

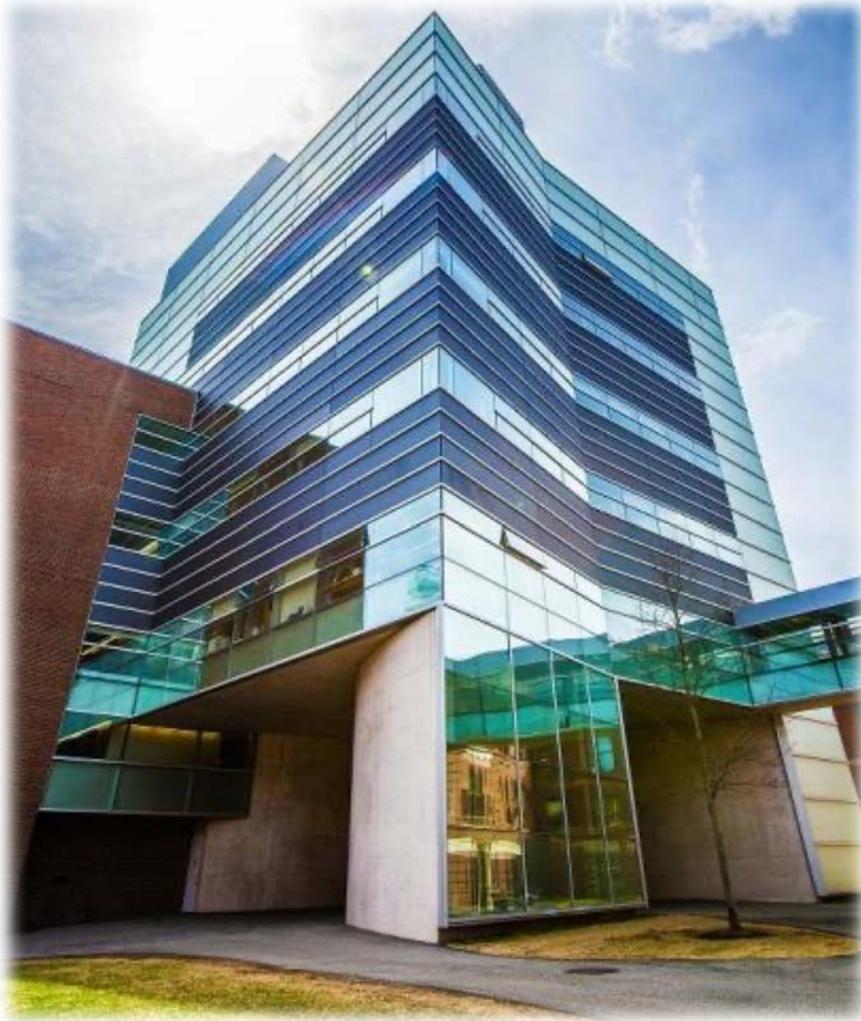


Harvard University:
Center for Nanoscale Systems
NSF NNCI Conference 2021



Center for
Nanoscale
Systems
Harvard University
FAS • SEAS

Epicenter for Interdisciplinary Nanoscience Research at Harvard: LABORATORY FOR INTEGRATED SCIENCE AND ENGINEERING (LISE)



