

Matthew M. Barry

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Previous Employment

- **University of Pittsburgh** **Pittsburgh, PA**
Assistant Professor *January 2017 – Current*

Primary appointment within the Mechanical Engineering and Materials Science (MEMS) Department and secondary appointment with the Chemical and Petroleum Engineering Department, with primary responsibility of undergraduate and graduate course instruction, with secondary focus on engineering education research and research, and tertiary focus on developing local industry collaboration. Responsible for class administration, lesson plan preparation, grading of assignments and tutoring of undergraduate students. Responsible for the MEMS graduate curriculum, undergraduate concentration in Computational Fluid Dynamics (CFD), and a graduate certificate in CFD. Conducted research in the areas of solid-state energy conversion, i.e. first-principles finite volume modeling of thermoelectric devices for nuclear-powered space propulsion systems and waste heat recovery systems, multi-state phase-change modeling and multi-method multi-physics thermal-fluid-electric optimization algorithm. Promoted the inclusion of under-represented and minority undergraduate and graduate students in research.
- **Youngstown State University** **Youngstown, OH**
Adjunct Professor *January 2018 – May 2018*
May 2017 – June 2017
September 2013 – May 2014

Position within the Mechanical Engineering Department with primary responsibility of undergraduate course instruction. Responsible for class administration, lesson plan preparation, grading of assignments and tutoring of undergraduate students.
- **University of Pittsburgh** **Pittsburgh, PA**
Visiting Research Associate *May 2016 – December 2016*

Pursued the development of non-destructive testing of advanced materials for the automotive and energy industries using conventional ultrasonic and new electromagnetic acoustic transmission techniques. Experimental studies focused on *in situ* characterization of materials to identify and quantify defects and chemical segregation. Work was pursued in Professor Isaac Garcia's research group.
- **Brush Aftermarket** **Pittsburgh, PA**
Mechanical/Balance Engineer *January 2016 – January 2017*

Aided in the repair and refurbishment of turbogenerator rotors and stators through means of mechanical, dynamic and vibrational analysis of rotating and stationary equipment. Focused on developing methods of rotordynamic analysis to complement in-house and field rotor balancing, methods of *in-situ* non-destructive testing and evaluation, and prediction of crack formation using FEA. Conducted rotor balancing, running electrical testing and heat runs. Prepared drawings, engineering specifications and testing standards. Aided in achieving ISO compliance with engineering procedures.

- University of Pittsburgh** **Pittsburgh, PA**
Instructor/Adjunct Lecturer *August 2015–December 2016*
 Taught undergraduate courses in accordance with the Mechanical Engineering and Materials Science department. Responsible for class administration, lesson plan preparation, grading of assignments and tutoring of undergraduate students.
- University of Pittsburgh** **Pittsburgh, PA**
R.K. Mellon Graduate Fellow *August 2010–December 2015*
 Conducted research on the following topics: nanoparticle drilling fluids; nanoparticle production via laser ablation; novel thermoelectric devices for waste heat recovery; and material processing of thermoelectric semiconductors for improved material performance, with a focus on additive manufacturing. Studies focused on thermal-fluid-hydraulic performance of thermoelectric devices using in-house codes and commercially available software to validate experiments. Leadership demonstrated through the instruction of nine (9) capstone Senior Design classes, one (1) Freshman Pilot Program, two (2) Freshmen Honors Engineering courses and four (4) undergraduate researchers.
- Department of Energy, National Energy Technology Laboratory** **Pittsburgh, PA**
Professional Internship Program - Researcher *June 2010–August 2010*
 Conducted research under supervision of Dr. Phuoc Tran through the administration of Oak Ridge Institute for Science and Education focusing on laser ablation methods for nanoparticle production.
- United States Army Corps of Engineers** **Pittsburgh, PA**
Mechanical Engineer, SCEP/Part-time: GS-04, Series 0899 *May 2008–October 2009*
 Assisted engineers in the design of mechanical, hydraulic and electrical systems for Pittsburgh District Dams. Prepared cost estimates, specifications and contracts. Conducted inspections of dam structures and operating equipment throughout the Pittsburgh District. Aided in the discovery and emergency repair of Allegheny 6, receiving **Achievement Medal for Civilian Service** (February 12th, 2009) and the **Federal Executive Board Pittsburgh Bronze Award** as part of the Allegheny Emergency Dam Safety Response Team.

