

Rachel C. Kurchin

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EDUCATION

2019	Massachusetts Institute of Technology <i>Cambridge, MA, USA</i> Ph.D., Materials Science and Engineering, GPA 4.6/5.0
2014	University of Cambridge <i>Cambridgeshire, UK</i> MPhil, Materials Science & Metallurgy (research-based)
2013	Yale University <i>New Haven, CT, USA</i> B.S., Physics (Intensive), with distinction (magna cum laude, GPA 3.9/4.0)
2009	The Harley School <i>Rochester, NY</i> GPA 3.97/4.0

RESEARCH POSITIONS

09/2019 – present	Carnegie Mellon University <i>Depts. of Mechanical Engineering, Materials Science and Engineering</i> MFI Postdoctoral Fellow with Venkat Viswanathan and Jay Whitacre
10/2014 – 07/2019	Massachusetts Institute of Technology <i>Dept. of Mechanical Engineering</i> Ph.D. student with Tonio Buonassisi
Summers 2016, 2017	National Renewable Energy Laboratory <i>Solar Energy Research Facility</i> Visiting Graduate Student with Vladan Stevanović
10/2013 – 06/2014	University of Cambridge <i>Dept. of Materials Science & Metallurgy</i> Master's Student with Stoyan Smoukov, advised by Dame Athene Donald
09/2012 – 05/2013	Yale University <i>Dept. of Electrical Engineering</i> Undergraduate researcher (senior thesis) with Minjoo Larry Lee
Summer 2012	Colorado School of Mines <i>Dept. of Physics</i> REU Student with Thomas Furtak
01/2012 – 05/2012	Yale University <i>Dept. of Chemical Engineering</i> Undergraduate researcher with Chinedum Osuji
Summer 2011	Weizmann Institute of Science <i>Dept. of Earth and Planetary Sciences</i> Undergraduate researcher with Ilan Koren
Summer 2008	University of Rochester <i>Laboratory for Laser Energetics</i> High school researcher with R. Stephen Craxton

TEACHING POSITIONS

09/2018 – 12/2018	Massachusetts Institute of Technology <i>Dept. of Materials Science and Engineering</i> Teaching Assistant for 3.23: Electronic, Optical, and Magnetic Properties of Materials
2011 – 2013	Yale University <i>Dean's Office</i> Science and Quantitative Reasoning Tutor

FELLOWSHIPS AND AWARDS

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

PUBLICATIONS

- 2019 [14] **R. C. Kurchin**, J. R. Poindexter, V. Vähäniissi, C. del Cañizo, T. Buonassisi. “How much physics is in a current-voltage curve? Inferring defect properties from photovoltaic device measurements.” *Submitted*
- [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. Wiegold, N. Hartono, M. Layurova, N. D. Klein, J. R. Poindexter, A. Polizzotti, S. Sun, M. G. Bawendi, T. Buonassisi. “A-site cation in inorganic A₃Sb₂I₉ 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. Wiegold, 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,
- [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 (BiI₃) for Photovoltaic Applications.” *The Journal of Physical Chemistry Letters* 6, 4297–4302 (2015)

TALKS

- 2018 *Semiconductor Parameter Extraction (and more!) with Bayesian Inference*
MIT Society of Industrial and Applied Mathematics

Computational Screening for Defect-Tolerant Semiconductors
Gordon Research Seminar on Defects in Semiconductors

Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors
Blue Waters Research Symposium
- 2017 *Toward Quantitative Metrics to Screen for Defect Tolerance in Novel Semiconducting Materials*
Materials Research Society Fall Meeting and Exhibit
- 2013 *Cross-Sectional EBIC Characterization of III-V Semiconductors for Photovoltaic Applications*
Yale Physics Department
- 2012 *Improving Active Layer Performance of Hybrid Photovoltaics by Nano Imprinting with Bulk Metallic Glass*
Yale Physics Department

POSTER PRESENTATIONS

- 2019 *Measuring Real-World Quantities from Computer Simulation with Bayesian Inference*
MIT de Florez Award Competition
Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods
MIT CCE Symposium
- 2018 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*
MIT Materials Day
Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors
Gordon Research Seminar on Defects in Semiconductors
Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors
Blue Waters Research Symposium
Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods
World Conference on Photovoltaic Energy Conversion
Design Principles for Defect-Tolerant Photovoltaic Absorbers
MIT de Florez Award Competition
- 2016 *Quantitative Metrics for Defect Tolerance in Semiconductors*
Materials Research Society Fall Meeting and Exhibit
Photovoltaics R&D: Thin Film Materials
MIT Energy Night
Bayes-Sun Inference: Next-Generation Photovoltaics through Advanced Probabilistic Modeling
MIT de Florez Award Competition
Statistical Inference of Materials Properties from Solar Cell Measurements
Beyond 2016: MIT's Frontiers of the Future Symposium
- 2015 *Improving the Accuracy of Novel Materials Screening: Growing Defect-Tolerant Photovoltaic Absorbers*
MRS Fall Meeting and Exhibit
Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials
MIT Materials Day
Solar Energy Technology & Innovation in Mexico
MIT Energy Initiative Solar Day
Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials
NREL HOPE workshop
- 2013 *Raman Spectroscopy of Silicon Quantum Dots*
Northeast Conference for Undergraduate Women in Physics
- 2012 *Raman Spectroscopy of Silicon Quantum Dots*
REMRSEC REU Poster Session

SERVICE

- 2019 – 2020 **Conference Organizer** *Pittsburgh Conference for Undergraduate Women in Physics*
- 2019 **Reviewer** *NeurIPS ML4PS Workshop*
- 2018 – 2019 **Member, Graduate Student Advisory Group for Engineering** *MIT School of Engineering*

2018 – 2019	Co-President, Women of Materials Science <i>MIT Department of Materials Science</i>
2017 – present	Reviewer <i>ACS Applied Energy Materials, RSC Energy & Environmental Science</i>
Spring 2017	Graduate Student Mentor, Solar Spring Break <i>MIT Energy Initiative</i>
2016 – 2019	Student Representative, Energy Education Task Force <i>MIT Energy Initiative</i>
2016 – 2019	Graduate Student Representative, Solar Test Bed Steering Committee <i>MIT Office of Sustainability</i>
2015	Conference Organizer <i>Solar Energy Technology & Innovation in Mexico Workshop</i>
2015 – 2017	Solar/Grid Community Co-Leader <i>MIT Energy Club</i>
January 2015	Graduate Student Panelist <i>Northeast Conference for Undergraduate Women in Physics</i>
March 2014	Science Demonstrator <i>Cambridge Hands-On Science</i>
2012 – 2013	Project Bright Co-Leader <i>Yale University</i>
2012	SPS Co-President <i>Yale Society of Physics Students</i>
2011 – 2012	Conference Organizer <i>Northeast Conference for Undergraduate Women in Physics</i>

COMPUTATIONAL SKILLS

<i>Simulation</i>	VASP, PC1D, SCAPS-1D
<i>Languages/ Environments</i>	Python (incl. numpy, scipy, pandas, matplotlib), Julia, Jupyter, MATLAB, Mathematica, L ^A T _E 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)

OTHER SKILLS AND ACTIVITIES

Foreign Languages

Spanish	Proficient
Hebrew	Intermediate

Music – Violinist

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

Athletics

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