Laura A. Schaefer

Associate Professor, Mechanical Engineering and Materials Science Department *laschaef@engr.pitt.edu*
University of Pittsburgh, Pittsburgh, PA 15261 *http://www.pitt.edu/~las149/*

EDUCATION

Georgia Institute of Technology, *Atlanta, Georgia.*
Ph.D. in Mechanical Engineering, August 2000.
M.S. in Mechanical Engineering, December 1997.
Ph.D. Dissertation: Single Pressure Absorption Heat Pump Analysis.
M.S. Thesis: Heat Exchanger Mean Temperature Differences for Refrigerant Mixtures.
Advisor: Dr. Samuel V. Shelton.
Minor: Operations Research (Optimization).

Rice University, *Houston, Texas.*
B.S. in Mechanical Engineering, May 1995.
B.A. in English, May 1995.

RESEARCH EXPERIENCE

Associate Director, January 2008 - Present.
Center for Energy, University of Pittsburgh, Pittsburgh, Pennsylvania.

Deputy Director, September 2006 - Present.
Mascaro Center for Sustainable Innovation, University of Pittsburgh, Pittsburgh, Pennsylvania.

Associate Professor, August 2006 - Present.
Bicentennial Board of Visitors Faculty Fellow, September 2005 - Present.
Assistant Professor, August 2000 - July 2006.
Mechanical Engineering and Materials Science Department, University of Pittsburgh, Pittsburgh, Pennsylvania.

Graduate Research Assistant, September 1998 - August 2000.
NSF Graduate Research Fellow, September 1995 - August 1998.
Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia.

RESEARCH OVERVIEW

My research area is the analysis, design and optimization of energy systems. My energy systems research relies on a solid basis of thermofluids modeling and to date has focused on topics such as:

- solid oxide fuel cell heat and mass transfer modeling,
- fluid and heat transfer properties of two-phase binary zeotropic flow in microchannels,
- hybrid fuel cell-turbine power generation assessment and optimization,
- design and characterization of thermoacoustic Stirling engines, and
- operational property prediction for alternative refrigerants.

This research has received over $6.5 million in funding by organizations such as NSF, AFOSR, ASHRAE, PITA, and NCIIA. For my future work, I plan to build on these areas through further experimental and computational investigation of multi-scale energy systems.

RESEARCH FUNDING ($6,951,766 TOTAL)

Peer-Reviewed Grants ($5,876,954 Total)

Environmentally Sound: Thermoacoustic Refrigeration, PI, NSF: CTS, 2007-2010, $300,000.

US-Brazil Partnership in Sustainability and Innovative Design, Senior Personnel, US DOE: FIPSE/CAPES, 2007-2010, $215,000.

Sustainable Design, Senior Personnel, NSF: REU Site, 2007-2010, $310,000.

International Sustainability Research: An Integrative Undergraduate Experience, Co-PI, NSF: OISE, 2007-2010, $150,000.

Development of an Inter-Disciplinary Fellowship Program in Sustainable Engineering, PI, US DOE: GAANN, 2006-2010, $506,000.

University of Pittsburgh Engineering Sustainability Program (UPESP), PI, NSF: Integrative Graduate Education and Research Traineeship Program (IGERT), 2005-2010, $3,386,647.

Microfabricated Thermoacoustic Refrigerators for Electronics Cooling Applications, Co-PI, NSF: ECS, 2005-2007, $95,000.

CAREER: Microscale Two-Phase Zeotropic Flow in Energy Systems, PI, NSF: CTS, 2003-2008, $405,107.

Seamless Integration of Information Devices: A Focus on Emerging Technologies in New Product Development, Co-PI, NSF: Combined Research-Curriculum Development, 2002-2005, $450,000.

New Investigator Award, PI, American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2002-2005, $30,000 plus $15,000 in matching funds.

JackHeat: A Lightweight, Fashionable, Self-Heating Jacket, PI, NCIIA, 2001-2002, $14,200.

Other Grants ($1,074,812 Total)

Investigation of Thermal Semiconductors for Adaptive Heat Management in Buildings, Co-PI, Mascaro Center for Sustainable Innovation, 2008-2010, $55,000.

Enhanced Water Recovery of Power Plant Cooling Tower Systems, Co-PI, NETL-CPW Collaborative Initiative, 2008-2009, $126,795.

Research in Sustainable Community Development, Senior Personnel, Pitt: GAP, 2006-2007, $20,000.

Comprehensive Characterization of Oxy-Fuel/Hydrogen Turbine Systems, PI, NETL-CPW Collaborative Initiative, 2005-2006, $192,000.

Energy Harvesting, Co-PI, Bechtel Bettis, Inc., 2005-2006, $215,000.

Next Generation Solid-State Illumination Systems for Green Construction, PI, Mascaro Sustainability Initiative, 2005-2006, $55,000.

Green Structural Neurology - A Nervous System for Green Buildings, Co-PI, Mascaro Sustainability Initiative, 2004-2005, $54,000.

Water Management of a Micro-Scale Direct Methanol Fuel Cell, Co-PI, Pennsylvania Infrastructure Technology Alliance, 2004-2005, $45,496.

Interactive Visualization in Turbulent Combustion and Microscale Energy Systems, PI, Defense University Research Instrumentation Program, 2003-2005, $150,529.

