

Rachel C. Kurchin

Curriculum Vitae

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Scholar

EDUCATION

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

RESEARCH POSITIONS

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

TEACHING POSITIONS

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

FELLOWSHIPS AND AWARDS

2019	Graduate Student Teaching Award MIT School of Engineering MIT CCE Symposium Poster Prize MIT Center for Computational Engineering
2018	MIT 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 Mechanical Engineering Department
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, Z. Liu, T. Buonassisi. “Using Bayesian Inference to Extract Defect Parameters from Current-Voltage Measurements of Solar Cells”. [In Preparation \(2019\)](#)
13. R. C. Kurchin, G. Romano, T. Buonassisi. “Bayesim: a tool for adaptive grid model fitting with Bayesian inference”. [In Press at Computer Physics Communications \(2019\)](#)
- 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 $A_3Sb_2I_9$ 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, \(2017\)](#)
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 (BiI₃) 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>
MIT Society of Industrial and Applied Mathematics, Cambridge, MA |
| 08/18/2018 | <i>Computational Screening for Defect-Tolerant Semiconductors</i>
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>
Blue Waters Research Symposium, Sunriver, OR |
| 11/28/2017 | <i>Toward Quantitative Metrics to Screen for Defect Tolerance in Novel Semiconducting Materials</i>
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>
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>
Yale Physics Department, New Haven, CT |

POSTERS

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| 03/18/2019 | <i>Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods</i>
MIT CCE Symposium, Cambridge, MA |
| 10/18/2018 | <i>Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods</i>
MIT Materials Day, Cambridge, MA |
| 08/18/2018 | <i>Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors</i>
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> |

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

SERVICE

2019 - present	Reviewer ACS Applied Energy Materials
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
Spring 2017	Graduate Student Mentor, Solar Spring Break MIT Energy Initiative
2016 - present	Student Representative, Energy Education Task Force MIT Energy Initiative
2016 - present	Graduate Student Representative, Solar Test Bed Steering Committee MIT Office of Sustainability
2015	Conference Organizer Solar Energy Technology & Innovation in Mexico workshop
2015 - 2017	Solar/Grid Community Co-Leader MIT Energy Club
January 2015	Graduate Student Panelist Northeast Conference for Undergraduate Women in Physics

March 2014	Science Demonstrator Cambridge Hands-On Science
2012 - 2013	Project Bright Co-Leader Yale University
2012	SPS Co-President Yale Society of Physics Students
2011 - 2012	Conference Organizer Northeast Conference for Undergraduate Women in Physics

COMPUTER SKILLS

<i>Simulation</i>	VASP, SCAPS-1D, PC1D
<i>Languages/Environments</i>	Python (incl. numpy, scipy, pandas, matplotlib, Jupyter), MATLAB, 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)
<i>General</i>	Hardware maintenance/repair

OTHER SKILLS AND ACTIVITIES

Foreign Languages

Spanish	Proficient
Hebrew	Intermediate

Music - Violinist

2018 - present	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 - present	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