NNCI – Northwest Nanotechnology Infrastructure

University of Washington / Oregon State University

1st NNCI Conference
Atlanta, GA, January 18, 2017

Some of our Key Personnel

- Karl Böhringer, NNI site director, UW
- Greg Herman, site director, OSU
- Daniel Ratner, educational lead
- Michael Khbeis, vendor liaison

Major UW Infrastructure Projects (to be completed in summer 2017)

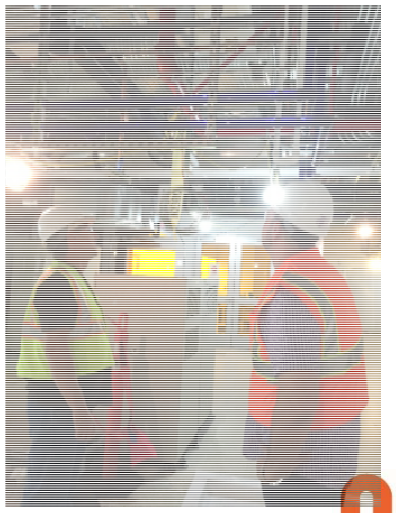
New Nano-engineered Systems Institute and building

- "NanoES will lead and act as a national magnet for design, processing and integration of scalable nano-engineered devices and systems."
- 35,000 sf office and laboratory space

Completely renovated Washington Nanofabrication Facility

- 12,000 sf of ISO Class 5, 6 and 7
- Bay and chase configuration
- Extended office space for non-UW users
- Additional new satellite lab for microfluidics and testing

Total investment > $100M



Synergy with other Facilities

<u>Washington Clean Energy Testbeds</u>

- Part of the UW Clean Energy Institute
- "… a regional testbed facility that will assist in the scale-up, prototyping, testing, and validating of clean energy innovations…

  The testbeds will be used by UW faculty and student researchers as well as others at the state's leading companies and research institutions."

- WCET will adopt the NNI facility management system
- WCET and NNI will coordinate staffing and create new opportunities for career advancement
- Opening in February 2017

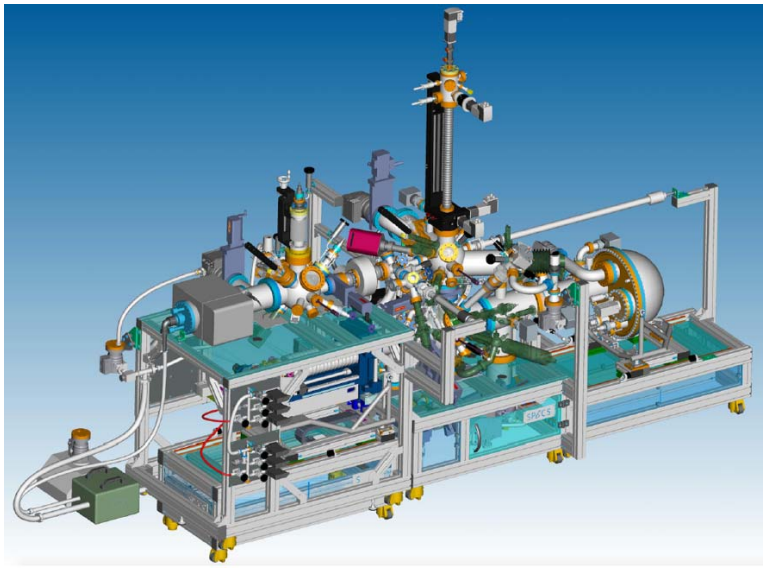
Major OSU Infrastructure Projects (completed in summer 2016)

Completion of Johnson Hall home for:

- School of Chemical, Biological and Environmental Engineering
- Office of Women and Minorities in Engineering
- Louis Stokes Alliance for Minority Participation in STEM (LSAMP)

Also home for new NNCI surface characterization capabilities:

- Near Ambient Pressure X-ray Photoelectron Spectroscopy / Scanning Tunneling Microscopy System (April 2017).