Robert Westervelt
Director

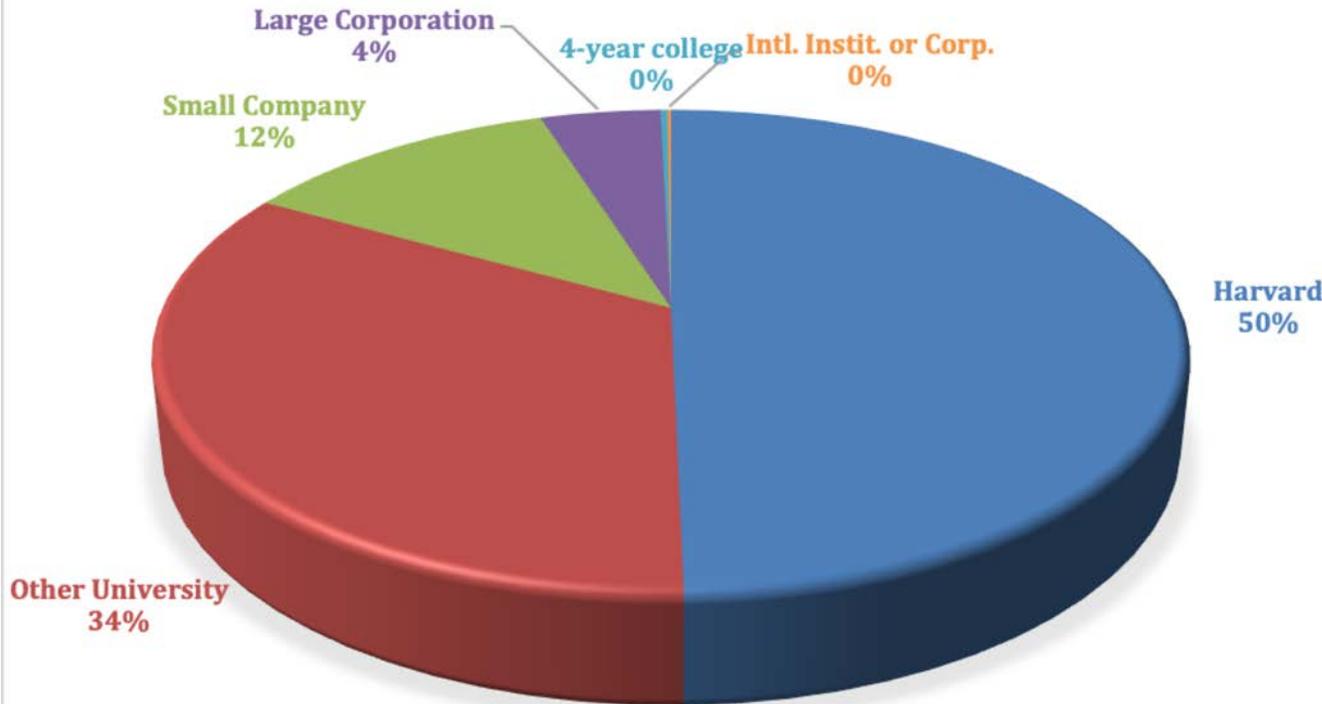


William L. Wilson
Executive Director

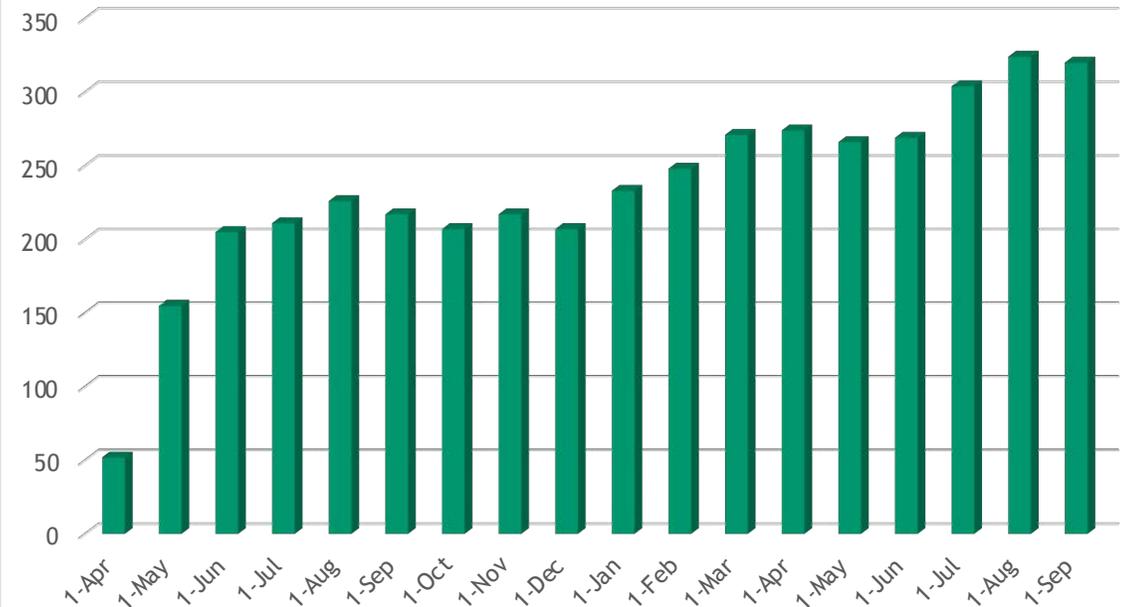
- **CNS** serves as a one-stop shop for all things “Nano and Quantum” (almost *exclusively* self-use)
- **CNS** is an Open facility. An important regional research and prototyping facility. With a large “non” Harvard userbase.
- **CNS** “*post-covid?*” we have slowly increased user density in a fashion consistent with CDC and Campus Guidance. (*Safety has been Paramount*)
- **CNS** has expanded remote training for some systems and has expanded “*in-person*” training and educational programs as density rules permit. (*Settling in on New Normal*).
- **CNS** develops new processing and experimental platforms. We are now opening satellite Cores on our New Allston Engineering Campus, (Imaging, Soft lithography, and Materials Characterization).
- **CNS** offers support for local Start-up companies and has established alliances with local technology incubators.