Education

- University of Pittsburgh** **Pittsburgh, PA**
Ph.D. Mechanical Engineering, *April 2012–April 2016*
 QPA: 3.886
- University of Pittsburgh** **Pittsburgh, PA**
M.S. Mechanical Engineering, *August 2010–April 2012*
- University of Pittsburgh** **Pittsburgh, PA**
B.S. Mech. Eng., B.A. History, Nuclear Eng. Certificate, *August 2005–April 2010*
 QPA: 3.159
 School of Engineering Honors – Spring Semester 2007, 2009, 2010; Fall Semester 2009

Awards

- **Visiting Committee Excellence in Education Award**, awarded by the Mechanical Engineering and Material Science Visiting Committee, University of Pittsburgh, 2018.
- **Best Poster Award**, International Conference on Thermoelectrics, *Numerically Resolved Radiation View Factors for Single and Multi-Junction Thermoelectric Devices*, Poster. Laura B.

Fulton, Justin Ying, Corey E. Clifford and **Matthew M. Barry**, (2017), Pasadena, CA, USA, July 30-August 4.

Funded Proposals

- Principal Investigator (Co-PI Shervin Sammak) for “Case Study of the Application of a Novel Integrated Thermoelectric Device Applied to the Waste Heat Recovery of Fleet Vehicles”, funded by the Mascaro Center for Sustainable Innovation, University of Pittsburgh for \$50,784 (July 1st, 2018 through June 30th, 2019).

Industry and Research Collaboration

- **Lubrizol Process Development** July 2016 – Present
Worked with Lubrizol under the direction of Cliff Kowall to aid in the development of petroleum processes, in particular, mixing. Using computational fluid dynamics, particular processes would be analyzed to identify deficiencies in processing techniques and available methods of improvement. Analyses were multi-physics based - thermal-fluid two-phase systems with chemical reactions.
- **Europa Clipper Mission** September 2017 – Present
Worked with the Jet Propulsion Laboratory under direction of program director Bill Nesmith and the California Institute of Technology on the NASA Europa Clipper mission. Work was pursuant on radio-isotope generator modeling and optimization, thermal modeling and management of the cryobot and mechanical design of the drill system.
- **SSVIP – HTP-6 Mission** January 2017 – January 2018
Worked with the Electrical and Computer Engineering Department’s National Science Foundation SHREC Center at the University of Pittsburgh under the direction of Alan George and NASA Goddard center with Chris Baker on the SSVIP HTP-6 International Space Station mission. Work was focused on the thermal modeling of individual system components and whole-system modeling. Numerically modeled circuit boards and circuit board structures to confirm operation under extreme conditions. Ensured compliance with NASA and ITAR standards.

Publications

1. (In Preparation) *A Critique of Existing Analytical Thermoelectric Models - Rectifying Heat Input with a Novel Approach*, **Matthew M. Barry**, Heonjoong Lee and Joanna R. Rivero, Energy.
2. (In Preparation) *Thermal-Fluid-Electric Coupled Modeling of Novel Pin-Fin Integrated Thermoelectric Devices*, Corey E. Clifford, Shervin Sammak, Austen D. Fradeneck, Michael J. Durka and **Matthew M. Barry**, Energy.
3. (In Preparation) *The Effect of Packing Density on the Thermal-Fluid-Electric Performance of Pin-Fin Integrated Thermoelectric Devices*, Corey E. Clifford, Shervin Sammak, Austen D. Fradeneck, Michael J. Durka and **Matthew M. Barry**, Energy.

