

# 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)

## RESEARCH POSITIONS

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- 2019 – pres.    **Carnegie Mellon University** *Depts. of Mechanical Engineering, Materials Science and Engineering*  
MFI ('19-'20), MolSSI ('21) 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

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- 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

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2020	<b>MolSSI Software Fellowship</b> <i>Molecular Sciences Software Institute</i> <b>Rising Star in Computational and Data Sciences</b> <i>Oden Institute at UT Austin</i>
2019	<b>MFI Postdoctoral Fellowship</b> <i>CMU Manufacturing Futures Initiative</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> <b>153</b> , 134706 (2020)
	[14]	<b>R. C. Kurchin</b> , J. R. 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> <b>10</b> , 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> <b>239</b> , 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> <b>30</b> , 5583–5592 (2018)
	[11]	J. Correa-Baena, L. Nienhaus, <b>R. C. Kurchin</b> , et al. “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.” <i>Chemistry of Materials</i> <b>30</b> , 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> <b>30</b> , 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> <b>1</b> , 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> <b>29</b> , (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<sub>3</sub>) for photovoltaic applications.” *The Journal of Physical Chemistry Letters* **6**, 4297–4302 (2015)

## TALKS

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- 2021 *Introducing Chemellia: Machine Learning, with Atoms*  
JuliaCon
- Building a Chemistry and Materials Science Ecosystem in Julia*  
JuliaCon
- 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

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

## REVIEWING/EDITING

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### Editor

since 2021 **Journal of Open-Source Software** *Open Journals*

### Reviewer

since 2021 **Chemistry of Materials** *American Chemical Society*  
**Journal of Physical Chemistry Letters** *American Chemical Society*  
**PR Materials** *Physical Review Journals*  
**JuliaCon**  
**Computational Materials Science** *Elsevier*  
**Journal of Photovoltaics** *IEEE*  
**Nature Computational Science** *Springer Nature*  
since 2020 **NPJ Computational Materials** *Springer Nature*  
2019 **NeurIPS ML4PS Workshop**  
since 2019 **Applied Energy Materials** *American Chemical Society*  
since 2017 **Energy & Environmental Science** *Royal Society of Chemistry*

## SERVICE

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July 2021 **Session Chair, Volunteer** *JuliaCon*  
2021 – present **Grand Award Judge** *Regeneron ISEF*  
2019 – 2020 **Conference Organizer** *Pittsburgh Conference for Undergraduate Women in Physics*  
2018 – 2019 **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 **Energy Education Task Force** *MIT Energy Initiative*  
2016 – 2019 **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

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*Simulation* VASP, GPAW, PC1D, SCAPS-1D  
*Languages* Julia, Python, Matlab, Mathematica, L<sup>A</sup>T<sub>E</sub>X, bash  
*HPC* Have earned allocations and used systems at national labs, NSF facilities, and universities  
*Software Development* Git, GitHub, open-source package development and maintenance in Julia and Python incl. CI, docs, issues/PR's, etc.

## OTHER SKILLS AND ACTIVITIES

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### Foreign Languages

Spanish            Proficient

Hebrew            Intermediate

### Music – Violinist

2014 – 2019       MIT Chamber Music Society, MIT Gilbert & Sullivan Players, MIT Musical Theater Guild

2009 – 2013       Jonathan Edwards College Philharmonic, Pit orchestras for the Yale Dramat, Yale Gilbert & Sullivan Society, Opera Theatre of Yale College, and various independent productions

### Athletics

2019, 2021       Finisher, Pumpkinman Half Iron and Ironman 70.3 Musselman Triathlons

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