Rachel C. Kurchin

Curriculum Vitae

Carnegie Mellon University
Scott Hall, 5000 Forbes Avenue
Pittsburgh, PA 15213

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Scholar

EDUCATION

2019 **Massachusetts Institute of Technology**
PhD in Materials Science and Engineering

2014 **University of Cambridge**
MPhil in Materials Science and Metallurgy

2013 **Yale University**
BS in Physics (Intensive) with distinction (magna cum laude, GPA 3.9)

RESEARCH POSITIONS

09/2019 – present **Carnegie Mellon University, Department of Mechanical Engineering**
MFI Postdoctoral Fellow with Venkat Viswanathan

10/2014 – 07/2019 **MIT, Department of Mechanical Engineering**
PhD Student with Tonio Buonassisi

Summers 2016, 2017 **National Renewable Energy Laboratory**
Visiting Graduate Student with Vladan Stevanovic

10/2013 – 06/2014 **University of Cambridge, Department of Materials Science and Metallurgy**
Master's student with Stoyan Smoukov

09/2012 – 05/2013 **Yale University, Department of Electrical Engineering**
Undergraduate researcher with Minjoo Larry Lee

Summer 2012 **Colorado School of Mines, REMRSEC**
REU student with Thomas Furtak

01/2012 – 05/2012 **Yale University, Department of Chemical Engineering**
Undergraduate researcher with Chinedum Osuji

Summer 2011 **Weizmann Institute of Science, Department of Earth and Planetary Sciences**
Undergraduate reseacher with Ilan Koren

Summer 2008 **University of Rochester, Laboratory for Laser Energetics**
Undergraduate researcher with R. Stephen Craxton

TEACHING POSITIONS

01/2019 – 02/2019 **Harbour Research Program, China**
Visiting Professor for "Academic Writing"

09/2018 – 12/2018 **MIT, Department of Materials Science and Engineering**
Teaching Assistant for class 3.23: Electronic, Optical, and Magnetic Properties of Materials

2011 – 2013 **Yale University, Dean's Office**
Science and QR Tutor

FELLOWSHIPS AND AWARDS

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

Graduate Student Teaching Award
MIT Department 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 Mechanical Engineering Department

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

2019 14. R. C. Kurchin, J. R. Poindexter, V. Vähänissi, C. del Cañizo, T. Buonassisi. "How much defect physics is in a current-voltage curve? Inferring defect properties from device-level electrical measurements and high-performance computing". In Preparation (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. Wieghold, N. Hartono, M. Layurova, N. D. Klein, J. R. Poindexter, A. Polizzotti, S. Sun, M. G. Bawendi, T. Buonassisi. "A-site cation in inorganic $A_3Sb_2I_9$ 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, A. Polizzotti, J. J. Yoo, S. Wieghold, 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. Levcenco, G. Ceder, T. Unold, T. Buonassisi. "Rapid semiconductor device characterization through Bayesian parameter estimation". Joule 1, 843–856 (2017)

08. R. Hoye, 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. Hoye, 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. Hoye, 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. 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, 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. Hoye, 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. Hoye, 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_3) for Photovoltaic Applications". The Journal of Physical Chemistry Letters 6, 4297–4302 (2015)

TALKS

10/25/2018 *Semiconductor Parameter Extraction (and more!) with Bayesian Inference*
MIT Society of Industrial and Applied Mathematics, Cambridge, MA

08/18/2018 *Computational Screening for Defect-Tolerant Semiconductors*
Gordon Research Seminar on Defects in Semiconductors, New London, NH

06/04/2018 *Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors*
Blue Waters Research Symposium, Sunriver, OR

11/28/2017 *Toward Quantitative Metrics to Screen for Defect Tolerance in Novel Semiconducting Materials*
Materials Research Society Fall Meeting and Exhibit, Boston, MA

04/29/2013 *Cross-Sectional EBIC Characterization of III-V Semiconductors for Photovoltaic Applications*
Yale Physics Department, New Haven, CT