Main Challenge: *Managing User Population Recovery*

USER DISTRIBUTION

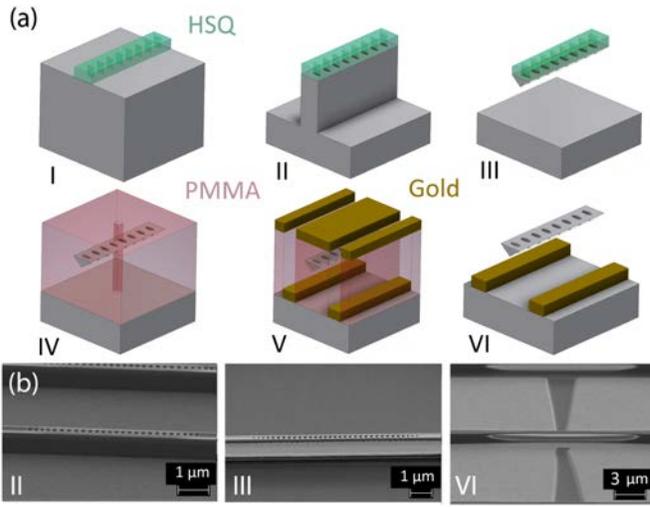
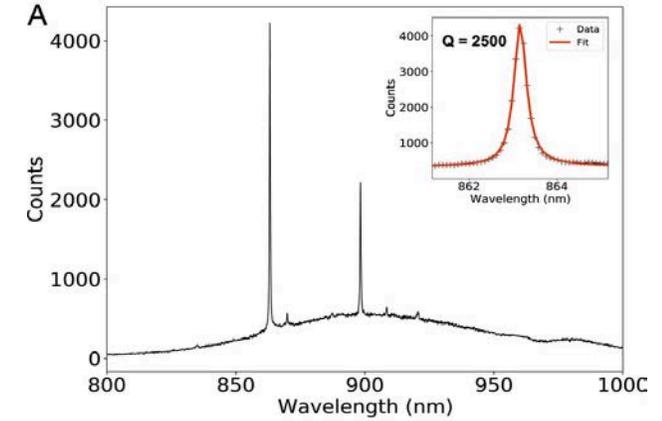
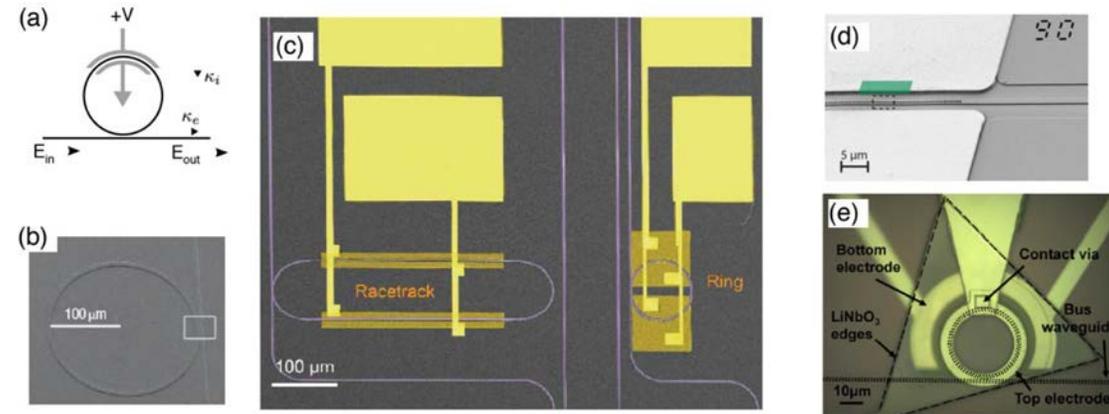
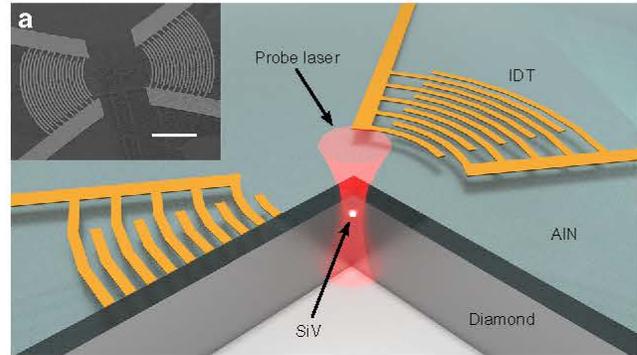


