# Austin J. Minnich

Professor of Mechanical Engineering and Applied Physics

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### Professional Preparation

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| 2006 | B.S. | University of California, Berkeley |
| 2008 | S.M. | Massachusetts Institute of Technology |
| 2011 | Ph.D. | Massachusetts Institute of Technology |

### Appointments

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| 2017 - Present | Professor, California Institute of Technology |
| 2011 - 2017 | Assistant Professor, California Institute of Technology |

### Awards and Honors

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| 2019 | Presidential Early Career Award for Scientists and Engineers (PECASE) |
| 2017 | Junior Prize, International Photoacoustic and Photothermal Association |
| 2017 | ASME Bergles-Rohsenow Young Investigator Award in Heat Transfer |
| 2017 | ONR Director of Research Award |
| 2015 | ONR Young Investigator Award |
| 2013 | NSF CAREER Award |

### Research Interests

Low noise microwave amplifiers, microwave and millimeter wave instrumentation, quantum-limited measurement, superconducting quantum devices

## Publications

### Submitted papers


1. Choi, A. Y., I. Esho, B. Gabritchidze, J. Kooi, and A. J. Minnich. Characterization of self-heating in cryogenic high electron mobility transistors using Schottky thermometry. *Journal of Applied Physics* **(In press)** (2021). https://arxiv.org/abs/2105.11571.
2. Esho, I., A. Y. Choi, and A. J. Minnich. Theory of drain noise in high electron mobility transistors based on real-space transfer. *arXiv* (2021). https://arxiv.org/abs/2108.03370.
3. Kamakari, H., S.-N. Sun, M. Motta, and A. J. Minnich. Digital quantum simulation of open quantum systems using quantum imaginary time evolution. *arXiv (accepted to PRX Quantum)* (2021). https://arxiv.org/abs/2104.07823.
4. Kim, T., S. X. Drakopoulos, S. Ronca, and A. J. Minnich. Origin of high thermal conductivity in disentangled ultra-high molecular weight polyethylene films: ballistic phonons within enlarged crystals. *arXiv* (2021). https://arxiv.org/abs/2111.11318.
5. Tan, A. T. K., S.-N. Sun, R. N. Tazhigulov, G. K.-L. Chan, and A. J. Minnich. Realizing symmetry-protected topological phases in a spin-1/2 chain with next-nearest neighbor hopping on superconducting qubits. *arXiv* (2021). https://arxiv.org/abs/2112.10333.
6. Kim, T., J. Moon, and A. J. Minnich. Origin of micron-scale propagation lengths of heat-carrying acoustic excitations in amorphous silicon. *arXiv* (2020). https://arxiv.org/abs/2007.15777.

7. Motta, M., E. Ye, J. R. McClean, Z. Li, A. J. Minnich, R. Babbush, and G. K.-L. Chan. Low rank representations for quantum simulation of electronic structure. *arXiv* (2018). https://arxiv.org/abs/1808.02625.