RF Skin Depth Experimentation and Analysis for Antennas, Co-PI, Swanson Center for Micro and Nano Systems, 2003-2004, $30,000.

Design, Construction, & Analysis of a Portable, Temperature-Regulated Insulin Carrier, PI, ASHRAE: Undergraduate Senior Project Grant, 2003-2004, $5,000.

Faculty Coupon, PI, General Electric Foundation, 2001-2004, $20,000.

A Micro Proton Exchange Membrane Fuel Cell, Co-PI, Pittsburgh Digital Greenhouse, 2001-2003, $90,000.

A Methodology for Hybrid Chiller Systems, PI, U. Pitt Research Development Fund, 2001-2003, $15,992.

HONORS AND AWARDS

Bicentennial Board of Visitors Faculty Fellow, School of Engineering, University of Pittsburgh, 2005-Present.
CAREER Award, National Science Foundation, Chemical and Transport Systems, 2003.
New Investigator Award, American Society of Heating, Refrigerating, & Air-Conditioning Engineers, 2002.
Faculty Honor Roll, School of Engineering, University of Pittsburgh, 2002.
Faculty for the Future Startup Fellowship (Faculty Coupon), General Electric Foundation, 2000.
Life Member's Scholarship, Georgia Engineering Foundation, 1999-2000.
Graduate Teaching Fellowship, American Society of Mechanical Engineers, 1998-2000.
Best Paper, Thermodynamic Analysis of Energy Systems, Advanced Energy Systems Division, ASME, 1999.
Graduate Grant-In-Aid, ASHRAE, 1998.
Graduate Research Fellowship, National Science Foundation, 1995-98.
Sylvia Farny Scholarship, American Society of Mechanical Engineers, 1994-95.

JOURNAL PAPERS UNDER REVIEW

1. Bao, J.[†], and **Schaefer, L.**, 2010, "Lattice Boltzmann Equation Model for Multi-Component Multi-Phase Flow with High Density Ratios," *Journal of Computational Physics*, under review.

2. Miller, V.[†], and **Schaefer, L.**, 2010, "Hydrokinetic Energy Extraction: Progress, Modeling, and Environmental Concerns," *Proceedings of ICE: EnergyJournal*, under review.

3. Trapp, A.[†], Zink, F.[†], Prokopyev, O., **Schaefer, L.**, 2010, "Thermoacoustic Heat Engine Modeling and Optimization," *Journal of Applied Mathematical Modeling*, under review.

4. Zink, F. [†], **Schaefer, L.**, 2010, "Variation of the Prandtl Number in CFD Simulations of the Thermoacoustic Cycle," *ASME Journal of Heat Transfer*, under review.

5. Zink, F.[†], Vipperman, J., and **Schaefer, L.**, 2010, "Modeling in Thermoacoustics: Past, Present, and Future," *Journal of Thermal Science and Engineering Applications*, under review.

6. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "Heat Transfer Analysis in Thermoacoustic Regenerators using CFD Simulation," *International Journal of Heat and Mass Transfer*, under review.

7. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "Sensitivities in the Design of Thermoacoustic Refrigerators," *Journal of Thermal Science and Engineering Applications*, under review.

[†] Graduate Student

8. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "Influence of Vortices on Heat Transfer in Thermoacoustic Stacks," *International Journal of Heat and Mass Transfer*, under review.

JOURNAL PAPERS

1. Miller, V.[†], and **Schaefer, L.**, 2010, "Dynamic Modeling of Hydrokinetic Energy Extraction," *Journal of Fluids Engineering*, accepted for publication.

2. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "CFD Simulation of Thermoacoustic Cooling," *International Journal of Heat and Mass Transfer*, accepted for publication.

3. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "CFD Simulation of a Thermoacoustic Engine with Coiled Resonator," *International Communications in Heat and Mass Transfer*, vol. 37, no. 3, pp. 226-229.

4. Zink, F.[†], Vipperman, J., **Schaefer, L.**, 2010, "Environmental Motivation to Switch to Thermoacoustic Refrigeration," *Applied Thermal Engineering*, vol. 30, nos. 2-3, pp. 119-126.

5. Zink, F.[†], Waterer, H., Archer, R., and **Schaefer, L.**, 2009, "Geometric Optimization of a Thermoacoustic Stack," *International Journal of Thermal Sciences*, vol. 48, no. 12, pp. 2309-2322.

6. Bao, J.[†], Yuan, P.[†], and **Schaefer, L.**, 2008, "A Mass Conserving Boundary Condition for the Lattice Boltzmann Method," *Journal of Computational Physics*, vol. 227, no. 18, pp. 8472-8487.

7. Maina, J. Y.[†], Mickle, M. H., Lovell, M. R., and **Schaefer, L. A.**, 2008, "Complex Radio Frequency (RF) Communications with Virtual Pulses," *Computers and Electrical Engineering*, vol. 34, no. 5, pp. 423-437.

8. Li, P.-W.[‡], **Schaefer, L.**, and Chyu, M. K., 2007, "Three-Dimensional Model for the Conjugate Heat and Gas Species Transport in a Planar Type Solid Oxide Fuel Cell," *International Journal of Transport Phenomena*, vol. 9, no. 1, pp. 1-18.

9. Maina, J. Y.[†], Mickle, M. H., Lovell, M. R., and **Schaefer, L.**, 2007, "Application of CDMA for Anticollision and Increase Read Efficiency of Multiple RFID Tags," *Journal of Manufacturing Systems*, vol. 26, no. 1, pp. 37-43.

