Eric J. Tervo

George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology
Marcus Nanotechnology Building, 345 Ferst Dr. NW, Atlanta, GA 30332
eric.tervo@gatech.edu

EDUCATION

Doctor of Philosophy in Mechanical Engineering expected Aug. 2019
Georgia Institute of Technology *NSF GRFP Fellow*
Tech to Teaching Certificate *NSF IGERT Fellow*
Advisors: Professors Zhuomin Zhang and Baratunde Cola *GPA: 4.00/4.00*
Dissertation: "Thermal Radiative Energy Transfer in Polaritonic Nanostructure Arrays"

Bachelor of Science in Mechanical Engineering May 2012
University of Wisconsin – Madison *GPA: 3.95/4.00*
Certificate in International Engineering

RESEARCH & PROFESSIONAL EXPERIENCE

National Renewable Energy Laboratory, Golden, CO begins Sept. 2019
Director's Postdoctoral Fellow

Thermoradiative Cells

- Will combine detailed electrical, thermal, and radiative transport models to investigate solid-state semiconductor devices for thermal energy harvesting.
- Will fabricate, characterize, and test thermoradiative materials and devices to analyze performance as well as conduct a study of their economic viability.

Georgia Institute of Technology, Atlanta, GA July 2014 – present
Graduate Student Researcher

Near-Field Thermal Radiation

- Developed theoretical and numerical methods to predict thermal radiation between nanostructures.
- Experimentally analyzed thermal radiative transport in packed nanoparticle beds.

Radiative Thermoelectric Energy Converters

- Modeled detailed operation of near-field thermophotovoltaic and thermoradiative cells.
- Led authorship of review article on near-field operation of radiative converters.

Sub-Diffractional Waveguiding

- Developed new analytical method to study resonator-based waveguides in inhomogeneous environments.

Residential PV-Battery Systems

- Led interdisciplinary analysis of photovoltaic and battery system performance and economics.

Southwest Research Institute, Fluid Dynamics Group, San Antonio, TX Aug. 2012 – June 2014
Engineer

- Led experimental and numerical research on distributed thermal leak detection for subsea pipelines.
- Participated in numerous research and testing projects for the oil and gas industry.

University of Wisconsin Solar Energy Lab, Madison, WI May – Dec. 2010, July – Dec. 2011
Undergraduate Research Assistant

Engineers In Action, La Paz, Bolivia Jan. – July 2011
Intern Engineer

Kohler Power Systems, Generators Division, Sheboygan, WI Jan. – Aug. 2009
Mechanical Engineering Design Co-op

JOURNAL PUBLICATIONS

*corresponding author(s)

9. L. Smalls, M. Francoeur*, & **E. J. Tervo***. Computationally efficient system Green's functions for the thermal discrete dipole approximation. In preparation.

8. D. Feng, **E. J. Tervo**, S. K. Yee, Z. M. Zhang*. The effect of evanescent waves on the dark current of a photodiode. In preparation.

7. **E. J. Tervo***, M. Francoeur, B. A. Cola, & Z. M. Zhang*. Thermal radiation in systems of many dipoles. In review with *Physical Review B* (2019). http://arxiv.org/abs/1906.10003

6. **E. J. Tervo***, M. E. Gustafson, Z. M. Zhang, B. A. Cola, & M. A. Filler*. Photonic thermal conduction by infrared plasmonic resonators in semiconductor nanowires. *Applied Physics Letters* 114, 163104 (2019). http://doi.org/10.1063/1.5093309

5. **E. J. Tervo*,** K. Agbim, A. Deangelis, J. Hernandez, H. K. Kim, & A. Odukomaiya. An economic analysis of residential photovoltaic systems with lithium ion battery storage in the United States. *Renewable and Sustainable Energy Reviews* 94, 1057-1066 (2018). http://doi.org/10.1016/j.rser.2018.06.055

4. **E. J. Tervo,** D. S. Boyuk, B. A. Cola, Z. M. Zhang*, & M. A. Filler*. Sub-diffractional waveguiding by mid-infrared plasmonic resonators in semiconductor nanowires. *Nanoscale* 10, 5708-5716 (2018). http://doi.org/10.1039/C8NR00701B

