# Condensed Matter Physics Seminar Series

## Scalable Quantum Nanophotonics: From Nanofabrication to Quantum Circuit Mapping

Marina Radulaski

*University of California, Davis*

Photonic systems are the leading candidates for deterministic quantum sources, quantum repeaters, and other key devices for quantum information processing. Scalability of this technology depends on the stability, homogeneity and coherence properties of quantum emitters, which makes color centers in wide band gap semiconductors a highly desirable platform for applications. Silicon carbide, in particular, has been an attractive commercial host of color centers featuring fiber-compatible single photon emission, long spin-coherence times and nonlinear optical properties. Integration of color centers with nanophotonic devices has been a challenging task, but significant progress has been made with demonstrations up to 120-fold resonant emission enhancement of emitters embedded in photonic crystal cavities. A novel direction in overcoming the integration challenge has been the development of triangular photonic devices, recently shown to preserve millisecond-scale spin-coherence in silicon carbide defects. Triangular photonics has promising applications in quantum networks, integrated quantum circuits, and quantum simulation. Here, open quantum system modeling provides insights into polaritonic physics achievable with realistic device parameters through evaluation of cavity-protection, localization and phase transition effects. Mapping of this dynamics to gate-based quantum circuits opens door for quantum advantage in understanding cavity quantum electrodynamical (QED) effects using commercial Noisy Intermediate-Scale Quantum (NISQ) hardware.

Marina Radulaski is an Assistant Professor of Electrical and Computer Engineering at the University of California, Davis where she leads the Quantum Nanophotonics Laboratory. She obtained a PhD in applied physics and postdoctoral training in electrical engineering at Stanford University, and holds undergraduate degrees in theoretical physics and computer science from the University of Belgrade and the Union University in Serbia, respectively. Prof. Radulaski is a recipient of the 2023 AFOSR Young Investigator Program Award, 2022 Google Research Scholar Award, and 2021 NSF CAREER Award 2021. She was selected for the 2021 OneQuantum Leading Female Scientist award, 2021 ETH Pauli Center for Theoretical Study Visiting Researcher program, 2017 Rising Stars in EECS cohort, 2017 Stanford Nano- and Quantum Science and Engineering Postdoctoral Fellows, 2012 Stanford Graduate Fellows, and 2012 Scientific American 30-Under-30 Up and Coming Physicists.

**Friday, May 26th, 2023 at 1:00 PM**
**4-330 PAB**