10. Zink, F.[†], Lu, Y.[†], and **Schaefer, L.**, 2007, "A Solid Oxide Fuel Cell System For Buildings," *Energy Conversion and Management*, vol. 48, no. 3, pp. 809-818.

11. Lu, Y.[†], and **Schaefer, L.**, 2006, "Numerical Study of a Flat-Tube High Power Density Solid Oxide Fuel Cell: Part II. Cell Performance and Stack Optimization," *Journal of Power Sources*, vol. 153, no. 1, pp. 68-75.

12. Yuan, P.[†], and **Schaefer, L.**, 2006, "Equations of State in a Lattice Boltzmann Model," *Physics of Fluids*, vol. 18, no. 4, article 042101.

13. Yuan, P.[†], and **Schaefer, L.**, 2006, "A Thermal Lattice Boltzmann Two-Phase Flow Model and its Application to Heat Transfer Problems - Part 2. Integration and Validation," *ASME Journal of Fluids Engineering*, vol. 128, no. 1, pp. 151-156.

14. Yuan, P.[†], and **Schaefer, L.**, 2006, "A Thermal Lattice Boltzmann Two-Phase Flow Model and its Application to Heat Transfer Problems - Part 1. Theoretical Foundation," *ASME Journal of Fluids Engineering*, vol. 128, no. 1, pp. 142-150.

[‡] Post-Doctoral Researcher

15. Lu, Y.[†], **Schaefer, L.**, and Li, P.-W.[‡], 2005, "Numerical Simulation of Heat Transfer and Fluid Flow of a Flat-Tube Type High Power Density Solid Oxide Fuel Cell," *ASME Journal of Fuel Cell Science and Technology*, vol. 2, no. 1, pp. 65-69.

16. Lu, Y.[†], **Schaefer, L.**, and Li, P.-W.[‡], 2005, "Numerical Study of a Flat-Tube High Power Density Solid Oxide Fuel Cell: Part I. Heat/Mass Transfer and Fluid Flow," *Journal of Power Sources*, vol. 140, no. 2, pp. 331-339.

17. Li, P.-W.[‡], **Schaefer, L.**, and Chyu, M. K., 2004, "A Numerical Model Coupling the Heat and Gas Species' Multiple Transport Processes in a Tubular SOFC," *ASME Journal of Heat Transfer*, vol. 126, no. 2, pp. 219-229.

18. Lu, Y.[†], and **Schaefer, L.**, 2004, "A SOFC System Fed with Hydrogen Sulfide and Natural Gas," *Journal of Power Sources*, vol. 135, pp. 184-191.

19. **Schaefer, L. A.**, and Schaefer, A. J., 2004, "Locating Hybrid Fuel Cell-Turbine Power Generation Under Uncertainty," *Annals of Operations Research*, vol. 132, pp. 301-322.

20. Li, P.-W.[‡], **Schaefer, L.**, Wang, Q.-M., Zhang, T.[†], and Chyu, M. K., 2003, "Multi-gas Transportation and Electrochemical Performance of a Polymer Electrolyte Fuel Cell with Complex Flow Channels," *Journal of Power Sources*, vol. 115, no. 1, pp. 90-100.

21. Li, P.-W.[‡], Zhang, T.[†], Wang, Q.-M., **Schaefer, L.**, and Chyu, M. K., 2003, "The Performance of PEM Fuel Cells Fed with Oxygen through the Free-convection Mode," *Journal of Power Sources*, vol. 114, pp. 63-69.

22. Cain, J. T., Clark, W. C., **Schaefer, L. A.**, Mandecki, W., Ulinski, D.[†], and Mickle, M. H., 2001, "Energy Harvesting for DNA Gene Sifting and Sorting," *International Journal of Parallel and Distributed Systems and Network*s, Special Issue on Energy Harvesting, vol. 4, no. 3, pp. 140-149.

23. **Schaefer, L. A.**, 1997, "The State Principle: Foundations and Consequences," *Journal of Energy Resources Technology*, Vol. 119, pp. 205-207.

BOOK CHAPTERS

1. **Schaefer, L.**, 2008, "Microrotorcraft," in *Encyclopedia of Micro- and Nanofluidics*, D. Li, ed., Springer.

2. Li, P.-W.[‡], **Schaefer, L.**, and Chyu, M. K., 2005, "Multiple Transport Processes in Solid Oxide Fuel Cells," Chapter 1 in *Transport Phenomena in Fuel Cells*, B. Sunden and M. Fahgri, eds., Southampton: Wit Press.

3. Shelton, S. V., and **Schaefer, L. A.**, 1999, "The Economic Payoff for Global Warming Emissions Reduction," in *Greenhouse Gas Control Technologies*, B. Eliasson et al., eds., Amsterdam: Pergamon Press, pp. 1151-53.

REFEREED CONFERENCE PROCEEDINGS

1. Miller, V., and **Schaefer, L.**, 2009, "Hydrokinetic Turbine Selection and System Characterization," ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2009-11115.

2. Zink, F., Vipperman, J., and **Schaefer, L.**, 2009, "Influence of the thermal properties of the driving components on the performance of a thermoacoustic engine," ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2009-11325.

3. Zink, F., Vipperman, J., and **Schaefer, L.**, 2009, "Heat Transfer Analysis in Thermoacoustic Regenerators using CFD," ASME, *Summer Heat Transfer Conference*, SHTC-88215.

