

# NQN Workshop on Quantum Transduction

**14-15 November 2019**

Watertown Hotel  
4242 Roosevelt Way NE  
Seattle, WA 98105

*Organizing Committee: Kai-Mei Fu (UW), Xiaodong Xu (UW), Arka Majumdar (UW), Mo Li (UW), Nathan Wiebe (UW/PNNL), Hailin Wang (UO), David Allcock (UO), David Wineland (UO), Ben Aleman (UO), Brian Smith (UO), Sophia Economou (VT), Edwin Barnes (VT), Hong Tang (Yale)*

## AGENDA

### Thursday, 14 November, 2019

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**8:00-8:45:** Check In, Light Breakfast

**8:45-9:00:** Introductory Remarks/Overview  
*Kai-Mei Fu, University of Washington*

#### **Focus Session 1: Photonics I**

*Facilitator: Arka Majumdar, University of Washington*

**9:00-9:25:** Nonlinear nanophotonics for connecting distant quantum nodes  
*Kartik Srinivasan, National Institute of Standards and Technology/U. of Maryland*

**9:25-9:50:** Silicon photonics for quantum computing with atomic spins  
*Lukas Chrostowski, University of British Columbia*

**9:50-10:15:** Quantum Information Processing with Spectral Qubits: State of the Art, Challenges, and Outlook  
*Pavel Lougovski, Oak Ridge National Laboratory*

**10:15-10:40:** Discussion

**10:40-11:00:** Coffee Break

#### **Focus Session 2: Ions/Atoms**

*Facilitator: David Allcock, University of Oregon*

**11:00-11:25:** Constructing entanglement networks with trapped ions  
*Ken Brown, Duke University*

**11:25-11:50:** Interfacing atomic and solid-state quantum systems: challenges and prospects  
*Harmut Haeffner, UC Berkeley*

## **Thursday, 14 November, 2019 Continued**

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**11:50-12:15:** Cold atoms for advanced quantum simulation, computation, and sensing  
*Dan Stamper-Kurn, UC Berkeley*

**12:15-12:40:** Discussion

**12:40-1:30: Lunch**

### **Focus Session 3: Opto-Mechanical**

*Facilitator: Hailin Wang, University of Oregon*

**1:30-1:55:** Quantum tricks for enhanced quantum transduction  
*Aashish Clerk, University of Chicago*

**1:55-2:20:** Mechanically-mediated electro-optic conversion  
*Cindy Regal, JILA, University of Colorado*

**2:20-2:45:** Diamond optomechanics for coherent manipulation of light  
*Paul Barclay, University of Calgary*

**2:45-3:10:** Discussion

**3:10-3:30:** Coffee Break

### **Focus Session 4: Opto-mechanical/microwave coupling, amplification**

*Facilitator: Sophia Economou, Virginia Tech*

**3:30-3:55:** Quantum amplification of boson-mediated interactions  
*David Allcock, University of Oregon*

**3:55-4:20:** Approaching fundamental limits for optomechanical coupling  
*John Teufel, NIST Boulder*

**4:20-4:45:** Dynamical noise suppression and microwave cavity-mediated spin-spin interactions in quantum dots  
*Edwin Barnes, Virginia Tech*

**4:45-5:10:** Discussion

**5:10-6:00: Poster Session**

## Friday, 15 November, 2019

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**8:00-8:45:** Check In, Continental Breakfast

**8:45-9:00:** Introductory Remarks/Overview

*Hailin Wang, University of Oregon*

### **Focus Session 5: Defect/Dot Spin Systems**

**9:00-9:25:** Toward large-scale engineering models for semiconductor and topological qubits

*John Gamble, Microsoft*

**9:25-9:50:** Coherent atomic qubits in silicon with strong spin-orbit coupling

*Joe Salfi, University of British Columbia*

**9:50-10:15:** Machine learning for automated formation of quantum dot arrays

*Justyna Zwolak, National Institute of Standards and Technology*

**10:15-10:40:** Discussion

*Nathan Wiebe, University of Washington*

**10:40-11:00: Coffee Break**

### **Focus Session 6: Photonics II**

*Facilitator: Kai-Mei Fu, University of Washington*

**11:00-11:25:** Quantum frequency conversion

*Hong Tang, Yale University*

**11:25-11:50:** Manipulation and characterization of single photon wave packets

*Brian Smith, University of Oregon*

**11:50-12:15:** Fundamental limits on electromagnetic scattering and light-matter interactions: approaching upper bounds on light extraction and Purcell enhancement in nano-structured media

*Alejandro Rodriguez, Princeton University*

**12:15-12:40:** Discussion

**12:40-1:30: Lunch**

### **Focus Session 7: New Materials**

*Facilitator: Mo Li, University of Washington*

**1:30-1:55:** 2D Materials: A New Platform for Quantum Emitters and Simulators

*Xiaodong Xu, University of Washington*

## **Friday, 15 November, 2019 Continued**

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**1:55-2:20:** Coherence in materials with tunable spin orbit coupling

*Javad Shabani, New York University*

**2:20-2:45:** Quantum anomalous hall effect in the magnetic topological insulator thin films

*Cui-Zu Chang, Penn State University*

**2:45-3:10:** Discussion

**3:10-3:30: Coffee Break**

### **Focus Session 8: Defects/Spins/Photons**

*Facilitator: Benjamín Alemán, University of Oregon*

**3:30-3:55:** Effects of crystal quality on optical and spin decoherence

*Charles Thiel, Montana State University*

**3:55-4:20:** Using machine learning to learn magnetic fields with NV centers at room temperature

*Nathan Wiebe, University of Washington*

**4:20-4:45:** Defects: spin-photon interfaces and nuclear spin registers

*Sophia Economou, Virginia Tech*

**4:45-5:10:** Discussion, Closing remarks