

# Rachel C. Kurchin

## Curriculum Vitae

Carnegie Mellon University  
Wean Hall 3402, Hammerschlag Drive  
Pittsburgh, PA 15213

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[rkurchin.gitub.io](https://github.com/rkurchin)  
Scholar

### EDUCATION

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2019	<b>Massachusetts Institute of Technology</b> PhD in Materials Science and Engineering
2014	<b>University of Cambridge</b> MPhil in Materials Science and Metallurgy
2013	<b>Yale University</b> BS in Physics (Intensive) with distinction (magna cum laude, GPA 3.9)

### RESEARCH POSITIONS

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09/2019 – present	<b>Carnegie Mellon University, Department of Mechanical Engineering</b> MFI Postdoctoral Fellow with Venkat Viswanathan
10/2014 – 07/2019	<b>MIT, Department of Mechanical Engineering</b> PhD Student with Tonio Buonassisi
Summers 2016, 2017	<b>National Renewable Energy Laboratory</b> Visiting Graduate Student with Vladan Stevanovic
10/2013 – 06/2014	<b>University of Cambridge, Department of Materials Science and Metallurgy</b> Master's student with Stoyan Smoukov
09/2012 – 05/2013	<b>Yale University, Department of Electrical Engineering</b> Undergraduate researcher with Minjoo Larry Lee
Summer 2012	<b>Colorado School of Mines, REMRSEC</b> REU student with Thomas Furtak
01/2012 – 05/2012	<b>Yale University, Department of Chemical Engineering</b> Undergraduate researcher with Chinedum Osuji
Summer 2011	<b>Weizmann Institute of Science, Department of Earth and Planetary Sciences</b> Undergraduate reseacher with Ilan Koren
Summer 2008	<b>University of Rochester, Laboratory for Laser Energetics</b> Undergraduate researcher with R. Stephen Craxton

### TEACHING POSITIONS

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01/2019 – 02/2019	<b>Harbour Research Program, China</b> Visiting Professor for “Academic Writing”
09/2018 – 12/2018	<b>MIT, Department of Materials Science and Engineering</b> Teaching Assistant for class 3.23: Electronic, Optical, and Magnetic Properties of Materials
2011 – 2013	<b>Yale University, Dean's Office</b> Science and QR Tutor

### FELLOWSHIPS AND AWARDS

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2019	<b>MFI Postdoctoral Fellowship</b> CMU Manufacturing Futures Initiative <b>Graduate Student Teaching Award</b> MIT Department of Materials Science and Engineering
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	<b>Graduate Student Teaching Award</b> MIT School of Engineering
	<b>CCE Symposium Poster Prize</b> MIT Center for Computational Engineering
2018	<b>Materials Day Best Poster Award</b> MIT Materials Research Laboratory
2017	<b>Blue Waters Graduate Fellowship</b> National Center for Supercomputing Applications
2016	<b>Total Energy Fellowship</b> MIT Energy Initiative
	<b>Second Place, de Florez Award Competition</b> MIT Mechanical Engineering Department
2014	<b>GRFP Honorable Mention</b> National Science Foundation
2013	<b>Gates Cambridge Scholarship</b> Cambridge Gates Trust
	<b>Howard L. Schultz Prize</b> Yale Physics Department
2012	<b>Mellon Grant</b> Pierson College at Yale University
	<b>REMRSEC REU Technical Achievement Award</b> Colorado School of Mines Renewable Energy Materials Research Science and Engineering Center
2009	<b>Robert C. Byrd Honors Scholarship</b> US Department of Education
	<b>Intel STS Semifinalist</b> Intel Science Talent Search