3. **E. J. Tervo,** E. Bagherisereshki, & Z. M. Zhang*. Near-field radiative thermoelectric energy converters: a review. *Frontiers in Energy* 12, 5-21 (2018). http://doi.org/10.1007/s11708-017-0517-z

2. **E. J. Tervo,** Z. M. Zhang, & B. A. Cola*. Collective near-field thermal emission from polaritonic nanoparticle arrays. *Physcial Review Materials* 1, 015201 (2017). http://doi.org/10.1103/PhysRevMaterials.1.015201

1. **E. J. Tervo,** O. S. Adewuyi, J. S. Hammonds Jr.*, & B. A. Cola*. High thermal conductivity in polaritonic SiO_2 nanoparticle beds. *Materials Horizons* 3, 434-441 (2016). http://doi.org/10.1039/c6mh00098c

CONFERENCE PROCEEDINGS

*corresponding author(s)

5. **E. J. Tervo***, Z. M. Zhang, & B. A. Cola. Validity of kinetic theory for radiative heat transfer in nanoparticle chains. In *The 9th International Symposium on Radiative Transfer* (2019). http://arxiv.org/abs/1901.10608

4. **E. J. Tervo,** B. A. Cola, & Z. M. Zhang*. Near-field radiative thermal conductivity of nanoparticle chains. In *The 16th International Heat Transfer Conference* (2018). http://doi.org/10.1615/IHTC16.rti.023143

3. A. Yuksel*, **E. Tervo,** B. Cola, & J. Murthy. Thermo-optical properties of packed nanoparticle thermal interface materials. In *2017 16th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm)* (2017). http://doi.org/10.1109/ITHERM.2017.7992467

2. S. Siebenaler*, **E. Tervo,** M. Kulkarni, S. Patni, & G. Gesoff. Characterization of Thermal and Acoustic Profiles of Potential Underwater Pipeline Leaks. In *2014 10th International Pipeline Conference* (2014). http://doi.org/10.1115/IPC2014-33725

1. S. Siebenaler*, **E. Tervo,** P. Vinh, & C. Lewis. Field testing of negative-wave leak detection systems. In *2014 10th International Pipeline Conference* (2014). http://doi.org/10.1115/IPC2014-33557

PRESENTATIONS

11. Technical Presentation: "Validity of Kinetic Theory for Radiative Heat Transfer in Nanoparticle Chains." The 9th International Symposium on Radiative Transfer, Athens, Greece, June 4, 2019.

10. Technical Presentation: "Dipolar Radiative Thermal Conductivity in Nanoparticle Arrays." 2018 ASME International Mechanical Engineering Congress & Exposition, Pittsburgh, PA, Nov. 14, 2018.

9. Poster Presentation: "Radiative Thermal Conduction by Plasmonic Resonator Chains in Semiconductor Nanowires." 2018 ASME International Mechanical Engineering Congress & Exposition, Pittsburgh, PA, Nov. 14, 2018.

8. Poster Presentation: "Near-Field Radiative Thermal Conductivity of Nanoparticle Chains." 16th International Heat Transfer Conference, Beijing, China, August 15, 2018.

7. Technical Presentation: "Near-Field Thermal Radiation in Many-Body Nanosystems with the Discrete Dipole Approximation." The 17th Electromagnetic and Light Scattering Conference, College Station, TX, March 8, 2018.

6. Technical Presentation: "Modeling of Near-Field Infrared Radiation and Waveguiding: Extracting Plasmonic Resonator Dispersion Relations from Spectroscopy and DDA." 2017 ASME International Mechanical Engineering Congress & Exposition, Tampa, FL, Nov. 9, 2017.

5. Technical Presentation: "An Economic Analysis of Residential Photovoltaic Systems with Battery Storage in the United States." Reset: A Forum and Celebration of Energy Transitions, Atlanta, GA, July 25, 2017.

4. Instructional Presentation: "Transient Plane Source Thermal Constants Analyzer." 2017 Georgia Tech Science and Technology of Advanced Materials and Interfaces Summer Workshop, Atlanta, GA, May 24, 2017.

3. Technical Presentation: "Heat Transfer by Propagating Surface Polaritons in Nanoparticle Chains." 2016 ASME International Mechanical Engineering Congress & Exposition, Phoenix, AZ, Nov. 16, 2016.