4. Miller, V., and **Schaefer, L.**, 2008, "Dynamic Modeling of Hydrokinetic Energy Extraction," Sustainable Energy Systems, ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2008-67722.

5. Zink, F., Vipperman, J., and **Schaefer, L.**, 2008, "Advancing Thermoacoustics Through CFD Simulation Using Fluent," Applications of Micro and Nanotechnologies to Energy Systems I, ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2008-66510.

6. Beckman, E., Sacre, M. B., Kovalcik, G., Mehalik, M., Ries, R., Needy, K., **Schaefer, L.**, and Shuman, L., 2007, "Combining Educational Studies, Research and International Experiences in Sustainable Engineering," *ASEE Annual Conference and Exposition*, Environmental Engineering Division.

7. Needy, K., Beckman, E., Sacre, M. B., Kovalcik, G., **Schaefer, L.**, and Shuman, L., 2006, "Combining Graduate Studies, Research and International Experiences in Sustainability," *ASEE Annual Conference and Exposition*, Environmental Engineering Division.

8. Li, P.-W., **Schaefer, L.**, and Chyu, M. K., 2005, "Optimization of Heat/Mass Transfer and Electric Charge Conduction in Solid Oxide Fuel Cells," *5th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion*, Xi'an, China, July 3-6, pp. 254-260.

9. **Schaefer, L.**, and Shelton, S., 2005, "Working Fluid Selection Through Parameter Estimation," *International Sorption Heat Pump Conference*, Denver, Colorado.

10. Yuan, P., and **Schaefer, L.**, 2004, "Lattice Boltzmann Simulation of Two-phase Flow and Heat Transfer in a Rectangular Channel," Fluids Engineering Division, ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2004-59437.

11. Lu, Y., **Schaefer, L.**, and Li, P.-W., 2004, "Numerical Simulation of Heat Transfer and Fluid Flow of a Flat-Tube High Power Density Solid Oxide Fuel Cell," *Second International Conference on Fuel Cell Science, Engineering and Technology*, Rochester, New York.

12. Desai, S., Lovell, M., Sacre, M., **Schaefer, L.**, and Mickle, M., 2003, "Development of the RAPID Network," *NCIIA 7th Annual Conference*, Boston, MA, March, 2003.

13. Li, P.-W., **Schaefer, L.**, and Chyu, M. K., 2003, "The Energy Budget in Tubular and Planar Type Solid Oxide Fuel Cells," Heat Transfer Division, ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2003-42426.

14. Li, P.-W., **Schaefer, L.**, and Chyu, M. K., 2003, "Interdigitated Heat/Mass Transfer and Chemical/Electrochemical Reactions in a Planar Type Solid Oxide Fuel Cell," *ASME Summer Heat Transfer Conference*, Las Vegas, HT2003-47436.

15. Li, P.-W., **Schaefer, L.**, and Chyu, M. K., 2003, "Investigation of the Energy Budget in an Internal Reforming Tubular Type Solid Oxide Fuel Cell Through Numerical Computation," *International Joint Power Generation Conference*, Atlanta, IJPGC2003-40126.

16. Li, P.-W., **Schaefer, L.**, and Chyu, M. K., 2003, "Three-Dimensional Model for the Conjugate Processes of Heat and Gas Species Transportation in a Flat Plate Solid Oxide Fuel Cell," *International Symposium of Transport Phenomenon*, Bali, Indonesia, June 6-9, pp. 305-312.

17. Mickle, M., Lovell, M., **Schaefer, L.**, Wang, A., and Cain, J.T., 2003, "Three Dimensional Sensing for Environment and Security Control," *IEEE International Conference on Systems, Man and Cybernetics, Transactions*.

18. Zhang, T., Li, P.-W., Wang, Q.-M., **Schaefer, L.**, and Chyu, M. K., 2003, "Fabrication and Performance Evaluation of Miniaturized Proton Exchange Membrane Fuel Cells," *Fuel Cell Science, Engineering and Technology*, Rochester, FUELCELL2003-1709.

19. Li, P.-W., **Schaefer, L.**, Wang, Q. M., Zhang, T., and Chyu, M. K., 2002, "Multi-gas Transportation and Electrochemical Performance in a Polymer Electrolyte Fuel Cell with Complicated Flow Channels," *First International Symposium on Thermal Science and Technology* (TSE 2002), Beijing, China, Oct. 23-26, pp. G438-G449.

20. Li, P.-W., **Schaefer, L.**, Wang, Q.-M., and Chyu, M. K., 2002, "Computation of the Conjugating Heat Transfer of Fuel and Oxidant Separated by a Heat-Generating Cell Tube in a Solid Oxide Fuel Cell," Heat Transfer Division, ASME, *International Mechanical Engineering Congress and Exposition*, IMECE2002-32564.

21. Shelton, S. V., Stewart, S. W., Erickson, D., **Schaefer, L. A.**, 2002, "Bubble Pump Design for Single Pressure Absorption Refrigeration Cycles," ASHRAE Transactions, vol. 108, no. 1, pp. 867-876.

22. **Schaefer, L. A.**, and Schaefer, A. J., 2001, "The Viability and Reliability of Hybrid Fuel Cell-Turbine Power Generation," *Proceedings of the 2001 Virginia Tech College of Engineering Green Engineering Conference*, M. Gregg, ed., Roanoke, Virginia, CD Transactions, S6-T-03.

