

**Sagar Bhandari**

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McKay 207, 9 Oxford Street, Harvard University, Cambridge, MA

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### CURRENT POSITION

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
Postdoctoral Fellow 2015- Present

### EDUCATION

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
• Ph.D. in Applied Physics May 2015  
    ◦ Dissertation Title “Imaging Electron Flow in Graphene”  
• M.Sc. in Applied Physics May 2012

**Trinity College** Hartford, CT  
• B.Sc., Physics 2009  
• B.Sc., Electrical Engineering 2009  
• Graduated valedictorian of the class

### RESEARCH EXPERIENCE

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
**Postdoctoral Fellow, Advisor:** Prof. Robert M. Westervelt 2015- Present  
Imaging electron flow in 2D materials using a liquid He cooled scanning probe microscope  
• Imaged Andreev reflection in graphene device with superconducting contacts  
• Imaged electron flow through collimating contacts in graphene device  
• Imaged quantum dot formation in MoS<sub>2</sub> nanostructures  
• Imaged electron flow in hBN-MoS<sub>2</sub>-hBN device

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
**Graduate Student, Advisor:** Prof. Robert M. Westervelt 2009- 2015  
Imaging electron flow in 2D materials using a liquid He cooled scanning probe microscope  
• Imaged cyclotron orbits of electrons in graphene.  
• Designed and implemented low temperature coarse positioning system in home built scanning probe.

Low temperature scanning capacitance probe  
• Designed and implemented low temperature scanning capacitance probe.

Direct imaging of atomic scale ripples in a suspended graphene using a high-resolution transmission electron microscope (TEM)  
• Fabricated suspended graphene samples on Silicon Nitride substrates and assisted in taking TEM images/ analyzing the data obtained on the ripples in graphene.

**Trinity College, Department of Engineering** Hartford, CT  
**Research Assistant** with Prof. David Ahlgren 2005- 2009

- Designed and implemented communication algorithms in swarm robots for participation in Trinity College Fire Fighting Robot Contest.
- Designed and implemented a rat eyelid movement sensor for use at Mass Eye/Ear Infirmary in Dr. Tessa A. Hadlock’s lab.
- Designed and built several firefighting autonomous robots for the competition.
- Mentored students and assisted in designing and building robots.

**Research Assistant** with Prof. Taikang Ning 2005- 2009

- Developed MATLAB code to analyze rat’s ECG data.
- Designed microprocessor systems on FPGA devices.

**Trinity College, Department of Physics** Hartford, CT  
**Research Assistant** with Prof. David Branning 2005- 2009

- Designed and implemented low-cost coincidence-counting electronics for quantum optics experiments.

**Research Assistant** with Prof. Christoph Geiss 2005- 2009

- Used Labview to upgrade the software for magnetic measurements on geological samples.

### TEACHING EXPERIENCE

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
**Teaching Assistant**

Applied Physics 195 “Introduction of Solid State Physics” 2011

- Assisted in lectures and grading.
- Prepared and presented sections throughout the semester and two class lectures.

**Trinity College** Hartford, CT  
**Teaching Assistant** 2007-2009

1. Engineering 120 “Introduction to Engineering Design: Mobile Robots”
2. Engineering 221 “Digital Circuits and Systems”
3. Engineering 307 “Semiconductor Electronics I”
4. Engineering 308 “Semiconductor Electronics II”
5. Engineering 323 “Microprocessor Systems”

- Assisted in lab, lectures and grading.
- Prepared and presented sections throughout the semester.
- Received Theodore R. Blakeslee II teaching fellow award.