New Capabilities

- Washington Nanofabrication Facility (WNF)
  - CVD of tantalum nitride and copper
  - Electroplating for high aspect ratio TSVs
  - Precision wafer thinning and CMP
  - NanoScribe 3D printer

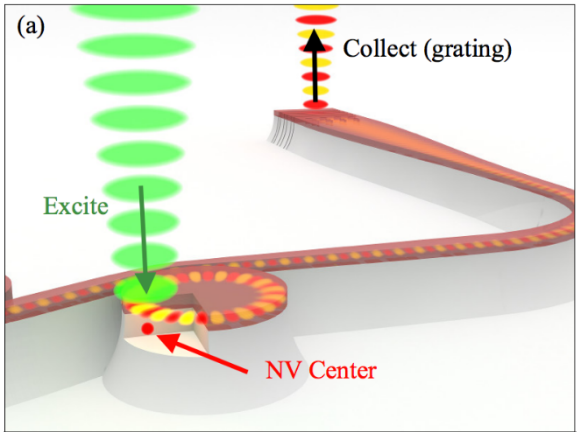
- Molecular Analysis Facility (MAF)
  - Cypher AFM
  - X-ray absorption near edge spectroscopy (XANES)
  - J105 ToF-SIMS
  - Liquid TEM holder (collaboration with Hummingbird Inc.)
  - Coming soon: FEI Titan Krios cryo-EM

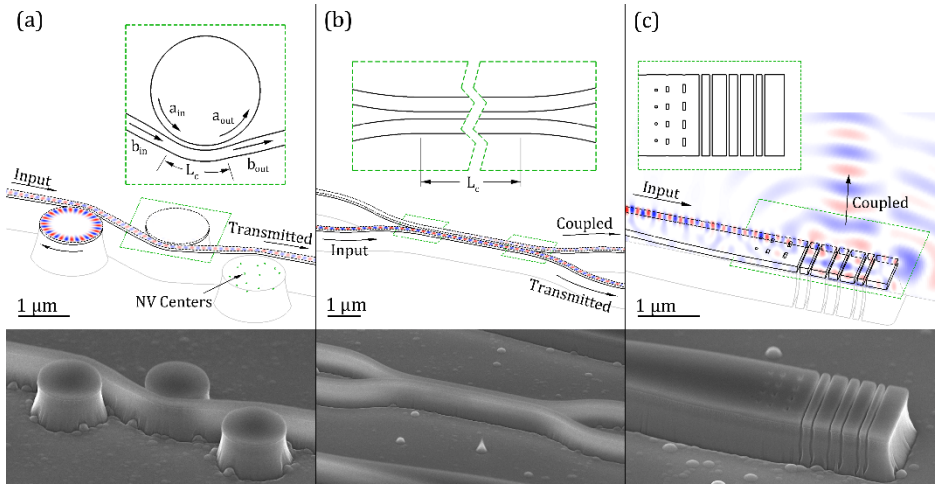
NNI Principal Focus Areas

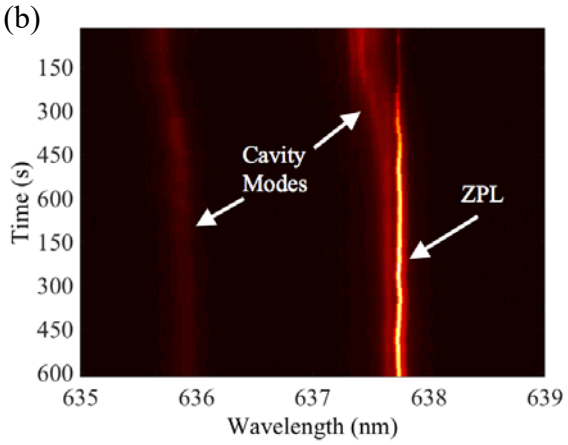
- Integrated Photonics
  … including cutting-edge optical communication, quantum computing, and biosensing
- Advanced Energy Materials and Devices
  … ranging from batteries to thin film solar cells
- Bio-nano interfaces and systems
  … from drug delivery to diagnostic sensors and bio-scaffolds
- Mentoring and Workforce Development
  … including K-12 outreach, community college and undergraduate internships, K-12 educator outreach and partnership

GaP-on-diamond Photonics for Quantum Information Processing

- Integrated photonics platform with single atomic defects in diamond
- 100's of devices per chip, automated testing and statistical analysis
- Components for complete integrated system, incl. disk resonators, directional and off-chip couplers