## PUBLICATIONS

- 2019 14. R. C. Kurchin, J. R. Poindexter, V. Vähäniissi, C. del Cañizo, T. Buonassisi. “How much defect physics is in a current-voltage curve? Inferring defect properties from device-level electrical measurements and high-performance computing”. [In Preparation \(2019\)](#)
13. R. C. Kurchin, G. Romano, T. Buonassisi. “Bayesim: a tool for adaptive grid model fitting with Bayesian inference”. [Computer Physics Communications 239, 161–165 \(2019\)](#)
- 2018 12. R. C. Kurchin, P. Gorai, T. Buonassisi, V. Stevanović. “Structural and Chemical Features Giving Rise to Defect Tolerance of Binary Semiconductors”. [Chemistry of Materials 30, 5583–5592 \(2018\)](#)
11. J. Correa-Baena, L. Nienhaus, R. C. Kurchin, S. S. Shin, S. Wieghold, N. Hartono, M. Layurova, N. D. Klein, J. R. Poindexter, A. Polizzotti, S. Sun, M. G. Bawendi, T. Buonassisi. “A-site cation in inorganic A<sub>3</sub>Sb<sub>2</sub>I<sub>9</sub> perovskite influences structural dimensionality, exciton binding energy, and solar cell performance”. [Chemistry of Materials 30, 3734–3742 \(2018\)](#)
- 2017 10. S. S. Shin, J. Correa-Baena, R. C. Kurchin, A. Polizzotti, J. J. Yoo, S. Wieghold, M. G. Bawendi, T. Buonassisi. “Solvent-Engineering Method to Deposit Compact Bismuth-Based Thin Films: Mechanism and Application to Photovoltaics”. [Chemistry of Materials 30, 336–343 \(2017\)](#)
09. R. Brandt, R. C. Kurchin, V. Steinmann, D. Kitchaev, C. Roat, S. Levchenko, G. Ceder, T. Unold, T. Buonassisi. “Rapid semiconductor device characterization through Bayesian parameter estimation”. [Joule 1, 843–856 \(2017\)](#)

08. R. Hoyer, L. C. Lee, R. C. Kurchin, T. N. Huq, K. Zhang, M. Sponseller, L. Nienhaus, R. E. Brandt, J. Jean, J. A. Polizzotti, A. Kursumović, M. G. Bawendi, V. Bulović, V. Stevanović, T. Buonassisi, J. L. Macmanus-Driscoll. “Strongly Enhanced Photovoltaic Performance and Defect Physics of Air-Stable Bismuth Oxyiodide (BiOI)”. [Advanced Materials 29, \(2017\)](#)
07. R. E. Brandt, J. Poindexter, P. Gorai, R. Kurchin, R. Hoyer, L. Nienhaus, M. Wilson, J. A. Polizzotti, R. Sereika, Z. Raimundas, L. C. Lee, J. L. Macmanus-Driscoll, M. Bawendi, V. Stevanovic, T. Buonassisi. “Searching for “Defect-Tolerant” Photovoltaic Materials: Combined Theoretical and Experimental Screening”. [Chemistry of Materials 29, 4667–4674 \(2017\)](#)
06. J. R. Poindexter, R. Hoyer, L. Nienhaus, R. C. Kurchin, A. E. Morishige, E. E. Looney, A. Osherov, B. Lai, V. Bulovic, V. Stevanovic, M. G. Bawendi, T. Buonassisi. “High Tolerance to Iron Contamination in Lead Halide Perovskite Solar Cells”. [ACS Nano 11, 7101–7109 \(2017\)](#)
- 2016 05. R. Hoyer, P. Schulz, L. T. Schelhas, A. M. Holder, K. H. Stone, J. D. Perkins, D. Vigil-Fowler, S. Siol, D. O. Scanlon, A. Zakutayev, A. Walsh, I. C. Smith, B. C. Melot, R. C. Kurchin, Y. Wang, J. Shi, F. C. Marques, J. J. Berry, W. Tumas, S. Lany, V. Stevanović, M. F. Toney, T. Buonassisi. “Perovskite-inspired photovoltaics: Best practices in materials characterization and calculations”. [Chemistry of Materials 29, 1964–1988 \(2016\)](#)
04. D. B. Needleman, J. R. Poindexter, R. C. Kurchin, I. M. Peters, G. Wilson, T. Buonassisi. “Economically sustainable scaling of photovoltaics to meet climate targets”. [Energy & Environmental Science 9, 2122–2129 \(2016\)](#)
03. A. Gufan, Y. Lehahn, E. Fredj, C. Price, R. C. Kurchin, I. Koren. “Segmentation and Tracking of Marine Cellular Clouds observed by Geostationary Satellites”. [International Journal of Remote Sensing 37, 1055–1068 \(2016\)](#)
- 2015 02. R. Hoyer, R. E. Brandt, A. Osherov, V. Stevanović, S. D. Stranks, M. Wilson, H. Kim, A. J. Akey, R. C. Kurchin, J. R. Poindexter, E. N. Wang, M. G. Bawendi, V. Bulović, T. Buonassisi. “Methylammonium bismuth iodide as a lead-free, stable hybrid organic-inorganic solar absorber”. [Chemistry - A European Journal 22, 2605–2610 \(2015\)](#)
01. R. E. Brandt, R. C. Kurchin, R. Hoyer, J. R. Poindexter, M. Wilson, S. Sulekar, F. Lenahan, P. Yen, V. Stevanović, J. C. Nino, M. G. Bawendi, T. Buonassisi. “Investigation of Bismuth Triiodide (BiI<sub>3</sub>) for Photovoltaic Applications”. [The Journal of Physical Chemistry Letters 6, 4297–4302 \(2015\)](#)

