

# Rachel C. Kurchin

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[Google Scholar](#)

## EDUCATION

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2019                    **Massachusetts Institute of Technology** *Cambridge, MA, USA*  
Ph.D., Materials Science and Engineering, GPA 4.6/5.0

2014                    **University of Cambridge** *Cambridgeshire, UK*  
MPhil, Materials Science & Metallurgy (research-based)

2013                    **Yale University** *New Haven, CT, USA*  
B.S., Physics (Intensive), with distinction (*magna cum laude*, GPA 3.9/4.0)

2009                    **The Harley School** *Rochester, NY*  
GPA 3.97/4.0

## RESEARCH POSITIONS

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09/2019 – present    **Carnegie Mellon University** *Depts. of Mechanical Engineering, Materials Science and Engineering*  
MFI Postdoctoral Fellow with Venkat Viswanathan and Jay Whitacre

10/2014 – 07/2019   **Massachusetts Institute of Technology** *Dept. of Mechanical Engineering*  
Ph.D. student with Tonio Buonassisi (committee: V. Stevanović, J. Grossman, B. Yildiz)

Summers 2016, 2017   **National Renewable Energy Laboratory** *Solar Energy Research Facility*  
Visiting Graduate Student with Vladan Stevanović

10/2013 – 06/2014   **University of Cambridge** *Dept. of Materials Science & Metallurgy*  
Master's Student with Stoyan Smoukov, advised by Dame Athene Donald

09/2012 – 05/2013   **Yale University** *Dept. of Electrical Engineering*  
Undergraduate researcher (senior thesis) with Minjoo Larry Lee

Summer 2012         **Colorado School of Mines** *Dept. of Physics*  
REU Student with Thomas Furtak

01/2012 – 05/2012   **Yale University** *Dept. of Chemical Engineering*  
Undergraduate researcher with Chinedum Osuji

Summer 2011         **Weizmann Institute of Science** *Dept. of Earth and Planetary Sciences*  
Undergraduate researcher with Ilan Koren

Summer 2008         **University of Rochester** *Laboratory for Laser Energetics*  
High school researcher with R. Stephen Craxton

## TEACHING POSITIONS

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09/2018 – 12/2018   **Massachusetts Institute of Technology** *Dept. of Materials Science and Engineering*  
Teaching Assistant for 3.23: Electronic, Optical, and Magnetic Properties of Materials

2011 – 2013          **Yale University** *Dean's Office*  
Science and Quantitative Reasoning Tutor

## FELLOWSHIPS AND AWARDS

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2020	<b>Rising Star in Computational and Data Sciences</b> <i>Oden Institute at the University of Texas at Austin</i>
2019	<b>MFI Postdoctoral Fellowship</b> <i>CMU Manufacturing Futures Initiative</i> <b>Graduate Student Teaching Award</b> <i>MIT Dept. of Materials Science and Engineering</i> <b>Graduate Student Teaching Award</b> <i>MIT School of Engineering</i> <b>CCE Symposium Poster Prize</b> <i>MIT Center for Computational Engineering</i>
2018	<b>Materials Day Best Poster Award</b> <i>MIT Materials Research Laboratory</i>
2017	<b>Blue Waters Graduate Fellowship</b> <i>National Center for Supercomputing Applications</i>
2016	<b>Total Energy Fellowship</b> <i>MIT Energy Initiative</i> <b>Second Place, de Florez Award Competition</b> <i>MIT Dept. of Mechanical Engineering</i>
2014	<b>GRFP Honorable Mention</b> <i>National Science Foundation</i>
2013	<b>Gates Cambridge Scholarship</b> <i>Cambridge Gates Trust</i> <b>Howard L. Schultz Prize</b> <i>Yale Physics Department</i>
2012	<b>Mellon Grant</b> <i>Pierson College at Yale University</i> <b>REMRSEC REU Technical Achievement Award</b> <i>Colorado School of Mines Renewable Energy Materials Research Science and Engineering Center</i>
2009	<b>Robert C. Byrd Honors Scholarship</b> <i>US Department of Education</i> <b>Intel STS Semifinalist</b> <i>Intel Science Talent Search</i>

