

James T. Teherani

Columbia University
Assistant Professor, Department of Electrical Engineering
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Updated March 2020

Field of specialization

semiconductor device physics;
modeling, simulation, and nanoscale fabrication of electronic devices built from 2D materials

Education

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| Massachusetts Institute of Technology | GPA 5.0/5.0 | |
| PhD Electrical Engineering and Computer Science | | 2015 |
| Thesis: <i>Fundamental Limits of the Switching Abruptness of Tunneling Transistors</i> | | |
| Advisors: Prof. Judy Hoyt and Prof. Dimitri Antoniadis | | |
| S.M. Electrical Engineering and Computer Science | | 2010 |
| Thesis: <i>Band-to-band Tunneling in Silicon Diodes and Tunnel Transistors</i> | | |
| Advisors: Prof. Judy Hoyt and Prof. Dimitri Antoniadis | | |
| The University of Texas at Austin | GPA 4.0/4.0 | |
| B.S. Electrical and Computer Engineering, Highest Honors | | 2008 |

Professional Experience

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| Columbia University | | 2015 – present |
| <i>Assistant Professor in the Department of Electrical Engineering</i> | | |
| MIT Department of Electrical Engineering and Computer Science | | 2015 |
| <i>Postdoctoral associate. Advisor: Prof. Antoniadis</i> | | |
| MIT Department of Electrical Engineering and Computer Science | | 2008 – 2015 |
| <i>Semiconductor device physics graduate researcher. Advisors: Prof. Hoyt and Prof. Antoniadis</i> | | |
| IBM Research, T. J. Watson Research Center, Yorktown Heights, New York | | 2009 |
| <i>Device physics intern. Advisor: Dr. Paul Solomon</i> | | |
| DRS Infrared Technologies, Dallas, Texas | | 2005, 2007 |
| <i>Engineering intern. Advisor: Jeffrey Beck</i> | | |

Courses Taught

| | | |
|---|--|-----------|
| ELEN E4301: Introduction to Semiconductor Devices | | Fall 2015 |
| 16 students; student evaluations: course 4.94/5, instructor 4.75/5 | | |
| ELEN E3106: Solid-state Devices and Materials (taught with Prof. Kymissis) | | Fall 2015 |
| 24 students; student evaluations: course 4.13/5, instructor 4.50/5 | | |

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| <i>Electrical Engineering Lab for ENGI E1102: The Art of Engineering</i> 30 students; student evaluations unavailable | Fall 2015 |
| <i>Electrical Engineering Lab for ENGI E1102: The Art of Engineering</i> 30 students; student evaluations: course 4.08/5, instructor 4.67/5 | Spring 2016 |
| <i>ELEN E4301: Introduction to Semiconductor Devices</i> 44 students; student evaluations: course 4.69/5, instructor 4.85/5 | Fall 2016 |
| <i>ELEN E9301: Topics: Theory and Practice of Device Scaling (taught with Prof. Theis)</i> 25 students; student evaluations: course 4.94/5, instructor 4.92/5 | Spring 2017 |
| <i>ELEN E6333: Semiconductor Device Physics</i> 12 students; student evaluations: course 4.93/5, instructor 5.00/5 | Fall 2017 |
| <i>ELEN E3106: Solid-state Devices and Materials</i> 37 students; student evaluations: course 3.95/5, instructor 4.05/5 | Fall 2018 |
| <i>ELEN E6333: Semiconductor Device Physics</i> 12 students; student evaluations: course 4.63/5, instructor 4.63/5 | Fall 2018 |
| <i>ELEN E6333: Semiconductor Device Physics</i> 17 students; student evaluations: course 4.54/5, instructor 4.62/5 | Fall 2019 |
| <i>ELEN E6903: Topics: Nanoelectronic Device Simulations (taught with Prof. Ramirez)</i> 11 students; student evaluations: course 3.43/5, instructor 3.67/5 | Fall 2019 |

Supervised Research

MS/PhD

| | |
|--|----------------|
| Xinyi Xu (co-advised with P. J. Schuck) | 2018 – 2019 |
| Abhinandan Borah, <i>Modeling Charge in Low DOS Systems</i> | 2016 – present |
| Ankur Nipane, <i>Electrostatics of Low Dimensional Junctions</i> | 2016 – present |
| Anjaly Thekkevilayil Rajendran (co-advised with J. Hone) | 2019 – present |

