

# Lee A. Weinstein

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## Massachusetts Institute of Technology

Sept. 2017

PhD in Mechanical Engineering      GPA: 5.00/5.00

Major: Energy Science and Engineering; Minor: Education

Thesis title: Improving Solar Thermal Receiver Performance  
via Spectral and Directional Selectivity

Research advisor: Gang Chen

Sept. 2013

MS in Mechanical Engineering      GPA: 5.00/5.00

Thesis title: Improvements to Solar Thermoelectric Generators  
through Device Design

Research advisor: Gang Chen

## University of California, Berkeley

May 2011

BS in Mechanical Engineering      GPA: 3.97/4.00

## Educational Experience

2019 - Present

**Principal Scientist — Brilliant.org**

2017 - 2019

**Science Quiz Writer**

I write science, engineering, and computer science content for [brilliant.org](https://brilliant.org), which provides online STEM education. I've worked on courses and challenges covering a wide range of topics including solar energy, scientific thinking, and cryptocurrency. I design my lessons to be broadly accessible without sacrificing technical accuracy.

2018 - Present

**Tutor — Signet Education**

I work as a subject tutor for Signet Education, covering a variety of technical subjects including math, chemistry, physics, and engineering. While the primary goal of subject tutoring is to improve a student's understanding and grades in the relevant course, I also strive to instill a passion for learning and an appreciation of science and math in my students.

2018 - 2019

**Production Lead — Principles of Manufacturing MicroMasters**

I helped facilitate and develop the Manufacturing Process Control and Management in Engineering courses for the Principles of Manufacturing MicroMasters program ([micromasters.mit.edu/pom](https://micromasters.mit.edu/pom)).

- 2014 – 2017      **Mentor – MITxplore**  
As a mentor for MITxplore ([mitxplore.org](http://mitxplore.org)) I worked with about ten 4th – 6th grade students per semester during weekly math outreach sessions. I also developed lessons to make complex math topics accessible and engaging for young students.
- Spring 2016      **Teaching Assistant – 2.55: Advanced Heat and Mass Transfer**  
I was a teaching assistant for course 2.55 (graduate level heat transfer) at MIT. I organized and led recitation sessions, office hours and exam review. I earned an overall rating of 6.8/7 on my course evaluations in this position.

## Selected Research Experience

- 2015 – 2018      **Solar-Thermal Aerogel Receiver – MIT**  
I was part of a team that developed a novel solar-thermal aerogel receiver, which achieves efficient solar to thermal conversion using transparent silica aerogel. I modeled system performance as well as fabricated and characterized experimental prototypes of the receiver.
- 2012 – 2015      **Macroscale Optical Cavity for Solar Receivers – MIT**  
I designed an optical cavity to reduce radiative losses from solar receivers. As part of this project, I programmed a ray tracing code to predict cavity performance and experimentally demonstrated reduced thermal losses from a receiver at elevated temperature. I also used ray tracing to show an improvement in absorption of photovoltaic cells with the cavity.
- 2011 – 2015      **Solar Thermoelectric Generator (STEG) – MIT**  
I helped design an improved efficiency STEG using optical concentration and modeled the device efficiency using heat transfer analysis. I tested a prototype STEG with integrated thermal storage.
- 2010 – 2011      **Energy scavenger from fluid flow – UC Berkeley**  
I helped develop a piezoelectric energy scavenger for use in HVAC ducts. My work on the project improved power output from 3  $\mu$ W to 2 mW, or approximately 700x increased performance. I modeled the fluid dynamics and solid mechanics of the system to optimize design, prototyped a variety of designs and completed performance and fatigue testing on prototypes.