4. (In Preparation) *GPU Accelerated Ray Tracing - Resolving Radiation View Factors within Multi-Junction Thermoelectric Devices*, Corey E. Clifford, Justin Ying, Laura B. Fulton and **Matthew M. Barry**, Energy
5. (In Preparation) *Parametric Study of Cold Uniaxial Pressing and Annealing of Polycrystalline Bi_2Te_3 for Enhanced Texture*, **Matthew M. Barry**, Cain J. Hung, Pawel Nowakowski, Jonathon Kim, Calixto I. Garcia and Minking K. Chyu, Journal of Electronic Materials
6. *Geometric Optimization of Thermoelectric Elements for Maximum Efficiency and Power Output*, **Matthew M. Barry**, Kenechi A. Agbim, Parthib Rao, Corey E. Clifford, B. V. K. Reddy and Minking K. Chyu, Energy. 12 (2016): 388-407.
7. *Numerical Solution of Radiation View Factors within a Thermoelectric Device*, **Matthew M. Barry**, Justin Ying, Michael J. Durka, Corey E. Clifford, B.V.K. Reddy and Minking K. Chyu, Energy. 102 (2016): 427-435.
8. *Smart Guidewires for Smooth Navigation in Neurovascular Intervention*, **Matthew M. Barry**, Mahdis Shayan, Brian Jankowitz, Yanfei Chen, Xinjie Duan, Anne Robertson, Minking K. Chyu and Youngjae Chun, Journal of Medical Devices. 9.1 (2015): 011011.
9. *Fluid Filtration Behavior and Rheological Properties of Nanoparticle Additive and Intercalated Clay Hybrid Bentonite Drilling Fluids*, **Matthew M. Barry**, Youngsoo Jung, Jung-Kun Lee, Phuoc Tran, Minking K. Chyu, Journal of Petroleum Science and Engineering. 127 (2015): 338-346.
10. *Performance of a Thermoelectric Device with Integrated Heat Exchangers*, **Matthew M. Barry**, Kenechi A. Agbim, Minking K. Chyu, Journal of Electronic Materials. 44.6 (2014): 1394-1401.
11. *Pulsed Nanosecond Laser Ablation of Gold in Deionized Water and Aqueous Chitosan Solution*, **Matthew M. Barry**, Bo Ding, Youngsoo Jung, B.V.K. Reddy, Phuoc Tran, Minking K. Chyu, Optics and Lasers in Engineering. 55 (2014): 59-68.
12. *Convective Heat Transfer and Contact Resistances Effects on Performance of Conventional and Composite Thermoelectric Devices*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), Journal of Heat Transfer 136 (10), 101401.
13. *Thermo-electric-hydraulic Performance of a Multistage Integrated Thermoelectric Device*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), Energy Conversion and Management, 77, 458-468.
14. *Enhancement of Thermoelectric Device Performance Through Integrated Flow Channels*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), Frontiers in Heat and Mass Transfer, 4, 023001.

15. *Thermoelectric Performance of Novel Composite and Integrated Devices Applied to Waste Heat Recovery*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), ASME J. Heat Transfer, 135 (3), 031706 (1-11).
16. *Mathematical Modeling and Numerical Characterization of Composite Thermoelectric Devices*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), International Journal of Thermal Sciences, 67, 53-63.
17. *Three-dimensional Multiphysics Coupled Field Analysis of an Integrated Thermoelectric Device*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2012), Numerical Heat Transfer Part A, 62, 933-947.

Conferences and Conference Proceedings.....