Postdoctoral Associates

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|--|----------------|
| Younghun Jung (co-advised with Prof. Hone) | 2016 – 2019 |
| Minsup Choi (co-advised with Prof. Hone) | 2017 – present |
| Yang Liu (co-advised with Prof. Hone) | 2019 – present |

MS

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| Sirisha Jayanti, <i>Calculation of Potential Across Non-ideal PN Junctions</i> | 2017 |
| Tian Sun, <i>Large Field Electromagnet for Electronic Test Set</i> | 2017 |
| Punnu Jose Sebastian, <i>Fabrication of Encapsulated van der Waals Structures</i> | 2017 – 2018 |
| Jiazhang Wang, <i>Modular Probe Station for Quick Device Assessment</i> | 2018 – 2019 |
| Muhammad Akbar Aziz, <i>Development of UV-Ozone Oxidation for Device Fabrication</i> | 2019 – present |

Undergraduate

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|---|------|
| Rebecca Murray, <i>Numerical Modeling of Auger Generation</i> | 2016 |
| Jakub Ostrowski, junior, Columbia Electrical Engineering | 2018 |

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| Joshua Polanco Calderon, sophomore, Columbia SEAS | 2018 |
| Leslie Ortiz, junior, Barnard Physics | 2018 |
| Andrew Murphy, senior, Columbia Physics | 2018 – 2019 |
| Alice Wu, junior, Columbia Electrical Engineering | 2018 – 2019 |
| Zhenguo Wu, junior, Columbia Electrical Engineering | 2018 – 2019 |
| Adina Bechhofer, junior, Columbia Electrical Engineering | 2018 – present |

Visiting students

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| Rui Ding, undergraduate from University of Science and Technology of China | 2016 |
| Jiayue Li, MS student from Nanjing University | 2016 – 2017 |
| Marco Fratus, MS student from KTH Sweden/Politecnico di Milano | 2016 – 2018 |
| Yefei Zhang, MS/PhD student from Xi'an Jiaotong University | 2016 – 2018 |
| Myeongjun Lee, visiting PhD student from SKKU, Korea | 2019 |

Thesis Committees

Committee member

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|---|------|
| Tarun Chari, PhD in Electrical Engineering <i>Optimization Studies in Graphene Electronics</i> | 2016 |
| Daniel Chenet, PhD in Mechanical Engineering <i>2D Materials: Synthesis, Characterization, and Applications</i> , joined Intel | 2016 |
| Amrita Masurkar, PhD in Electrical Engineering <i>Charge Injection and Transport in Pentacene Field-Effect Transistors</i> | 2016 |
| Hyungsik Kim, PhD in Electrical Engineering <i>Unconventional CVD Graphene and α-MoO₃ Electronics for Very Large Scale Integration (VLSI)</i> | 2017 |
| Scott Trocchia, PhD in Electrical Engineering <i>Single-molecule Carbon Nanotube Field-effect Transistors for Genomic Applications</i> | 2017 |
| Charishma Puliyaanda Subbaiah, PhD in Electrical Engineering <i>Electrically Driven Ion Pumping in a Single-walled Carbon Nanotube</i> | 2018 |
| Cheng Tan, PhD in Electrical Engineering <i>Gate Tunable Transport in Hexagonal Boron Nitride Encapsulated Bilayer Graphene</i> | 2019 |
| Changjian Julia Zhang, PhD in Mechanical Engineering <i>Engineering and Probing Two-dimensional Materials and Heterostructures</i> | 2020 |
| Peijie Ong, PhD in Applied Physics and Applied Mathematics <i>Optimization and characterization of noise in ion channel and carbon nanotube biosensing platforms</i> | 2020 |

Publications

(by convention, PI is typically listed last)

