

**School of Electrical and Computer Engineering
Purdue University**

January 2018

Name: Peter Bermel, Associate Professor

Education:

BS	May 2000	University of North Carolina-Chapel Hill
MPhil	June 2002	Cambridge University
PhD	May 2007	Massachusetts Institute of Technology

Professional and Honorary Society Memberships:

Phi Beta Kappa, 1999 – present
Materials Research Society (MRS), 2011 - present
Optical Society of America (OSA), 2013 - present
Institute of Electrical & Electronics Engineers (IEEE), 2014 - present
SPIE, 2015 - present

Honors and Awards:

- [1] Winston Churchill Foundation Scholar, 2000-2001
- [2] Compton Fellow, Massachusetts Institute of Technology, 2001-2003
- [3] NSF Graduate Research Fellow, 2001-2004
- [4] SRC TECHCON Best in Session Award in Energy System and Sustainability Student Award, 2013
- [5] Purdue Summer Undergraduate Research Fellowship (SURF) Student Mentoring Award, 2014
- [6] Purdue Summer Undergraduate Research Fellowship (SURF) Best Poster Award, 2015
- [7] IMPACT Faculty Fellow, Fall 2015
- [8] NSF CAREER Award, 2015-2020
- [9] Advisor to Bilsland Dissertation Fellowship Awardee Enas Sakr, August 2016-July 2017
- [10] Advisor to Bilsland Dissertation Fellowship Awardee Zhiguang Zhou, August 2018-July 2019
- [11] Seed for Success Award, 2016 and 2017

Professional Experience

June 2007 – May 2011	Postdoctoral Associate, Massachusetts Institute of Technology (with Prof. Marin Soljačić)
June 2011 – December 2011	Research Scientist, Massachusetts Institute of Technology
Jan. 2012 – July 2017	Assistant Professor, School of Electrical and Computer Engineering, Purdue University
July 2017 – present	Associate Professor, School of Electrical and Computer Engineering, Purdue University

Consulting Activities

2006-2007	British Aerospace Engineering, Burlington, MA
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Research Grants and Contracts Received

- [1] Principal Investigator (with Prof. Minghao Qi), Private Foundation Grant, “Improving thin-film crystalline silicon solar cell efficiencies with photonic crystals,” February 2008 – January 2011, \$600,000 (MIT and Purdue)
- [2] Co-principal Investigator (with John D. Joannopoulos, PI), NSF, "Extreme Science and Engineering Discovery Environment," Grant No. OCI-10535, August 2011 – April 2013, Subcontract for 3.3 million service units.
- [3] Principal Investigator, PRF Research Grant, "Modeling Nonlinear Comb Generation with Coupled Mode Theory," Grant No. 205957, July 2012 – June 2013, \$17,241.
- [4] Principal Investigator, SRC, "Designing and fabricating thermophotovoltaic systems for improved performance and reliability," Grant No. P15383, October 2012 – September 2015, \$255,000.
- [5] Principal Investigator, Bay Area PV Consortium, “Exploratory Photovoltaic Modeling and Simulation: An End-to-End Technology-Agnostic Approach,” Grant No. 13011422, January 2013 – December 2015, \$600,000. Directly responsible for \$158,706.
- [6] Principal Investigator, PRF Research Grant, “Multiphysics design and optimization of earth-abundant solar cells made from copper zinc tin sulfide (CZTS),” Grant No. 205958, July 2013 – June 2014, \$17,241.

- [7] Principal Investigator, NREL Non-proprietary Partnering Opportunity, September 2014-June 2015.
- [8] Principal Investigator, Bay Area PV Consortium Grant, “Integrated approach to fundamental challenges in high-performance thin-film photovoltaics,” January 2016 – June 2016, \$125,000. Directly responsible for \$48,000.
- [9] Principal Investigator, NSF CAREER Award, “Thermophotonics for efficient harvesting of waste heat as electricity”, February 15, 2015 – January 31, 2020, \$500,000.
- [10] Principal investigator, “Ultra-thin metasurfaces for redirecting light and managing thermal emission,” Northrop Grumman Aerospace Systems, June 1, 2015 – May 31, 2016. \$40,000.
- [11] Co-principal investigator, Center for Integrated Thermal Management of Aerospace Vehicles (CITMAV), August 15, 2015 – July 31, 2017. Directly responsible for \$129,000.
- [12] Co-principal investigator, NEPTUNE Center, “GaN interface engineering,” Office of Naval Research, September 1, 2015 – August 31, 2017, \$2,000,000. Directly responsible for \$280,000.
- [13] Co-principal investigator, NSF PRIME Award, “Evaluation Framework for Advanced STEM MOOCs,” November 1, 2015 – October 31, 2018, \$799,923. Directly responsible for \$180,000.
- [14] Principal Investigator, NEC Corporation Award, “Characterization & filter design of high-performance rare earth-based thermophotovoltaics,” December 1, 2015 – March 21, 2016, \$31,284.
- [15] Principal investigator, “Ultra-thin metasurfaces for redirecting light and managing thermal emission,” Northrop Grumman Aerospace Systems, November 1, 2016 – October 31, 2017. \$40,000.
- [16] Principal Investigator, “Reliability of Next-Generation Thermal Management Systems for High-Power Naval Electronics,” NEPTUNE Project, Office of Naval Research, January 20, 2017 – September 14, 2019, \$450,000. Directly responsible for \$225,000.
- [17] Co-Principal Investigator, “Ultra-wide Bandgap Semiconductor β -Ga₂O₃ Interface Engineering for Naval Power Electronics Applications via Atomic Layer Epitaxy,” NEPTUNE Project, Office of Naval Research, January 20, 2017 – September 14, 2019, \$450,000. Directly responsible for \$225,000.

- [18] Co-Principal Investigator, “Photonics Science and Technologies for Security, Energy and Healthcare Apps,” March 21, 2017 – March 20, 2019, \$400,000.
- [19] Co-Principal Investigator, “Co-development of an Environment-Controlled Atomic Layer Deposition Cluster System for Epitaxial Dielectric Integration on GaN and Beyond,” Defense University Research Instrumentation Program (DURIP), Office of Naval Research, June 1, 2017- July 14, 2018, \$300,000. Equipment is shared between Peide Ye and Peter Bermel groups.
- [20] Co-investigator, “NRT: Sustainable Food, Energy and Water Systems (SFEWS),” National Science Foundation, August 1, 2017-July 31, 2022, \$2,500,000. Directly responsible for \$261,578.
- [21] Principal investigator, “Ultra-thin metasurfaces for redirecting light and managing thermal emission,” Northrop Grumman Aerospace Systems, December 1, 2017 – November 31, 2018. \$20,000.

Professional Society Activities

MRS - Session Chair, Photonic and Plasmonic Materials for Enhanced Photovoltaic Performance, MRS Fall Meeting, November 28-December 2, 2011

SPIE - Session Chair, SPIE Optics + Photonics Conference, San Diego, CA, August 28-30, 2013

OSA - Session Chair, OSA Renewable Energy & Environment Conference, Optical Nanostructures and Advanced Materials for Photovoltaics Session PM4C, Tucson, AZ, November 3-6, 2013

MRS - Session Chair, MRS Fall 2014 Meeting, Symposium L on Metamaterials Session L7, Boston, MA, December 1-5, 2014

SPIE - Session Chair, Infrared Remote Sensing and Instrumentation XXII, SPIE Optics + Photonics Conference, San Diego, CA, August 9-13, 2015

OSA - Committee Member, Optical Nanostructures and Advanced Materials for Photovoltaics (PV), November 2-5, 2015

IEEE - Program Committee Member (Deputy PV Jobs Chair) and Session Chair, IEEE Photovoltaic Specialist’s Conference, June 5-10, 2016

SPIE - Session Chair, SPIE Optics+Photonics Conference, August 29-September 1, 2016

MRS – Session Chair, MRS Spring Conference, April 17-21, 2017

IEEE –Program Committee Member (Deputy PV Jobs Chair), IEEE Photovoltaic Specialist’s Conference, June 25-30, 2017

SPIE – Symposium Organizer and Session Chair, SPIE Optics+Photonics Conference, August 6-10, 2017

OSA – Session Chair, OSA Light, Energy and the Environment Congress, November 5-9, 2017

