

Troy R. Munro

Assistant Professor

Brigham Young University, Department of Mechanical Engineering

350E EB, Provo, UT 84602

E-mail: troy.munro@byu.edu

Phone: 801-422-6541

Lab website: temp.byu.edu

Education

Katholieke Universiteit (KU) Leuven, Leuven, Belgium 2016

Utah State University (USU)

Dual PhD, Mechanical Engineering and Physics

Thesis: "Thermal Property Measurement of Thin Fibers by Complementary Methods"

Co-Advisor (KU Leuven): Prof. Christ Glorieux

Co-Advisor (USU): Prof. Heng Ban

Utah State University 2012

MS, Mechanical Engineering

Thesis: "Heater Geometry and Heat Flux Effects on Subcooled, Thin Wire, Nucleate Pool Boiling in Microgravity"

Advisor: Prof. Heng Ban

Utah State University 2012

BS, Mechanical Engineering (Mathematics minor)

Capstone Project: "Collection of CO₂ from the Martian Atmosphere

for use as a Propellant for a Radioisotope Powered Mars Research Vehicle"

Advisor: Prof. Byard Wood

Professional Experience

Brigham Young University, Provo, UT 2016-present

Assistant Professor, Mechanical Engineering

Idaho National Lab, Idaho Falls, ID 2017-2020

Academic Visitor

Utah State University, Logan, UT 2012-2016

Graduate Researcher, Multiscale Thermophysics Laboratory

Katholieke Universiteit (KU) Leuven, Leuven, Belgium 2013-2016

Doctoral Researcher, Laboratory for Soft Matter and Biophysics

Utah State University, Logan, UT 2011-2013

GAS Undergraduate Research Team Director, Physics

Research Interests

- Instrumentation for thermal measurements
- Heat transfer in nuclear reactors
- Developing methods for microscale sensing of materials
- Thermal characterization
- Thermal control in biological systems
- Optical sensors

Honors and Awards

Awards

- C.F. Lucks Award, 33rd International Thermal Conductivity Conference (ITCC), 2017.
- College Graduate Researcher of the Year, USU, 2016.
- Department Graduate Researcher of the Year, USU, 2016.
- Outstanding Engineering Graduate Scholar, USU College of Engineering, 2015.
- Graduate Enhancement Award, USU, 2015.
- Utah State University Presidential Doctoral Research Fellowship, USU, 2012-2016.
 - Member of inaugural nine students
- AIAA Region VI Student Conference, 2nd place March 2011 and 3rd place March 2012.
- Best in Engineering Paper, Utah Academy of Sciences, Arts, and Letters, 2012.
- Rocky Mountain NASA Space Grant Consortium Fellowship, 2011-2012.
- Get Away Special Undergraduate Research Team Summer Fellowship, 2008.
- Nuclear Regulatory Commission Scholarship, 2009-2011.
- Utah State University Presidential Scholarship, 2007-2011.

Teaching Experience

BYU

- ME Capstone Coach, ME EN 475/476 (Senior Required Course)
 - Fall 2017/Winter 2018: 6 students
- Materials Science, ME EN 250 (Sophomore Required Course)
 - Winter 2017: 82 students, evaluation score 4.3/5.0
 - Fall 2017: 55 students, evaluation score 4.3/5.0
 - Spring 2018: 32 students, evaluation score 4.5/5.0
 - Fall 2018: 40 students, evaluation score 4.3/5.0
 - Winter 2019: 47 students, evaluation score 4.4/5.0
 - Spring 2019: 16 students, evaluation score 4.8/5.0
 - Fall 2019: 84 students, evaluation score 4.2-4.6/5.0
- Engineering Measurements, ME EN 362 (Junior Required Course)
 - Fall 2016: 29 students, evaluation score 3.7/5.0
 - Winter 2018: 58 students, evaluation score 4.2/5.0
 - Winter 2019: 46 students, evaluation score 4.1/5.0
 - Winter 2020: 51 students, evaluation score 4.2-4.6/5.0

USU

- Thermal Fluid Design, MAE 5410 (Senior Elective Course)
 - Spring 2015, 15 students, evaluation score 4.1/5.0
- Recitation Instructor for Heat and Mass Transfer, MAE 3440, Spring 2013.