Papers in Refereed Journals

- J1. H. F. Schaake, M. A. Kinch, D. Chandra, F. Aqariden, P. K. Liao, D. F. Weirauch, C.-F. Wan, R. E. Scritchfield, W. W. Sullivan, J. T. Teherani, and H. D. Shih, "High-Operating-Temperature MWIR Detector Diodes," *Journal of Elec Materi*, vol. 37, no. 9, pp. 1401–1405, Sep. 2008. <https://doi.org/10.1007/s11664-008-0423-6>
- J2. J. Beck, R. Scritchfield, B. Sullivan, J. T. Teherani, C.-F. Wan, M. Kinch, M. Ohlson, M. Skokan, L. Wood, P. Mitra, M. Goodwin, and J. Robinson, "Performance and Modeling of the MWIR HgCdTe Electron Avalanche Photodiode," *Journal of Elec Materi*, vol. 38, no. 8, pp. 1579–1592, Aug. 2009. <https://doi.org/10.1007/s11664-009-0684-8>
- J3. P. M. Solomon, I. Lauer, A. Majumdar, J. T. Teherani, M. Luisier, J. Cai, and S. J. Koester, "Effect of Uniaxial Strain on the Drain Current of a Heterojunction Tunneling Field-Effect Transistor," *Electron Device Letters, IEEE*, vol. 32, no. 4, pp. 464–466, 2011. <https://doi.org/10.1109/LED.2011.2108993>
- J4. P. Hashemi, W. Chern, H. Lee, J. T. Teherani, Y. Zhu, J. Gonsalvez, G. G. Shahidi, and J. L. Hoyt, "Ultrathin Strained-Ge Channel P-MOSFETs With High-K/Metal Gate and Sub-1-nm Equivalent Oxide Thickness," *IEEE Electron Device Letters*, vol. 33, no. 7, pp. 943–945, Jul. 2012. <https://doi.org/10.1109/LED.2012.2195631>
- J5. J. T. Teherani, W. Chern, D. A. Antoniadis, J. L. Hoyt, L. Ruiz, C. D. Poweleit, and J. Menéndez, "Extraction of large valence-band energy offsets and comparison to theoretical values for strained-Si/strained-Ge type-II heterostructures on relaxed SiGe substrates," *Phys. Rev. B*, vol. 85, no. 20, p. 205308, May 2012. <https://doi.org/10.1103/PhysRevB.85.205308>
- J6. J. T. Teherani, S. Agarwal, E. Yablonovitch, J. L. Hoyt, and D. A. Antoniadis, "Impact of Quantization Energy and Gate Leakage in Bilayer Tunneling Transistors," *IEEE Electron Device Letters*, vol. 34, no. 2, pp. 298–300, Feb. 2013. <https://doi.org/10.1109/LED.2012.2229458>
- J7. T. Yu, J. T. Teherani, D. A. Antoniadis, and J. L. Hoyt, "InGaAs/GaAsSb Quantum-Well Tunnel-FETs With Tunable Backward Diode Characteristics," *IEEE Electron Device Letters*, vol. 34, no. 12, pp. 1503–1505, 2013. <https://doi.org/10.1109/LED.2013.2287237>
- J8. S. Agarwal, J. T. Teherani, J. L. Hoyt, D. A. Antoniadis, and E. Yablonovitch, "Engineering the Electron-Hole Bilayer Tunneling Field-Effect Transistor," *IEEE Transactions on Electron Devices*, vol. 61, no. 5, pp. 1599–1606, May 2014. <https://doi.org/10.1109/TED.2014.2312939>
- J9. W. Chern, P. Hashemi, J. T. Teherani, D. A. Antoniadis, and J. L. Hoyt, "Record Hole Mobility at High Vertical Fields in Planar Strained Germanium on Insulator With Asymmetric Strain," *IEEE Electron Device Letters*, vol. 35, no. 3, pp. 309–311, Mar. 2014. <https://doi.org/10.1109/LED.2014.2300197>
- J10. J. T. Teherani, W. Chern, D. A. Antoniadis, and J. L. Hoyt, "Ultra-Thin, High Quality HfO₂ on Strained-Ge MOS Capacitors with Low Leakage Current," *ECS Trans.*, vol. 64, no. 6, pp. 267–271, Aug. 2014. <https://doi.org/10.1149/06406.0267ecst>