PhD Thesis Supervision Completed

Xufeng Wang PhD Co-supervised with Prof. Lundstrom
“Design and analysis of solar cells by coupled electrical-optical simulation”
Passed September 10, 2014

James Moore PhD Co-supervised with Prof. Lundstrom
“Measurement and analysis techniques for device agnostic electrical
characterization of thin film solar cells”
Passed November 23, 2015

Haejun Chung PhD
“Computational design for next-generation solar cells”
Passed January 12, 2017

Roman Shugayev PhD
“Analysis and design of novel nanophotonic structures”
Passed July 14, 2017

Master’s Thesis Supervision Completed

Haejun Chung MS
“Time domain simulation with novel photovoltaic materials”
Passed January 15, 2014

Chao Zhou MS
“Overcoming fundamental barriers in photovoltaic and terahertz generation”
Passed April 24, 2015

Dan Konopa MS
“Thermal and optical characterization of high-power laser diodes”
Passed April 17, 2016

Hao Tian MS
“Performance and Reliability of Integrated Solar Thermal Electrical Devices”
Passed November 29, 2016

Master's and PhD Thesis Students Currently Being Supervised

Enas Sakr	PhD	(fifth-year student)
Zhiguang Zhou	PhD	(fourth-year student)
Yubo Sun	PhD	(fourth-year student)
Sayan Roy	MS/PhD	(third-year student)
Elizabeth Grubbs	PhD	(third-year student)
Evan Schlenker	MS	(second-year student)
Allison Perna	MS	(second-year student)
David Kortge	MS/PhD	(second-year student)
Oluseye Akomolede	PhD	(second-year student)

ECE Project (296, 495, 496, 695, 696, 697) Supervision Completed

Omar Yehia	EE 496	December 2014	Thermophotovoltaic design
Shailja Dhaka	EE 296	December 2015	Directional thermal emission
Tianran Liu	EE 496	December 2015	Direct thermal emission measurement
Namrata Raghavan	EE 496	December 2016	

Courses Developed

ECE 595	Numerical Simulations (Spring 2013)
nanoHUB-U NPM	Nanophotonic Modeling (Fall 2014)
ECE 695	Numerical Simulations (Spring 2015)
edX	Nanophotonic Modeling (Fall 2016)

School Committee Activities

Admissions Committee

Member, 2012—present

Associate Director, 2014—present

Undergraduate Curriculum Committee

Member, 2012—2014

College Committee Activities

Discovery and Innovation Magazine Advisory Board

Advisory Board Member, 2015 – present

University-Wide Committee Activities

United Kingdom Scholarships Advisory Board (for the National and International Scholarships Office)

Founding Member, 2014—present

Summer Undergraduate Research Fellowship (SURF) Advisory Committee
Advisory Board Member, 2015 – present
Discovery Park Undergraduate Research Internship (DURI) Program
Lead Organizer, Summer 2017—present

Research Book Contributions and Books Published

- [1] Peter Bermel, Jeongwon Lee, Ivan Celanovic, John D. Joannopoulos, Marin Soljačić, *Annual Review of Heat Transfer XV*, Begell House, Reading, CT, 2012 – 1 chapter (20 pages) contributed.
- [2] Peter Bermel, Xufeng Wang, Gary J. Cheng, “Photonic Systems for Crystalline Silicon and Thin-Film Photovoltaic Manufacturing,” Andy Weiner, Shimon Nof, Eds., *Applications of Photonics*, 2014.

Serial Journal Articles

- [1] Peter Bermel, Mark Warner. "Photonic band structure of highly deformable self-assembling systems", *Phys. Rev. E* **65**, 010702 (2002).
- [2] Peter Bermel, Mark Warner. "Photonic band structure of cholesteric elastomers", *Physical Review E* **65**, 056614 (2002).
- [3] Yasha Yi, Peter Bermel, Kazumi Wada, Xiaoman Duan, John. D. Joannopoulos, and Lionel. C. Kimerling, "Tunable multichannel optical filter based on silicon photonic band gap materials actuation", *Applied Physics Letters* **81**, 4112 (2002).
- [4] Peter Bermel, John D. Joannopoulos, Yoel Fink, Paul A. Lane, Charles Tapalian, "Properties of radiating pointlike sources in cylindrical omnidirectionally reflecting waveguides," *Physical Review B* **69**, 035316 (2004).
- [5] Yasha Yi, Shoji Akiyama, Peter Bermel, Xiaoman Duan, and Lionel C. Kimerling, "On-chip Si-based waveguide with 1D photonic crystal cladding," *Optics Express* **12**, 4775 (2004).
- [6] Peter Bermel, Elefterios Lidorikis, Yoel Fink, and John D. Joannopoulos, "Simulations of active materials in an electromagnetic field", *Physical Review B* **73**, 165125; also republished in *Virtual Journal of Nanoscale Science & Technology* **13** (18), 2006.

- [7] Peter Bermel, Alejandro Rodriguez, Steven G. Johnson, John D. Joannopoulos and Marin Soljačić "Single-photon all-optical switching using waveguide-cavity quantum electrodynamics", *Physical Review A* **74**, 043818 (2006).
- [8] Yasha Yi, S. Akiyama, Peter Bermel, Xiaoman Duan, Lionel C. Kimerling, "Sharp bending of on-chip silicon Bragg cladding waveguide with light guiding in low-index core materials", *IEEE Journal of Selected Topics in Quantum Electronics* **12** (6), 1345 (2006).
- [9] Peter Bermel, Chiyan Luo, Lirong Zeng, Lionel C. Kimerling, and John D. Joannopoulos, "Improving thin-film crystalline silicon solar cell efficiencies with photonic crystals", *Optics Express* **15**, 16986 (2007).
- [10] Rafif E. Hamam, Mihai Ibanescu, Evan J. Reed, Peter Bermel, Steven G. Johnson, Erich Ippen, John D. Joannopoulos, and Marin Soljacic, "Purcell effect in nonlinear photonic structures: a coupled mode theory analysis", *Optics Express* **16**, 12523 (2008).
- [11] Michael Ghebrebrhan, Peter Bermel, Yehuda Avniel, John D. Joannopoulos, Steven G. Johnson, "Global optimization of silicon photovoltaic cell front coatings", *Optics Express* **17**, 7505 (2009).
- [12] Ardavan Farjadpour, David Roundy, Mihai Ibanescu, Peter Bermel, John D. Joannopoulos, and Steven G. Johnson, "Meep: a flexible free-software package for electromagnetic simulations by the FDTD method", *Computer Physics Communications* **181**, 687 (2010).
- [13] Peter Bermel, Michael Ghebrebrhan, Walker Chan, Yi Xiang Yeng, Mohammad Araghchini, Rafif Hamam, Christopher H. Marton, Klavs F. Jensen, Marin Soljacic, John D. Joannopoulos, Steven G. Johnson, Ivan Celanovic, "Design and global optimization of high-efficiency thermophotovoltaic systems", *Optics Express* **18**, A314 (2010).
- [14] Michael Ghebrebrhan, Peter Bermel, Yi Xiang Yeng, Ivan Celanovic, Marin Soljacic, and John D. Joannopoulos, "Tailoring thermal emission via Q-matching of photonic crystal resonances", *Physical Review A* **83**, 033810 (2011)
- [15] David Chester, Peter Bermel, John D. Joannopoulos, Marin Soljacic, Ivan Celanovic, "Design and global optimization of high-efficiency solar thermal systems with tungsten cermet", *Optics Express* **19**, 103 (2011).
- [16] Ivan Celanovic, Peter Bermel, Marin Soljacic, "Thermophotovoltaic power conversion systems: current performance and future potential," *Japanese Society of Applied Physics* **80**, 0687 (2011).