# Publications

1. L. A. Weinstein, K. McEnaney, E. Strobach, S. Yang, B. Bhatia, L. Zhao, Y. Huang, J. Loomis, F. Cao, S. V. Boriskina, Z. Ren, E. N. Wang and G. Chen. "A Hybrid Electric and Thermal Solar Receiver." *Joule*, 2018.
2. K. McEnaney, L. Weinstein, D. Kraemer, H. Ghasemi and G. Chen. "Aerogel-based solar thermal receivers." *Nano Energy*, **40**, 180-186, 2017.
3. D. Kraemer, Q. Jie, K. McEnaney, F. Cao, W. Liu, L.A. Weinstein, J. Loomis, Z. Ren and G. Chen. "Concentrating solar thermoelectric generators with a peak efficiency of 7.4%" *Nature Energy*, **1**, 16153, 2016.
4. S.V. Boriskina, L.A. Weinstein, J.K. Tong, W.C. Hsu and G. Chen. "Hybrid Optical-Thermal Antennas for Enhanced Light Focusing and Local Temperature Control." *ACS Photonics*, **3** (9), 1714-1722, 2016.
5. L.A. Weinstein, J. Loomis, B. Bhatia, D.M. Bierman, E.N. Wang and G. Chen. "Concentrating Solar Power." *Chemical Reviews*, **115** (23), 12797-12838, 2015.
6. J. Loomis, L. Weinstein, S.V. Boriskina, X. Huang, V. Chiloyan and G. Chen. "Diverging polygon-based modeling (DPBM) of concentrated solar flux distributions." *Solar Energy*, **122**, 24-35, 2015.
7. L.A. Weinstein, W.C. Hsu, S. Yerci, S.V. Boriskina, G. Chen, "Enhanced absorption of thin-film photovoltaic cells using an optical cavity," *Journal of Optics*, **17** (5), 055901, 2015.
8. L. Weinstein, D. Kraemer, K. McEnaney, G. Chen, "Optical cavity for improved performance of solar receivers in solar-thermal systems," *Solar Energy*, **108**, 69-79, 2014.
9. L.A. Weinstein, K. McEnaney, G. Chen, "Modeling of thin-film solar thermoelectric generators," *Journal of Applied Physics*, **113** (16), 164504, 2013.
10. L.A. Weinstein, M.R. Cacan, P.M. So, P.K. Wright, "Vortex shedding induced energy harvesting from piezoelectric materials in heating, ventilation and air conditioning flows," *Smart Materials and Structures*, **21** (4), 045003, 2012.
11. J. Bakhshi, L. Weinstein, K.S. Poksay, B. Nishinaga, D.E. Bredesen, R.V. Rao, "Coupling endoplasmic reticulum stress to the cell death program in mouse melanoma cells: effect of curcumin," *Apoptosis*, **13** (7), 904-914, 2008.

# Published Conference Proceedings

1. L.A. Weinstein, D.M. Bierman, E.N. Wang and G. Chen, "Directional selectivity as an alternative to concentration for high efficiency solar thermal systems," TFESC-12752, ASTFE Thermal and Fluid Engineering Summer Conference, August 9-12, 2015, New York City, NY