- J11. T. Yu, J. T. Teherani, D. A. Antoniadis, and J. L. Hoyt, "Effects of substrate leakage and drain-side thermal barriers in $\text{In}_{0.53}\text{Ga}_{0.47}\text{As}/\text{GaAs}_{0.5}\text{Sb}_{0.5}$ quantum-well tunneling field-effect transistors," *Appl. Phys. Express*, vol. 7, no. 9, p. 094201, Sep. 2014. <https://doi.org/10.7567/APEX.7.094201>
- J12. J. T. Teherani, S. Agarwal, W. Chern, P. M. Solomon, E. Yablonovitch, and D. A. Antoniadis, "Auger generation as an intrinsic limit to tunneling field-effect transistor performance," *Journal of Applied Physics*, vol. 120, no. 8, p. 084507, Aug. 2016. <https://doi.org/10.1063/1.4960571>
- J13. A. Kerelsky, A. Nipane, D. Edelberg, D. Wang, X. Zhou, A. Motmaendadgar, H. Gao, S. Xie, K. Kang, J. Park, J. T. Teherani, and A. Pasupathy, "Absence of a Band Gap at the Interface of a Metal and Highly Doped Monolayer MoS_2 ," *Nano Lett.*, Sep. 2017. <https://doi.org/10.1021/acs.nanolett.7b01986>
- J14. A. Nipane, S. Jayanti, A. Borah, and J. T. Teherani, "Electrostatics of lateral p-n junctions in atomically thin materials," *Journal of Applied Physics*, vol. 122, no. 19, p. 194501, Nov. 2017. <https://doi.org/10.1063/1.4994047>
- J15. J. T. Teherani, "A Comprehensive Theoretical Analysis of Hole Ballistic Velocity in Si, SiGe, and Ge: Effect of Uniaxial Strain, Crystallographic Orientation, Body Thickness, and Gate Architecture," *IEEE Transactions on Electron Devices*, vol. 64, no. 8, pp. 3316–3323, Aug. 2017. <https://doi.org/10.1109/TED.2017.2708691>
- J16. A. Borah, P. J. Sebastian, A. Nipane, and J. T. Teherani, "An Intuitive Equivalent Circuit Model for Multilayer Van Der Waals Heterostructures," *IEEE Transactions on Electron Devices*, vol. 65, no. 10, pp. 4209–4215, Oct. 2018. <https://doi.org/10.1109/TED.2018.2851920>
- J17. A. Nipane, S. Jayanti, A. Borah, and J. T. Teherani, "Erratum: 'Electrostatics of lateral p-n junctions in atomically thin materials,'" *Journal of Applied Physics*, vol. 124, no. 13, p. 139902, Oct. 2018. <https://doi.org/10.1063/1.5051548>
- J18. A. Nipane, Y. Zhang, and J. T. Teherani, "Role of out-of-plane dielectric thickness in the electrostatic simulation of atomically thin lateral junctions," *Journal of Applied Physics*, vol. 123, no. 21, p. 214302, Jun. 2018. <https://doi.org/10.1063/1.5027520>
- J19. Y. Jung, M. S. Choi, A. Nipane, A. Borah, B. Kim, A. Zangiabadi, T. Taniguchi, K. Watanabe, W. J. Yoo, J. Hone, and J. T. Teherani, "Transferred via contacts as a platform for ideal two-dimensional transistors," *Nature Electronics*, vol. 2, no. 5, p. 187, May 2019. <https://doi.org/10.1038/s41928-019-0245-y>
- J20. I. Moon, S. Lee, M. Lee, C. Kim, D. Seol, Y. Kim, K. Hyun Kim, G. Young Yeom, J. T. Teherani, J. Hone, and W. Jong Yoo, "The device level modulation of carrier transport in a 2D WSe_2 field effect transistor via a plasma treatment," *Nanoscale*, vol. 11, no. 37, pp. 17368–17375, 2019. <https://doi.org/10.1039/C9NR05881H>

Proceedings of Refereed Conferences

- C1. J. Beck, R. Scritchfield, B. Sullivan, J. T. Teherani, C.-F. Wan, M. Kinch, M. Ohlson, M. Skokan, L. Wood, P. Mitra, M. Goodwin, and J. Robinson, "Performance and modeling of the MWIR HgCdTe electron