## TALKS

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| 10/25/2018 | <i>Semiconductor Parameter Extraction (and more!) with Bayesian Inference</i><br>MIT Society of Industrial and Applied Mathematics, Cambridge, MA                      |
| 08/18/2018 | <i>Computational Screening for Defect-Tolerant Semiconductors</i><br>Gordon Research Seminar on Defects in Semiconductors, New London, NH                              |
| 06/04/2018 | <i>Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors</i><br>Blue Waters Research Symposium, Sunriver, OR                      |
| 11/28/2017 | <i>Toward Quantitative Metrics to Screen for Defect Tolerance in Novel Semiconducting Materials</i><br>Materials Research Society Fall Meeting and Exhibit, Boston, MA |
| 04/29/2013 | <i>Cross-Sectional EBIC Characterization of III-V Semiconductors for Photovoltaic Applications</i><br>Yale Physics Department, New Haven, CT                           |
| 04/27/2012 | <i>Improving Active Layer Performance of Hybrid Photovoltaics by Nano Imprinting with Bulk Metallic Glass</i><br>Yale Physics Department, New Haven, CT                |

**POSTERS**

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- 05/06/2019 *Measuring Real-World Quantities from Computer Simulation with Bayesian Inference*  
MIT de Florez Award Competition, Cambridge, MA
- 03/18/2019 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*  
MIT CCE Symposium, Cambridge, MA
- 10/18/2018 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*  
MIT Materials Day, Cambridge, MA
- 08/18/2018 *Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors*  
Gordon Research Seminar on Defects in Semiconductors, New London, NH
- 06/04/2018 *Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors*  
Blue Waters Research Symposium, Sunriver, OR
- 06/14/2018 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*  
World Conference on Photovoltaic Energy Conversion, Waikoloa, HI
- 05/11/2018 *Design Principles for Defect-Tolerant Photovoltaic Absorbers*  
MIT de Florez Award Competition, Cambridge, MA
- 12/01/2016 *Quantitative Metrics for Defect Tolerance in Semiconductors*  
Materials Research Society Fall Meeting and Exhibit, Boston, MA
- 10/14/2016 *Photovoltaics R&D: Thin Film Materials*  
MIT Energy Night, Cambridge, MA
- 05/05/2016 *Bayes-Sun Inference: Next-Generation Photovoltaics through Advanced Probabilistic Modeling*  
MIT de Florez Award Competition, Cambridge, MA
- 04/12/2016 *Statistical Inference of Materials Properties from Solar Cell Measurements*  
Beyond 2016: MIT's Frontiers of the Future symposium, Cambridge, MA
- 12/03/2015 *Improving the Accuracy of Novel Materials Screening: Growing Defect-Tolerant Photovoltaic Absorbers*  
MRS Fall Meeting and Exhibit, Boston, MA
- 10/14/2015 *Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials*  
MIT Materials Day, Cambridge, MA