## Refereed Journal Publications

1. Choi, A. Y., P. S. Cheng, B. Hatanpää, and A. J. Minnich. Electronic noise of warm electrons in semiconductors from first principles. *Physical Review Materials* **5**(4) (2021), 044603. https://link.aps.org/doi/10.1103/{PhysRevMaterials}.5.044603.
2. Sun, S.-N., M. Motta, R. N. Tazhigulov, A. T. Tan, G. K.-L. Chan, and A. J. Minnich. Quantum Computation of Finite-Temperature Static and Dynamical Properties of Spin Systems Using Quantum Imaginary Time Evolution. *PRX Quantum* (2021). https://journals.aps.org/prxquantum/abstract/10.1103/{PRXQuantum}.2.010317.
3. Gao, Y., Q. Sun, J. M. Yu, M. Motta, J. McClain, A. F. White, A. J. Minnich, and G. K.-L. Chan. Electronic structure of bulk manganese oxide and nickel oxide from coupled cluster theory. *Physical Review B* (2020). https://journals.aps.org/prb/abstract/10.1103/{PhysRevB}.101.165138.
4. Sun, B. et al. High frequency atomic tunneling yields ultralow and glass-like thermal conductivity in chalcogenide single crystals. *Nature Communications* **11**(1) (2020), 6039. http://www.nature.com/articles/s41467-020-19872-w.
5. Cheng, P., N. Shulumba, and A. J. Minnich. Thermal transport and phonon focusing in complex molecular crystals: Ab initio study of polythiophene. *Physical Review B* **100**(9) (2019), 094306. https://link.aps.org/doi/10.1103/{PhysRevB}.100.094306.
6. Hua, C., L. Lindsay, X. Chen, and A. J. Minnich. Generalized Fourier's law for nondiffusive thermal transport: Theory and experiment. *Physical Review B* **100**(8) (2019), 085203. https://link.aps.org/doi/10.1103/{PhysRevB}.100.085203.
7. Manley, M. E., O Hellman, N Shulumba, A. F. May, P. J. Stonaha, J. W. Lynn, V. O. Garlea, A Alatas, R. P. Hermann, J. D. Budai, H Wang, B. C. Sales, and A. J. Minnich. Intrinsic anharmonic localization in thermoelectric PbSe. *Nature Communications* **10**(1) (2019), 1928. http://dx.doi.org/10.1038/s41467-019-09921-4.
8. Moon, J., R. P. Hermann, M. E. Manley, A. Alatas, A. H. Said, and A. J. Minnich. Thermal acoustic excitations with atomic-scale wavelengths in amorphous silicon. *Physical Review Materials* **3**(6) (2019), 065601. https://link.aps.org/doi/10.1103/{PhysRevMaterials}.3.065601.
9. Motta, M., C. Sun, A. T. K. Tan, M. J. O, E. Ye, A. J. Minnich, F. G.S. L. Brandão, and G. K.-L. Chan. Determining eigenstates and thermal states on a quantum computer using quantum imaginary time evolution. *Nature physics* (2019). http://www.nature.com/articles/s41567-019-0704-4.
10. Robbins, A. B., S. X. Drakopoulos, I. Martin-Fabiani, S. Ronca, and A. J. Minnich. Ballistic thermal phonons traversing nanocrystalline domains in oriented polyethylene. *Proceedings of the National Academy of Sciences of the United States of America* **116**(35) (2019), 17163–17168. http://dx.doi.org/10.1073/pnas.1905492116.
11. Thomas, N. H., M. C. Sherrott, J. Broulliet, H. A. Atwater, and A. J. Minnich. Electronic Modulation of Near-Field Radiative Transfer in Graphene Field Effect Heterostructures. *Nano Letters* **19**(6) (2019), 3898–3904. http://dx.doi.org/10.1021/acs.nanolett.9b01086.
12. Ye, E. and A. J. Minnich. Ab initio based investigation of thermal transport in superlattices using the Boltzmann equation: Assessing the role of phonon coherence. *Journal of applied physics* **125**(5) (2019), 055107. http://aip.scitation.org/doi/10.1063/1.5075481.
13. Chen, X., C. Hua, H. Zhang, N. K. Ravichandran, and A. J. Minnich. Quasiballistic Thermal Transport from Nanoscale Heaters and the Role of the Spatial Frequency. *Phys Rev Appl* **10**(5) (2018), 054068. https://link.aps.org/doi/10.1103/{PhysRevApplied}.10.054068.
14. DeAngelis, F., M. G. Muraleedharan, J. Moon, H. R. Seyf, A. J. Minnich, A. J. H. McGaughey, and A. Henry. Thermal transport in disordered materials. *Nanoscale & Microscale Thermophysical Eng.* (2018), 1–36. https://www.tandfonline.com/doi/full/10.1080/15567265.2018.1519004.

15. Dou, N. G., R. A. Jagt, C. M. Portela, J. R. Greer, and A. J. Minnich. Ultralow thermal conductivity and mechanical resilience of architected nanolattices. *Nano Lett* **18**(8) (2018), 4755–4761. http://pubs.acs.org/doi/10.1021/acs.nanolett.8b01191.

16. Guo, R., Y.-D. Jho, and A. J. Minnich. Coherent control of thermal phonon transport in van der Waals superlattices. *Nanoscale* **10** (2018), 14432 –14440. http://dx.doi.org/10.1039/c8nr02150c.

17. Hua, C. and A. J. Minnich. Heat dissipation in the quasiballistic regime studied using the Boltzmann equation in the spatial frequency domain. *Phys. Rev. B* **97** (1 2018), 014307. https://link.aps.org/doi/10.1103/PhysRevB.97.014307.

18. Ilic, O., N. H. Thomas, T. Christensen, M. C. Sherrott, M. Soljačić, A. J. Minnich, O. D. Miller, and H. A. Atwater. Active Radiative Thermal Switching with Graphene Plasmon Resonators. *ACS Nano* **12**(3) (2018), 2474–2481. http://dx.doi.org/10.1021/acsnano.7b08231.

19. Jurado, Z., J. Kou, S. M. Kamali, A. Faraon, and A. J. Minnich. Wavelength-selective thermal extraction for higher efficiency and power density thermophotovoltaics. *J Appl Phys* **124**(18) (2018), 183105. http://aip.scitation.org/doi/10.1063/1.5049733.