- avalanche photodiode," *Proceedings of the SPIE*, 2009, vol. 7298, pp. 729838-729838-17. <https://doi.org/10.1117/12.819045>
- C2. P. Hashemi, J. T. Teherani, and J. L. Hoyt, "Investigation of hole mobility in gate-all-around Si nanowire p-MOSFETs with high-K/metal-gate: Effects of hydrogen thermal annealing and nanowire shape," *IEEE International Electron Devices Meeting (IEDM)*, 2010, pp. 34.5.1-34.5.4. <https://doi.org/10.1109/IEDM.2010.5703477>
- C3. W. Chern, P. Hashemi, J. T. Teherani, T. Yu, Y. Dong, G. Xia, D. A. Antoniadis, and J. L. Hoyt, "High mobility high-K-all-around asymmetrically-strained Germanium nanowire trigate p-MOSFETs," *IEEE International Electron Devices Meeting (IEDM)*, 2012, pp. 16.5.1-16.5.4. <https://doi.org/10.1109/IEDM.2012.6479055>
- C4. S. Agarwal, J. T. Teherani, J. L. Hoyt, D. A. Antoniadis, and E. Yablonovitch, "Optimization of the electron hole bilayer tunneling field effect transistor," *71st Device Research Conference (DRC)*, 2013, pp. 109-110. <https://doi.org/10.1109/DRC.2013.6633817>
- C5. J. T. Teherani, W. Chern, D. A. Antoniadis, and J. L. Hoyt, "Simulation of enhanced hole ballistic velocity in asymmetrically strained Germanium nanowire trigate p-MOSFETs," *IEEE International Electron Devices Meeting (IEDM)*, 2013, pp. 32.4.1-32.4.4. <https://doi.org/10.1109/IEDM.2013.6724737>
- C6. J. T. Teherani, T. Yu, D. A. Antoniadis, and J. L. Hoyt, "Electrostatic design of vertical tunneling field-effect transistors," *Third Berkeley Symposium on Energy Efficient Electronic Systems (E3S)*, 2013, pp. 1-2. <https://doi.org/10.1109/E3S.2013.6705872>
- C7. J. T. Teherani, W. Chern, S. Agarwal, J. L. Hoyt, and D. A. Antoniadis, "A framework for generation and recombination in tunneling field-effect transistors," *Fourth Berkeley Symposium on Energy Efficient Electronic Systems (E3S)*, 2015, pp. 1-3. <https://doi.org/10.1109/E3S.2015.7336797>
- C8. A. Kerelsky, A. Nipane, D. Edelberg, D. Wang, M. Cheng, A. Dadgar, H. Gao, K. Kang, J. Park, J. T. Teherani, and A. Pasupathy, "Band Structure Evolution in Vertically Contacted MoS₂ Probed Using Scanning Tunneling Spectroscopy," *Bulletin of the American Physical Society*, New Orleans, Louisiana, 2017, vol. Volume 62, Number 4. <http://meetings.aps.org/Meeting/MAR17/Session/L32.12>
- C9. M. S. Choi, Y. Jung, D. Rhodes, B. Kim, J. T. Teherani, J. Hone, and W. J. Yoo, "Study of Contact Properties for Semiconducting TMDCs Using Via Contacts Embedded in h-BN," *Bulletin of the American Physical Society*, Los Angeles, California, 2018. <http://meetings.aps.org/Meeting/MAR18/Session/T60.169>
- C10. Y. Jung, M. S. Choi, A. Borah, A. Nipane, W. J. Yoo, J. Hone, and J. T. Teherani, "Reliable High-Quality Metal-Embedded h-BN Contacts to p-type WSe₂," *76th Device Research Conference (DRC)*, 2018, pp. 1-2. <https://doi.org/10.1109/DRC.2018.8442181>
- C11. J. T. Teherani, "The Auger FET: a Novel Device Concept for Subthermal Switching," *IEEE 2nd Electron Devices Technology and Manufacturing Conference (EDTM)*, 2018, pp. 208-210. <https://doi.org/10.1109/EDTM.2018.8421442>

- C12. J. T. Teherani, "Orientation Dependence of the Hole Ballistic Velocity in Si, SiGe, and Ge Thin-Body Structures with Uniaxial Compressive Strain," *ECS Fall Meeting*, Cancun, Mexico, 2018, vol. MA2018-02, pp. 1017–1017. <http://ma.ecsdl.org/content/MA2018-02/31/1017>
- C13. A. Nipane, P. J. Sebastian, Y. Jung, M. S. Choi, A. Borah, W. J. Yoo, J. Hone, and J. T. Teherani, "Atomic Layer Etching (ALE) of WSe₂ Yielding High Mobility p-FETs," *2019 Device Research Conference (DRC)*, 2019, pp. 231–232. <https://doi.org/10.1109/DRC46940.2019.9046402>