23. **Schaefer, L. A.**, and Shelton, S. V., 2001, "Electric and Gas Water Heating: Environmental and Economic Implications," *Proceedings of the 2001 Virginia Tech College of Engineering Green Engineering Conference*, M. Gregg, ed., Roanoke, Virginia, CD Transactions, S2-M-04.

24. Shelton, S. V., Delano, A., and **Schaefer, L. A.**, 1999, "Design Analysis of the Einstein Refrigeration Cycle," *Proceedings, Renewable & Advanced Energy Systems for the 21st Century*, CD Transactions, RAES-04.

25. Shelton, S. V., Delano, A., and **Schaefer, L. A.**, 1999, "Second Law Study of the Einstein Refrigeration Cycle," *Proceedings, Renewable & Advanced Energy Systems for the 21st Century*, CD Transactions, SLA-02.

26. Shelton, S. V., Jacob, D., and **Schaefer, L. A.**, 1999, "Analysis of the Air Cooled Ammonia-Water Triple Effect Cycle," *Proceedings of the ASME Advanced Energy Systems Division*, vol. 39, S. Aceves et al., ed., 151-158.

27. Shelton, S. V., Vodenicker, J., and **Schaefer, L. A.**, 1999, "Three Dimensional Graphic Analysis of Absorption Cycles," *Proceedings of the ASME Advanced Energy Systems Division*, vol. 39, S. Aceves et al., ed., 143-150.

28. **Schaefer, L. A.**, and Shelton, S. V., 1998, "Heat Exchanger Mean Temperature Differences for Refrigerant Mixtures," *Proceedings of the ASME Advanced Energy Systems Division*, vol. 38, H. Metghalchi et al., ed., 383-389.

PRESENTATIONS AND OTHER CONFERENCE PROCEEDINGS

1. Kerzmann, T., and **Schaefer, L.**, 2009, "Hybrid Four Parameter Multijunction Cell Model," *Engineering Sustainability 2009: Innovations that Span Boundaries*, seminar presentation.

2. **Schaefer, L.**, 2009, "From Micropower to Microchannels: Modeling Sustainable Energy Systems," *Mechanical Science and Engineering, University of Illinois at Urbana-Champaign*, invited presentation.

3. **Schaefer, L.**, 2009, "From Micropower to Microchannels: Modeling Sustainable Energy Systems," *Mechanical Engineering, University of California-Berkeley*, invited presentation.

4. Miller, V., and **Schaefer, L.**, 2008, "Energy Policy and its Application to Sustainable Small Scale Hydropower Development," *AASHE '08 Proceedings*, poster presentation.

5. Miller, V., and **Schaefer, L.**, 2008, "Hydrokinetic Energy Extraction," *Student Industrial Ecology Conference*, poster presentation.

6. Miller, V., Landis, A., and **Schaefer, L.**, 2008, "Hydrokinetic Energy Extraction: Progress, Modeling, and Environmental Concerns," *UKERC Sparks: Energy Research in Context*, poster presentation.

7. Zink, F., Vipperman, J., and **Schaefer, L.**, 2008, "Environmental Motivation to Switch to Thermoacoustic Refrigeration," *AASHE '08 Proceedings*, poster presentation.

8. **Schaefer, L.**, 2007, "Green Energy Systems for Buildings and Small Communities," *Frontiers in Transport Phenomena Research and Education*, NSF Sponsored Workshop, University of Connecticut, invited presentation.

9. **Schaefer, L.**, 2007, "Distributed Generation: One Example of Environmental and Economic Implications," *Engineering Sustainability 2007*, invited presentation.

10. Kerzmann, T., Zink, F., and **Schaefer, L.**, 2007, "Industrial Symbiosis - Sharing and Recycling Water Resources," *Engineering Sustainability 2007*, poster presentation.

11. Miller, V., Fuchs, A., Rossi, G., and **Schaefer, L.**, 2007, "Green Roofs: Alleviating Urban Stress," *Engineering Sustainability 2007*, poster presentation.

12. **Schaefer, L.**, 2005, "From Micropower to Microchannels: Energy Systems at Multiple Scales," *G.W.W. School of Mechanical Engineering, Georgia Institute of Technology*, invited presentation.

13. Guido, M., and **Schaefer, L.**, 2005, "Heat Transfer Modeling," *Western Pennsylvania ANSYS User's Group*, research presentation.

14. **Schaefer, L.**, 2005, "From Micropower to Microchannels: Energy Systems at Multiple Scales," *Department of Mechanical and Aerospace Engineering, University of Florida*, invited presentation.

15. **Schaefer, L.**, 2005, "ASHRAE Research Opportunities," *ASHRAE: Pittsburgh Chapter*, invited presentation.

16. **Schaefer, L.**, 2005, "From Micropower to Microchannels: Energy Systems at Multiple Scales," *Mechanical Engineering Department, Stanford University*, invited presentation.

17. **Schaefer, L.**, and Yuan, P., 2004, "Modeling Two-Phase Microchannel Flow," *ASHRAE: TC 8.3*, Anaheim, CA, research presentation.

18. **Schaefer, L.**, 2003, "Modeling and Analysis of Proton Exchange Membrane and Solid Oxide Fuel Cells," *CMU: Institute for Complex Engineered Systems*, invited presentation.

