

Sean Lubner, Ph.D.

Assistant Professor, Boston University
Mechanical Engineering, Materials Science & Engineering
slubner@bu.edu

Appointments & Experience

Assistant Professor 2022–Present	<i>Boston University (BU)</i> Mechanical Engineering, Materials Science & Engineering
Research Scientist 2021–2022	<i>Massachusetts Institute of Technology (MIT)</i> Research Laboratory of Electronics (RLE)
Research Scientist 2018–2021	<i>Lawrence Berkeley National Laboratory (LBNL)</i> (Seaborg Research Fellow) Energy Storage & Distributed Resources; Energy Technologies Area (ETA)
Postdoc 2016–2018	<i>Lawrence Berkeley National Laboratory (LBNL)</i> Energy Storage & Distributed Resources; Energy Technologies Area (ETA) Advisor: Dr. Ravi Prasher

Education

Ph.D. 2011–2016	<i>University of California, Berkeley</i> (NSF Fellow) Mechanical Engineering Major: Heat Transfer, Minors: Analysis, Solid State Physics Thesis Advisor: Prof. Chris Dames
B.S. 2007–2011	<i>Carnegie Mellon University</i> Applied Physics, Mechanical Engineering, minor in Philosophy

Journal Publications & Book Chapters (* denotes co-corresponding authors)

1. Y. Zeng, *et al.*, “Nonintrusive thermal-wave sensor for operando quantification of degradation in commercial batteries,” *Nature Communications* **14** 8203 (2023).
2. Y. Zeng, B. Zhang, Y. Fu, F. Shen, Q. Zheng, D. Chalise, R. Miao, S. Kaur, **S. D. Lubner**, M. Tucker, V. Battaglia, C. Dames, and R. S. Prasher, “Extreme fast charging of commercial Li-ion batteries via combined thermal switching and self-heating approaches,” *Nature Communications* **14** 3229 (2023).
3. D. Chalise, A. Saxon, Y. Zeng, V. Srinivasan, **S. D. Lubner**, M. Keyser, and R. S. Prasher, “Non-invasive accurate time resolved inverse battery calorimetry,” *Energy Storage Materials* **60** 102810 (2023).
4. D. Chalise, R. Jonson, J. Schaadt, P. Barai, Y. Zeng, S. Kaur, **S. D. Lubner**, V. Srinivasan, M. Tucker, and R. S. Prasher, “Using Thermal Interface Resistance for Noninvasive Operando Mapping of Buried Interfacial Lithium Morphology in Solid-State Batteries,” *ACS Applied Materials & Interfaces* **15**, **13** (2023).
5. V. Baibakova, M. Elzouka, **S. D. Lubner**, R. Prasher, A. Jain, “Optical emissivity dataset of multi-material heterogeneous designs generated with automated figure extraction,” *Scientific data* **9**, (2022).