1. *A New Approach to Teaching Statics Using a Makerspace*, Lee A. Dosse, **Matthew M. Barry**, Karthika Ramanathan, Renee M. Clark. 2019 IEEE Frontiers in Education Conference, Cincinnati, OH, USA, October 16-19.
2. *Reducing Emissions - Fuel Consumption Reduction Technologies for Pittsburgh Port Authority Buses; Thermoelectric Generators*, Iza G. Lantgios, Shervin Sammak and **Matthew M. Barry**. Mascaro Center for Sustainable Innovation: A Climate for Change - Engineering Sustainability 2019, Pittsburgh, PA, USA, April 7-9.
3. *Thermal Energy Conversion – Analytic Modeling of an Integrated Thermoelectric Device*, Joshua A. Cameron, Shervin Sammak and **Matthew M. Barry**. Mascaro Center for Sustainable Innovation: A Climate for Change - Engineering Sustainability 2019, Pittsburgh, PA, USA, April 7-9.
4. *Application of Thermoelectric Generators for Carbon Emission Reduction of Fossil-Fuel Power Plants*, Edward M. Ledesma, Shervin Sammak and **Matthew M. Barry**. Mascaro Center for Sustainable.
5. *Waste Heat Recovery of Cummins ISL Diesel Engines using Integrated Thermoelectric Devices - Thermal-Fluid-Electric Coupled Numerical Modeling*, Iza G. Lantgios, Edward M. Ledesma, Joshua A. Cameron, Joanna R. Rivero, Corey E. Clifford, Austen D. Fradeneck, Shervin Sammak and **Matthew M. Barry**, (2019), 4th Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Las Vegas, NV, USA, April 14-17.
6. *Analytic Modeling of Waste Heat Recovery of Cummins ISL Diesel Engines using Integrated Thermoelectric Devices*, Joshua A. Cameron, Iza G. Lantgios, Edward M. Ledesma, Joanna R. Rivero, Corey E. Clifford, Austen D. Fradeneck, Shervin Sammak and **Matthew M. Barry**, (2019), 4th Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Las Vegas, NV, USA, April 14-17.
7. *Finite Volume Modeling of Thermoelectric Generators*, Edward M. Ledesma, Iza G. Lantgios, Joshua A. Cameron, Joanna R. Rivero, Corey E. Clifford, Austen D. Fradeneck, Shervin Sammak and **Matthew M. Barry**, (2019), 4th Thermal and Fluids Engineering Conference (TFEC),

American Society of Thermal and Fluids Engineers (ASTFE), Las Vegas, NV, USA, April 14-17.