20. Kou, J. and A. J. Minnich. Dynamic optical control of near-field radiative transfer. *Opt Express* **26**(18) (2018), A729. https://www.osapublishing.org/abstract.cfm?{URI}=oe-26-18-A729.

21. Moon, J., B. Latour, and A. J. Minnich. Propagating elastic vibrations dominate thermal conduction in amorphous silicon. *Phys. Rev. B* **97** (2 2018), 024201. https://link.aps.org/doi/10.1103/PhysRevB.97.024201.

22. Ravichandran, N. K., H. Zhang, and A. J. Minnich. Spectrally Resolved Specular Reflections of Thermal Phonons from Atomically Rough Surfaces. *Phys. Rev. X* **8**(4) (2018), 041004. https://link.aps.org/doi/10.1103/{PhysRevX}.8.041004.

23. Yang, L., B. Latour, and A. J. Minnich. Phonon transmission at crystalline-amorphous interfaces studied using mode-resolved atomistic Green's functions. *Phys. Rev. B* **97**(20) (2018), 205306. https://link.aps.org/doi/10.1103/{PhysRevB}.97.205306.

24. Hua, C., X. Chen, N. K. Ravichandran, and A. J. Minnich. Experimental metrology to obtain thermal phonon transmission coefficients at solid interfaces. *Physical Review B* **95**(20) (May 2017), 205423. https://link.aps.org/doi/10.1103/PhysRevB.95.205423.

25. Kim, T., D. Ding, J.-H. Yim, Y.-D. Jho, and A. J. Minnich. Elastic and thermal properties of free-standing molybdenum disulfide membranes measured using ultrafast transient grating spectroscopy. *APL Materials* **5**(8) (Aug. 2017), 086105. http://aip.scitation.org/doi/full/10.1063/1.4999225.

26. Kou, J.-l., Z. Jurado, Z. Chen, S. Fan, and A. J. Minnich. Daytime Radiative Cooling Using Near-Black Infrared Emitters. *ACS Photonics* (Feb. 2017). http://dx.doi.org/10.1021/acsphotonics.6b00991.

27. Latour, B., N. Shulumba, and A. J. Minnich. Ab initio study of mode-resolved phonon transmission at Si/Ge interfaces using atomistic Green's functions. *Phys. Rev. B* **96** (10 2017), 104310. https://link.aps.org/doi/10.1103/PhysRevB.96.104310.

28. Liao, B., E. Najafi, H. Li, A. J. Minnich, and A. H. Zewail. Photo-excited hot carrier dynamics in hydrogenated amorphous silicon imaged by 4D electron microscopy. en. *Nature Nanotechnology* **12** (July 2017), 871–876. http://www.nature.com/nnano/journal/vaop/ncurrent/full/nnano.2017.124.html.

29. Shulumba, N., O. Hellman, and A. J. Minnich. Intrinsic localized mode and low thermal conductivity of PbSe. *Physical Review B* **95**(1) (Jan. 2017), 014302. http://link.aps.org/doi/10.1103/PhysRevB.95.014302.

30. Shulumba, N., O. Hellman, and A. J. Minnich. Lattice Thermal Conductivity of Polyethylene Molecular Crystals from First-Principles Including Nuclear Quantum Effects. *Phys. Rev. Lett.* **119** (18 2017), 185901. https://link.aps.org/doi/10.1103/PhysRevLett.119.185901.