Past, Current, and Pending Support

External Support

Awarded

1. PI for “Improvement of Modeling Predictions in Friction Stir Welding by More Accurate Measurement of Heat Transfer Between Tooling and Workpiece,” NSF CMMI, **\$348k** for 3 years, 1/2020-12/2022, (T. Munro, M. Miles).
2. Co-PI for “Validated, Multi-Scale Molecular Dynamics Simulations to Predict the Thermophysical Properties of Molten Salts Containing Fuel, Fission, and Corrosion

- Products,” DOE Nuclear Energy University Program (NEUP), **\$239k** for 3 years, 10/2019-9/2022, (S. Nickerson, M. Memmott, T. Munro).
3. PI for “Faculty Development Program to Integrate New Faculty in Nuclear Engineering Research at Brigham Young University,” Nuclear Regulatory Commission Faculty Development Grant, **\$450k** for 3 years, 7/2019-6/2022, (D. Maynes, T. Munro).
 4. PI for “3D temperature control to study biological processes,” NIH NIGMS (R15), **\$439k** for 3 years, 4/2019-3/2022, (T. Munro, G. Nordin, A. Woolley).
 5. PI for "Improved Temperature Control for Accurate DNA Analysis with 3D Printed Microfluidic Devices" Utah NASA Space Grant Consortium, **\$8k** for 1 year, 3/2018-4/2019, (T. Munro, G. Nordin).
 6. Co-PI for “GASPACS: Get Away Special Passive Attitude Control Satellite, A 1U CubeSat with an Inflatable Structure for Two Axis Aero-controlled Stabilization,” NASA CubeSat Launch Initiative Selection Decision (CSLI), **Flight aboard rocket, ~\$40,000**, Awarded Feb 2014 (PI: Jan Sojka, At USU).
 7. Co-PI for “Follow-Up Nucleate Boiling on Flight Experiment (FUNBOE) 2.5,” NASA RGSFOP, **Flight aboard airplane, ~\$31,000**, Mar 2012-Jul 2013. (PI: Ryan Martineau, At USU)
 8. PI for “Follow-Up Nucleate Boiling on Flight Experiment (FUNBOE) 2.0,” NASA RGSFOP, **Flight aboard airplane, ~\$28,000**, Dec 2010-June 2011. (At USU)
 9. PI for “Follow-Up Nucleate Boiling on Flight Experiment (FUNBOE),” NASA Reduced Gravity Student Flight Opportunity Program (RGSFOP), **Flight aboard airplane, ~\$28,000**, Dec 2009-June 2010. (At USU)

Pending

1. PI for “Optical Cocktail: Complementary fiber optic bundle based techniques to non-destructively measure thickness and voids on ATF claddings,” DOE Nuclear Energy University Program (NEUP), **\$800k** for 3 years, 10/2020-9/2023,
2. PI for “Improving thermal conductivity predictions using high-throughput, parallel thermorefectance measurements of individual grains and grain boundaries,” DOE Nuclear Energy University Program (NEUP), **\$800k** for 3 years, 10/2020-9/2023,

Internal Support

Awarded

1. PI for “A Novel Fiber Optic Probe to Improve Friction Stir Welding Process Modeling by Characterizing Thermal Interface Resistances,” Mentored Research Grant, **\$25k** for 2 years, 7/2018-6/2020, (T. Munro, M. Miles).
2. PI for "Blu-ray Based Scanning Thermal Microscope to Measure Spatial Distribution of Thermal Properties," Undergraduate Mentoring Grant, **\$3.9k** for 1 year, May 2017, (T. Munro).
3. PI for "Idaho National Lab Research Initiation" College Research Initiation Travel Support, **\$1.4k** for summer 2017, (T. Munro).
4. PI for "Making the Abstract Concrete: Mentoring Students by Hacking a Blu-ray Player into a Fluorescent Microscope," Office of Graduate Studies Graduate Mentoring Award, **\$13k** for 1 year, Feb 2017, (T. Munro).
5. Co-PI for “Get Away Special (GAS) Undergraduate Research Team,” Utah State University Research and Graduate Studies Office, **\$60k**, 02/01/13-01/31/18. (PI: J. Sojka).

Pending

1. N/A

Publications

All BYU students are designated with ‡ (BYU undergraduate) and † (BYU graduate)