### MENTORING EXPERIENCE

**Harvard University, School of Engineering and Applied Sciences** Cambridge, MA  
**Research Mentor** for Undergraduate students

- Andrew Lin, Project: Quantum point contacts in graphene MD/PhD Student at University of Pennsylvania now. 2013-2017

- Mary Keenan, Project: Imaging electrons in ballistic graphene devices 2016-2017  
PhD Student in Physics at Harvard University now.
- Jeffrey Iuliano, Project: Fabricating hBN encapsulated graphene devices 2012-2013  
PhD Student in Physics at Johns Hopkins University now.
- Kyle DiCamillo, Project: Fabrication and characterization of graphene 2012-2013  
PhD Student in Physics at Georgetown University now.
- San Thiengi, Project: Fabrication and characterization of graphene 2011  
PhD Student at Colorado School of Mines now.
- Bilan Yang, Project: Automating graphene fabrication 2015  
Masters student in Mechanical Engineering department at Stanford University now.
- Rabeb Layouni, Project: Scanning capacitance microscopy tip fabrication 2015  
Completed BS. in Chemical Engineering from UMass, Amherst.
- Alejandra Marin, Project: Simulating capacitance microscopy in MATLAB 2015  
Pursuing BS. in Electrical Engineering at UMass, Lowell.
- Rylan Spencer, Project: Simulations for tip sample capacitance 2017  
Undergraduate student at Dartmouth college.
- Alexander Kelser, Project: Imaging hydrodynamic flow of electrons in graphene 2017  
Pursuing BS. in Physics at Harvard University.

### CONFERENCE TALKS

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Watanabe, T. Taniguchi, P. Kim and R. M. Westervelt, “Imaging electron flow in atomically thin materials”, Hybrid Quantum Systems (HQS), Miyagi Zao, Japan, Sep 10 - Sep 13, 2017.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Watanabe, T. Taniguchi, P. Kim and R. M. Westervelt, “Imaging Andreev reflection under a magnetic field in graphene”, Low Temperature Physics Conference 28, Gothenburg, Sweden, Aug 8 - Aug 17, 2017.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Watanabe, T. Taniguchi, P. Kim and R. M. Westervelt, “Imaging electron flow through collimating contacts in graphene”, QTC, Espoo, Finland, Aug 5-Aug 8, 2017.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Watanabe, T. Taniguchi, P. Kim and R. M. Westervelt, “Imaging collimation of electron flow in graphene”, EP2DS-22, Penn State, PA, July 31-Aug 4, 2017.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Wang, K. Watanabe, T. Taniguchi, P. Kim and R.M. Westervelt, "Imaging Electron Motion in 2D Materials," EDISON20, Buffalo, NY, July 16-21, 2017.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Wang, K. Watanabe, T. Taniguchi, P. Kim and R.M. Westervelt, "Imaging Electron Motion in Atomic Layer Systems," Quantum Materials and Devices Seminar, Harvard University, Sept.15, 2016.

**Contributed Talk**, S. Bhandari, G.-H. Lee, K. Watanabe, T. Taniguchi, P. Kim and R.M. Westervelt, "Imaging Electron Flow through Graphene in a Magnetic Field," Int. Conf. on Nanoscience and Technology (ICN+T 2016), Busan, Korea, Aug. 21-26, 2016.

**Invited Talk**, S. Bhandari, K. Wang, K. Watanabe, T. Taniguchi, P. Kim and R.M. Westervelt, "Imaging Electron Flow in a Few Layer MoS<sub>2</sub> Devices," Int. Conf. Physics of Semiconductors (ICPS 2016), Beijing, China, July 31 to Aug 5, 2016.

**Contributed Talk**, S. Bhandari, GH. Lee, P. Kim and R.M. Westervelt, "Analysis of Scanned Probe Images for Magnetic Focusing in Graphene," Int. Conf. on Superlattices, Nanostructures and Nanodevices (ICSNN 2016), in Hong Kong, China, July 25-30, 2016.

**Contributed Talk**, S. Bhandari, GH. Lee, P. Kim and R.M. Westervelt, "Imaging Magnetic Focusing of Electrons in Graphene," Int. Conf. Graphene 2016, Genova, Italy, April 19-22, 2016.