31. Thomas, N. H., Z. Chen, S. Fan, and A. J. Minnich. Semiconductor-based Multilayer Selective Solar Absorber for Unconcentrated Solar Thermal Energy Conversion. En. *Scientific Reports* **7**(1) (July 2017), 5362. https://www.nature.com/articles/s41598-017-05235-x..
32. Yang, L. and A. J. Minnich. Thermal transport in nanocrystalline Si and SiGe by ab initio based Monte Carlo simulation. en. *Scientific Reports* **7** (Mar. 2017), 44254. http://www.nature.com/srep/2017/170314/srep44254/full/srep44254.html.
33. Ding, D., T. Kim, and A. J. Minnich. Active Thermal Extraction and Temperature Sensing of Near-field Thermal Radiation. *Scientific Reports* **6** (Sept. 2016), 32744. http://www.nature.com/articles/srep32744.
34. Ding, D., T. Kim, and A. J. Minnich. Active thermal extraction of near-field thermal radiation. *Physical Review B* **93**(8) (Feb. 2016), 081402. http://link.aps.org/doi/10.1103/PhysRevB.93.081402.
35. Dou, N. G. and A. J. Minnich. Heat conduction in multifunctional nanotrusses studied using Boltzmann transport equation. *Applied Physics Letters* **108**(1) (Jan. 2016), 011902. http://scitation.aip.org/content/aip/journal/apl/108/1/10.1063/1.4939266.
36. Minnich, A. J. Exploring the extremes of heat conduction in anisotropic materials. *Nanoscale and Microscale Thermophysical Engineering* **20**(1) (Mar. 2016), 1. http://www.tandfonline.com/doi/abs/10.1080/15567265.2016.1170080.
37. Moon, J. and A. J. Minnich. Sub-amorphous thermal conductivity in amorphous heterogeneous nanocomposites. *RSC Advances* **6**(107) (2016), 105154–105160. http://pubs.rsc.org/en/Content/ArticleLanding/2016/RA/C6RA24053D.
38. Ravichandran, N. K. and A. J. Minnich. Role of thermalizing and nonthermalizing walls in phonon heat conduction along thin films. *Physical Review B* **93**(3) (Jan. 2016), 035314. http://link.aps.org/doi/10.1103/PhysRevB.93.035314.
39. Zhang, H., X. Chen, Y.-D. Jho, and A. J. Minnich. Temperature-Dependent Mean Free Path Spectra of Thermal Phonons Along the c-Axis of Graphite. *Nano Letters* **16**(3) (Feb. 2016), 1643–1649. http://dx.doi.org/10.1021/acs.nanolett.5b04499.
40. Ding, D. and A. J. Minnich. Selective radiative heating of nanostructures using hyperbolic metamaterials. *Optics Express* **23**(7) (Apr. 2015), A299–A308. https://www.osapublishing.org/oe/abstract.cfm?uri=oe-23-7-A299.
41. Hua, C. and A. J. Minnich. Semi-analytical solution to the frequency-dependent Boltzmann transport equation for cross-plane heat conduction in thin films. *Journal of Applied Physics* **117**(17) (May 2015), 175306. http://scitation.aip.org/content/aip/journal/jap/117/17/10.1063/1.4919432.
42. Minnich, A. J. Advances in the measurement and computation of thermal phonon transport properties. *Journal of Physics: Condensed Matter* **27**(5) (Feb. 2015), 053202. http://iopscience.iop.org/0953-8984/27/5/053202.
43. Minnich, A. J. Multidimensional quasiballistic thermal transport in transient grating spectroscopy. *Physical Review B* **92**(8) (Aug. 2015), 085203. http://link.aps.org/doi/10.1103/PhysRevB.92.085203.
44. Minnich, A. J. Phonon heat conduction in layered anisotropic crystals. *Physical Review B* **91**(8) (Feb. 2015), 085206. http://link.aps.org/doi/10.1103/PhysRevB.91.085206.
45. Minnich, A. J. Thermal phonon boundary scattering in anisotropic thin films. *Applied Physics Letters* **107**(18) (Nov. 2015), 183106. http://scitation.aip.org/content/aip/journal/apl/107/18/10.1063/1.4935160.
46. Robbins, A. B. and A. J. Minnich. Crystalline polymers with exceptionally low thermal conductivity studied using molecular dynamics. *Applied Physics Letters* **107**(20) (Nov. 2015), 201908. http://scitation.aip.org/content/aip/journal/apl/107/20/10.1063/1.4936195.

47. Schleeh, J., J. Mateos, I. Íñiguez-de-la Torre, N. Wadefalk, P. A. Nilsson, J. Grahn, and A. J. Minnich. Phonon black-body radiation limit for heat dissipation in electronics. *Nature Materials* **14**(2) (Feb. 2015), 187–192. http://www.nature.com/nmat/journal/v14/n2/full/nmat4126.html.
48. Zhang, H., C. Hua, D. Ding, and A. J. Minnich. Length Dependent Thermal Conductivity Measurements Yield Phonon Mean Free Path Spectra in Nanostructures. *Scientific Reports* **5** (Mar. 2015). http://www.nature.com/srep/2015/150313/srep09121/full/srep09121.html.
49. Zhang, H. and A. J. Minnich. The best nanoparticle size distribution for minimum thermal conductivity. en. *Scientific Reports* **5** (Mar. 2015). http://www.nature.com/srep/2015/150311/srep08995/full/srep08995.html.
50. Ding, D., X. Chen, and A. J. Minnich. Radial quasiballistic transport in time-domain thermoreflectance studied using Monte Carlo simulations. *Applied Physics Letters* **104**(14) (Apr. 2014), 143104. http://scitation.aip.org/content/aip/journal/apl/104/14/10.1063/1.4870811.
51. Hua, C. and A. J. Minnich. Analytical Green's function of the multidimensional frequency-dependent phonon Boltzmann equation. *Physical Review B* **90**(21) (Dec. 2014), 214306. http://link.aps.org/doi/10.1103/PhysRevB.90.214306.
52. Hua, C. and A. J. Minnich. Importance of frequency-dependent grain boundary scattering in nanocrystalline silicon and silicon–germanium thermoelectrics. *Semiconductor Science and Technology* **29**(12) (Dec. 2014), 124004. http://iopscience.iop.org/0268-1242/29/12/124004.
53. Hua, C. and A. J. Minnich. Transport regimes in quasiballistic heat conduction. *Physical Review B* **89**(9) (Mar. 2014), 094302. http://link.aps.org/doi/10.1103/PhysRevB.89.094302.
54. Maasilta, I. and A. J. Minnich. Heat under the microscope. *Physics Today* **67**(8) (Aug. 2014), 27–32. http://scitation.aip.org/content/aip/magazine/physicstoday/article/67/8/10.1063/PT.3.2479.
55. Ravichandran, N. K. and A. J. Minnich. Coherent and incoherent thermal transport in nanomeshes. *Physical Review B* **89**(20) (May 2014), 205432. http://link.aps.org/doi/10.1103/PhysRevB.89.205432.
56. Minnich, A. J. Thermal transport: Naturally glassy crystals. *Nature Nanotechnology* **8**(6) (June 2013), 392–393. http://www.nature.com/nnano/journal/v8/n6/full/nnano.2013.106.html.
57. Minnich, A. J. Determining Phonon Mean Free Paths from Observations of Quasiballistic Thermal Transport. *Physical Review Letters* **109**(20) (Nov. 2012), 205901. http://link.aps.org/doi/10.1103/PhysRevLett.109.205901.

