Rachel C. Kurchin

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Google Scholar

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)

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

RESEARCH POSITIONS

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

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

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

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

2020 [15] **R. Kurchin**, V. Viswanathan. "Marcus-Hush-Chidsey Kinetics at Electrode-Electrolyte Interfaces." *Journal of Chemical Physics (Submitted)* (2020)

[14] **R. C. Kurchin**, J. .. Poindexter, V. Vahanissi, et al."How Much Physics Is in a CurrentVoltage Curve? Inferring Defect Properties from Photovoltaic Device Measurements." *IEEE Journal of Photovoltaics* 1–6 (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 $A_3Sb_2I_9$ 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**, 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. Hoye, 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. Hoye, 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. Hoye, 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. Hoye, et al. "Investigation of bismuth triiodide (BiI_3) for photovoltaic applications." *The Journal of Physical Chemistry Letters* 6, 4297–4302 (2015)

TALKS

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

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 Quntum Dots* Northeast Conference for Undergraduate Women in Physics
2012	*Raman Spectroscopy of Silicon Quntum Dots* REMRSEC REU Poster Session

REVIEWING

2020 – present	**NPJ Computational Materials** *Springer Nature*
2019	**33rd 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** *Pittsburgh Conference for Undergraduate Women in Physics*
2018 – 2019	**Member, Graduate Student Advisory Group for Engineering** *MIT School of Engineering*
2018 – 2019	**Co-President, Women of Materials Science** *MIT Department of Materials Science*
Spring 2017	**Graduate Student Mentor, Solar Spring Break** *MIT Energy Initiative*
2016 – 2019	**Student Representative, Energy Education Task Force** *MIT Energy Initiative*
2016 – 2019	**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*

COMPUTATIONAL SKILLS

Simulation	VASP, PC1D, SCAPS-1D
Languages/ Environments	Python (incl. numpy, scipy, pandas, matplotlib), Julia, Jupyter, MATLAB, Mathematica, LaTeX, Unix
HPC	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 womens VIII in May Bumps 2014)
2009 – 2012	Member (2009 – 2012), Manager (2010 – 2011), Yale Bulldog Cycling Team