2. Poster Presentation: "Enhanced Thermal Conductivity Via Surface Phonon Polaritons." 2015 Gordon Research Conference: Nanomaterials for Applications in Energy Technology, Ventura, CA, Feb. 26, 2015.

1. Technical Presentation: "Leak Characterization in Offshore Pipelines." 2013 Marine Technology Society Subsea Leak Detection Symposium, Houston, TX, Nov. 19, 2013.

TEACHING EXPERIENCE

Undergraduate Thermodynamics May – Aug. 2018

co-Instructor of Record

- Taught undergraduate thermodynamics with Prof. Zhuomin Zhang. Responsibilities included teaching majority of class periods, preparing homework assignments and tests, grading, and holding office hours.
- Student evaluation score for instructor overall effectiveness: 4.84/5.00 (97th percentile)

Undergraduate Heat Transfer Jan. – May 2017

Teaching Practicum Assistant

- Taught several classes and worked with Prof. Zhuomin Zhang on lesson planning, teaching analysis, and development of homework and exam problems.

Tech to Teaching Certificate May 2019

- Program material includes learning mechanisms, learner differences and motivation, evidence-based teaching techniques, teaching and learning assessment, and integration of education technology.
- Coursework includes Course Design and Fundamentals of Teaching and Learning.

MENTORING EXPERIENCE

Graduate Student Mentoring Aug. 2015 – present

- Mentored Colorado School of Mines graduate student Will Callahan on modeling electrical transport in thermoradiative cells.
- Mentored University of Utah graduate student Lindsay Smalls on computational approaches to the thermal discrete dipole approximation.
- Mentored Georgia Tech graduate student Dudong Feng on modeling solid-state radiative energy converters.
- Trained, supervised, and collaborated with Georgia Tech graduate student Zhe Cheng in material preparation and thermal property measurement techniques to investigate thermal radiation in nanoparticle beds.

Undergraduate Student Mentoring May 2015 – present

- Worked with NREL Science Undergraduate Laboratory Internship student Frank Andujar Lugo on thermal storage modeling for integration in a combined PV-battery-thermal storage system.
- Trained and worked with Georgia Tech undergraduate student Michael Gustafson on use of supercomputing facilities to support collaborative project on sub-diffractional nanowire waveguides.
- Trained, supervised, and assisted Georgia Tech undergraduate student Zachary Herbst in material preparation and characterization methods to develop novel coated nanoparticles for thermal interface materials.

GRANTS, AWARDS, & HONORS

- Awarded the National Renewable Energy Laboratory Director's Postdoctoral Fellowship — May 2019
- Awarded NSF travel funding for the 16th International Heat Transfer Conference (Grant No. CBET-1811794) — Aug. 2018
- Awarded NSF travel funding for the 2017 ASME International Mechanical Engineering Congress and Exhibition (Grant No. CMMI-1649149) — Nov. 2017
- Contributed to successful DOE-BES proposal with Prof. Zhuomin Zhang: *Near-Field Thermoradiative Energy Harvesting and Electroluminescent Refrigeration* (Grant No. DE-SC0018369) — July 2017
- Selected for 2017 ARPA-E Energy Innovation Summit Student Program — Feb. 2017
- Awarded Georgia Tech IEN User Facility Seed Grant: *Fabrication and Characterization of Surface Phonon Polariton Metamaterials* — May 2015
- National Science Foundation Graduate Research Fellowship Program Awardee (Grant No. DGE-1650044) — April 2015
- National Science Foundation IGERT: Nanomaterials for Energy Storage & Conversion Awardee (Grant No. DGE-1069138) — Sept. 2014
- Georgia Tech President's Fellowship — Sept. 2014

SERVICE

- Member of ASME, SPIE, APS, and ASEE — 2014 – present
- Head trainer for Georgia Tech Heat Lab's Hot Disk TPS 2500S instrument — Jan. 2015 – Sept. 2018
- Member of Engineers Without Borders, Atlanta Professional Chapter — April 2016 – May 2018
- Review committee member for Georgia Tech President's Undergraduate Research Awards — Oct. 2017
- Student Advisory Council member for Institute for Materials at Georgia Tech — Nov. 2014 – Dec. 2016
- Organizing committee member for SouthEast Regional Symposium 2015 — May 2015
- Founder and President of Engineers Without Borders, Alamo Professional Chapter — Oct. 2012 – Dec. 2013