## Refereed Journal Publications (prior to Caltech)

1. Hu, Y., L. Zeng, A. J. Minnich, M. S. Dresselhaus, and G. Chen. Spectral mapping of thermal conductivity through nanoscale ballistic transport. en. *Nature Nanotechnology* **10**(8) (Aug. 2015), 701–706. http://www.nature.com/nnano/journal/v10/n8/full/nnano.2015.109.html.
2. Johnson, J. A., A. A. Maznev, J. Cuffe, J. K. Eliason, A. J. Minnich, T. Kehoe, C. M. S. Torres, G. Chen, and K. A. Nelson. Direct Measurement of Room-Temperature Nondiffusive Thermal Transport Over Micron Distances in a Silicon Membrane. *Physical Review Letters* **110**(2) (Jan. 2013), 025901. http://link.aps.org/doi/10.1103/PhysRevLett.110.025901.
3. Luckyanova, M. N., J. Garg, K. Esfarjani, A. Jandl, M. T. Bulsara, A. J. Schmidt, A. J. Minnich, S. Chen, M. S. Dresselhaus, Z. Ren, E. A. Fitzgerald, and G. Chen. Coherent Phonon Heat Conduction in Superlattices. *Science* **338**(6109) (Nov. 2012), 936–939. http://www.sciencemag.org/content/338/6109/936.
4. Minnich, A. J., G. Chen, S. Mansoor, and B. S. Yilbas. Quasiballistic heat transfer studied using the frequency-dependent Boltzmann transport equation. *Physical Review B* **84**(23) (Dec. 2011), 235207. http://link.aps.org/doi/10.1103/PhysRevB.84.235207.
5. Minnich, A. J., J. A. Johnson, A. J. Schmidt, K. Esfarjani, M. S. Dresselhaus, K. A. Nelson, and G. Chen. A thermal conductivity spectroscopy technique to measure phonon mean free paths. *Physical Review Letters* **107** (Aug. 2011). Chosen as Editor's suggestion., 095901. http://prl.aps.org.clsproxy.library.caltech.edu/abstract/PRL/v107/i9/e095901.

