

Rachel C. Kurchin

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EDUCATION

- 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)

RESEARCH POSITIONS

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

TEACHING EXPERIENCE, PREPARATION, AND RECOGNITION

- 2020 **Guest lecture** *CMU Course 12-623/24-623: Molecular Simulation of Materials*
Future Faculty Program *CMU Eberly Center for Teaching Excellence*
Guest lectures *CMU Course 24-786: Bayesian Machine Learning*
- 2019 **Graduate Student Teaching Award** *MIT Department of Materials Science and Engineering*
Graduate Student Teaching Award *MIT School of Engineering*

2018 **Teaching Assistant** *MIT Dept. of Materials Science and Engineering*
 TA 3.23: Electronic, Optical, and Magnetic Properties of Materials

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

FELLOWSHIPS AND AWARDS

2020 **MolSSI Software Fellowship** *Molecular Sciences Software Institute*
Rising Star in Computational and Data Sciences *Oden Institute at UT Austin*

2019 **MFI Postdoctoral Fellowship** *CMU Manufacturing Futures Initiative*
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

- 2020 [15] **R. Kurchin**, V. Viswanathan. “Marcus-Hush-Chidsey kinetics at electrode-electrolyte interfaces.” *The Journal of Chemical Physics* **153**, 134706 (2020)
- [14] **R. C. Kurchin**, J. .. Poindexter, V. Vahanissi, et al. “How Much Physics Is in a Current–Voltage Curve? Inferring Defect Properties from Photovoltaic Device Measurements.” *IEEE Journal of Photovoltaics* **10**, 1532–1537 (2020)
- 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**, et al. “A-site cation in inorganic $\text{A}_3\text{Sb}_2\text{I}_9$ 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**, et al. “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, et al. “Rapid semiconductor device characterization through Bayesian parameter estimation.” *Joule* **1**, 843–856 (2017)
- [08] R. Hoye, L. C. Lee, **R. C. Kurchin**, et al. “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**, 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 (BiI₃) for photovoltaic applications.” *The Journal of Physical Chemistry Letters* **6**, 4297–4302 (2015)

TALKS

- 2020 *Graph Convolutional Networks for Atomic Structures*
Cambridge Machine Learning Discussion Group
Marcus-Hush-Chidsey Kinetics at Solid Surfaces
Battery Modeling Webinar Series
Accelerating Energy Materials Discovery with Computation
Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)
Accelerating Energy Materials Discovery with Computation
University of Illinois Urbana-Champaign Electrical & Computer Engineering Department
- 2019 *Bayesim Workshop*
Helmholtz Institute for Renewable Energy Erlangen Nuremberg
- 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
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
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

REVIEWING

- 2021 – present **Nature Computational Science** *Springer Nature*
2020 – present **NPJ Computational Materials** *Springer Nature*
2019 – present **NeurIPS ML4PS Workshop**
2019 – present **Applied Energy Materials** *American Chemical Society*
2017 – present **Energy & Environmental Science** *Royal Society of Chemistry*

SERVICE

2019 – 2020	Conference Organizer <i>Pittsburgh Conference for Undergraduate Women in Physics</i>
2018 – 2019	Member, Graduate Student Advisory Group for Engineering <i>MIT School of Engineering</i>
2018 – 2019	Co-President, Women of Materials Science <i>MIT Department of Materials 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 (incl. DifferentialEquations, Flux, and other SciML packages), 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, 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 women's VIII in May Bumps 2014)
2009 – 2012	Member (2009 – 2012), Manager (2010 – 2011), Yale Bulldog Cycling Team