry Chen** (Ben Gurion University)

**Date:** Thursday, Jan. 31st, 2:00pm
**Room:** BNC 1001

*Rescheduled due to weather advisory.*

**Abstract:** Nanophotonic structures are capable of generating field hotspots, which can enhance quantum light-matter interactions by many orders of magnitude. However, numerical simulations for applications such as radiative heat transfer, electron energy loss spectroscopy, van der Waals forces, Purcell factor throughout a volume, and many others are challenging and often computationally prohibitive. Common to these simulations is that the Green's function or local photonic density of states must be known at each point across a volume of space, necessitating the solution of Maxwell's equations perhaps many thousands of times.

We propose a modal solution, which requires just a single simulation to find the modes of the nanophotonic system, from which we immediately obtain the Green's function everywhere in space. This not only reduces simulation time by approximately 2 orders of magnitude, but also offers ready physical insight into the spatial variation of Green's function. Modal methods have long been used for closed systems, where the formulation is exceedingly simple. We have generalized modal methods to open systems while maintaining this simplicity, catering to the explosion of research interest in nanophotonics. We furthermore present a highly-efficient exponentially-convergent method of generating the modes themselves.

**Bio:** Parry Chen is currently a postdoc at Ben Gurion University in Israel, developing numerical methods for computational electrodynamics. He previously held a postdoc position at Tel Aviv University, designing wire media metamaterials. His PhD was obtained from the University of Sydney, researching exotic photonic crystals featuring metamaterials and their simulation methods.