Usage Recovery

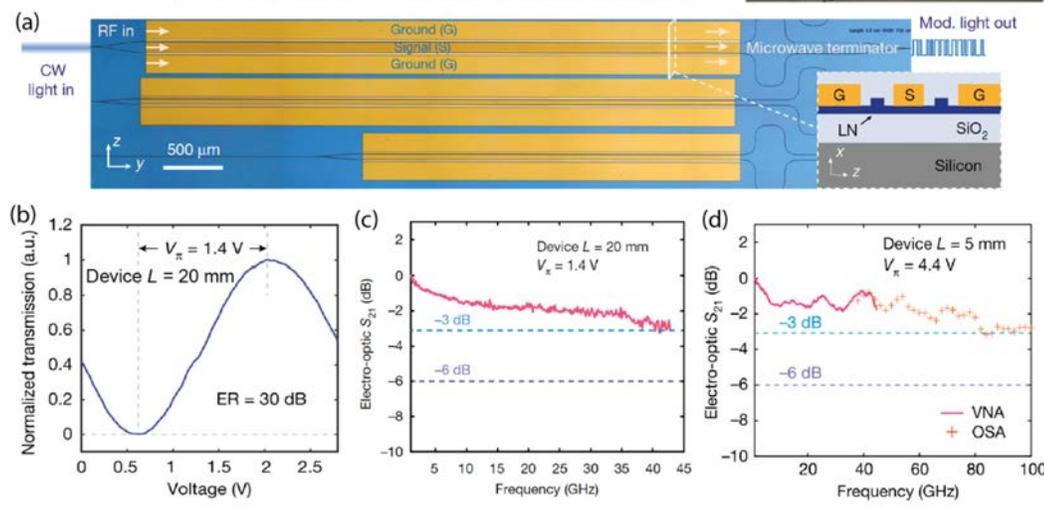


- ✓ User distribution Similar to pre-Covid
- ✓ User Re-training (*new phenomena*)
- ✓ Staff Retention/Satisfaction Challenges

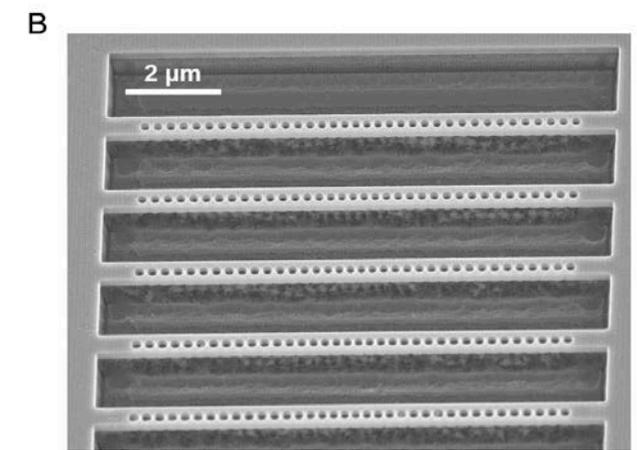
Research Focus: Quantum Materials, Device Processing