19. **Schaefer, L.**, 2003, "Alternative Vehicle Technologies," *GSPIA: Panel on the Greening of Public Transportation*, invited presentation.

20. **Schaefer, L.**, 2003, "A Portable Insulin Cooler," *ASHRAE: Pittsburgh Chapter*, invited presentation.

21. Kreke, J., Roberts, N., Norman, B., Ries, R., **Schaefer, L.**, and Schaefer, A., 2001, "Optimal Location and Operation of Co-Generators for Energy System Design," *Proceedings of the Sandia National Lab/CUSTOM Conference*, poster presentation.

22. **Schaefer, L.**, 2001, "Designing Energy Systems Under Uncertainty," *Proceedings of the Sandia National Lab/CUSTOM Conference*, invited presentation.

23. **Schaefer, L. A.**, and Shelton, S. V., 1998, "The Economic Payoff for Global Warming Emissions Reduction (Part 1)," *University System of Georgia Research Symposium*, seminar presentation.

SUPERVISORY ACTIVITES

Post-Doctoral Researchers

Mustafa Bayrak, January 2007 - December 2007, Current Employer: Department of Mechanical Engineering, Niğde University, Turkey.
Yuksel Korkmaz, January 2003 - December 2004.
Pei-Wen Li, Co-Directed with M. K. Chyu, August 2001 - July 2006, Current Employer: Aerospace and Mechanical Engineering Department, University of Arizona.

Ph.D. Students

Justin DuBlois, *Hybrid Solar Power/Solar Thermal Systems*, September 2009 - Present.
Michael Ikeda, *Development of Small-Scale Absorption Cycles*, September 2007 - Present.
Veronica Miller, *Novel Hydrokinetic Power Generation: An Environmentally-Conscious Approach*, September 2006 - Present.
Jie Bao, *Multicomponent and Multiphase Thermal Flow Characterization Using the Lattice-Boltzmann Method*, September 2005 - Present.
Tony Kerzmann, *Linear Concentrating Photovoltaics Simulation and Analysis*, September 2005 - Present.
Florian Zink, *Identification and Attenuation of Losses in Thermoacoustics: Issues Arising in the Miniaturization of Thermoacoustic Devices*, Graduated December 2009.
Michael Guido, *Prediction of Heat Dissipation in 3-D Circuit Architecture*, Co-Directed with M. Lovell, Graduated December 2005, Current Employer: Mallett Technology, Inc.
Peng Yuan, *Numerical Characterization of Two-Phase, Two-Component Heat Transfer and Fluid Flow in Mesochannels*, Graduated December 2005, Current Employer: ANSYS, Inc.
Yixin Lu, *Simulation and Analysis of a Flat Tube Type Solid Oxide Fuel Cell*, Graduated April 2005, Current Employer: Worleyparsons.

M.S. Students

Benjamin Leven, *Heat Exchangers for Compact Thermoacoustic Devices*, September 2007 - December 2008.
Raymond Brush, *Transient Thermal Property Evaluation During Cure of Substrate Materials*, Co-Directed with M. Lovell, Graduated August 2004.

Ph.D. Dissertation Committee Member

Sang-Kug Chung, *Micro Object Manipulation by Oscillating Bubbles*, Expected Graduation Date: Fall 2009.
Nina Baird, *Sustainable Mechanical Systems: Conditioning with Low-Grade Thermal Energy*, Expected Graduation Date: Fall 2009 (Carnegie Mellon University).
Hee-Joon Lee, *Thermal-Fluids Design of Evaporative Micro-channel Systems*, Graduated Fall 2008 (Carnegie Mellon University).
Pushkarraj Deshmukh, *Design and Development of an Environmental Cell for Dynamic In Situ Observation of Gas-Solid Reactions at Elevated Temperatures*, Graduated Spring 2008.
Roxana Cisloiu, *A Stabilized Mixed Finite Element Formulation for Finite Strain Deformation*, Graduated Spring 2006.
Ayat Osman, *Life Cycle Optimization Model for Integrated Cogeneration and Energy Systems Applications in Buildings*, Graduated Spring 2006.
Khaled Bataineh, *Development of Precision TEM Holder Assemblies for Use in Extreme Environments*, Graduated Fall 2005.

James Cordle, *Modeling and Design of a Piezoelectric Microvalve for Pressurized Droplet Formation*, Graduated Fall 2005.
Tomasz Drozda, *An Application of the Filtered Density Function Methods to Non-Premixed Diffusion Flames*, Graduated Summer 2005.
Tao Zhang, *Design, Fabrication and Performance of a Miniaturized Polymer Electrolyte Fuel Cell (PEFC) System*, Graduated Spring 2005.
Yosef Alyousef, *Management of Two-Phase Transport Phenomena Through Surface Structure and Wettability Control*, Graduated Spring 2005 (Carnegie Mellon University).
Junfeng Mei, *Formulation and Processing of Conductive Inks for Inkjet Printing of Electrical Circuits*, Graduated Fall 2004.
Salil Desai, *Multiphysics Analysis and Optimization of 3 Dimensional Printing Technology Using Nano Fluidic Suspensions*, Graduated Summer 2004.
Roy Issa, *Numerical Modeling of the Dynamics and Heat Transfer of Impacting Sprays for a Wide Range of Pressures*, Graduated Fall 2003.
Osama Al-Aqal, *Heat Transfer Distributions on the Walls of a Narrow Channel with Jet Impingement and Cross Flow*, Graduated Summer 2003.
Alan Briggs, *Transient Conjugate Heat Transfer in a Circular Duct for Power-Law Fluid with Viscous Dissipation*, Graduated Summer 2003.
Ammata Tusnapuckdi, *Heat Transfer in Non-Newtonian Fluid Flow from an Oblique Array of Plates of Unequal Length*, Graduated Spring 2002.