6. X. Huang, Y. Xie, M. Balooch, **S. D. Lubner**, Peter Hosemann, “Helium implantation in Si (100): Swelling, microstructure, and mechanical property changes,” *Journal of Applied Physics* **132**, 025106 (2022).
7. **S. D. Lubner*** and R. S. Prasher*, “Combined heat and electricity using thermal storage to decarbonize buildings and industries,” *One Earth* **5** (2022).
8. Y. Zeng, D. Chalise, Y. Fu, J. Schaadt, S. Kaur, V. Battaglia, **S. D. Lubner***, R. S. Prasher*, “Operando spatial mapping of lithium concentration using thermal-wave sensing,” *Joule* **5** 8 (2021).
9. D. Lilley, A. K. Menon, S. Kaur, **S. D. Lubner**, R. S. Prasher, “Phase Change Materials for Thermal Energy Storage: A Perspective on Linking Phonon Physics to Performance,” *Journal of Applied Physics* **22**, 220903 (2021).
 - Front cover featured article & Editor’s Pick. PR: <https://phys.org/news/2021-12-phase-materials-thermal-energy-storage.html>
10. Y. Zeng, D. Chalise, **S. D. Lubner**, S. Kaur, R. S. Prasher, “A review of thermal physics and management inside lithium-ion batteries for high energy density and fast charging,” *Energy Storage Materials* **41**, 264 (2021).
11. Y. Gao, Q. Zheng, J. C. Jonsson, **S. D. Lubner**, C. Curcija, L. Fernandes, S. Kaur, C. Kohler, “Parametric study of solid-solid translucent phase change materials in building windows,” *Applied Energy* **301**, 117467 (2021).
12. P. Paul *et al.*, “A Review of Existing and Emerging Methods for Lithium Detection and Characterization in Li-Ion and Li-Metal Batteries,” *Advanced Energy Materials*, **11**(17), 2100372 (2021).
13. M. Elzouka, C. Yang, A. Albert, R. S. Prasher*, **S. D. Lubner***, “Interpretable Forward and Inverse Design of Particle Spectral Emissivity Using Common Machine-Learning Models,” *Matter (Cell Reports Physical Science)*, **1** (12), 100259 (2020).
14. **S. D. Lubner**, S. Kaur, Y. Fu, V. Battaglia, R. S. Prasher, “Identification and Characterization of the Dominant Thermal Resistance in Lithium-Ion Batteries Using Operando 3-Omega Sensors,” *Journal of Applied Physics* **127**, 105104 (2020).
15. A. K. Menon, I. Haechler, S. Kaur, **S. D. Lubner**, R. S. Prasher, “Enhanced Solar Evaporation Using a Photo-Thermal Umbrella: Towards Zero Liquid Discharge Wastewater Management,” *Nature Sustainability* **3**, 144 (2020).
16. C. Fang, Z. Liu, J. Lau, M. Elzouka, G. Zhang, P. Khomein, **S. D. Lubner**, P. N. Ross, G. Liu, “Gradient Polarity Solvent Wash for Separation and Analysis of Electrolyte Decomposition Products on Electrode Surfaces,” *Journal of The Electrochemical Society* **167**, 020506 (2020).
17. M. I. Khan, **S. D. Lubner**, D. F. Ogletree, E. Wong, C. Dames, “Temperature Dependence of Secondary Electron Emission: A New Route to Nanoscale Temperature Measurement Using Scanning Electron Microscopy,” *Journal of Applied Physics* **124**, 195104 (2018).
18. H. Natesan, J. Choi, **S. D. Lubner**, C. Dames, and J. Bischof, “Multi-scale Thermal Conductivity Measurements for Cryobiological Applications,” in *Multiscale Technologies for Cryomedicine: Implementation from Nano to Macroscale*, Chapter 5, 125-171 (2016).

19. H. Natesan, W. Hodges., J. Choi., **S. D. Lubner.**, C. Dames, and J. Bischof, “A Micro-Thermal Sensor for Focal Therapy Applications,” *Scientific Reports* **6**, 21395 (2016).
20. **S. D. Lubner**, J. Choi, G. Wehmeyer, B. Waag, V. Mishra, H. Natesan, J. C. Bischof, and C. Dames, “Reusable Bi-Directional 3ω Sensor to Measure Thermal Conductivity of 100- μm Thick Biological Tissues,” *Review of Scientific Instruments* **86**, 014905 (2015).
21. J. Choi, **S. D. Lubner**, H. Natesan, Y. Hasegawa, A. Fong, C. Dames, and J. C. Bischof, “Thermal Conductivity Measurements of Thin Biological Tissues Using a Microfabricated 3-Omega Sensor,” *Journal of Medical Devices*, **7.2** (2013).

Selected Awards & Honors

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| 2024 | Air Force Office of Scientific Research (AFOSR) Young Investigator Program (YIP) Awardee |
| 2023 | Dean’s Catalyst Award (Boston University) |
| 2018 | Early Career LDRD research grant recipient, LBNL (1 of 6 out of ~100 applicants) |
| 2016 | The Institution of Engineering and Technology PATW Winner (1 st place winner out of ~350+; multi-round international technical presenting & public speaking competition) |
| 2014 | Outstanding TA Award, UC Berkeley (top 9% of 2,000+) |
| 2012 | NSF GRFP – National Science Foundation Fellowship (top 10% of 20,000+) |
| 2012 | Hertz Fellowship Finalist (top 8% of 600+) |
| 2009–2011 | Awards & Honors from Carnegie Mellon University: Rowing Team Captain, Forstall Award for Excellence in Mech. Eng. (top 3% of 100+), Mech. Eng. Departmental Research Honors, Senior Leadership Recognition Award, University Honors, Boeing Scholarship, Undergraduate Teaching Fellow |

Patents (full and provisional; filed & pending)