6. Zebarjadi, M., G. Joshi, G. Zhu, B. Yu, A. Minnich, Y. Lan, X. Wang, M. Dresselhaus, Z. Ren, and G. Chen. Power Factor Enhancement by Modulation Doping in Bulk Nanocomposites. *Nano Letters* **11**(6) (June 2011), 2225–2230. http://dx.doi.org/10.1021/nl201206d.
7. Hao, Q., G. Zhu, G. Joshi, X. Wang, A. Minnich, Z. Ren, and G. Chen. Theoretical studies on the thermoelectric figure of merit of nanograined bulk silicon. *Applied Physics Letters* **97**(6), 063109 (2010), 063109. http://link.aip.org/link/?APL/97/063109/1.
8. Schmidt, A. J., K. C. Collins, A. J. Minnich, and G. Chen. Thermal conductance and phonon transmissivity of metal–graphite interfaces. *Journal of Applied Physics* **107**(10), 104907 (2010), 104907. http://link.aip.org/link/?JAP/107/104907/1.
9. Lan, Y., A. Minnich, G. Chen, and Z. Ren. Enhancement of Thermoelectric Figure-of-Merit by a Bulk Nanostructuring Approach. *Advanced Functional Materials* **20** (2009), 357 –376. http://dx.doi.org/10.1002/adfm.200901512.
10. Minnich, A. J., M. S. Dresselhaus, Z. F. Ren, and G. Chen. Bulk Nanostructured Thermoelectric Materials: Current Research and Future Prospects. *Energy & Environmental Science* **2**(5) (2009). (Invited, peer-reviewed. Among the top 10 downloaded articles in EES for July, August, December 2009, January-May, July-December 2010, January 2011)., 466 –479. http://pubs.rsc.org/en/Content/ArticleLanding/2009/EE/b822664b.
11. Minnich, A. J., H. Lee, X. W. Wang, G. Joshi, M. S. Dresselhaus, Z. F. Ren, G. Chen, and D. Vashaee. Modeling study of thermoelectric SiGe nanocomposites. *Physical Review B* **80**(15) (Oct. 2009), 155327. http://link.aps.org/abstract/PRB/v80/e155327.
12. Yang, J., Q. Hao, H. Wang, Y. C. Lan, Q. Y. He, A. J. Minnich, D. Z. Wang, J. A. Harriman, V. M. Varki, M. S. Dresselhaus, G. Chen, and Z. F. Ren. Solubility study of Yb in n-type skutterudites $Yb_xCo_4Sb_{12}$ and their enhanced thermoelectric properties. *Physical Review B* **80**(11) (2009), 115329. http://link.aps.org/abstract/PRB/v80/e115329.
13. Poudel, B., Q. Hao, Y. Ma, Y. Lan, A. Minnich, B. Yu, X. Yan, D. Wang, A. Muto, D. Vashaee, X. Chen, J. Liu, M. S. Dresselhaus, G. Chen, and Z. Ren. High-Thermoelectric Performance of Nanostructured Bismuth Antimony Telluride Bulk Alloys. *Science* **320**(5876) (2008), 634–638. http://www.sciencemag.org.clsproxy.library.caltech.edu/content/320/5876/634.
14. Minnich, A. and G. Chen. Modified effective medium formulation for the thermal conductivity of nanocomposites. *Applied Physics Letters* **91**(7) (2007). (also in August 27, 2007 issue of Virtual Journal of Nanoscale Science & Technology)., 073105. http://link.aip.org/link/?APL/91/073105/1.


## Invited Book Chapters


1. Minnich, A. J. "Measuring phonon mean free paths using thermal conductivity spectroscopy". In: ed. by G. Chen. Annual Review of Heat Transfer. Belsevere, 2012.


## Invited Seminars and Presentations

1. NSF-JST joint workshop on Thermal Transport, Materials Informatics and Quantum Computing, "Low noise transistor microwave amplifiers for quantum computing"; March 24, 2021.
2. IBM QISKIT Seminar, "Finite-temperature dynamics of spin systems on near-term quantum hardware"; March 12, 2021.
3. USC Physics Department, "Non-unitary dynamics of spin systems on near-term quantum hardware"; February 3, 2021.
4. NSF Workshop: New Frontiers in Thermal Transport, "Ultralow noise transistor microwave amplifiers for quantum computing"; December 14, 2020.
5. Purdue Viskanta Fellowship Lecture, "Misbehavin: unusual atoms in solids and extreme thermal transport properties"; December 10, 2020.