04/27/2012 *Improving Active Layer Performance of Hybrid Photovoltaics by Nano Imprinting with Bulk Metallic Glass*
Yale Physics Department, New Haven, CT

POSTERS

05/06/2019 *Measuring Real-World Quantities from Computer Simulation with Bayesian Inference*
MIT de Florez Award Competition, Cambridge, MA

03/18/2019 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*
MIT CCE Symposium, Cambridge, MA

10/18/2018 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*
MIT Materials Day, Cambridge, MA

08/18/2018 *Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors*
Gordon Research Seminar on Defects in Semiconductors, New London, NH

06/04/2018 *Structural and Chemical Features Contributing to Defect Tolerance of Binary Semiconductors*
Blue Waters Research Symposium, Sunriver, OR

06/14/2018 *Semiconductor Parameter Extraction via Current-Voltage Characterization and Bayesian Inference Methods*
World Conference on Photovoltaic Energy Conversion, Waikoloa, HI

05/11/2018 *Design Principles for Defect-Tolerant Photovoltaic Absorbers*
MIT de Florez Award Competition, Cambridge, MA

12/01/2016 *Quantitative Metrics for Defect Tolerance in Semiconductors*
Materials Research Society Fall Meeting and Exhibit, Boston, MA

10/14/2016 *Photovoltaics R&D: Thin Flm Materials*
MIT Energy Night, Cambridge, MA

05/05/2016 *Bayes-Sun Inference: Next-Generation Photovoltaics through Advanced Probabilistic Modeling*
MIT de Florez Award Competition, Cambridge, MA

04/12/2016 *Statistical Inference of Materials Properties from Solar Cell Measurements*
Beyond 2016: MIT's Frontiers of the Future symposium, Cambridge, MA

12/03/2015 *Improving the Accuracy of Novel Materials Screening: Growing Defect-Tolerant Photovoltaic Absorbers*
MRS Fall Meeting and Exhibit, Boston, MA

10/14/2015 *Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials*
MIT Materials Day, Cambridge, MA

09/10/2015 *Solar Energy Technology & Innovation in Mexico*
MIT Energy Initiative Solar Day, Cambridge, MA

07/22/2015 *Toward Algorithmic Screening of Novel, Defect-Tolerant Solar Materials*
NREL HOPE workshop, Golden, CO

01/20/2013 *Raman Spectroscopy of Silicon Quntum Dots*
Northeast Conference for Undergraduate Women in Physics, Ithaca, NY

08/02/2012 *Raman Spectroscopy of Silicon Quntum Dots*
REMRSEC REU poster session, Golden, CO

SERVICE

2018 - present **Member, Graduate Student Advisory Group for Engineering**
MIT School of Engineering

2018 - present **Co-President, Women of Materials Science**
MIT Department of Materials Science

2017 - present **Reviewer**
ACS Applied Energy Materials, RSC Energy & Environmental Science

Spring 2017 **Graduate Student Mentor, Solar Spring Break**

	MIT Energy Initiative
2016 - present	**Student Representative, Energy Education Task Force** MIT Energy Initiative
2016 - present	**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

COMPUTER SKILLS

Simulation	VASP, SCAPS-1D, PC1D
Languages/Environments	Python (incl. numpy, scipy, pandas, matplotlib, Jupyter), MATLAB, LaTeX, Unix
HPC	Have earned allocations on and used both Intel and Cray systems including Peregrine (NREL), NERSC (LBL), Blue Waters (UIUC), Supercloud (MIT)
General	Hardware maintenance/repair

OTHER SKILLS AND ACTIVITIES

Foreign Languages

Spanish	Proficient
Hebrew	Intermediate

Music - Violinist

2018 - 2019	MIT Musical Theatre Guild
2014 - 2017	MIT Gilbert and Sullivan Players
2014 - 2016	MIT Chamber Music Society
2009 - 2013	Jonathan Edwards College Philharmonic
2009 - 2013	Pit orchestras for the Yale Dramat, Yale Gilbert and Sullivan Society, Opera Theatre of Yale College, and various independent theatrical productions

Athletics

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