1. “Blackbody emitters for thermal radiative energy transport,” Application No. 63/623,424, Jan. 2024.
2. “Passive carbon capture device using solar energy,” Docket No. 00012-086WO1, Nov 2023.
3. “Conductive ceramic composites for high temperature thermal energy storage,” Application No. PCT/US2023/34304, Oct. 2022.
 - **Licensed by independent company**, Nov. 2023
4. “Nanoparticle composites for use as an insulation and methods of making thereof,” Application No. 63/426,838, Nov. 2022
 - **Licensed by independent company**, Jan. 2023
5. “Prediction of battery failure through thermal signatures,” Docket No. SD15906.0/S174378, July 2023.
6. “System and method for determining a spatial thermal property profile of a sample,” U.S. Patent 9,851,316. Dec. 2017.
7. Patents (and subsequent follow-on patents) awarded for work done at Apple on iPad, iPad accessories, and Mac desktop accessories. Individual patent numbers as of March 2020:
 8,264,310 | 8,390,411 | 8,143,982 | 8,143,983 | 8,344,836 | 8,390,413 | 8,576,031 |
 8,395,465 | 8,253,518 | 8,138,869 | 8,884,730 | 8,390,412 | 8,242,868 | 8,665,044 |
 8,514,042 | 8,665,045 | 8,648,679 | 8,928,437 | 9,329,630 | 10,236,106 | 9,568,954 |
 9,851,316 | 10,580,556 | 8,289,114

Invited Talks and Seminars

1. “High Temperature Thermal Energy for Long Duration Energy Storage and Complete Decarbonization,” *Molecular Foundry Annual User Meeting*, Berkeley, CA, 2022.
2. “Forward and Inverse Design of Spectral Emissivity using Machine Learning Models,” *Materials Research Society (MRS) Fall Meeting*, virtual, 2021.
3. “New Cooperative Adsorbents and Regeneration Methods for the Efficient Removal of CO₂ from Air,” *Carbon Negative Initiative Forum*, virtual, 2021.
4. “Bespoke *Operando* Thermal Wave Sensors: Biological & Gas Signature Measurements and Failure Detection in Deployed Electrical Systems,” *Defense Threat Reduction Agency (DTRA)*, virtual, 2021.
5. “Designing Thermal Energy Storage Materials from 20°C to 2,000°C,” *Beyond Lithium-Ion XIII Conference*, virtual, 2021.
6. Internet talk show interview, “Why Renewable Energy Needs Better Energy Storage to Succeed,” *ThinksWithTwitch*, 2020. Available online: <https://youtu.be/SYBHHER75OY>
7. Seminar, “Energy Storage Solutions for a Clean Energy Future,” *Midday Science Cafe* (2020). Available online: <https://youtu.be/xX0EouD-nao>
8. Departmental seminar, “Controlling Photons and Phonons for Energy Storage and Thermal Design,” Carnegie Mellon University, Pittsburgh, PA, 2020.
9. Seminar, “Engineering Heat for Clean Energy Technologies,” University of Washington, Seattle, WA, 2019.

Conference Papers and Presentations (* indicates presenter)

1. **S. D. Lubner***, M. Elzouka, C. Yang, A. Singh, M. Park, C. Guo, A. Albert, V. Zorba, and R. S. Prasher, “*Forward and Inverse Design of Spectral Emissivity Using Common Machine-Learning Models*,” *Summer Heat Transfer Conference (SHTC)*, Philadelphia, PA, 2022.
2. **S. D. Lubner***, S. Kaur, Y. Fu, V. Battaglia, R. Prasher, “*Operando Measurements of the Dominant Thermal Resistance in Li-Ion Batteries*,” *ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK)*, Anaheim, CA, 2019.
3. **S. D. Lubner**, S. Kaur*, R. S. Prasher, “*New and emerging applications of nanoscale thermal science and engineering*,” *Proceedings of the 16th International Heat Transfer Conference (IHTC)*, Beijing, China, 2018.
4. **S. D. Lubner***, S. Kaur, Y. Fu, V. Battaglia, R. Prasher, “*In-Operando Thermal Diagnostics of Lithium-Ion Batteries*,” *ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK)*, San Francisco, CA, 2018.
5. **S. D. Lubner***, S. Kaur, K. Shah, Y. Fu, A. Jain, V. Battaglia, R. Prasher, “*In-Situ Thermal Characterization of Lithium-Ion Batteries*,” *ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK)*, San Francisco, CA, 2017.