- [17] Mohammad Araghchini, Yi Xiang Yeng, Natalia Jovanovic, Peter Bermel, Leslie A. Kolodziejski, Marin Soljacic, Ivan Celanovic, John D. Joannopoulos, "Fabrication of two-dimensional tungsten photonic crystals for high-temperature applications", *Journal of Vacuum Science and Technology B* **29**, 061402 (2011).
- [18] YiXiang Yeng, Michael Ghebrebrhan, Peter Bermel, Walker R. Chan, John D. Joannopoulos, Marin Soljacic, Ivan Celanovic, *Proc. Natl. Acad. Sci.* **109**, 2280 (2012).
- [19] Walker R. Chan, Peter Bermel, Robert C.N. Pilawa-Podgurski, Christopher H. Marton, Klavs F. Jensen, Jay J. Senkevich, John D. Joannopoulos, Marin Soljacic, and Ivan Celanovic, "Toward high-energy-density, high-efficiency, and moderate-temperature chip-scale thermophotovoltaics," *Proc. Natl. Acad. Sci.*, published ahead of print on February 25, 2013. doi:10.1073/pnas.1301004110.
- [20] Leo T. Varghese, Yi Xuan, Ben Niu, Li Fan, Peter Bermel, Minghao Qi, "Enhanced photon management of thin-film silicon solar cells using inverse opal photonic crystals with 3D photonic bandgaps," *Advanced Optical Materials* **1**, 692-698 (2013).
- [21] Peter Bermel, "Photon management and beyond for photovoltaics," *Optics Communications* **314**, 66-70 (2013).
- [22] Shimon Y. Nof, Gary J. Cheng, Andrew M. Weiner, Xin W. Chen, Avital Bechar, Marshall G. Jones, Claude B. Reed, Alkan Donmez, Thomas D. Weldon, Peter Bermel, Satish T. S. Bukkapatnam, Changqing Cheng, Soundar R. T. Kumara, Arden Bement, Richard Koubek, Bopaya Bidanda, Yung C. Shin, Agostino Capponi, Seokcheon Lee, Mark R. Lehto, Andrew L. Liu, Omid Nohadani, Marcos Dantus, Peter W. Lorraine, David D. Nolte, Robert W. Proctor, Harshad P. Sardesai, Leyuan Shi, Juan P. Wachs, Xi-Cheng Zhang, "Laser and Photonic Systems Integration: Emerging Innovations and Framework for Research and Education," *Human Factors and Ergonomics in Manufacturing & Service Industries* **23**, 483-516 (2013).
- [23] Peter Bermel, Robert L. Byer, Eric R. Colby, Benjamin M. Cowan, Jay Dawson, R. Joel England, Robert J Noble, Minghao Qi, Rodney B Yoder, "Summary of the 2011 Dielectric Laser Accelerator Workshop," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* **734**, A51-59 (2014).

- [24] Youngsuk Nam, Yi Xiang Yeng, Andrej Lenert, Peter Bermel, Ivan Celanovic, Marin Soljacic, Evelyn N. Wang, "Solar thermophotovoltaic energy conversion systems with two-dimensional tantalum photonic crystal absorbers and emitters," *Solar Energy Materials & Solar Cells* **122**, 287-296 (2014).
- [25] Xufeng Wang, M. Ryyan Khan, Mark Lundstrom, and Peter Bermel, "Performance-limiting factors for GaAs-based single nanowire photovoltaics," *Optics Express* **22**, A344-A358 (2014).
- [26] Haejun Chung, K-Y. Jung, Xin Tze Tee, and Peter Bermel, "Time domain simulation of tandem silicon solar cells with optimal textured light trapping enabled by the quadratic complex rational function," *Optics Express* **22**, A818-A832 (2014).
- [27] M. Ryyan Khan, Xufeng Wang, Peter Bermel, and Muhammad A. Alam, "Enhanced light trapping in solar cells with a meta-mirror following Generalized Snell's law," *Optics Express* **22**, A973-A985 (2014).
- [28] Peter Bermel and Roman Shugayev, "Time-domain simulations of nonlinear interaction in microring resonators using finite-difference and coupled mode techniques," *Optics Express* **22**, 19204-19218 (2014).
- [29] Xufeng Wang, Jayprakash Bhosale, James Moore, Rehan Kapadia, Peter Bermel, Ali Javey, and Mark Lundstrom, "Photovoltaic Material Characterization with Steady-State and Transient Photoluminescence," *IEEE Journal of Photovoltaics* **5**, 282-287 (2015).
- [30] Maxwell Zheng, Hsin-Ping Wang, Carolin M. Sutter-Fella, Corsin Battaglia, Shaul Aloni, Xufeng Wang, James Moore, Jeffrey W. Beeman, Mark Hettick, Matin Amani, Wei-Tse Hsu, Joel W. Ager, Peter Bermel, Mark Lundstrom, Jr-Hau He and Ali Javey, "Thin-film solar cells with InP absorber layers directly grown on nonepitaxial metal substrates," *Advanced Energy Materials* **5** (2015).
- [31] Haejun Chung, K.-Y. Jung, and Peter Bermel, "Flexible flux plane simulations of parasitic absorption in nanoplasmonic thin-film silicon solar cells," *Optical Materials Express* **5**, 2054-2068 (2015).
- [32] Chao Zhou and Peter Bermel, "High-efficiency cascaded up and down conversion in nonlinear Kerr cavities", *Optics Express* **23**, 24390-24406 (2015).

- [33] Zhiguang Zhou, Enas Sakr, Omar Yehia, Anubha Mathur, Peter Bermel, "Photonic Crystal Selective Structures for Solar Thermophotovoltaics," *MRS Advances* **1**, 1-7 (2015). doi: 10.1557/adv.2015.25
- [34] Chao Zhou, Haejun Chung, Xufeng Wang, and Peter Bermel. "Design of CdZnTe and Crystalline Silicon Tandem Junction Solar Cells." *IEEE Journal of Photovoltaics* **6**, 301-308 (2016).
- [35] Ognjen Ilic, Peter Bermel, Gang Chen, John D. Joannopoulos, Ivan Celanovic, and Marin Soljačić, "Tailoring high-temperature radiation and the resurrection of the incandescent source," *Nature Nanotechnology* (2016).
- [36] J.S. Bhosale, J.E. Moore, X. Wang, P. Bermel, M.S. Lundstrom, "Steady-state photoluminescent excitation characterization of semiconductor carrier recombination," *Review of Scientific Instruments* **87**, 013104 (2016).
- [37] Haejun Chung, Xingshu Sun, Peter Bermel, "Optical approaches to improving perovskite/Si tandem cells," *MRS Advances* **1**, 901-910 (2016).
- [38] Zhiguang Zhou, Omar Yehia, and Peter Bermel. "Integrated photonic crystal selective emitter for thermophotovoltaics." *Journal of Nanophotonics* **10**, 016014 (2016).
- [39] Haejun Chung, Chao Zhou, Xin Tze Tee, K-Y. Jung, and Peter Bermel, "Hybrid dielectric light trapping designs for thin-film CdZnTe/Si tandem cells." *Optics Express* **24**, A1008-A1020 (2016).
- [40] Enas Sakr, Deanna Dimonte, Peter Bermel, "Metasurfaces with Fano resonances for directionally selective thermal emission," *MRS Advances* **1**, 3307-3316 (2016). DOI: 10.1557/adv.2016.526
- [41] Peter Bermel, Kazuaki Yazawa, Jeffery Gray, Xianfan Xu, Ali Shakouri, "Hybrid strategies and technologies for full spectrum solar conversion," *Energy & Environmental Science* (advance online publication, August 15, 2016).
- [42] Kerrie Anna Douglas, Peter Bermel, Md Monzurul Alam, Tanya Faltens, Krishna Madhavan, "Big Data Characterization of Learner Behaviour a Highly Technical MOOC Engineering Course," *Journal of Learning Analytics* **3**, 170-192 (2016).

- [43] Xingshu Sun, Timothy J Silverman, Zhiguang Zhou, Mohammad Ryyan Khan, Peter Bermel, Muhammad Ashraful Alam, "An Optics-Based Approach to Thermal Management of Photovoltaics: Selective-Spectral and Radiative Cooling," *IEEE Journal of Photovoltaics* **7**, 566-574 (2017).
- [44] Chung, Haejun, Xingshu Sun, Aditya D. Mohite, Rahul Singh, Lokendra Kumar, Muhammad A. Alam, and Peter Bermel. "Modeling and designing multilayer 2D perovskite/silicon bifacial tandem photovoltaics for high efficiencies and long-term stability." *Optics Express* 25, no. 8 (2017): A311-A322.
- [45] Sakr, Enas, and Peter Bermel. "Angle-Selective Reflective Filters for Exclusion of Background Thermal Emission." *Physical Review Applied* 7.4 (2017): 044020.
- [46] E. Gencer, C. Miskin, X. Sun, M. R. Khan, P. Bermel, M. A. Alam, and R. Agrawal, Directing solar photons to sustainably meet food, energy, and water needs, *Scientific Reports* 7, 3133 (2017).
- [47] Enas Sakr and Peter Bermel. "Thermophotovoltaics with spectral and angular selective doped-oxide thermal emitters." *Optics Express* 25, no. 20 (2017): A880-A895.
- [48] Sayan Roy and Peter Bermel, "Electronic and optical properties of ultra-thin 2D tungsten disulfide for photovoltaic applications," *Solar Energy Materials and Solar Cells* 174, 370-379 (accepted, November 2017).
- [49] Roman Shugayev and Peter Bermel, "Propagation loss-immune biocompatible nanodiamond refractive index sensors," *Advanced Optical Materials* (accepted, December 2017).
- [50] Hao Tian, Woojin Ahn, Kerry Maize, Mengwei Si, Peide Ye, Muhammad Ashraful Alam, Ali Shakouri, and Peter Bermel, "Thermoreflectance Imaging of Electromigration Evolution in Asymmetric Aluminum Constrictions," *Journal of Applied Physics* (accepted, December 2017).

