

# Qichen Song

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<b>Research Interest</b>	My research interests lie primarily in electron and phonon transport in nanostructured semi-conductors using optical spectroscopy such as transient thermal grating (TTG) and frequency-domain thermoreflectance (FDTR), and nonequilibrium Green's function (NEGF) calculations.	
<b>Education</b>	<b>Massachusetts Institute of Technology</b>	2015 - present
	Ph.D. in Mechanical Engineering, expected in Dec. 2021 Science Master in Mechanical Engineering, Feb. 2018	
	<b>Huazhong University of Science and Technology</b>	2011 - 2015
	Bachelor of Engineering in Thermal Energy and Power Engineering	
<b>Courses</b>	MechE (major): Advanced fluid mechanics, General thermodynamics, Advanced heat & mass transfer, Nano-to-macro transport processes (TA) Physics (minor): Theory of solids II, Relativistic quantum field theory I, Relativistic quantum field theory II, Statistical mechanics I, Statistical mechanics II EECS: Applied quantum & statistical physics, Physics for solid-state applications, Principles & applications of quantum optics MSE: Atomistic computer modeling of materials Math: Mathematical methods in nanophotonics, Computational science & engineering I	
<b>Awards</b>	Kaufman Teaching Certificate Program	2020
	Warren M. Rohsenow Fellowship	2015 - 2016
	National Scholarship (three times)	2012 & 2013 & 2014
<b>Publications</b>	<b>Q.C. Song</b> , R. Pan, J. Shin, A. Schmidt, H. Lu, A. Henry and G. Chen, 'Observation of Anderson localization of phonons at moderate temperatures', <i>in preparation for Science</i> , <b>2021</b>	
	<b>Q.C. Song</b> and G. Chen, 'Nonspecular electron transmission leads to drastically reduced contact resistance between dissimilar semiconductors', <i>to be submitted to PRB</i> , <b>2021</b>	
	<b>Q.C. Song</b> and G. Chen, 'Evaluation of diffuse mismatch model for phonon scattering at disordered interfaces', <i>Phys. Rev. B</i> , <b>2021</b> , 104, 085310.	
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	C.A. Garde, X.X. Yan, <b>Q.C. Song</b> , J. Li, L. Gu, T. Aoki, S-W Lee, G. Chen, R.Q. Wu, X.Q. Pan, 'Nanoscale imaging of interface reflected phonons by electron microscopy', <b>2021</b> , <i>in review with Nature</i>	
	H.Z. Wang, Z.P. Yao, W.S. Leong, G. S. Jung, <b>Q.C. Song</b> , M. Hempel, T. Palacios, G. Chen, M. J. Buehler, A. Aspuru-Guzik, J.Kong 'Frank-van der Merwe Growth in Bilayer Graphene', <i>Matter</i> , <b>2021</b> , 4, 10, 3339-3353.	
	W. Ren, <b>Q.C. Song</b> , H. Zhu, J. Mao, L. You, G.A. Gamage, J. Zhou, T. Zhou, J. Jiang, C. Wang, J. Luo, J. Wu, Z. Wang, G. Chen, Z.F. Ren, 'Intermediate-level doping strategy to simultaneously optimize power factor and phonon thermal conductivity for improving thermoelectric figure of merit', <i>Material Today Physics</i> , <b>2020</b> , 15, 100250	
	Q.Y. Lu, S. Huberman, H.T. Zhang, <b>Q.C. Song</b> , J.Y. Wang, G. Vardar, A. Hunt, I. Waluyo, G. Chen and B. Yildiz, 'Bi-directional tuning of thermal transport in SrCoO <sub>x</sub> with electrochemically induced phase transitions', <i>Nat. Mater.</i> , <b>2020</b> 1, 8	

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H.T. Zhu, J. Mao, Y. Li, J.F. Sun, Y.M. Wang, Q. Zhu, G.N. Li, **Q.C. Song**, J.W. Zhou, Y.H. Fu, R. He, T. Tong, Z.H. Liu, W.Y. Ren, L. You, Z.M. Wang, J. Luo, A. Sotnikov, J.M. Bao, K. Nielsch, G. Chen, D. J. Singh and Z.F. Ren, ‘Discovery of TaFeSb-based half-Heuslers with high thermoelectric performance’, *Nat. Commun.*, **2019**, 10, 270

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J.W. Zhou, H.T. Zhu, T.H. Liu, **Q.C. Song**, R. He, J. Mao, Z.H. Liu, W.Y Ren, B. Liao, D. J. Singh, Z.F. Ren, G. Chen, ‘The origin of large thermoelectric power factors in half-Heusler systems’, *Nat. Commun* **2018**, 9, 1721

T.H. Liu, J.W. Zhou, M.D. Li, Z.W. Ding, **Q.C. Song**, B. Liao, L. Fu, G. Chen, ‘Electron Mean-Free-Path Filtering in Dirac Material for Improved Thermoelectric Performance’, *Proc. Natl. Acad. Sci.*, **2018**, 115 (5), 879-884.

M.D. Li, **Q.C Song**, W.W. Zhao, J. A. Garlow, T.H. Liu, L.J. Wu, Y.M. Zhu, J.S. Moodera, M. H. W. Chan, G. Chen, and C-Z Chang, ‘Dirac-electron-mediated magnetic proximity effect in topological insulator/magnetic insulator heterostructures’, *Phys. Rev. B: Rapid Communications*, **2017**, 96, 201301.

**Q.C. Song**, T.H. Liu, J.W. Zhou, Z.W. Ding, G. Chen, ‘*Ab initio* study of electron mean free paths and thermoelectric properties of lead telluride’, *Material Today Physics*, **2017**, 2, 69-77.

M. An, **Q.C. Song**, X.X. Yu, Z.L. Jin, D.K. Ma, B.L. Huang, N. Yang, ‘Generalized two-temperature model for coupled phonons’, *Nano Lett.*, **2017**, 17 (9), 5805-5810.

M.D. Li, **Q.C. Song**, T.H. Liu, L. Meroueh, G.D. Mahan, M.S. Dresselhaus, G. Chen, ‘Tailoring superconductivity with quantum dislocations’, *Nano Lett.*, **2017**, 17 (8), 4604-4610.

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**Q.C. Song**, M. An, X.D. Chen, Z. Peng, J.F. Zang, N. Yang, ‘The adjustable thermal resistor by reversibly folding a graphene sheet’, *Nanoscale*, **2016**, 8, 14943-14949.

**Presentations** Probing local heating and cooling at interfaces: a non-equilibrium Green’s function study, APS March meeting, 2018, Los Angeles, California  
*Ab initio* study of electron transport in lead telluride, APS March meeting, 2017, New Orleans, Louisiana

**Services** Journal reviewer for PRL, Nano Lett., Adv. Mater., Joule

**Computer Skills** Python, Qiskit, MATLAB, L<sup>A</sup>T<sub>E</sub>X, FORTRAN, C++

**References** Gang Chen                      Asegun Henry                      Mingda Li  
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