

# James T. Teherani

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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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<b>Massachusetts Institute of Technology</b>	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		
<b>The University of Texas at Austin</b>	GPA 4.0/4.0	
B.S. Electrical and Computer Engineering, Highest Honors		2008

## Professional Experience

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

## Courses Taught

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

<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

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### 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

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

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

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

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

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

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### Committee member

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 <math>\alpha</math>-MoO<sub>3</sub> 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

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(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 HfO<sub>2</sub> 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  $\text{MoS}_2$ ," *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  $\text{WSe}_2$  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  $\text{HgCdTe}$  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 MoS<sub>2</sub> 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 WSe<sub>2</sub>," *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 WSe<sub>2</sub> 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

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### 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

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



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 <sup>th</sup> 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

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

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### University Service

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

Educational Outreach Video, <a href="#">Building at the Nanoscale: Part 01</a> , 2D and 3D materials	2019
Educational Outreach Video, <a href="#">Building at the Nanoscale: Part 02</a> , 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

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, <a href="#">Is Moore's Law Ending?</a>	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, <a href="#">What is a Semiconductor?</a>	2015
<i>Video creator and actor, Engaging, entertaining, and educational STEM video with 400,000 views</i>	
MIT+K12 Videos, <a href="#">How Computers Compute</a>	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, <a href="#">Series and Parallel Circuits: A Water Analogy</a>	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