Serial Journal Correspondence or Letters

- [1] Ardavan Farjadpour, David Roundy, Alejandro Rodriguez, Mihai Ibanescu, Peter Bermel, John D. Joannopoulos, Steven G. Johnson, and G.W. Burr, "Improving accuracy by subpixel smoothing in the finite-difference time domain", *Optics Letters* **31** (20), 2972 (2006).
- [2] Peter Bermel, Alejandro Rodriguez, John D. Joannopoulos, and Marin Soljacic, "Tailoring optical nonlinearities via the Purcell effect", *Physical Review Letters* **99**, 053001 (2007).

- [3] Lirong Zeng, Peter Bermel, Yasha Yi, Bernard Alamariu, Kurt A. Broderick, J. Liu, C. Hong, Xiaoman Duan, John D. Joannopoulos, and Lionel C. Kimerling, "Demonstration of Enhanced Absorption in Thin Film Si Solar Cells With Textured Photonic Crystal Back Reflector", *Applied Physics Letters* **93**, 221105 (2008).
- [4] Peter Bermel, Michael Ghebregbrhan, Michael Harradon, Yi Xiang Yeng, Ivan Celanovic, John D. Joannopoulos, Marin Soljacic, "Tailoring photonic metamaterial resonances for thermal radiation", *Nanoscale Research Letters* **6**, 549 (2011).
- [5] Alejandro W. Rodriguez, Ognjen Ilic, Peter Bermel, Ivan Celanovic, John D. Joannopoulos, Marin Soljacic, and Steven G. Johnson, "Frequency-selective near-field radiative heat transfer between photonic crystal slabs", *Physical Review Letters* **107**, 114302 (2011).
- [6] Enas Sakr, Zhiguang Zhou, and Peter Bermel, "High Efficiency Rare-Earth Emitter for Thermophotovoltaic Applications," *Applied Physics Letters* **105**, 111107 (2014).
- [7] Roman Shugayev and Peter Bermel. "Selective absorption and emission on magnetic transitions in low dimensional dielectric structures." *Applied Physics Letters* **108**, 071106 (2016).
- [8] Roman Shugayev and Peter Bermel, "Core-shell Mie resonant structures for quantum computing applications," *Applied Physics Letters* **109**, 221102 (2016).
- [9] Tian, Hao, Zhiguang Zhou, Tianran Liu, Cindy Karina, Urcan Guler, Vladimir Shalaev, and Peter Bermel. "High temperature efficient, stable Si wafer-based selective solar absorbers." *Applied Physics Letters* 110, no. 14 (2017): 141101.
- [10] Chung, Haejun, Zhiguang Zhou, and Peter Bermel. "Collimated thermal radiation transfer via half Maxwell's fish-eye lens for thermophotovoltaics." *Applied Physics Letters* 110, no. 20 (2017): 201111.

Conference Proceedings and Presentations

- [1] Yasha Yi, Peter Bermel, Kazumi Wada, Xiaoman Duan, John D. Joannopoulos, and Lionel C. Kimerling, "Low Voltage Tunable One Dimensional Photonic Crystal with Large Air Defects", *Materials Research Society Proceedings*, vol. 722, L3.3 (2002).
- [2] Yasha Yi, Peter Bermel, Shoji Akiyama, Jessica G. Sandland, Xiaoman Duan, and Lionel C. Kimerling, "Low loss Photonic Crystal Cladding Waveguide with Large Photonic Band Gap," *Materials Research Society Proceedings*, vol. 797, W3.4 (2003).

- [3] Yasha Yi, Peter Bermel, Shoji Akiyama, Xiaoman Duan, and Lionel C. Kimerling, "On-chip silicon-based waveguide with light guiding in low-index core materials", Proceedings of SPIE, vol. 5730, Optoelectronic Integration on Silicon II, 181 (2005).
- [4] Lirong Zeng, Peter Bermel, Yasha Yi, Ning-ning Feng, Bernard Alamariu, Ching-yin Hong, Xiaoman Duan, John Joannopoulos, and Lionel C. Kimerling, "Optimization of Textured Photonic Crystal Backside Reflector for Si Thin Film Solar Cells", Materials Research Society Proceedings, vol. 974E, CC2.6 (2006).
- [5] Ardavan Farjadpour, David Roundy, Alejandro Rodriguez, Mihai Ibanescu, Peter Bermel, John D. Joannopoulos, Steven G. Johnson, and Geoffrey Burr, "Improving accuracy by sub-pixel smoothing in FDTD", Proceedings of SPIE, vol. 6322, 63220G (2006).
- [6] Lirong Zeng, Peter Bermel, Yasha Yi, Bernard A. Alamariu, Kurt A. Broderick, Jifeng Liu, Ching-yin Hong, Xiaoman Duan, John Joannopoulos and Lionel C. Kimerling, "Realization of Significant Absorption Enhancement in Thin Film Silicon Solar Cells with Textured Photonic Crystal Backside Reflector," Materials Research Society Proceedings, vol. 1123, P02.1 (2008).
- [7] Walker Chan, Peter Bermel, Yi Xiang Yeng, Christopher H. Marton, Klavs F. Jensen, Marin Soljagic, John D. Joannopoulos, Ivan Celanovic, "A high-efficiency millimeter-scale thermophotovoltaic generator", 25th European Photovoltaic Solar Energy Conference (September 9, 2010).
- [8] Peter Bermel, Walker Chan, Yi Xiang Yeng, John D. Joannopoulos, Marin Soljagic, Ivan Celanovic, "Design and global optimization of high-efficiency thermophotovoltaic systems", 25th European Photovoltaic Solar Energy Conference (September 9, 2010).
- [9] Peter Bermel, "2011 Dielectric Laser Acceleration Workshop", ICFA Beam Dyn. Newslett. 56, 91-113 (2012).
- [10] Youngsuk Nam, Yi Xiang Yeng, Peter Bermel, Marin Soljagic, Evelyn N. Wang, "Numerical Study of a Solar Thermophotovoltaic Energy Converter with High Performance 2D Photonic Crystals," ASME Heat Transfer Summer Conference 58222, 179-185 (2012).
- [11] Youngsuk Nam, Andrej Lenert, Yi Xiang Yeng, Peter Bermel, Marin Soljagic, Evelyn N. Wang, "Solar thermophotovoltaic energy conversion systems with tantalum photonic crystal absorbers and emitters," IEEE Transducers Conference T3P.116, 1372-1375 (Barcelona, Spain, June 16-20, 2013).