## Conference Presentations

1. L. Weinstein, T. Cooper, S. Yang, B. Bhatia, L. Zhao, E. Strobach, G. Ni, S. Boriskina, E. Wang and G. Chen, "On-sun demonstration of a Solar-Thermal Aerogel Receiver (STAR)," MRS-ES09.10.05, MRS Fall Meeting, November 26 - December 1, 2017, Boston, MA.
2. L.A. Weinstein, V. Chiloyan, T.A. Cooper, S.V. Boriskina and G. Chen, "Limit to the spectral selectivity of a passive radiative surface based on the Kramers-Kronig relations," HT2017-4837, ASME Summer Heat Transfer Conference, July 9 - 12, 2017, Seattle, WA.
3. L. Weinstein, V. Chiloyan, S. Boriskina and G. Chen, "Limit on the Performance of Spectrally Selective Surfaces for Solar Applications," MRS-NM4.6.04, MRS Fall Meeting, November 27 - December 2, 2016, Boston, MA
4. L. Weinstein, S. Fay, C. Douglas, C. Jiang, A. Hosoi and C. Clanet, "Dribbling as a Particle-Particle Interaction," Sports Physics, June 8 - June 10, 2016, Paris, France
5. L. Weinstein, S. Yang, L. Zhao, B. Bhatia, E. Strobach, D. Bierman, T. Cooper, L. Meroueh, S.B. Boriskina, E.N. Wang and G. Chen, "A Solar-Thermal Aerogel Receiver (STAR) for Cost-Effective Electricity Generation," MRS-EE3.1.08, MRS Spring Meeting, March 28 - April 1, 2016, Phoenix, AZ
6. L. Weinstein, J. Loomis, X. Huang, S. Yang, L. Zhao, Y. Huang, F. Cao, T. Sun, B. Bhatia, D. Bierman, E. Strobach, W.C. Hsu, G. Ni, L. Tang, S. Boriskina, Z. Ren, E. Wang and G. Chen, "Hybrid PV and Thermal Solar Receiver Using Silica Aerogel and Thin-Film Multi-Layer Spectral Splitting," MRS-OO11.02, MRS Fall Meeting, November 29 - December 4, 2015, Boston, MA
7. K. McEnaney, D. Kraemer, L.A. Weinstein, Q. Jie, W.S. Liu, F. Cao, Z. Ren and G. Chen, "Demonstrated high efficiency of concentrating solar thermoelectric generators," MRS-CC8.01, MRS Fall Meeting, November 30 - December 5, 2014, Boston, MA
8. L.A. Weinstein, W.C. Hsu, S. Boriskina and G. Chen, "External Cavity for Enhanced Absorption in Thin-Film Photovoltaics", ES-FuelCell2014-6865, ASME International Conference on Energy Sustainability, June 30 - July 2, 2014, Boston, MA

9. L.A. Weinstein, D. Kraemer, K. McEnaney and G. Chen, "Angularly dependent emissivity using optical cavities", IMECE2013-64894, ASME International Conference and Exhibition, November 15 - 21, 2013, San Diego, CA

## Patents

1. G. Chen, E.N. Wang, S.V. Boriskina, L.A. Weinstein, S. Yang, B. Bhatia, L. Zhao, E.M. Strobach, T.A. Cooper, D.M. Bierman, X. Huang, J. Loomis. Solar Thermal Aerogel Receiver, Application #: US 62/299,090
2. G. Chen, E.N. Wang, S.V. Boriskina, K. McEnaney, H. Ghasemi, S. Yerci, A. Lenert, S. Yang, N. Miljkovic, L.A. Weinstein, D. Bierman. Internally-Heated Thermal and Externally-Cool Photovoltaic Cascade Solar Energy System for Full Solar Spectrum Utilization, Application #: US 14/464,103
3. S. Boriskina, D. Kraemer, K. McEnaney, L.A. Weinstein, G. Chen. Solar power conversion system with directionally-and spectrally-selective properties based on a reflective cavity, Application #: US 13/972,261

## Selected Leadership and Service

2013 – 2017	Webmaster, MITxplore, MIT
2014 – 2017	Graduate Member at Large, Intramural Executive Board, MIT
2015 – 2017	Member, DAPER Advisory Board, MIT
2015	Intramural Chair, Graduate Association of Mechanical Engineers, MIT
2014	President, Graduate Association of Mechanical Engineers, MIT
2012	Orientation Chair, Graduate Association of Mechanical Engineers, MIT
2010 – 2011	Student Relations Officer, Tau Beta Pi, UC Berkeley
Spring 2011	Student Relations Chair, Pi Tau Sigma, UC Berkeley

## Awards and Honors

2017	Harold J. Pettegrove Award
2015	MIT Mechanical Engineering Research Exhibition – Audience Choice Award
2011 – 2012	Warren M. Rohsenow Fellowship recipient
2011, 2012	National Science Foundation GRFP Honorable Mention
Spring 2011	Pi Tau Sigma – Officer of the Semester
2007 – 2011	Regents' and Chancellor's Scholar