Other Major Publications

- MP1. J. T. Teherani, "Band-to-band tunneling in silicon diodes and tunnel transistors," Thesis, MIT, Cambridge, MA, USA, 2010. <https://doi.org/1721.1/60215>
- MP2. J. T. Teherani, "TEM Lattice Calculator," *nanohub.org*, 2013. <https://doi.org/10.4231/D3VQ2S96B>
- MP3. J. T. Teherani and J. L. Hoyt, "A Physically-Intuitive Method for Calculation of the Local Lattice Constant from a High-Resolution Transmission Electron Microscopy Image by Fourier Analysis," *arXiv*, Sep. 2013. <http://arxiv.org/abs/1309.3155>
- MP4. J. T. Teherani, "Uniaxial and Biaxial Stress/Strain Calculator for Semiconductors," *nanohub.org*, 2014. <https://doi.org/10.4231/D33F4KN4J>
- MP5. J. T. Teherani, "How Computers Compute," *YouTube*, 2014. <https://youtu.be/8cVsgFN3hSM>
- MP6. J. T. Teherani, "What is a Semiconductor?" *YouTube*, 2015. <https://youtu.be/gUmDVe6C-BU>
- MP7. J. T. Teherani, "Fundamental limits of the switching abruptness of tunneling transistors," Thesis, Massachusetts Institute of Technology, 2015. <https://doi.org/1721.1/99853>
- MP8. A. Borah and J. T. Teherani, "Electrostatic Properties Simulation of Layered 2D Material Devices," *nanohub.org*, 2017. <https://doi.org/10.21981/D3C24QQ39>
- MP9. J. T. Teherani, "Building at the Nanoscale | Part 01: 2D vs 3D Materials," *YouTube*, 2019. <https://youtu.be/4m-1vxXQHtY>
- MP10. J. T. Teherani, "Building at the Nanoscale | Part 02: How to Build 2D Atomic Stacks," *YouTube*, 2019. <https://youtu.be/JgfkLhMo1fA>

Grants

Current

Sponsor National Science Foundation
 Title MRSEC: Columbia Center for Precision Assembly of Superstratic and Superatomic Solids
 Lead PI J. Hone (Columbia University)
 Total Amount \$15,791,022
 Award Period 11/1/2014 — 10/31/2020
 Location Columbia Nano Initiative (CNI)

Sponsor National Science Foundation
 Title CAREER: Exploiting Many-Particle Physics for Low-Energy Nanoelectronics
 Lead PI J. Teherani (Columbia University)
 Total Amount \$508,000
 Award Period 2/15/2018 — 1/31/2023
 Location Columbia Nano Initiative (CNI)

Sponsor National Science Foundation
 Title Collaborative Research: REU Site: Nano-NY
 Lead PI I. Kymissis (Columbia University)
 Total Amount \$372,997
 Award Period 4/1/2018 — 3/31/2020
 Location Columbia Nano Initiative (CNI)

Pending

Sponsor National Science Foundation
 Title Collaborative Research: REU Site: Nano-NY
 Lead PI I. Kymissis (Columbia University)
 Total Amount \$398,853
 Award Period 4/1/2020 — 3/31/2023
 Location Columbia Nano Initiative (CNI)

Sponsor National Science Foundation
 Title Columbia University MRSEC on Precision-Assembled Quantum Materials
 Lead PI J. Hone (Columbia University)
 Total Amount \$15,600,000
 Award Period 9/1/2020 — 8/31/2026
 Location Columbia Nano Initiative (CNI)

Awards and Honors

DRS Technologies Academic Scholarship 2006
 University of Texas, B. N. Gafford Scholarship in Electrical and Computer Engineering 2006

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| University of Texas, Engineering Foundation Undergraduate Endowed Presidential Scholarship | 2007 |
| National Nanotechnology Infrastructure Network (NNIN) International Winter School Fellow | 2011 |
| Purdue University, Network for Computation Nanotechnology Summer School Scholarship | 2011 |
| National Defense Science and Engineering Graduate Fellowship (NDSEG) | 2010 – 2013 |
| George E. Smith Award (best paper in IEEE Electron Device Letters journal) | 2014 |
| NSF Center for Energy Efficient Electronics Science Leadership Award | 2014 |
| National Science Foundation Graduate Fellowship | 2010 – 2015 |
| Edward and Carole Kim Faculty Involvement Award — for excellent teaching and service to students | 2018 |
| National Science Foundation CAREER Award | 2018 |