**Contributed Talk**, S. Bhandari, GH. Lee, P. Kim and R.M. Westervelt, "Imaging Magnetic Focusing of Electrons in Graphene," Int. Conf. on Electronic Properties of Two-Dimensional Systems (EP2DS), 2015, Sendai, Japan, July 26-31, 2015.

**Contributed Talk**, S. Bhandari, R. M. Westervelt, "Low Temperature Scanning Capacitance Probe for Imaging Electron Motion", Low Temperature Physics Conference, Buenos Aires, Argentina, August 6-13, 2014.

## PUBLICATIONS

**Sagar Bhandari**, Gil-Ho Lee, Kenji Watanabe, Takashi Taniguchi, Philip Kim, Robert M. Westervelt, *Imaging Andreev Reflection in Graphene*, 2017 (in preparation)

**Sagar Bhandari**, Gil-Ho Lee, Kenji Watanabe, Takashi Taniguchi, Philip Kim, Robert M. Westervelt, *Imaging Electron Flow from Collimating Contacts in Graphene*, arXiv:1710.10186 [cond-mat.mes-hall], 2017 (Submitted)

**Sagar Bhandari**, Ke Wang, Kenji Watanabe, Takashi Taniguchi, Phillip Kim, Robert M. Westervelt, *Imaging Electron Flow and Quantum Dot Formation in MoS<sub>2</sub> Nanostructures* arXiv:1701.07532 [cond-mat.mes-hall], 2017.

**Sagar Bhandari**, Ke Wang, Kenji Watanabe, Takashi Taniguchi, Phillip Kim, Robert M. Westervelt, *Imaging Electron Motion in Few Layer MoS<sub>2</sub> Device*, Journal of Physics: Conference Series, in press, 2017

**Sagar Bhandari**, Andrew Lin, Robert M. Westervelt, *Investigating the Transition Region of Scanned Probe Images of the Cyclotron Orbit in Graphene*, Journal of Nanoelectronics and Optoelectronics, in press, 2017.

**Sagar Bhandari**, Gil-Ho Lee, Philip Kim, Robert M. Westervelt, *Analysis of Scanned Probe*

*Images for Magnetic Focusing in Graphene*, Journal of Electronic Materials, DOI: 10.1007/s11664-017-5350-y, 2017.

**Sagar Bhandari**, Robert Westervelt, *Imaging Electron Motion in Graphene*, Semiconductor Science and Technology, Vol. 32, No. 2, Special Issue on Hybrid Quantum Materials and Devices, 2017

**Sagar Bhandari**, Gil-Ho Lee, Anna Klales, Kenji Watanabe, Takashi Taniguchi, Eric Heller, Phillip Kim, Robert Westervelt, *Imaging Cyclotron Orbits of Electrons in Graphene*, Nano Letters, 2016, 16(3), pp 1690-1694.

Estelle Kalfon-Cohen, **Sagar Bhandari**, Robert M. Westervelt, and David C. Bell. *Electronic Properties of TEM-Sculpted Structure in Graphene*, Microscopy and Microanalysis 19, no. S2, 1940-1941 (2013).

**Sagar Bhandari**, Robert M. Westervelt. *Low Temperature Scanning Capacitance Probe for Imaging Electron Motion*, 2014, J. Phys.: Conf. Ser. 568.

Weili Wang, **Sagar Bhandari**, Wei Yi, Efthimios M. Kaxiras, Robert M. Westervelt. *Direct Imaging of Atomic Scale Ripples in Graphene*. 2012. Nano Lett. 12 (5).

David Branning, **S. Bhandari**, Mark Beck. *Low-Cost coincidence-counting electronics for undergraduate quantum optics*, AJP 77(7): 667-670, 2009.

**Sagar Bhandari**, Prashanna Gautam, David J. Ahlgren. *Implementation of RF communication with TDMA algorithm in swarm robots*, TEPR 2008