- [12] M. Ryyan Khan, Peter Bermel, and Muhammad A. Alam, "Thermodynamic limits of solar cells with non-ideal optical response," 39th Photovoltaic Specialists Conference (Tampa, FL, June 16-19, 2013).
- [13] Bermel, Peter. "Performance limits for GaAs-based nanowire photovoltaics. "Optical Nanostructures and Advanced Materials for Photovoltaics, Optical Society of America (Phoenix, Arizona, 2013).
- [14] M. Ryyan Khan, Xufeng Wang, Enas Sakr, Muhammad Alam, and Peter Bermel, "Enhanced selective absorption & emission with a meta-mirror following generalized Snell's law," Materials Research Society Proceedings, vol. 1728, L2.09 (2014).
- [15] Tanya Faltens, Peter Bermel, Amanda Buckles, K. Anna Douglas, Alejandro Strachan, Lynn Zentner, Gerhard Klimeck, "nanoHUB.org: A Gateway to Undergraduate Simulation-Based Research in Materials Science and Related Fields," Materials Research Society Proceedings, vol. 1762, AAA6.05 (2015).
- [16] Steve Johnston, Alyssa Allende Motz, James Moore, Maxwell Zheng, Ali Javey, Peter Bermel, "Photoluminescence imaging characterization of thin-film InP," Proceedings of IEEE Photovoltaic Specialists Conference 42 (June 14-18, 2015).
- [17] Enas Sakr, Zhiguang Zhou, and Peter Bermel, "Enhancing selectivity of infrared emitters through quality-factor matching," Proceedings of SPIE 9608, Infrared Remote Sensing and Instrumentation XXIII, 960819 (September 1, 2015)
- [18] Peter Bermel, Reza Asadpour, Chao Zhou, Muhammad A. Alam, "A modeling framework for potential induced degradation in PV modules," Proceedings of SPIE 9563, Reliability of Photovoltaic Cells, Modules, Components, and Systems VIII, 95630C (September 23, 2015).
- [19] Sakr, Enas, Shailja Dhaka, and Peter Bermel. "Asymmetric angular-selective thermal emission." In Proceedings of SPIE Optoelectronics and Photonic Materials and Devices (OPTO) Conference 97431, p. 97431D. (2016).
- [20] Yubo Sun, Xingshu Sun, Steve Johnston, Carolin M. Sutter-Fella, Mark Hettick, Ali Javey, and Peter Bermel, "Voc Degradation in TF-VLS Grown Solar Cells," IEEE Photovoltaic Specialists Conference 43 (June 5-10, 2016).

- [21] Haejun Chung, Rahul Singh, Lokendra Kuma, Muhammad A. Alam, and Peter Bermel, "Characterization and Redesign of Perovskite/Silicon Tandem Cells," IEEE Photovoltaic Specialists Conference 43 (June 5-10, 2016).
- [22] James E. Moore, Xufeng Wang, Elizabeth K. Grubbs, Jennifer Drayton, Steve Johnston, Dean Levi, Mark S. Lundstrom, Peter Bermel, "Photoluminescence Excitation Spectroscopy Characterization of Cadmium Telluride Solar Cells," IEEE Photovoltaic Specialists Conference 43 (June 5-10, 2016).
- [23] Douglas, Kerrie Anna, Brittany Paige Mihalec-Adkins, N. Hick, N. Diefes-Dux, P. Bermel, and K. Madhavan. "Learners in advanced nanotechnology MOOCs: Understanding their intention and motivation," in *123rd Annual Conference of the American Society of Engineering Education*, pp. 26-29 (2016).
- [24] W. Sanchez, A. Magana, and P. Bermel, "Undergraduate Engineering Students' Representational Competence of Circuits Analysis and Optimization: An Exploratory Study," in *123rd Annual Conference of the American Society of Engineering Education* (2016).
- [25] Brittany Mihalec-Adkins, Nathan M. Hicks, Kerrie Anna Douglas, Peter Bermel, Heidi Diefes-Dux, Krishna Madhavan, "Surveying the Motivations of Groups of Learners in Highly-Technical STEM MOOCs," IEEE Frontiers in Education (accepted, July 8, 2016).
- [26] Nathan M. Hicks, Doipayyan Roy, Siddharth Shah, Kerrie Anna Douglas, Peter Bermel, Heidi Diefes-Dux, Krishna Madhavan, "Integrating Analytics and Survey Responses to Understand Advanced Nanotechnology MOOC Learners," IEEE Frontiers in Education (accepted, July 8, 2016).
- [27] Zhiguang Zhou, Xingshu Sun, Peter Bermel, "Radiative cooling for thermophotovoltaic systems," *Proceedings of SPIE* **9973**, Infrared Remote Sensing and Instrumentation XXIV, 997308 (September 14, 2016). doi:10.1117/12.2236174.
- [28] Sakr, Enas, and Peter Bermel. "Spectral and angular-selective thermal emission from gallium-doped zinc oxide thin film structures." *Proceedings of the SPIE*, **10099**, 100990A 8, 99 (2017).
- [29] Douglas, Kerrie A., Heidi A. Diefes-Dux, Peter Bermel, Krishna Madhavan, Nathan M. Hicks, and Taylor V. Williams. "Board# 32: NSF PRIME Project: Contextualized Evaluation of Advanced STEM MOOCs." In *124th Annual Conference of the American Society of Engineering Education* (2017).

- [30] Mohammed, Amr, Kerry Maize, Katie Stallings, Tobin Marks, David Clarke, Peter Bermel, Muhammad Alam, and Ali Shakouri. "High temporal & spatial resolution imaging of catastrophic & soft breakdown in self-assembled nanodielectrics (SANDs) films." In IEEE Device Research Conference (DRC), 2017 75th Annual, pp. 1-2 (2017).
- [31] Sun, Yubo, Zhiguang Zhou, Xin Jin, Xingshu Sun, Muhammad Ashraful Alam, and Peter Bermel. "Radiative cooling for concentrating photovoltaic systems." In Thermal Radiation Management for Energy Applications, vol. 10369, p. 103690D. International Society for Optics and Photonics (2017).
- [32] Aggarwal, Harsh Wardhan, Peter Bermel, Nathan M. Hicks, Kerrie A. Douglas, Heidi A. Diefes-Dux, and Krishna Madhavan. "Using pre-course survey responses to predict sporadic learner behaviors in advanced STEM MOOCs work-in-progress." In 2017 IEEE Frontiers in Education Conference (FIE), pp. 1-4 (2017).
- [33] Zielinski, Mitchell, Nathan M. Hicks, Su Wang, Kerrie A. Douglas, Peter Bermel, Heidi A. Diefes-Dux, and Krishna Madhavan. "Instructor outcomes of teaching a STEM MOOC." In 2017 IEEE Frontiers in Education Conference (FIE), pp. 1-7. (2017).
- [34] Bermel, Peter, Zhiguang Zhou, Xingshu Sun, Yubo Sun, and Muhammad A. Alam. "Optical Modeling and Characterization of Radiative Cooling for Solar Energy Applications." In Optics for Solar Energy, pp. RTh1B-1. Optical Society of America (2017).

Invited Lectures

- [1] Yasha Yi, (Peter Bermel, Kazumi Wada, Xiaoman Duan, John. D. Joannopoulos, and Lionel. C. Kimerling), "Low Voltage Tunable One Dimensional Photonic Crystal with Large Air Defects", Materials Research Society Fall Meeting, Session L3, talk 3, (December 2002).
- [2] Peter Bermel, (Chiyen Luo, John D. Joannopoulos), "Improving Solar Cell Efficiencies through Periodicity", MIT CIPS 3rd Annual Conference (May 5, 2006).
- [3] Lirong Zeng, (Peter Bermel, Yasha Yi, Ning-ning Feng, Bernard Alamariu, Ching-yin Hong, Xiaoman Duan, John D. Joannopoulos, and Lionel C. Kimerling), "Optimization of Textured Photonic Crystal Backside Reflector for Si Thin Film Solar Cells", Materials Research Society Fall Meeting, Session CC2, talk 6 (November 2006).