6. Advanced Quantum Testbed Seminar, "Finite-temperature dynamics of spin systems on near-term quantum hardware"; August 20, 2020
7. UC Riverside Electrical Engineering Department, "Low-noise transistor microwave amplifiers: towards the quantum noise limit"; November 4, 2019.
8. Quantum LA Workshop, "Quantum imaginary-time evolution, quantum Lanczos and quantum thermal averaging", Los Angeles, CA; April 30, 2019.
9. MRS Spring Meeting, "Exploring the Upper Limits of Thermal Conductivity in Molecular Crystals", Phoenix, AZ; April 24, 2019.
10. Kinetic Theory Workshop, "Transport phenomena in solids from first-principles using the linearized Boltzmann equation", Madison, WI; April 19, 2019.
11. APS March Meeting, "Thermal transport in highly anharmonic crystals from first-principles", Los Angeles, CA; March 5, 2018.
12. Air Force Research Laboratory, "Heat and charge transport in solids and devices: a first-principles perspective," Dayton, OH; January 25, 2018.
13. UCLA Chemistry Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Los Angeles, CA; October 23, 2017.
14. **Plenary Award Talk** at International Photothermal and Photoacoustic Association Meeting, "Revealing the microscopic processes that govern heat flow using photothermal experiments," Bilbao, Spain, July 19, 2017.
15. Materials Research Society Spring Meeting, "Real-time probing of strain enhancement of thermal conductivity in polyethylene films ," Phoenix, AZ; April 23, 2017.
16. UC Santa Barbara Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Santa Barbara, CA; November 7, 2016.
17. Army Research Office Workshop on The Future of Vibration Energy Transfer in Solids and Structures: Needs and Opportunities, "Thermal conductivity and lattice instabilities," Seattle, WA; October 18, 2016.
18. **Keynote talk** in 2016 Society of Engineering Sciences Conference, "Thermal phonon scattering at interfaces and boundaries: linking atomistic structure and the phonon spectrum," College Park, MD; October 2, 2016.
19. 2016 Society of Engineering Sciences Conference, "Manipulating near-field and far-field thermal radiation," College Park, MD; October 2, 2016.
20. Thermal Transport at the Nanoscale Workshop, "The importance of interfaces for thermoelectric energy conversion," Telluride, CO; June 22, 2016.
21. Purdue University Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," West Lafayette, IN; May 13, 2016.
22. Northwestern University Materials Science Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Evanston, IL; April 19, 2016.
23. UIUC Mechanical Science and Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Urbana-Champaign, IL; April 18, 2016.
24. Rensselaer Polytechnic Institute Materials Science Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Troy, NY; March 30, 2016.

25. Hume-Rothery Award Symposium, TMS 2016 Annual Meeting, "Experimental Studies of Mode-resolved Thermal Phonon Transport Properties," Nashville, TN; February 16, 2016.
26. Stanford University Materials Science Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Stanford, CA; January 8, 2016.
27. Materials Research Society Fall Meeting, "The importance of interfaces for thermoelectric energy conversion," Boston MA; December 3, 2015.
28. UC Riverside Electrical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Riverside, CA; Oct 19, 2015.
29. **Keynote lecture** in thermal management session, Materials Science and Technology 2015, "Exploring the limits of heat dissipation in electronic devices," Columbus, OH; October 5, 2015.
30. University of Minnesota Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Minneapolis, MN; September 30, 2015.
31. Carnegie Mellon Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Pittsburgh, PA; September 11, 2015.
32. American Chemical Society Meeting, Physics Division, "The importance of interfaces for thermoelectric energy conversion," Boston, MA; August 17, 2015.
33. Northrop Grumman Nanomaterials Workshop, "Nanotrusses as multifunctional materials," Redondo Beach, CA; July 6, 2015.
34. Northrop Grumman Photonics group, "Photonic structures for engineering thermal radiation," Redondo Beach, CA; June 25, 2015.
35. Toyota Research Institute North America Thermal Management workshop, "Multilayer thermal switch," Ann Arbor, MI; June 9, 2015.
36. Massachusetts Institute of Technology Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Cambridge, MA; May 6, 2015.
37. "Nanomaterials for Energy" Gordon Conference, "Exploring heat conduction in nanomaterials for energy," Ventura, CA; February 25, 2015.
38. Rutgers University Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," New Brunswick, NJ; January 21, 2015.
39. Materials Research Society Fall Meeting, "Understanding and engineering the MFP spectrum," Boston MA; December 1, 2014.
40. ASME International Conference and Exhibition, Panel on measuring phonon MFPs, Montreal, Canada, November 19, 2014.
41. Northrop Grumman Nanophotonics workshop, "Photonic structures for engineering thermal radiation," Redondo Beach, CA; October 14, 2014.
42. University of California, Berkeley Mechanical Engineering Department, "Heat under the microscope: understanding the microscopic processes that govern thermal transport," Berkeley, CA; September 11, 2014.
43. 8th US-Japan Joint Seminar on Nanoscale Transport Phenomena, "Understanding and measuring the phonon MFP spectrum," Santa Clara, CA; July 14, 2014.