Diamond



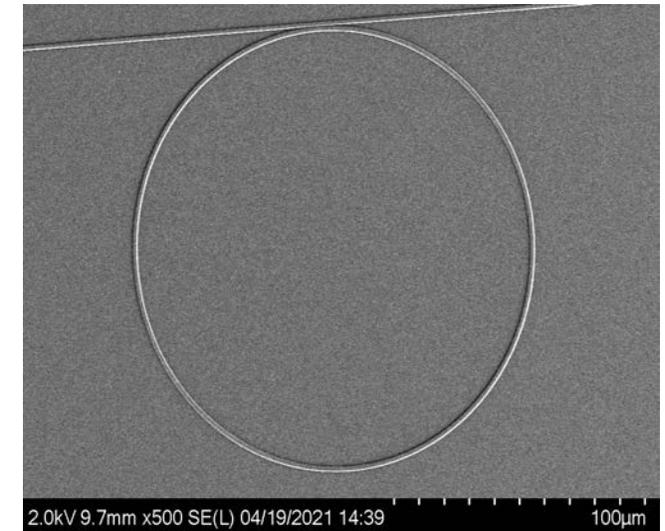
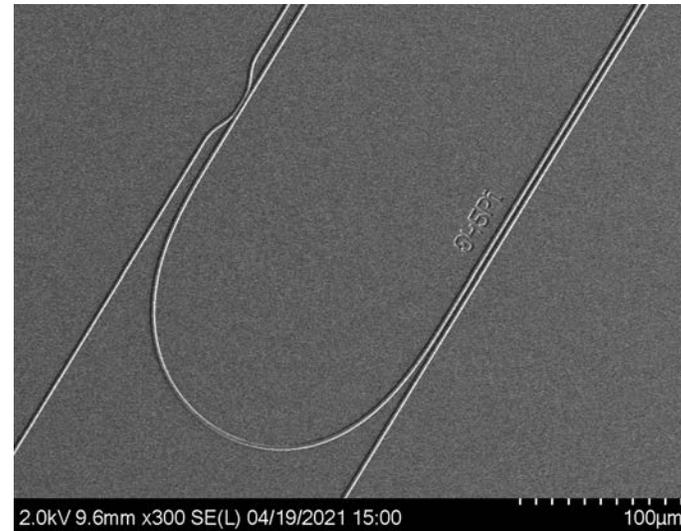
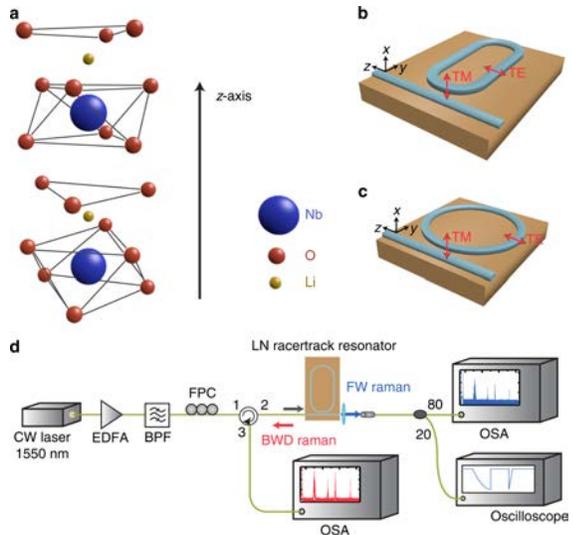
LiNbO₃



SiC: VSi

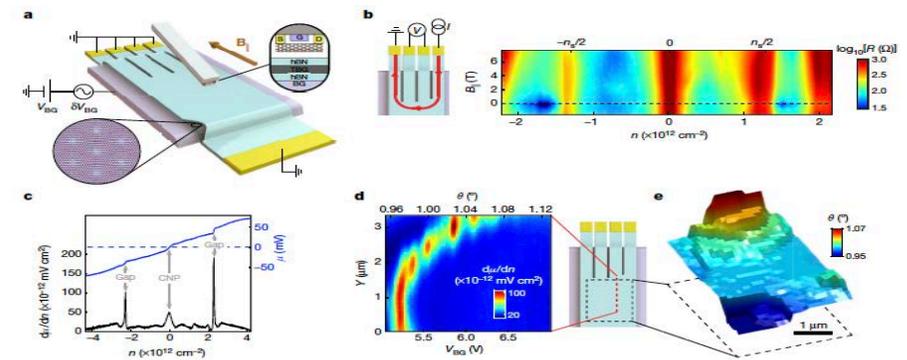
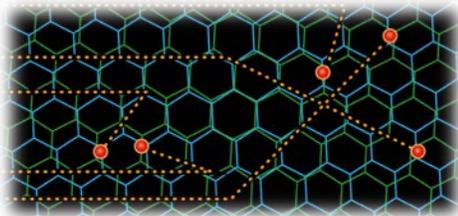
Research Highlight: *Quantum Engineering*