- 09/10/2015 *Solar Energy Technology & Innovation in Mexico*  
MIT Energy Initiative Solar Day, Cambridge, MA
- 07/22/2015 *Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials*  
NREL HOPE workshop, Golden, CO
- 01/20/2013 *Raman Spectroscopy of Silicon Quantum Dots*  
Northeast Conference for Undergraduate Women in Physics, Ithaca, NY
- 08/02/2012 *Raman Spectroscopy of Silicon Quantum Dots*  
REMRSEC REU poster session, Golden, CO

**SERVICE**

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- 2018 - present **Member, Graduate Student Advisory Group for Engineering**  
MIT School of Engineering
- 2018 - present **Co-President, Women of Materials Science**  
MIT Department of Materials Science
- 2017 - present **Reviewer**  
ACS Applied Energy Materials, RSC Energy & Environmental Science

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Spring 2017	<b>Graduate Student Mentor, Solar Spring Break</b> MIT Energy Initiative
2016 - present	<b>Student Representative, Energy Education Task Force</b> MIT Energy Initiative
2016 - present	<b>Graduate Student Representative, Solar Test Bed Steering Committee</b> MIT Office of Sustainability
2015	<b>Conference Organizer</b> Solar Energy Technology & Innovation in Mexico workshop
2015 - 2017	<b>Solar/Grid Community Co-Leader</b> MIT Energy Club
January 2015	<b>Graduate Student Panelist</b> Northeast Conference for Undergraduate Women in Physics
March 2014	<b>Science Demonstrator</b> Cambridge Hands-On Science
2012 - 2013	<b>Project Bright Co-Leader</b> Yale University
2012	<b>SPS Co-President</b> Yale Society of Physics Students
2011 - 2012	<b>Conference Organizer</b> Northeast Conference for Undergraduate Women in Physics

## COMPUTER SKILLS

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<i>Simulation</i>	VASP, SCAPS-1D, PC1D
<i>Languages/Environments</i>	Python (incl. numpy, scipy, pandas, matplotlib, Jupyter), MATLAB, L <sup>A</sup> T <sub>E</sub> X, Unix
<i>HPC</i>	Have earned allocations on and used both Intel and Cray systems including Peregrine (NREL), NERSC (LBL), Blue Waters (UIUC), Supercloud (MIT)
<i>General</i>	Hardware maintenance/repair

## OTHER SKILLS AND ACTIVITIES

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### Foreign Languages

Spanish	Proficient
Hebrew	Intermediate

### Music - Violinist

2018 - 2019	MIT Musical Theatre Guild
2014 - 2017	MIT Gilbert and Sullivan Players
2014 - 2016	MIT Chamber Music Society
2009 - 2013	Jonathan Edwards College Philharmonic
2009 - 2013	Pit orchestras for the Yale Dramat, Yale Gilbert and Sullivan Society, Opera Theatre of Yale College, and various independent theatrical productions

### Athletics

2018 - 2019	Treasurer, MIT Triathlon Team
2014, 2018	Finisher, Stockholm and Marine Corps Marathons
2013 - 2014	Rower, Churchill College Boat Club (1st women's VIII in May Bumps 2014)
2009 - 2012	Member (2009 - 2012), Manager (2010 - 2011), Yale Bulldog Cycling Team