44. University of California, Santa Barbara Materials Science Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Santa Barbara, CA; June 6, 2014.
45. Center for Phononics and Thermal Energy Science, Tongji University, Shanghai, China; “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” May 31, 2014.
46. University of California, San Diego Mechanical Engineering Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” La Jolla, CA; May 12, 2014.
47. Boeing Research and Technology, El Segundo, CA; “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” March 27, 2014.
48. APS March Meeting, Denver, CO; “Heat under the microscope: uncovering the microscopic processes of phonon heat conduction,” March 7, 2014.
49. University of California, Irvine Mechanical Engineering Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Los Angeles, CA; February 28, 2014.
50. Yonsei University, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Seoul, South Korea; February 13, 2014.
51. University of Southern California Electrical Engineering Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Los Angeles, CA; January 22, 2014.
52. University of California, Los Angeles Mechanical Engineering Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Los Angeles, CA; January 10, 2014.
53. University of California, Santa Barbara Thermoelectrics group, “Understanding and Engineering Phonons for Thermoelectric Energy Conversion,” Santa Barbara, CA; December 10, 2013.
54. University of Washington Mechanical Engineering Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Seattle, WA; November 5, 2013.
55. University of Oregon Chemistry Department, “Heat under the microscope: understanding the microscopic processes that govern thermal transport,” Eugene, OR; November 4, 2013.
56. WE Heraus Invited Seminar, “Understanding and Engineering Phonons for Thermoelectric Energy Conversion,” Bad Honnef, Germany; April 10, 2013.
57. Materials Research Society Spring Meeting, Symposium V, “The Theory and Practice of Measuring Phonon Mean Free Paths,” San Francisco, CA; April 4, 2013.
58. Boeing Research and Technology, El Segundo, CA; “Understanding and Engineering Phonons for Thermoelectric Energy Conversion,” March 29, 2013.
59. Dow Chemical, “Exploring Nanoscale Heat Transfer for Energy Applications,” Midland, MI; February 21, 2013.
60. UC Riverside Materials Science and Engineering Department, “Understanding and Engineering Phonons for Thermoelectric Energy Conversion,” Riverside, CA; Jan 16, 2013.

## Professional Affiliations

American Physical Society (APS), Materials Research Society (MRS)

## Professional Activities and Service

- **Reviewer:** Science, Nature, Nature Materials, Nature Nanotechnology, Nature Communications, Scientific Reports, Physical Review Letters, RSC Advances, ACS Nano, Nano Letters, Journal of Applied Physics, Applied Physics Letters, Physical Review B
- **Professional Service:** Conference organizer, 2020 US-Japan Conference; Symposium organizer, 2017 MRS Spring Meeting; NSF Panel Reviewer (2015); Co-organizer, Thermoelectrics session, American Physical Society March Meeting (2013).

## Present Thesis Advisees

Peishi Cheng, Erika Yang, Yang Gao, Alex Choi, Nachiket Naik, Adrian Tan, Tomi Esho, Benjamin, Hatanpaa, Shi-Ning Sun, Hirsh Kamikara

## Former Advisees

| **Member** | **Prior position** | **Current position** |
|---|---|---|
| Junlong Kou | Graduate Student | Hyacinth Photonics |
| Andrew Robbins | Graduate Student | Aerospace Corporation |
| Nate Thomas | Graduate Student | Edisun |
| Nicholas Dou | Graduate Student | Northrop Grumman |
| Jaeyun Moon | Graduate Student | Postdoc, Oak Ridge National Laboratory |
| Taeyong Kim | Graduate Student | Postdoc, UCSB |
| Bo Sun | Postdoctoral Scholar | Assistant Professor, Xinjin University |
| Ruiqiang Guo | Postdoctoral Scholar | Postdoc, University of Pittsburgh |
| Nina Shulumba | Postdoctoral Scholar | Postdoc |
| Lina Yang | Postdoctoral Scholar | Postdoc |
| Xiangwen Chen | Postdoctoral Scholar | Postdoc, JPL |
| Hang Zhang | Postdoctoral Scholar | Assistant Professor, Institute of Thermophysics |
| Ding Ding | Graduate Student | Postdoctoral Scholar, Singapore |
| Chengyun Hua (Winner of best thesis award in department) | Graduate Student | Russell Postdoctoral Scholar, Oak Ridge National Laboratory |
| Navaneetha Ravichandran | Graduate Student | Postdoctoral Scholar, Boston College |
| Benoit Latour | Postdoctoral Scholar | Michellin Tires, France |

## Courses taught

- ME 201/APh 251 (Low noise microwave electronics), Spring 2020
- ME 201/APh 251 (Introduction to Tensor Networks), Fall 2019
- ME 201/APh 251 (Physics on near-term quantum computers), Spring 2019
- ME 11a (Thermodynamics), Fall 2018
- ME 119ab (Heat and Mass Transfer), Winter/Spring 2018
- ME 118 (Thermodynamics), Fall 2017
- ME 117 (Nano-to-macro Transport Processes), Fall 2016
- ME 119b (Heat and Mass Transfer), Winter 2016
- ME 119a (Heat and Mass Transfer), Fall 2015
- ME 117 (Nano-to-macro Transport Processes), Winter 2015
- ME 11a (Thermodynamics), Fall 2014
- ME 119b (Heat and Mass Transfer), Spring 2014

- ME 18a (Thermodynamics), Winter 2013
- ME 117 (Nano-to-macro Transport Processes), Fall 2012
- ME 119a (Heat and Mass Transfer), Fall 2011