Invited Talks

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| University of Notre Dame <i>Auger Generation as a Fundamental Limit to the Off-state of TFETs</i> | 2016 |
| Purdue University <i>Auger generation as an intrinsic limit to tunneling field-effect transistor performance</i> | 2016 |
| DRS Infrared Technologies <i>Auger generation as an intrinsic limit to tunneling field-effect transistor performance</i> | 2016 |
| IBM T. J. Watson Research Center <i>Auger generation as an intrinsic limit to tunneling field-effect transistor performance</i> | 2016 |
| Steep Slope Workshop at École Polytechnique Fédérale de Lausanne <i>Auger generation as an intrinsic limit to tunneling field-effect transistor performance</i> | 2016 |
| Massachusetts Institute of Technology, Microsystems Tech. Annual Research Conference <i>Opportunities after Graduate School</i> | 2017 |
| University of Texas at Austin <i>Auger generation as an intrinsic limit to tunneling field-effect transistor performance</i> | 2017 |
| 2018 IEEE Electron Devices Technology and Manufacturing (EDTM) Conference <i>The Auger FET: a Novel Device Concept for Subthermal Switching</i> | 2018 |
| The 27 th Connecticut Symposium on Microelectronics & Optoelectronics (CMOC) <i>The Unique Electrostatics of Vertical Junctions to 2D Materials</i> | 2018 |
| IEEE 2nd Electron Devices Technology and Manufacturing Conference (EDTM) <i>The Auger FET: a Novel Device Concept for Subthermal Switching</i> | 2018 |
| The Electrochemical Society Fall Meeting <i>Orientation Dependence of the Hole Ballistic Velocity in Si, SiGe, and Ge Thin-Body Structures with Uniaxial Compressive Strain</i> | 2018 |
| IEEE S3S (SOI-3D-Subthreshold) Microelectronics Technology Unified Conference <i>Optimization of Intrinsic Auger-Assisted Tunneling of TFETs with Steep Subthreshold Slopes</i> | 2018 |
| USC Department of Electrical Engineering <i>Auger Generation as an Intrinsic Mechanism Limiting Tunneling Field-Effect Transistor Performance</i> | 2018 |

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| The 7th SKKU Workshop on Materials Frontier Research (Topics on Atomically Engineered Materials and Processing) <i>Transferred via contacts as a device platform for ideal 2D transistors</i> | 2019 |
| Graphene for US Conference <i>New techniques for doping and contacts to 2D materials</i> | 2020 |

Service

University Service

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| Faculty Advisor, Columbia University Society of Women Engineers (SWE) | 2016 – present |
| Faculty Advisor, Columbia University Amateur Radio Club | 2018 – present |
| Faculty Advisor, Columbia University Society of Hispanic Professional Engineers (SHPE) | 2018 – present |
| Department of Electrical Engineering Undergraduate Committee | 2015 – present |
| Department of Electrical Engineering Curriculum Committee | 2018 – present |
| Department of Electrical Engineering ABET Committee | 2018 – present |
| Department of Electrical Engineering Undergraduate Advising Committee Chair | 2018 – present |
| Department of Electrical Engineering PhD Defense Qualifying Exam (DQE) Committee | 2018 – present |
| Department of Electrical Engineering Distinguished Lectures Committee | 2018 – 2019 |

Service to the Discipline

| | |
|---|----------------|
| Editor, IEEE Transactions on Electron Devices <i>Special Issue on 2D Materials for Electronic, Optoelectronic and Sensor Devices</i> | 2017 – 2018 |
| Review Panelist, Department of Defense <i>National Defense Science and Engineering Graduate (NDSEG) Fellowship</i> | 2017 – 2019 |
| Nanotechnology Committee Member, IEEE Electron Device Society (EDS) | 2017 – present |
| Technical Program Committee Member, Device Research Conference | 2018 – present |