## PUBLICATIONS

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2020	[15]	<b>R. Kurchin</b> , V. Viswanathan. “Marcus-Hush-Chidsey kinetics at electrode-electrolyte interfaces.” <i>The Journal of Chemical Physics</i> 153, 134706 (2020)
	[14]	<b>R. C. Kurchin</b> , J. .. Poindexter, V. Vahanissi, et al. “How Much Physics Is in a Current Voltage Curve? Inferring Defect Properties from Photovoltaic Device Measurements.” <i>IEEE Journal of Photovoltaics</i> 10, 1532–1537 (2020)
2019	[13]	<b>R. C. Kurchin</b> , G. Romano, T. Buonassisi. “Bayesim: a tool for adaptive grid model fitting with Bayesian inference.” <i>Computer Physics Communications</i> 239, 161–165 (2019)
2018	[12]	<b>R. C. Kurchin</b> , P. Gorai, T. Buonassisi, V. Stevanović. “Structural and chemical features giving rise to defect tolerance of binary semiconductors.” <i>Chemistry of Materials</i> 30, 5583–5592 (2018)
	[11]	J. Correa-Baena, L. Nienhaus, <b>R. C. Kurchin</b> , et al. “A-site cation in inorganic $A_3Sb_2I_9$ perovskite influences structural dimensionality, exciton binding energy, and solar cell performance.” <i>Chemistry of Materials</i> 30, 3734–3742 (2018)
2017	[10]	S. S. Shin, J. Correa-Baena, <b>R. C. Kurchin</b> , et al. “Solvent-engineering method to deposit compact bismuth-based thin films: mechanism and application to photovoltaics.” <i>Chemistry of Materials</i> 30, 336–343 (2017)
	[09]	R. Brandt, <b>R. C. Kurchin</b> , V. Steinmann, et al. “Rapid semiconductor device characterization through Bayesian parameter estimation.” <i>Joule</i> 1, 843–856 (2017)
	[08]	R. Hoyer, L. C. Lee, <b>R. C. Kurchin</b> , et al. “Strongly enhanced photovoltaic performance and defect physics of air-stable bismuth oxyiodide (BiOI).” <i>Advanced Materials</i> 29, (2017)

- [07] R. E. Brandt, J. Poindexter, P. Gorai, **R. Kurchin**, et al. “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**, et al. “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**, et al. “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**, et al. “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**, et al. “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**, et al. “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, et al. “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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- 2020 *Accelerating Energy Materials Discovery with Computation*  
University of Illinois Urbana-Champaign Electrical & Computer Engineering Department  
*Bayesian Parameter Estimation: Computational Methods*  
CMU Course 24-786: Bayesian Machine Learning
- 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

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

## REVIEWING

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2020 – present	<b>NPJ Computational Materials</b> <i>Springer Nature</i>
2019 – present	<b>NeurIPS ML4PS Workshop</b>
2019 – present	<b>Applied Energy Materials</b> <i>American Chemical Society</i>
2017 – present	<b>Energy &amp; Environmental Science</b> <i>Royal Society of Chemistry</i>

## SERVICE

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2019 – 2020	<b>Conference Organizer</b> <i>Pittsburgh Conference for Undergraduate Women in Physics</i>
2018 – 2019	<b>Member, Graduate Student Advisory Group for Engineering</b> <i>MIT School of Engineering</i>
2018 – 2019	<b>Co-President, Women of Materials Science</b> <i>MIT Department of Materials Science</i>
Spring 2017	<b>Graduate Student Mentor, Solar Spring Break</b> <i>MIT Energy Initiative</i>
2016 – 2019	<b>Student Representative, Energy Education Task Force</b> <i>MIT Energy Initiative</i>

2016 – 2019	<b>Graduate Student Representative, Solar Test Bed Steering Committee</b> <i>MIT Office of Sustainability</i>
2015	<b>Conference Organizer</b> <i>Solar Energy Technology &amp; Innovation in Mexico Workshop</i>
2015 – 2017	<b>Solar/Grid Community Co-Leader</b> <i>MIT Energy Club</i>
January 2015	<b>Graduate Student Panelist</b> <i>Northeast Conference for Undergraduate Women in Physics</i>
March 2014	<b>Science Demonstrator</b> <i>Cambridge Hands-On Science</i>
2012 – 2013	<b>Project Bright Co-Leader</b> <i>Yale University</i>
2012	<b>SPS Co-President</b> <i>Yale Society of Physics Students</i>
2011 – 2012	<b>Conference Organizer</b> <i>Northeast Conference for Undergraduate Women in Physics</i>

## COMPUTATIONAL SKILLS

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<i>Simulation</i>	VASP, PC1D, SCAPS-1D
<i>Languages/ Environments</i>	Python (incl. numpy, scipy, pandas, matplotlib), Julia (incl. DifferentialEquations, Flux, and other SciML packages), Jupyter, MATLAB, Mathematica, 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)

## OTHER SKILLS AND ACTIVITIES

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### 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, 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