Quantum Networking: Raman lasing and soliton mode-locking in lithium niobate microresonators: Mengjie Yu, Yoshitomo Okawachi, Rebecca Cheng, Cheng Wang, Mian Zhang, Alexander L. Gaeta and Marko Lončar (*Harvard University*)



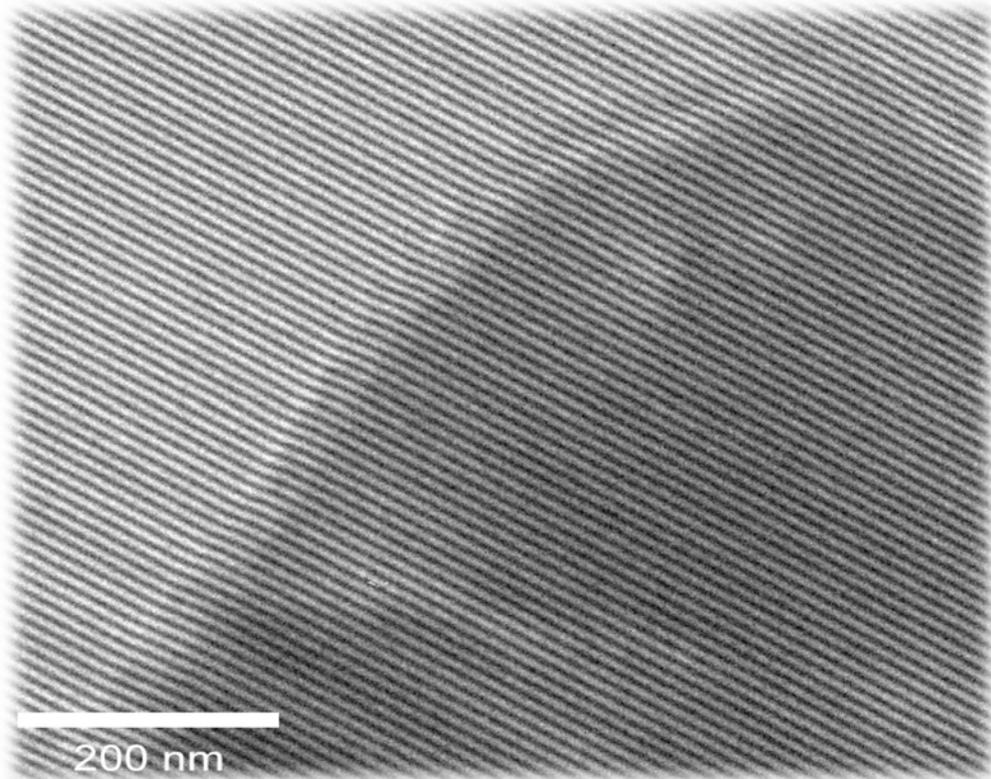
***New Materials/device Processing developed with Staff Support**

Cascade of Phase Transitions and Dirac Revivals in Magic-angle Graphene: U. Zondiner, A. Rozen, D. Rodan-Legrain, Y. Cao, R. Queiroz, T. Taniguchi, K. Watanabe, Y. Oreg, F. von Oppen, Ady Stern, E. Berg, P. Jarillo-Herrero & S. Ilani; MIT