- [4] Lirong Zeng, (Peter Bermel, Yasha Yi, Bernard Alamariu, Kurt A. Broderick, Jifeng Liu, Ching-yin Hong, Xiaoman Duan, John D. Joannopoulos, and Lionel C. Kimerling), "Realization of Significant Efficiency Enhancement in Thin Film Silicon Solar Cells with a Textured Photonic Crystal Backside Reflector ", Materials Research Society Fall Meeting, Session P2, talk 1 (December 2, 2008).
- [5] Peter Bermel, (Michael Ghebrebrhan, John D. Joannopoulos, Lirong Zeng, Lionel Kimerling, Minghao Qi, Leo Varghese, Steven G. Johnson), "Enhancing thin-film photovoltaic cell efficiencies through light trapping", University of North Carolina Solar Energy Research Center Inaugural Conference (January 16, 2009).
- [6] Peter Bermel, (Michael Ghebrebrhan, John D. Joannopoulos, Lirong Zeng, Lionel Kimerling, Minghao Qi, Leo Varghese, Steven G. Johnson), "Enhancing thin-film photovoltaic cell efficiencies through light trapping", 2009 MIT Solar Energy Symposium (January 29, 2009).
- [7] Peter Bermel, Michael Ghebrebrhan, John D. Joannopoulos, Lirong Zeng, Lionel Kimerling, Minghao Qi, Leo Varghese, Yi Xiang Yeng, Walker Chan, Ivan Celanovic, Steven G. Johnson, Marin Soljagic, "Enhancing the efficiency of solar power with photonic crystals", Stanford University (May 24, 2010).
- [8] Peter Bermel, Michael Ghebrebrhan, Walker Chan, Yi Xiang Yeng, Mohammad Araghchini, Rafif Hamam, Christopher H. Marton, Klavs F. Jensen, Marin Soljagic, John D. Joannopoulos, Steven G. Johnson, Ivan Celanovic, "Design and global optimization of high-efficiency thermophotovoltaic systems", 25th European Photovoltaic Solar Energy Conference (September 9, 2010).
- [9] Peter Bermel, Michael Ghebrebrhan, Michael Harradon, Yi Xiang Yeng, Ivan Celanovic, John D. Joannopoulos, Marin Soljagic, "Tailoring photonic metamaterial resonances for thermal radiation," Villa Conference on Metamaterials (April 21, 2011).
- [10] Peter Bermel, Michael Ghebrebrhan, Walker Chan, Yi Xiang Yeng, Alejandro Rodriguez, John D. Joannopoulos, Steven G. Johnson, Ivan Celanovic, Marin Soljagic, "Enhancing the efficiency of solar power with photonic crystals", Purdue University (May 4, 2011).
- [11] Peter Bermel, Michael Ghebrebrhan, Walker Chan, Yi Xiang Yeng, Christopher H. Marton, Klavs F. Jensen, Ivan Celanovic, John D. Joannopoulos, Steven G. Johnson, Marin Soljagic, "Photonics for highly efficient thermophotovoltaic energy conversion systems", CMOS Emerging Technologies Conference (June 16, 2011).

- [12] Peter Bermel, Michael Ghebrebrhan, Claudia Lau, Xing Sheng, Jurgen Michel, Lionel Kimerling, Marin Soljacic, Steven G. Johnson, "Correlated randomness for broad-band light-trapping in semiconductor systems," Materials Research Society Fall Meeting, Session J (November 28, 2011).
- [13] Peter Bermel, "Enhancing Concentrating Photovoltaic (CPV) Efficiencies with Photonics," Emerging Ideas Workshop on High-Efficiency, High Concentration Photovoltaics through Advanced Optical System Design, sponsored by ARPA-E (March 26, 2012).
- [14] Peter Bermel, "Enhancing Thermophotovoltaic Efficiencies with Photonics," MITRE Workshop on the Potential Threat of Future Power and Energy Technology Breakthroughs (March 27-29, 2012).
- [15] Peter Bermel, Yi Xiang Yeng, Ivan Celanovic, John D. Joannopoulos, Marin Soljacic, "Photonic Nanostructures for Enabling High-Efficiency Thermophotovoltaics," Symposium on Nanomaterials for Energy (April 16, 2012).
- [16] Craig Turchi, Nick Melosh, Peter Bermel, "High-Temperature, Direct Thermal-to-Electric Conversion Systems for CSP," DOE Concentrating Solar Panel FY2013-2015 LPDP Review (July 26, 2012).
- [17] Peter Bermel, "Photovoltaic Modeling and Simulation at Purdue," Bay Area Photovoltaic Consortium Bi-Annual Meeting (May 6, 2013).
- [18] Ashraf Alam, Vikram Dalal, Ganesh Subbarayan, Peter Bermel, "Physics-based Intrinsic Degradation Modeling Framework for Solar Cells: A Cell-to-Module Perspective," DOE PREDICTS Review (June 2013).
- [19] Peter Bermel, "Ultra-high efficiency compact solar modules enabled by photonic superprisms," SPIE Optics + Photonics (August 25, 2013).
- [20] Peter Bermel, Jayprakash Bhosale, Xufeng Wang, Dionisis Berdebes, Mark Lundstrom, "Characterizing VLS-Grown InP: Simulation and Experiment," Bay Area Photovoltaic Consortium High-Efficiency & Multijunction Meeting (October 14, 2013).
- [21] Peter Bermel, Xufeng Wang, Mark Lundstrom, "Performance limits for GaAs-based nanowire photovoltaics," OSA Renewable Energy & Environment Conference, Optical Nanostructures and Advanced Materials for Photovoltaics Session PM2C (November 4, 2013).

- [22] Peter Bermel, Jayprakash Bhosale, Xufeng Wang, Dionisis Berdebes, Mark Lundstrom, "Characterizing VLS-Grown InP: Simulation and Experiment," JNCASR-Purdue Workshop, Jawaharal Nehru Center for Advanced Scientific Research, Bangalore, Karnataka, India (January 9, 2014).
- [23] Xufeng Wang, Jayprakash Bhosale, James Moore, Rehan Kapadia, Peter Bermel, Ali Javey, and Mark Lundstrom, "Inline Photovoltaic Material Characterization with Steady-State and Transient Photoluminescence," Bay Area Photovoltaic Consortium Meeting, Stanford, California (May 13, 2014).
- [24] Xufeng Wang, Jayprakash Bhosale, James Moore, Rehan Kapadia, Peter Bermel, Ali Javey, and Mark Lundstrom, "Inline Photovoltaic Material Characterization with Steady-State and Transient Photoluminescence," IEEE 40th Photovoltaic Specialists' Conference, Denver, Colorado (June 10, 2014).
- [25] Zhiguang Zhou, Roman Shugayev, Qingshuang Chen, Omar Yehia, Anubha Mathur, Enas Sakr, Vlad Shalaev, Urcan Guler, Sasha Boltasseva, Peter Bermel, "Q-factor matched selective thermal emitters for high-performance TPV," Indo-US Workshop on Nanomaterials for Energy, West Lafayette, Indiana (September 17, 2014).
- [26] Peter Bermel, Zhiguang Zhou, Roman Shugayev, Qingshuang Chen, Omar Yehia, Anubha Mathur, Enas Sakr, Vlad Shalaev, Urcan Guler, Sasha Boltasseva, "Selective absorbers and emitters for thermophotovoltaics," Incubator on the Fundamental Limits of Optical Energy, Optical Society of America, Washington, DC (November 14, 2014).
- [27] Peter Bermel, M. Ryyan Khan, Xufeng Wang, Enas Sakr, and Muhammad Alam, "Enhanced selective absorption & emission with a meta-mirror following generalized Snell's law," Materials Research Society Fall 2014 Meeting L2.06, Boston, Massachusetts (December 1, 2014).
- [28] Tanya Faltens, Peter Bermel, Amanda Buckles, K. Anna Douglas, Alejandro Strachan, Lynn Zentner, Gerhard Klimeck, "nanoHUB.org: A Gateway to Undergraduate Simulation-Based Research in Materials Science and Related Fields," Materials Research Society Fall 2014 Meeting AAA6.05, Boston, Massachusetts (December 2, 2014).
- [29] Peter Bermel, "Dispatchable thermal power generation with storage," Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN, February 26, 2015.