M.S. Thesis Committee Member

Kyungjoo Ryu, *Micro Pumping and Particle Separation/Collection Using Oscillating Bubbles*, Graduated Summer 2008.
Stephen Heston, *Linear Quadrupole Focusing for High Resolution Microdroplet-Based Fabrication*, Graduated Fall 2004.
Ayat Osman, *Life Cycle Environmental Impact Analysis of Alternative Uses of Natural Gas-Fired Equipment in Buildings*, Graduated Fall 2002.

Undergraduate Research Assistants (Including 2 Women and 2 Minority Students)

Leonardo Moura, Exchange Student from UNICAMP, Brazil.
Konstantin Tourkov, Expected Graduation Date: Spring 2010.
Paul Tunis, Expected Graduation Date: Spring 2010.
Nick Vukmer, Expected Graduation Date: Spring 2011.
Brian Easter, Graduated Spring 2009.
Steve Lavoritano, Graduated Spring 2009.
Wesley Knotts, Graduated Spring 2008.
Gerald diNoia, Graduated Spring 2008.
Eddie Halusic, Graduated Spring 2008.
Todd Locker, Graduated Spring 2007.
Matt Paden, Graduated Spring 2007.
Allen Patrick, Graduated Spring 2006.
Donald McCalmon, Graduated Spring 2005.
Scott Butler, Graduated Fall 2004.
Misheka Wilson, Graduated Spring 2004.
Nick Krizan, Graduated Spring 2003.
Brittany Guthrie, Graduated Spring 2002.
Christopher Hardin, Graduated Spring 2002.
Nathaniel Roberts, Graduated Summer 2001.

Undergraduate Design Projects

A Novel Method for the Production and Storage of Electric Power Through Rainfall, Senior Design Project, W. Epting, J. Ferrett, A. Chapman, and J. Brunner, January - April, 2009.

Solar Assisted Window Fan, MCSI Undergraduate Energy Efficiency Design Competition, P. Wetherill and S. Palmer, August 2008 - April 2009.

Water Distillation and Power Generation using Concentrating PV, Senior Design Project, D. Mirizio, A. Lindgren, and D. Berkepile, August - December, 2008.

Sustainable Redesign of Low-Income Housing, Summer Undergraduate Research Experience, S. Streiner, J. Pilz, and W. Koubaa, May - August, 2008.

Alternative Insulin Cooling for Portable Transport, Product Realization Design Project, N. Pireas, J. Cooke, D. Jacobs, and A. Rubinski, January - May, 2004.

Building Heat Flow and Water Usage Analysis and Optimization, Senior Design Project, B. Peters, S. Washington, J. Horner, and S. Griffin, January - May, 2003.

JackHeat: A Lightweight, Self-Heating Jacket, Product Realization Design Project, D. Chekan, M. Hoopes, and V. MacLaren, January 2001 - April 2002.

A Heated Headform for Hardhat Analysis and Design, Senior Design Project, H. DeBiase, C. Tucker, and S. McKinney, January - May, 2001.

PROFESSIONAL EXPERIENCE

Hertz Foundation Intern, Summer, 1994.
Undergraduate Summer Institute, Lawrence Livermore National Laboratory, Livermore, California.
Worked with a mentor to model a Xenon atom in a laser beam and attended lectures by Livermore scientists.

Martin Marietta Intern, June - August, 1993.
Education Division, National Air and Space Museum, Washington, D.C.
Designed and built a longitudinal wave device for *How Things Fly*, the museum's first interactive gallery.

CONSULTING EXPERIENCE

CryoTherm, Inc., *Fluid Property Matching for Optimized Cycle Operation*, Summer 2002.
ETAAC, Inc., *Phoenix Test Protocol Design*, Spring 2001.

TEACHING EXPERIENCE

University of Pittsburgh

Undergraduate Courses

MEMS 1051: Advanced Thermodynamics, Spring 2002, Fall 2002, Spring 2003, Fall 2003, Spring 2006, Spring 2007, Fall 2009. *Average Effectiveness as a Teacher:* 4.2/5.0.

MEMS 1065: Thermal Systems Analysis and Design, Spring 2001, Fall 2001, Fall 2003, Fall 2004, Fall 2005, Fall 2006, Fall 2006 (Partial Semester), Fall 2007, Fall 2008, Spring 2010. *Average Effectiveness as a Teacher:* 4.2/5.0.

ME 1071: Fluid Mechanics I, Fall 2000. *Effectiveness as a Teacher:* 4.0/5.0.

MEMS 1085: Undergraduate Seminar, Fall 2001, Spring 2002, Fall 2002, Spring 2006.

Graduate Courses

CEE 2210: Powering the Campus of the Future (Joint Class with Carnegie-Mellon University), Fall 2001.