New Imaging Instrument: *(finally installed / operational)*

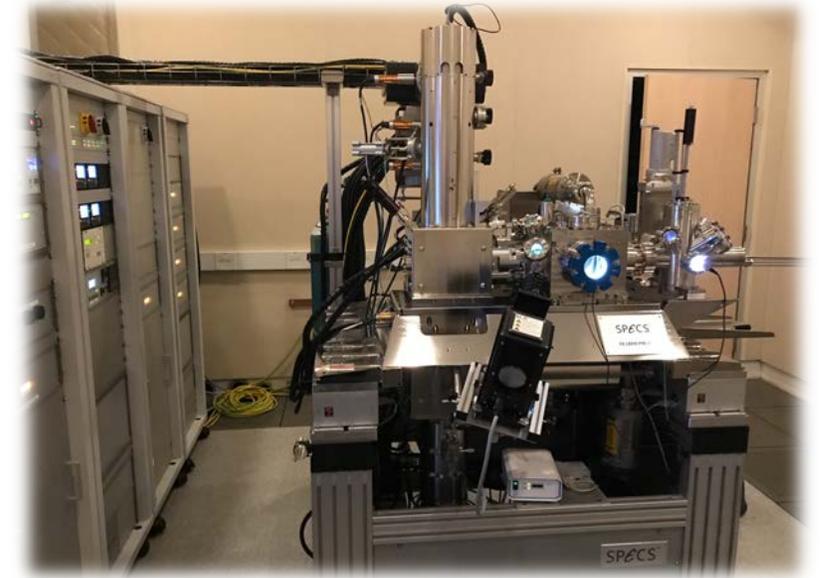
Harvard Quantum Imager (HQI)



Fe₂O₃ (ferromagnetic fringe domains imaged via Electron Holography)



New Imaging Capability: *(finally installed / operational)*



An old technology
“reborn”
(NSF MRI Supported)

New **LEEM** System

Lab Expansion: *Harvard's Allston Engineering Campus*



Materials
Characterization

1 Full time Staff Member (just hired)
1 Staff shared-with Cambridge

Imaging and
Analysis

2 Staff Members
shared-with Cambridge

Soft
Lithography

1 Staff Member
shared with
Cambridge

**CNS Allston Labs Located
in the SEC
(132 pieces of
equipment added)**



REU/REV Programs:

REU – conventional program : but with project offerings from entire userbase, both internal and external



***REU PROGRAM** – Advanced research opportunities for Ugrads from external, 2 and 4yr institutions; added international students in FY19

Research Experience Veterans – *staff serves as mentors*

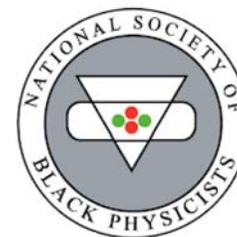
(some interns carried through school year)



Full Re-boot planned for 2022

Diversity Efforts: *Student Initiatives*

- Establishment of Student Chapter of NSBP at Harvard (now officially supported by Physics and the University)
- Sister Chapter being developed at MIT (plans for regional presence)



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2021 Remote Project with
Navajo Technical University