- [30] Ryyan Khan, Xufeng Wang, Enas Sakr, Ashraf Alam, Peter Bermel, "Enhancing selective thermal absorbers and emitters for efficient solar energy conversion," OASIS 5 Conference, Tel Aviv, Israel (March 3, 2015).
- [31] Haejun Chung, Ryyan Khan, Xufeng Wang, Enas Sakr, Ashraf Alam, Peter Bermel "Optimizing Plasmonic Silicon Photovoltaics and Thermal Emitters with Ag Nanoparticles," JNCASR-Purdue Workshop on Nanomaterials for Energy, JNCASR, Bangalore, India, March 20-21, 2015. Workshop speaker.
- [32] Steve Johnston, Alyssa Allende Motz, James Moore, Maxwell Zheng, Ali Javey, Peter Bermel, "Photoluminescence imaging characterization of thin-film InP," IEEE Photovoltaic Specialists Conference 42 (June 14-18, 2015).
- [33] Enas Sakr, Zhiguang Zhou, and Peter Bermel, "Enhancing selectivity of infrared emitters through quality-factor matching," SPIE Optics+Photonics Conference, Infrared Remote Sensing and Instrumentation Session XXIII, 960819 (August 11, 2015)
- [34] Peter Bermel, Reza Asadpour, Chao Zhou, Muhammad A Alam, "A modeling framework for potential induced degradation in PV modules," SPIE Optics+Photonics Conference, Reliability of Photovoltaic Cells, Modules, Components, and Systems Session VIII, 95630C (August 9, 2015).
- [35] Peter Bermel and Dan Konopa, "Thermal testbed for DEW," Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Dayton, OH, August 25, 2015.
- [36] Peter Bermel, "Metasurfaces for selective control of thermal emission," Massachusetts Institute of Technology Solid State Solar Thermal Energy Conversion (S3TEC) Seminar, Cambridge, MA, October 7, 2015.
- [37] Peide Ye and Peter Bermel, "GaN interface engineering for naval RF power electronics applications via atomic layer epitaxy," NEPTUNE Center Kickoff Event, West Lafayette, IN, November 6, 2015.
- [38] Zhiguang Zhou, Enas Sakr, Peter Bermel, "Integrated Photonic Crystal Selective Structures for Solar Thermophotovoltaics," Materials Research Society Fall 2015 Meeting OO11.03, Boston, Massachusetts (December 2, 2015).
- [39] Dan Konopa and Peter Bermel, "High-Power Laser Thermal Testbed," Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Indianapolis, IN (August 23-24, 2016).

- [40] Peter Bermel, “Metasurfaces for selective control of thermal emission,” Materials Research Society Spring 2016 Meeting, Session EP8, Phoenix, Arizona (March 31, 2016).
- [41] Peide Ye and Peter Bermel, “GaN interface engineering for naval RF power electronics applications via atomic layer epitaxy,” NEPTUNE Center Semiannual Meeting, Arizona State University, Tempe, AZ (May 23-25, 2016).
- [42] Peter Bermel, “Selectively Controlling Thermal Emission with Applications in Thermophotovoltaics,” CMOS Emerging Technologies Meeting, Montreal, Quebec, Canada (May 25-27, 2016).
- [43] Dan Konopa, Tim Fisher, Peter Bermel, “Effects of Thermal Management on the Beam Quality of High Power Laser Diode Bars” AIAA Conference, Orlando, FL (June 13-17, 2016).
- [44] Zhiguang Zhou, Enas Sakr, Tianran Liu, Cindy Karina, Shailja Dhaka, Peter Bermel, “Solar Thermophotovoltaics: An Alternative for Modular, Dispatchable Solar Electric Power,” Gordon Research Conference, Hong Kong University of Science and Technology (July 17-22, 2016).
- [45] Zhiguang Zhou, Kingshu Sun, Enas Sakr, Peter Bermel, “Radiative cooling for thermophotovoltaic systems,” SPIE Optics+Photonics, San Diego, CA (August 28 –September 1, 2016).
- [46] Zhiguang Zhou, Enas Sakr, Tianran Liu, Cindy Karina, Shailja Dhaka, Peter Bermel, “Thermophotovoltaics for generating electricity form sustainable heat sources,” SPIE Optics+Photonics, San Diego, CA (August 28-September 1, 2016).
- [47] Peter Bermel, Dan Konopa, Jeff Engerer, Stephen Hodson, Evan Schlenker, Tim Fisher, “Modeling & Testbed Design for High Frequency Thermal Loads,” Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN (August 23-24, 2016).
- [48] Enas Sakr, Zhiguang Zhou, Deanna Dimonte, Shailja Dhaka, Peter Bermel, “Spectral and angular-selective thermal emission control with nanophotonic structures,” NG NEXT Physics of Light-Matter Interaction Workshop, Redondo Beach, CA (October 25-27, 2016).
- [49] Hong Zhou, Peter Bermel, Peide Ye, “GaN Interface Engineering for Naval RF Power Electronics Applications via Atomic Layer Epitaxy,” NEPTUNE Center Semiannual Meeting, University of California-Davis, Davis, CA (November 1-3, 2016).

- [50] Evan Schlenker and Peter Bermel, "Combining Laser Diodes with Flash Boiling," Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Torrance, CA (February 1-2, 2017).
- [51] Peter Bermel, "Angle-Selective Filters for Position-Sensitive Illumination and Shadowing," Materials Research Society Spring 2017 Meeting, Session ED13, Phoenix, Arizona (April 17-21, 2017).
- [52] Peter Bermel, David Kortge, Hong Zhou, Elizabeth Grubbs, Jinhyun Noh, Peide Ye, "GaN Interface Engineering for Naval RF Power Electronics Applications via Atomic Layer Epitaxy," NEPTUNE Center Program Review, Cambridge, Massachusetts (May 9-11, 2017).
- [53] Peter Bermel, "Design, Fabrication, and Characterization of High-temperature Selective Thermal Emitters," CMOS Emerging Technologies Conference, Warsaw, Poland (May 28-30, 2017).
- [54] Douglas, Kerrie A., Heidi A. Diefes-Dux, Peter Bermel, Krishna Madhavan, Nathan M. Hicks, and Taylor V. Williams. "Board# 32: NSF PRIME Project: Contextualized Evaluation of Advanced STEM MOOCs." In *124th Annual Conference of the American Society of Engineering Education*, Columbus, Ohio (June 25-28, 2017).
- [55] Mohammed, Amr, Kerry Maize, Katie Stallings, Tobin Marks, David Clarke, Peter Bermel, Muhammad Alam, and Ali Shakouri. "High temporal & spatial resolution imaging of catastrophic & soft breakdown in self-assembled nanodielectrics (SANDs) films." in *IEEE 75th Annual Device Research Conference* (June 24-27, 2017).
- [56] Enas Sakr, Zhiguang Zhou, Peter Bermel, "Spectral and angular-selective thermal emission control with nanophotonic structures," NG NEXT Seminar Series, Redondo Beach, CA (August 10, 2017).
- [57] Peter Bermel, "Thermophotovoltaic power generation from solar and waste heat," University of New Mexico, Albuquerque, New Mexico (September 6, 2017).
- [58] Peter Bermel, "Thermophotovoltaic power generation from solar and waste heat," New Mexico Institute of Mining and Technology, Socorro, New Mexico (September 8, 2017).
- [59] Evan Schlenker, Dan Konopa, Stephen Hodson, Tim Fisher, and Peter Bermel, "Integrating Flash Boiling with Laser Diodes," Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN (September 27-28, 2017).

- [60] Dan Konopa, Evan Schlenker, Timothy Fisher, Jeff Engerer, Stephen Hodson, and Peter Bermel, “Modelling and Characterization of Transient Heating of High-Power Diode Lasers,” NATO Advanced Vehicles Technology Panel 270 Workshop, Utrecht, the Netherlands (October 10-11, 2017).
- [61] Peter Bermel, David Kortge, Hong Zhou, Elizabeth Grubbs, Jinhyun Noh, Peide Ye, “Ultra-wide Bandgap Semiconductor β -Ga₂O₃ Interface Engineering for Naval RF Power Electronics Applications via Atomic Layer Epitaxy,” NEPTUNE Center Program Review, Annapolis, Maryland (November 5-8, 2017).
- [62] Bermel, Peter, Zhiguang Zhou, Xingshu Sun, Yubo Sun, and Muhammad A. Alam. "Optical Modeling and Characterization of Radiative Cooling for Solar Energy Applications," OSA Light, Energy, and the Environment Congress, Boulder, CO (November 5-9, 2017).
- [63] Peter Bermel, “Selective Thermal Radiation for Sustainable Energy,” Yale University Energy & Science Institute (November 15, 2017).

Published Reviews

- [1] Jorge Bravo-Abad, Alejandro Rodriguez, Peter Bermel, Steven G. Johnson, John D. Joannopoulos, and Marin Soljacic, "Enhanced nonlinear optics in photonic-crystal nanocavities", *Optics Express* **15**, 16161 (2007).
- [2] Peter Bermel, “Turning light on a dime”, *Nature Photonics* **7**, 89-91 (2013).
- [3] Zhiguang Zhou, Qingshuang Chen, Peter Bermel, "Prospects for high-performance thermophotovoltaic conversion efficiencies exceeding the Shockley-Queisser limit," *Energy Conversion and Management* **97**, 63-69 (2015).
- [4] Peter Bermel, Svetlana V. Boriskina, Zongfu Yu, and Karl Joulain, "Control of radiative processes for energy conversion and harvesting," *Optics Express* **23**, A1533-A1540 (2015).
- [5] Svetlana Boriskina, Peter Bermel, *et al.*, “Roadmap on optical energy conversion,” *Journal of Optics* (2016).
- [6] Zhiguang Zhou, Enas Sakr, Yubo Sun, Peter Bermel, “Solar thermophotovoltaics: reshaping the solar spectrum,” *Nanophotonics* **5** (2016).

