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)

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 $A_3Sb_2I_9$ 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 *High-fidelity Accelerated Design of High-performance Electrochemical Systems*
Materials Science & Technology Conference 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

2020 *High-fidelity Accelerated Design of High-performance Electrochemical Systems*
NeurIPS 2020 Climate Change and AI Workshop

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
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 *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 Quntum Dots*
Northeast Conference for Undergraduate Women in Physics

2012 *Raman Spectroscopy of Silicon Quntum 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** *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 (incl. DifferentialEquations, Flux, and other SciML packages), 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 women's VIII in May Bumps 2014)
2009 – 2012	Member (2009 – 2012), Manager (2010 – 2011), Yale Bulldog Cycling Team