Public Outreach

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| Educational Outreach Video, Building at the Nanoscale: Part 01 , 2D and 3D materials | 2019 |
| Educational Outreach Video, Building at the Nanoscale: Part 02 , how to build structures from atomically thin 2D materials | 2019 |
| Outreach talk on graduate school opportunities to the Society of Hispanic Engineers | 2019 |
| Lab tour and outreach seminar to 50 students from Corpus Christi school (7th and 8th graders) | 2019 |
| Seminar on “Graduate Education and Careers” to annual EngAGE program, which targets prospective graduate students from underrepresented backgrounds | 2019 |
| Girl Scouts lab tour and outreach seminar through the Society of Women Engineers (middle school) | 2018 |
| Summer@SEAS seminar on life beyond undergraduate education | 2018 |
| MRSEC REU Seminar, “What is Grad School All About?” | 2018 |
| STEM workshop for students from the Bronx Center for Science and Mathematics | 2018 |

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| Columbia Engineering Outreach Programs, Inside Engineering | |
| <i>Central Park East II, Manhattan, New York</i> | 2018 |
| <i>Mott Hall II Middle School, Manhattan, New York</i> | 2018 |
| <i>John Ericsson Middle School, Brooklyn, New York</i> | 2018 |
| <i>Mott Hall II Middle School, Manhattan, New York</i> | 2017 |
| <i>Mott Hall II Middle School, Manhattan, New York (second visit)</i> | 2017 |
| <i>Scholars' Academy, Queens, New York</i> | 2016 |
| <i>Lower East Side Preparatory High School, Manhattan, New York</i> | 2016 |
| <i>Mott Hall II Middle School, Manhattan, New York</i> | 2016 |
| <i>Bayside High School, Bronx, New York</i> | 2016 |
| MakeCU Hardware Hackathon, Faculty Judge | 2018 |
| SAT Physics Workshop for Students from <i>Bronx Center for Science and Mathematics</i> | 2018 |
| Columbia Engineering Achievers in Graduate Education (EngAGE), diversity recruitment | 2017, 2018 |
| <i>Lecture on Graduate Education and Research</i> | |
| Society of Women Engineers, Faculty Panel on Research and Career Opportunities | 2017 |
| Educational Outreach Video, Is Moore's Law Ending? | 2017 |
| Society of Women Engineers, Engineering Exploration Experience, <i>Electricity from our Bare Hands</i> | 2017 |
| GOALS (Greater Opportunities Advancing Leadership and Science) for Girls | 2016 |
| Society of Women Engineers, Engineering Exploration Experience, <i>How Computer Chips Work</i> | 2016 |
| MakeCU Hardware Hackathon, <i>How to Hack Like An Engineer</i> | 2016 |
| Science & Engineering Expo at the School at Columbia, <i>How to Make Computer Chips</i> | 2016 |
| Society of Women Engineering, Panel on Undergraduate Research | 2015 |
| MIT+K12 Videos, What is a Semiconductor? | 2015 |
| <i>Video creator and actor, Engaging, entertaining, and educational STEM video with 400,000 views</i> | |
| MIT+K12 Videos, How Computers Compute | 2014 |
| <i>Video creator and actor, Engaging, entertaining, and educational STEM video with 35,000 views</i> | |
| MIT Online Science, Technology, and Engineering Community (MOSTEC) | 2013, 2014 |
| <i>Guest lecturer, STEM enrichment lecture to inspire underserved high school seniors</i> | |
| MIT Educational Studies Program, Spark | 2013 |
| <i>Teacher, taught Saturday classes to ~100 students middle school students on computer chip fabrication</i> | |
| MIT Minority Introduction to Engineering and Science (MITES) | 2012 |
| <i>Guest lecturer, STEM program serving under-represented high school juniors</i> | |
| MIT+K12 and Khan Academy, Series and Parallel Circuits: A Water Analogy | 2012 |
| <i>Video and experiment creator and actor, demonstration of different types of circuits with 16,000 views</i> | |
| Cambridge Science Festival IDEAS Competition | 2012 |
| <i>Mentor, advised team in local green technologies competition</i> | |
| MIT Society of Women Engineers, Women in Science & Engineering Program (WiSE) | 2012 |
| <i>Guest lecturer, STEM outreach to inspire young women</i> | |

- MIT Society of Women Engineers, Keys to Empowering Youth 2010
Guest lecturer, engineering outreach to middle school girls
- University of Texas, UTeach Outreach 2006 – 2007
Teacher, taught a weekly hands-on science unit to four local elementary school classrooms
- University of Texas, Student Engineers Educating Kids (SEEK) 2006
Mentor, academic weekly mentor to students from disadvantaged middle schools