

# Rachel C. Kurchin

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[Google Scholar](#)

## EDUCATION

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

## RESEARCH POSITIONS

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

## TEACHING POSITIONS

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

## FELLOWSHIPS AND AWARDS

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- 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

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- 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 (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. 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<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. 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 (BiI<sub>3</sub>) for photovoltaic applications.” *The Journal of Physical Chemistry Letters* 6, 4297–4302 (2015)

## TALKS

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- 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      *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

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- 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	<b>Co-President, Women of Materials Science</b> <i>MIT Department of Materials Science</i>
2017 – present	<b>Reviewer</b> <i>ACS Applied Energy Materials, RSC Energy &amp; Environmental 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, 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
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