- [7] Xingshu Sun, Yubo Sun, Zhiguang Zhou, Muhammad Ashraful Alam, Peter Bermel, "Radiative sky cooling: fundamental physics, materials, structures, and applications," *Nanophotonics* (published online, July 29, 2017).

Patents Approved and Patent Applications

- [1] Rafif Hamam, Peter Bermel, Yi Xiang Yeng, Michael Ghebrebrhan, Ivan Celanovic, John D. Joannopoulos, Marin Soljagic, "Discriminating electromagnetic radiation based on angle of incidence", submitted to USPTO on July 19, 2011
- [2] Peter Bermel, Michael Ghebrebrhan, Walker Chan, Yi Xiang Yeng, Mohammad Araghchini, Rafif Hamam, Christopher H. Marton, Klavs F. Jensen, Marin Soljagic, John D. Joannopoulos, Steven G. Johnson, Ivan Celanovic, "Design and global optimization of high-efficiency thermophotovoltaic systems", submitted to USPTO in May 2010.
- [3] Michael Ghebrebrhan, Peter Bermel, Yehuda Avniel, John D. Joannopoulos, Steven G. Johnson, "Global optimization of silicon photovoltaic cell front coatings", submitted to USPTO on April 14, 2009.
- [4] Peter Bermel, John D. Joannopoulos, Chiyan Luo, "Improving Solar Cell Efficiencies Through Periodicity", published by USPTO on October 10, 2007.
- [5] Peter Bermel, Alejandro Rodriguez, John D. Joannopoulos, Marin Soljagic, "Optical devices having controlled nonlinearity", filed provisional patent with USPTO on May 2, 2007; issuance fee paid on December 19, 2012.
- [6] Peter Bermel, John D. Joannopoulos, "Pi-Phase shift device for light", submitted to USPTO on November 15, 2006; issued on May 12, 2009.
- [7] Peter Bermel, Ognjen Ilic, Walker R. Chan, Ahmet Musabeyoglu, Aviv Ruben Cukierman, Michael Robert Harradon, Ivan Celanovic, and Marin Soljagic. "High efficiency incandescent lighting." U.S. Patent 8,823,250, issued September 2, 2014.

Activities as a Referee

- | | |
|----------------|---|
| 2002 – Present | American Physical Society |
| 2008 – Present | Optical Society of America |
| 2012 – Present | Department of Energy: Basic Energy Sciences and Small Business Vouchers |

2012 – Present	Nature Photonics
2013 – Present	National Science Foundation
2016 – Present	Nature Energy
2017 – Present	University of New South Wales-Ph.D. External Reviewer

Editorial Positions

Associate Editor, *Optics Express*, Optical Society of America, Washington, DC, July 2014 - June 2020 (after renewal for 3 years).

Short Courses and Workshops Attended:

- [1] Workshop on Dielectric Linear Accelerators, sponsored by Stanford Linear Accelerator Center (SLAC), Stanford, CA, September 15, 2011. Photonics session co-chair.
- [2] Emerging Ideas Workshop on High-Efficiency, High Concentration Photovoltaics through Advanced Optical System Design, sponsored by ARPA-E, Arlington, VA, March 26, 2012. Workshop speaker.
- [3] MITRE Workshop on the Potential Threat of Future Power and Energy Technology Breakthroughs. McLean, VA, March 27-29, 2012. Workshop speaker.
- [4] Symposium on Nanomaterials for Energy. West Lafayette, IN, April 16-17, 2012. Workshop speaker.
- [5] Gavriel Salvendy Second International Symposium on Frontiers in Industrial Engineering. West Lafayette, IN, May 4-5, 2012. Security and Communications session chair.
- [6] International Workshop on Novel Ideas in Optics. West Lafayette, IN, May 31 – June 2, 2012. Contributed poster.
- [7] Challenges in PV Science, Technology, and Manufacturing. West Lafayette, IN, August 2-3, 2012. Co-organizer.
- [8] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Berkeley, CA, October 2-3, 2012. Contributed poster.
- [9] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Stanford, CA, May 6-7, 2013. Workshop speaker.
- [10] NSF NEEDS Kickoff Workshop, Cambridge, MA, May 14-15, 2013.
- [11] Brazil-US Workshop: Nanotechnology for Renewable and Sustainable Energy Materials, Denver, CO, May 22-23, 2013.

- [12] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Berkeley, CA, November 17-18, 2013. Contributed poster.
- [13] JNCASR-Purdue Workshop, Bangalore, India, January 8-9, 2014. Workshop speaker.
- [14] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Stanford, CA, May 12-13, 2014. Session chair.
- [15] NSF NEEDS Review Workshop, Berkeley, CA, June 10-12, 2014.
- [16] JNCASR-Purdue Workshop, West Lafayette, Indiana, September 17-18, 2014. Workshop speaker
- [17] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Berkeley, CA, October 6-7, 2014. Contributed poster.
- [18] OSA Incubator on Fundamental Limits of Optics for Energy. Washington, DC, November 12-14, 2014. Workshop speaker.
- [19] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN, February 25-26, 2015. Workshop Speaker.
- [20] JNCASR-Purdue Workshop on Nanomaterials for Energy, JNCASR, Bangalore, India, March 20-21, 2015. Workshop speaker.
- [21] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Stanford, CA, May 7-8, 2015. Contributed 2 posters.
- [22] NSF NEEDS Center Annual Meeting. Cambridge, MA, May 11-12, 2015.
- [23] DARPA DSO Proposer's Day. Arlington, VA, July 21-22, 2015.
- [24] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Dayton, OH, August 24-26, 2015. Workshop speaker.
- [25] nanoHUB User Conference, West Lafayette, IN, August 31 – September 1, 2015. Contributed 3 posters.
- [26] National Academy of Engineering Frontiers of Engineering Participant, September 9-11, 2015.
- [27] Purdue Quantum Center Kickoff, October 14-15, 2015.

- [28] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Berkeley, CA, October 19-20, 2015. Contributed 3 posters.
- [29] NEPTUNE Center Kickoff Event, West Lafayette, IN, November 6, 2015. Contributed talk.
- [30] Future Directions Workshop for Power and Energy, January 19-20, 2016.
- [31] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Indianapolis, IN, February 29-March 1, 2016. Contributed to an invited workshop talk.
- [32] Bay Area Photovoltaic Consortium Bi-Annual Meeting. Stanford, CA, May 16-17, 2016. Contributed 2 posters.
- [33] NEEDS Annual Meeting and Review, Stanford, CA, May 18-19, 2016. Contributed poster.
- [34] NEPTUNE Center Bi-Annual Meeting, Tempe, AZ, May 23-25, 2016. Contributed talk and poster.
- [35] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN, August 24-25, 2016. Contributed talk.
- [36] Bay Area Photovoltaic Consortium Bi-Annual Meeting, Berkeley, CA, October 3-4, 2016. Contributed poster.
- [37] DuraMat Workshop, Golden, CO, October 10-11, 2016. Contributed poster.
- [38] NG NEXT Physics of Light-Matter Interaction Workshop, Redondo Beach, CA, October 25-27, 2016. Contributed talk and served as panelist.
- [39] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, Torrance, CA, February 1-2, 2017. Contributed to an invited workshop talk.
- [40] NEPTUNE Center Program Review, Cambridge, MA, May 9-11, 2017. Contributed talk and poster.
- [41] Center for Integrated Thermal Management of Aerospace Vehicles Semiannual Meeting, West Lafayette, IN, September 27-28, 2017. Contributed to an invited workshop talk.

- [42] NATO Advanced Vehicles Technology Panel 270 Workshop, Utrecht, the Netherlands, October 10-11, 2017. Gave an invited workshop talk.
- [43] IEEE Frontiers in Engineering Conference NSF Funding Workshop, Indianapolis, Indiana, October 18-21, 2017. Actively participated in workshop, and led breakout group during event.