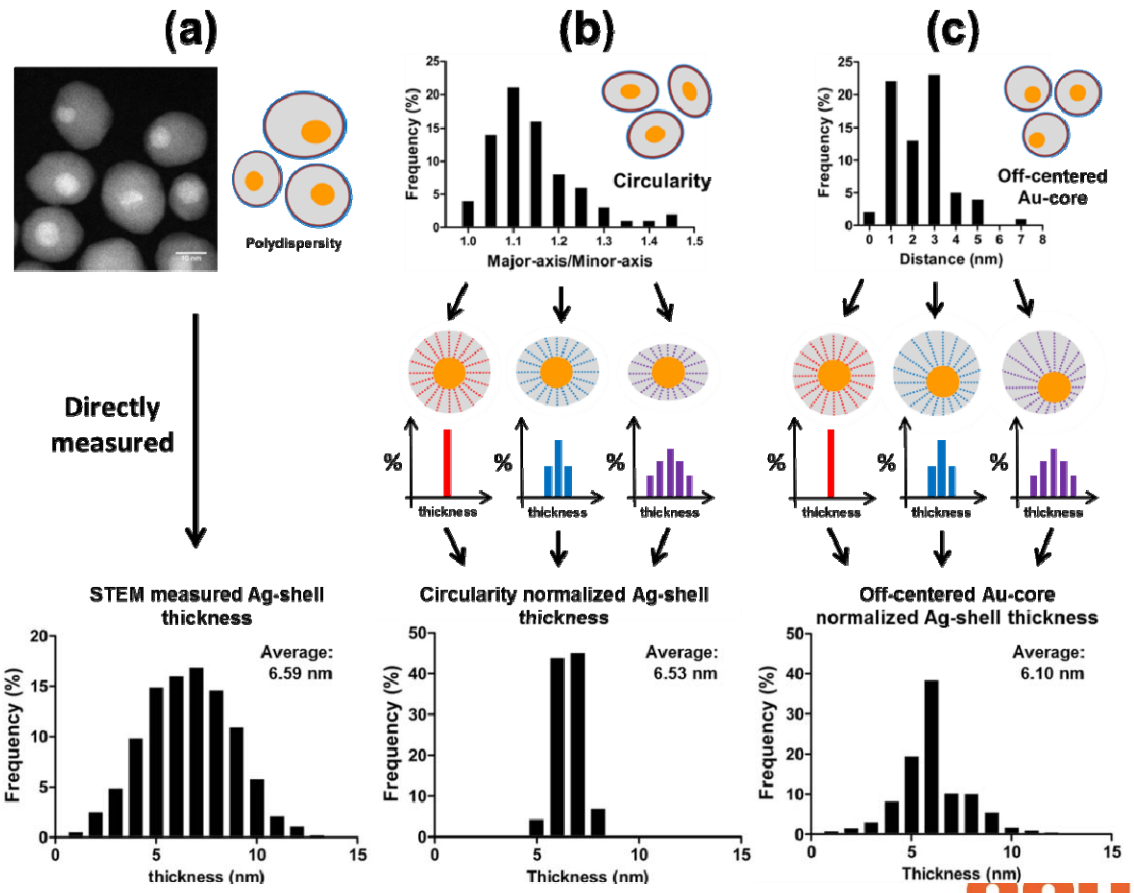




[1] M. Gould et al., "Efficient extraction of zero- phonon-line photons from single nitrogen-vacancy centers in an integrated GaP-on-diamond platform," Phys. Rev. Appl. 6, 011001 (2016).
[2] M. Gould et al., "Large-scale GaP-on-diamond integrated photonics platform for NV center-based quantum information," J. Opt. Soc. Am. B 33(3), B35-B42 (2016) .

Quantifying the Impact of Nanoparticle Coatings and Nonuniformities on XPS Analysis

- Rigorous characterization of nanoparticles with TEM, AFM, XPS, ToF-SIMS, SFG vibrational spectroscopy
- Simulation of Electron Spectra for Surface Analysis (SESSA) for non-spherical nanoparticles
- Including the contributions from geometrical non-uniformities leads to more accurate predictions of elemental composition with SESSA



[1] YC Wang, H Engelhard, DR Baer, DG Castner, Analytical Chemistry 88 3917-3925 (2016)

External Stakeholders

Government & Foundations

Education

Industry

Announcement and Invitation

3rd Annual NNCI Conference

Seattle, Washington, late summer 2018