8. *Optimization Method for Cross-Sectional Area of Segmented Thermoelectric Legs to Maximize Performance*, Joanna R. Rivero, Edward Ledesma, Iza G. Lantgios, Joshua A. Cameron, Corey E. Clifford, Shervin Sammak, Katherine Hornbostel and **Matthew M. Barry**, (2019), 4th Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Las Vegas, NV, USA, April 14-17.
9. *Modeling of Cryobot Melting Rates in Cryogenic Ice*, Margarita Brandt, Wayne Zimmerman, Daniel Berisford, Juergen Mueller, **Matthew M. Barry**, Michael J. Durka, Richmond Kristof, Bart Hogan, William Stone, 2019 IEEE Aerospace Conference, Big Sky, Montana, March 2-9.
10. *A Critique of Existing Analytical Thermoelectric Models - Rectifying Heat Input with a Novel Approach*, Joanna R. Rivero and **Matthew M. Barry**, (2018), 3rd Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Fort Lauderdale, FL, USA, March 4-7.
11. *GPU Accelerated Ray Tracing - Resolving Radiation View Factors within Multi-Junction Thermoelectric Devices*, Laura B. Fulton, Justin Ying, Corey E. Clifford and **Matthew M. Barry**, (2018), 3rd Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Fort Lauderdale, FL, USA, March 4-7.
12. *Thermal-Fluid-Electric Coupled Modeling of Novel Pin-Fin Integrated Thermoelectric Devices - The effect of Packing Density on Performance*, Corey E. Clifford, Shervin Sammak, Austen D. Fradeneck, Joanna R. Rivero, Mark L. Kimber and **Matthew M. Barry**, (2018), 3rd Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Fort Lauderdale, FL, USA, March 4-7.
13. *Optimization of Cross-Sectional Area of Segmented Thermoelectric Elements Legs for Maximum Performance*, Joanna R. Rivero, Corey E. Clifford and **Matthew M. Barry**, (2018), 3rd Thermal and Fluids Engineering Conference (TFEC), American Society of Thermal and Fluids Engineers (ASTFE), Fort Lauderdale, FL, USA, March 4-7.
14. *Variable Cross-Sectional Area of Thermoelectric Element Legs for Maximum Performance*, Presentation. Joanna R. Rivero, Juliana M. Said, Corey E. Clifford and **Matthew M. Barry**, (2017), International Conference on Thermoelectrics, Pasadena, CA, USA, July 30-August 4.
15. *Thermal-Fluid-Electric Coupled Modeling of a Novel Pin-Fin Integrated Thermoelectric Device*, Presentation. Juliana M. Said, Joanna R. Rivero, Corey E. Clifford, Michael J. Durka, Austen D. Fradeneck, Mark L. Kimber and **Matthew M. Barry**, (2017), International Conference on Thermoelectrics, Pasadena, CA, USA, July 30-August 4.
16. *Numerically Resolved Radiation View Factors for Single and Multi-Junction Thermoelectric Devices*, Poster. Laura B. Fulton, Justin Ying, Corey E. Clifford and **Matthew M. Barry**, (2017), International Conference on Thermoelectrics, Pasadena, CA, USA, July 30-August 4.

17. *Grain Boundary Engineering of Bulk Polycrystalline Bismuth Telluride through Uniaxial Pressing and Annealing - The Effects of Processing Parameters on Texture and Thermoelectric Performance*, Poster. **Matthew M. Barry**, Cain J. Hung, Jonathon Kim, Louis B. Kisch, Pawel Nowakoski, Calixto I. Garcia and Minking K. Chyu, (2017), International Conference on Thermoelectrics, Pasadena, CA, USA, July 30-August 4.
18. *Additive Manufacturing of Bi_2Te_3 for Improved Thermoelectric Performance: Effects of Laser Sintering and Deposition with and without PCO Substrates*, **Matthew M. Barry**, Jon Kim, C. Garcia and Minking Chyu, (2014), Materials Science and Technology Conference, Pittsburgh, USA, October 12-16.
19. *Experimental Investigations on the Performance of a Thermoelectric Device with an Integrated Heat Exchanger and Flow Channels*, **Matthew M. Barry**, Kenechi A. Agbim, B.V.K. Reddy, Minking K. Chyu, (2014), International Heat Transfer Conference, Kyoto, Japan, August 10-15.
20. *Performance of a Thermoelectric Device with Integrated Heat Exchangers*, **Matthew M. Barry**, Kenechi A. Agbim, Minking K. Chyu, (2014) International Conference on Thermoelectrics, Nashville Tennessee, July 6-9.
21. *Comprehensive Numerical Modeling of Thermoelectric Devices Applied to Automotive Exhaust Gas Waste-Heat Recovery*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2013), ASME Heat Transfer Conference, Minneapolis, USA, July 14-19.
22. *Enhanced Heat Transfer Characteristics and Performance of Composite Thermoelectric Devices*, Minking K. Chyu, B.V.K. Reddy, **Matthew M. Barry**, John Li, (2012), Int. Conference on Advanced Computational Methods and Experiments in Heat Transfer XII, vol 35, pp. 13-24, WIT press, Split, Croatia, June 27-29.
23. *A Fluid-Thermo-Electric Coupled Field Analysis of an Integrated Thermoelectric Device*, B.V.K. Reddy, **Matthew M. Barry**, John Li, Minking K. Chyu, (2012), Energy Procedia, 14, 2088-2095.