Outreach: CNS Scholars



*Prof. K. Dorsey – Smith College



Prof. T. Searles – UIC



Prof. R. Horton – Miss State University



Dr. Pia Sorenson – SEAS



Prof. K. Aidala – Mount Holyoke



Prof. T. Brower-Thomas – Howard University



Prof. D. Simien – UAB

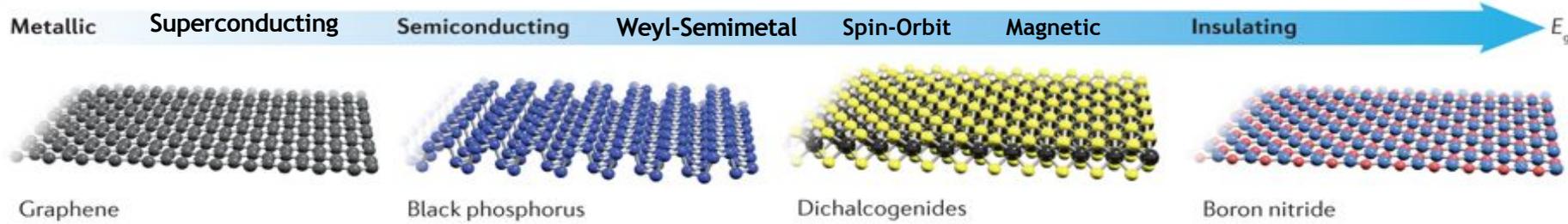


Doing Check-ins



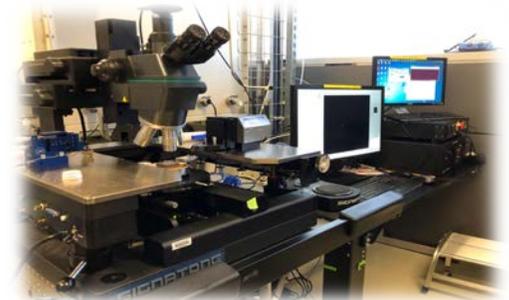
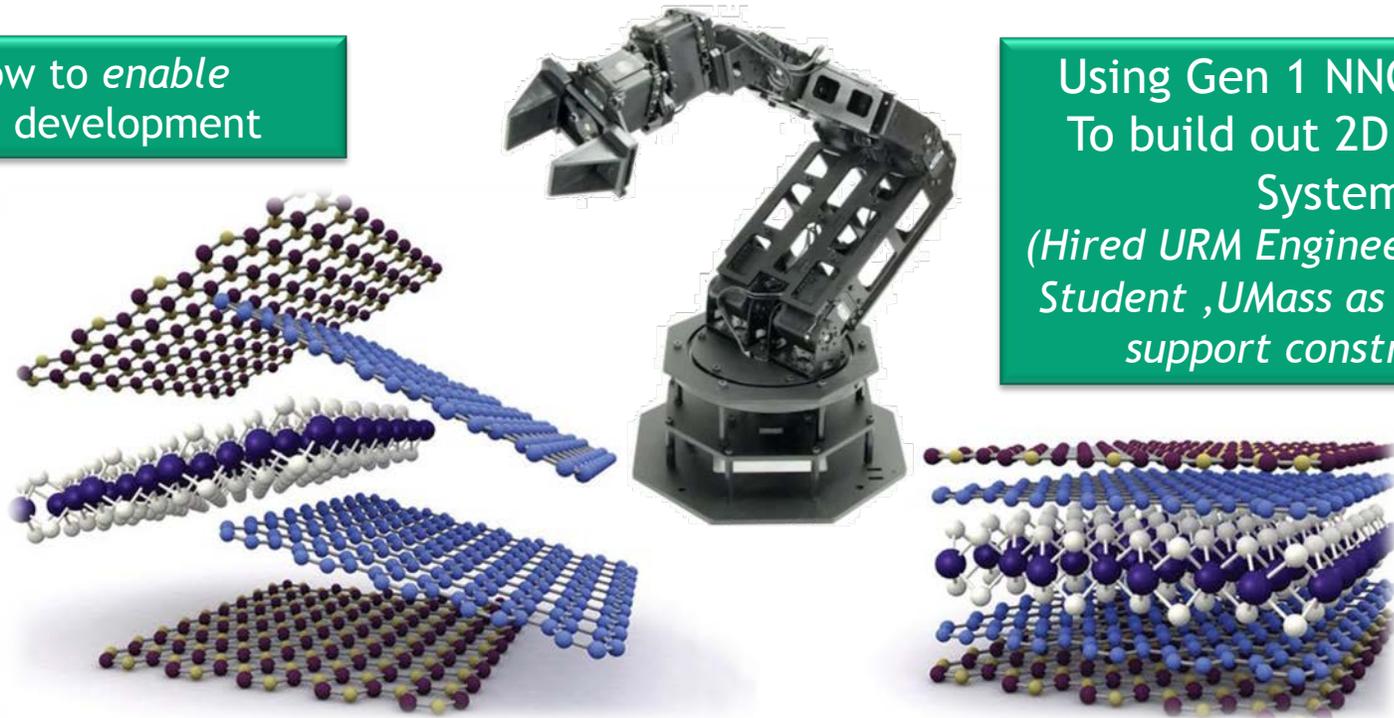
*NSF Career Awardee

Outreach: Quantum Infrastructure Development



Exploring how to *enable* infrastructure development

Using Gen 1 NNCI Support To build out 2D Assembly System
(Hired URM Engineering Masters Student, UMass as an Intern to support construction)



CNS Team:



Thank you!
Questions?
<https://cns1.rc.fas.harvard.edu/>