ENGR 2200: Introduction to Sustainable Engineering, Fall 2006. *(Qualitative Evaluations Only.)*

ENGR 3200: Engineering Sustainability: Capstone Definition, Spring 2008, Fall 2009. *(Qualitative Evaluations Only.)*

ENGR 3210: Engineering Sustainability: Capstone Realization, Summer 2008, Spring 2010. *(Qualitative Evaluations Only.)*

ME 2085: ME Graduate Seminar, Fall 2004.

ME 2074: Graduate Fluid Mechanics I, Spring 2003. *Effectiveness as a Teacher:* 3.65/5.0.

ME 3007: Energetics, Fall 2004, Fall 2007, Fall 2008. *(Qualitative Evaluations Only.)*

Representative Comments from Evaluations: "Dr. Schaefer is probably the best engineering professor I have had in the last four years." "One of the best teachers at Pitt." "Cares about students and what they learn." "Very comfortable learning environment." "Ability to make a difficult subject very interesting and understandable." "Excellent at getting the class interested in learning."

Georgia Institute of Technology

Thermal Systems Analysis, Winter 1999, Doctoral Teaching Intern, Assisted Professor James Hartley.
Effectiveness as a Teacher: 4.6/5.0.

Thermodynamics I, Spring 1999, Teaching Practicum, Assisted Professor Sam Shelton.

Fluid Mechanics I, Spring 1996, Teaching Practicum, Assisted Professor G. Paul Neitzel.

Representative Comments from Evaluations: "Laura was an excellent supplement to Dr. Hartley's class." "Laura is an awesome TA and she will be a great teacher." "The TA, Laura, was extremely knowledgeable and helpful throughout the quarter. I believe she has significantly contributed to my understanding of the subject applications." "Our TA, Laura Schaefer, was awesome. She helped to clear up so many questions."

SELECTED CONTRIBUTIONS TO DIVERSITY

Invited Participant, Women's International Research Engineering Summit.
Faculty Counselor, Society of Women Engineers.
Advisor, Female and Minority Graduate and Undergraduate Research Assistants.
PI and Co-PI, IGERT, GAANN, and IRES grants which are designed to increase the recruitment and retention of minority graduate students.
Participant, Women's Leadership Skills Workshop for Untenured Engineering Faculty.
Panelist, SWE Discussion Forum on Engineering Careers.

PROFESSIONAL SERVICE

National:

American Society of Mechanical Engineers:
Executive Committee, Advanced Energy Systems Division, 2005 - Present.
Media Editor, Advanced Energy Systems Division, 2002 - 2006.
Chair, Heat Pump Technical Committee, AESD, 2004 - 2006.
Vice-Chair, Heat Pump Technical Committee, AESD, 2002 - 2004.
Secretary, Heat Pump Technical Committee, AESD, 2000 - 2002.
Track Organizer, Energy Sessions, IMECE, 2006.
Topical Organizer, Heat Pump Technical Committee, AESD, IMECE, 2005 - Present.
Session Chair, Heat Pump Technical Committee, AESD, IMECE, 1999 - Present.
Session Chair, K-6: Heat Transfer in Energy Systems, Heat Transfer Division, 2004 - Present.
Member, K-6: Heat Transfer in Energy Systems, Heat Transfer Division, 2000 - Present.

American Society of Heating, Refrigerating, & Air-Conditioning Engineers:
Chair, TC 8.3 - Absorption and Heat Operated Machines, 2006 - 2008.
Vice-Chair, TC 8.3, 2004 - 2006.
Secretary, TC 8.3, 2002 - 2004.
Programs Chair, TC 8.3, 2002 - 2005.
Programs Chair, TC 1.1 - Thermodynamics and Psychrometrics, 2005 - Present.
Chair, TC 1.1, 2003 - 2005.

University of Pittsburgh:

Faculty Advisor, ASME, University of Pittsburgh Student Chapter, 2001 - Present.
Faculty Counselor, SWE, University of Pittsburgh Student Chapter, 2004 - Present.
Member, Planning and Budgetary Committee, School of Engineering, 2004 - 2007.
Chair, Space Committee, Mechanical Engineering and Materials Science Department, 2005 - 2007.
Chair, Ad hoc Interprogram Graduate Committee, MEMS Department, 2006 - 2007.
Member, Strategic Planning Committee, MEMS Department, 2006 - 2007.
Member, Faculty Search Committee, MEMS Department, 2002 - 2003, 2006 - Present.
Member, Graduate Committee, Mechanical Engineering Department, 2000 - 2003, 2004 - 2006, 2007 - Present.
Member, Undergraduate Committee, Mechanical Engineering Department, 2003 - 2004.
Speaker, Mechanical Engineering Section, University of Pittsburgh Career Day, 2001 - 2003.
Chairman, Heat Transfer Preliminary Exam Committee, 2003, 2005, 2006, 2007.
Chairman, Fluids Preliminary Exam Committee, 2002-2003.
Member, Green Construction Committee, School of Engineering, 2001 - 2003.

Georgia Institute of Technology:

Chair, Georgia Tech Graduate Student Symposium, 1998.
Volunteer and Speaker, Society of Women Engineers High School Outreach Program, 1996 - 97.

PROFESSIONAL AFFILIATIONS

American Society of Mechanical Engineers, 1992 - Present.
Society of Women Engineers, 1992 - Present.
American Society of Heating, Refrigerating, & Air-Conditioning Engineers, 1995 - Present.
American Society for Engineering Education, 2000 - Present.