Students

Graduate.....

- Joanna R. Rivero
 - Ph.D., Pitt Strive Fellow
 - 2018 NCWIT Collegiate Award Recipient for "Variable Cross-Sectional Area of Thermoelectric Element Legs for Maximum Performance using Optimization and Thermal-Electric Coupled Methods" conducted during undergraduate research at University of Pittsburgh
- Joshua A. Cameron
 - Ph.D., supported by MCSI Seed Grant "Case Study of the Application of Novel Integrated Thermoelectric Device Applied to Waste Heat Recovery of Fleet Vehicles"
 - Expected graduation spring 2020
- Kevin A. Glunt

- Supported by Lubrizol.
- Expected graduation spring 2020

Undergraduate.....

- o Edward M. Ledesma, *Sustainable Design in Mechanical Engineering Fellow*
 - Supported by MCSI Seed Grant “Case Study of the Application of Novel Integrated Thermoelectric Device Applied to Waste Heat Recovery of Fleet Vehicles”
 - Expected graduation spring 2019
- o Iza G. Lantgios, *Sustainable Design in Mechanical Engineering Fellow*
 - Supported by MCSI Seed Grant “Case Study of the Application of Novel Integrated Thermoelectric Device Applied to Waste Heat Recovery of Fleet Vehicles”
 - Expected graduation spring 2019
- o Laura B. Fulton, B.S.
 - Graduated Spring 2018
 - 2017 ICT Best Poster Award for “Numerically Resolved Radiation View Factors for Single and Multi-Junction Thermoelectric Devices”
 - 2018 NCWIT Award Finalist for “Numerically Resolved Radiation View Factors for Single and Multi-Junction Thermoelectric Devices (TEDs)”
 - Co-author on one (1) journal paper, conference presenter at one (1) conference and poster presented at one (1) conference
- o Juliana M. Said, B.S.
 - Graduate Spring 2018
 - Presenter of one (1) conference presentation

Courses Taught

University of Pittsburgh.....

- o ENGR 0135 - Statics and Mechanics of Materials I
- o ENGR 0145 - Statics and Mechanics of Materials II
- o MEMS 0031 - Introduction to Electrical Circuits
- o MEMS 0051 - Introduction to Thermodynamics
- o MEMS 0071 - Introduction to Fluid Mechanics
- o MEMS 1051 - Applied Thermodynamics
- o ME 2052 - Intro to Technical Communication
- o ME 2053 - Heat Transfer
- o ME 2060 - Numerical Methods
- o ME 2256/MEMS 1156 - Applied Computational Heat and Mass Transfer

Youngstown State University.....

- o MECH 2603 - Thermodynamics
- o MECH 2604 - Thermodynamics 2
- o MECH 3720 - Fluid Dynamics
- o MECH 3762 - Design of Machine Elements
- o MET 3705 - Thermodynamics

- MET 3714 - Fluid Mechanics and Fluid Power Systems

Service

Academic Involvement.....

- Academic advisor for the Honors Engineering Society, Tau Beta Pi
- Academic advisor for Pitt Rocketry Team
- Academic advisor for Pitt Aero FSAE
- Volunteer Instructor for INVESTING NOW, a college preparatory summer program for pre-college students administered through the Office of Diversity at the University of Pittsburgh (2017 – present)
- Undergraduate Committee Member, Department of Mechanical Engineering and Materials Science, University of Pittsburgh (2017 – present)
- Graduate Committee Member, Department of Mechanical Engineering and Materials Science, University of Pittsburgh (2018 – present)
- Co-chair Graduate Thermal Fluid Committee, Department of Mechanical Engineering and Materials Science, University of Pittsburgh (2018 – present)

Journal Reviews.....

- Reviewer for *Thermal and Fluids Engineering Conference, Applied Thermal Engineering, Applied Energy, Energy, Thermal Science, Materials, Journal of Electronic Materials*