6. **S. D. Lubner***, S. Kaur, K. Shah, Y. Fu, V. Battaglia, R. Prasher, “Characterizing and Engineering Nanoscale Thermal Interfaces for Advanced Thermal Insulation and Lithium-Ion Batteries,” *9th US-Japan Joint Seminar on Nanoscale Transport Phenomena*, Tokyo, Japan, 2017.
7. **S. D. Lubner***, M. I. Khan, C. Dames, “Measurements Of The Effects Of Grain Boundary And Alloy Scattering On Spectral Phonon Mean Free Path Distributions,” *American Physical Society (APS) March Meeting*, New Orleans, LA, March 2017.
8. **S. D. Lubner***, S. Kaur, J. Franklin, K. Shah, Y. Fu, V. Battaglia, D. F. Ogletree, R. Prasher, “Nanometer-Scale Measurements of Battery Cathode Interfacial Thermal Transport Physics,” *Molecular Foundry User Meeting*, Berkeley, CA, 2017.
9. **S. D. Lubner***, J. Choi, B. Waag, H. Natesan, J. C. Bischof and C. Dames, “A New Technique for Measuring Thermal Conductivity of Sub-Millimeter Biological Tissues,” *ASME NanoEngineering for Medicine and Biology (NEMB)*, San Francisco, CA, February 2014.
 - One of 18 out of 88 poster presenters chosen as a finalist to give a “lightning round” oral presentation; 2nd place winner of lightning round
10. M. I. Khan*, **S. D. Lubner**, C. Dames, “Temperature Mapping Using Scanning Electron Microscopy,” *Materials Research Society (MRS) Spring Meeting*, San Francisco, CA, April 2015.
11. **S. D. Lubner***, J. Choi, Y. Hasegawa, A. Fong, J. C. Bischof and C. Dames, “Measurements of the Thermal Conductivity of Sub-Millimeter Biological Tissues,” *ASME International Mechanical Engineering Congress and Exposition (IMECE)*, Houston, TX, November 2012.
12. **S. D. Lubner***, J. Sierra, C. F. Higgs III, “Numerical Modeling of the Soft Elastohydrodynamic Tribosystems,” *Carnegie Mellon University’s Meeting Of The Minds Symposium*, Pittsburgh, PA, May 2011.

Service, Teaching, and Outreach

Reviewed Journal Papers For:

Nature Communications	Europhysics Letters (EPL)
Applied Physics Letters (APL)	International Journal of Thermal Sciences (IJTS)
PLOS ONE (Public Library of Science)	Engineered Science (ES) Energy and Environment
Journal of Applied Physics (JAP)	Energies
Nano Letters	InterPACK
Journal of Physics D: Applied Physics	Applied Sciences
Journal of The Electrochemical Society (JES)	International Journal of Heat and Mass Transfer (JHMT)
Electrochemical Society (ECS) Journal of Solid State Science and Technology	
Nanoscale and Microscale Thermophysical Engineering	

Conference and Workshop Organization:

- Session co-chair for Materials Research Society (MRS) Fall Meeting 2021 virtual session.
- Track co-chair for ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK), 2020
- Session co-chair for ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK), 2019
- LBL Instrumentation colloquium co-organizer, 2019

- LBL Computing Sciences + Energy Technologies inter-area Energy Probe workshop session co-organizer, 2019

Teaching:

2022–Present	Assistant Professor	<i>Boston University</i>
Energy and Thermodynamics (ME304 – undergraduate course)		
	Semester	# Responses
	Fall 2022	17
	Spring 2023	29
	Fall 2023	28
2014	Graduate Student Instructor (TA)	<i>UC Berkeley</i>
	<ul style="list-style-type: none"> • Undergraduate course: Advanced Heat Transfer • Overall student rating: 4.6 / 5.0 (92%) 	
2013	Graduate Student Instructor (TA)	<i>UC Berkeley</i>
	<ul style="list-style-type: none"> • Graduate course: Microscale Thermophysics and Heat Transfer • (Official student rating feedback not collected – high praise anecdotally) 	
2009–2010	Undergraduate Teaching Fellow	<i>Carnegie Mellon University</i>
	<ul style="list-style-type: none"> • Undergraduate course: Introduction to Mechanical Engineering 	
2008–2009	Undergraduate Teaching Assistant	<i>Carnegie Mellon University</i>
	<ul style="list-style-type: none"> • Undergraduate course: Experimental Physics 	

Outreach:

2012–2016	Elementary School Science Mentor Volunteer	<i>UC Berkeley</i>
	<ul style="list-style-type: none"> • Club President: 2013-2014 • Design, build, and teach interactive and hands-on science lessons at La Escuelita Elementary School in Oakland, CA 	
2015	Invited Demo & Presentation: “The Micro World”	<i>California Academy of Sciences</i>