Journals - Published

1. Magnusson, J.‡, Memmott, M., and **Munro, T.**, “Review of Thermophysical Property Methods Applied to Fueled and Un-Fueled Molten Salts”, *Annals of Nuclear Energy* (Accepted, May 21,2020).
2. Lewis, C.‡, Erikson, J.W.‡, Sanchez, D.A.†, McClure, C.E.‡, Nordin, G.P, **Munro, T.R.**, Colton, J.S., “Use of Machine Learning with Temporal Photoluminescence Signals from CdTe Quantum Dots for Temperature Measurement in Microfluidic Devices,” *ACS Applied Nano Materials*, **3**(5), pp. 4045-4053, 2020.
3. Tasidou, K.A., Magnusson, J. ‡, **Munro, T.**, and Assael, M.J., “Reference Correlations for the Viscosity of molten LiF-NaF-KF, LiF-BeF₂, and Li₂CO₃-Na₂CO₃-K₂CO₃”, *J. Phys. Chem. Ref. Data*, **48**, pp. 043102, 2019.
4. Hayden, S.†, and **Munro, T.**, “Fluorescent Scanning Thermal Microscope based on a Blu-Ray Optical Head to Measure Thermal Diffusivity,” *Review of Scientific Instruments*, **90**, pp. 024903, 2019.
5. Gardner, L., **Munro, T.**, Villarreal, E., Harris, K., Fronk, T., and Ban, H., "Thermal Characterization of Alkali Treated Kenaf Fibers and Kenaf-Epoxy Composites," *Fibers and Polymers*, **19**, pp. 393-402, 2018.
6. Guillou, J., Lavadiya, D.N., **Munro, T.**, Fronk, T., and Ban, H. “From lignocellulose to biocomposite: Multi-level modelling and experimental investigation of the thermal properties of kenaf fiber reinforced composites based on constituent materials,” *Applied Thermal Engineering*, **128**, pp. 1372-1381, 2018.
7. **Munro, T.**, Liu, L., Ban, H., and Glorieux, C., “Thermophysical Properties of Thin Fibers via Photothermal Quantum Dot Fluorescence Spectral Shape-based Thermometry,” *International Journal of Heat and Mass Transfer*, **112**, pp. 1090-1097, 2017.
8. **Munro, T.**, Putzeys, T., Copeland, C., Xing, C., Lewis, R., Ban, H., Glorieux, C., and Wubbenhorst, M., “Investigation of synthetic spider silk crystallinity and alignment via electrothermal, pyroelectric, literature XRD, and tensile techniques,” *Macromolecular Materials and Engineering*, 302(4), pp. 1600480, 2017.
9. Xing, C., **Munro, T.**, Jensen, C., Ban, H., Copeland, C., and Lewis, R., “Thermal Characterization of Natural and Synthetic Spider Silks by Both the 3 ω and Transient Electrothermal Methods,” *Materials & Design*, **119**, 2017.
10. **Munro, T.**, Liu, L., Glorieux, C., and Ban, H., “CdSe/ZnS Quantum Dot Fluorescence Spectra Shape-based Thermometry via Neural Network Reconstruction,” *Journal of Applied Physics*, **119**(21), pp. 214903, 2016.
11. Liu, L., Zhong, K., **Munro, T.**, Alvarado, S., Côte, R., Creten, S., Fron, E., Ban, H., Van der Auweraer, M., Roozen, B., Matsuda, O., and Glorieux, C., “Wideband Fluorescence-based Thermometry by Neural Network Recognition: Photothermal Application in Frequency and Time Domain – from 10 Nanoseconds to DC,” *Journal of Applied Physics*, **118**(18), pp. 184906, 2015.
12. **Munro, T.R.**, Ban, H., “Flow and Heat Flux Behavior of Micro-bubble Jet Flows Observed in Thin, Twisted-Wire, Subcooled, Boiling in Microgravity” *Microgravity Science and Technology*, **27**, pp. 49-60, 2015.

13. **Munro, T.R.**, Koeln, J.P., Fassmann, A.W., Barnett, R.J., and Ban, H., “Phase Change Heat Transfer and Bubble Behavior Observed on Twisted Wire Heater Geometries in Microgravity,” *International Journal of Heat and Fluid Flow*, **47**, pp. 21-30, 2014.
14. Xing, C., **Munro, T.**, Jensen, C., White, B., Ban, H., “Thermal Characterization of Fine Fibers Using an Improved Direct Electrical Heating Method,” *International Journal of Thermophysics*, **35**(8), pp. 1512-1525, 2014.
15. Xing, C., Jensen, C., **Munro, T.**, White, B., Ban, H., Chirtoc, M., “Accurate Thermal Property Measurement of Fine Fibers by the 3-omega Technique,” *Applied Thermal Engineering*, **73**(1), pp. 315-322, 2014.
16. Xing, C., Jensen, C., **Munro, T.**, White, B., Ban, H., Chirtoc, M., “Thermal Property Characterization by the 3-omega Technique,” *Applied Thermal Engineering*, **71**(1), pp. 589-595, 2014.
17. Xing, C., White, B., **Munro, T.**, Ban, H., Copeland, C., and Lewis, R., “Thermophysical Properties of the Dragline Silk of *Nephila clavipes* Spider,” *Polymer*, **55**(16), pp. 4226-4231, 2014.
18. Xing, C., **Munro, T.**, Jensen, C., White, B., Ban, H., Copeland, C., and Lewis, R., “Thermophysical Property Measurement of Electrically Nonconductive Fibers by the Electrothermal Technique,” *Measurement Science and Technology*, **25**(11), pp. 115604, 2014.
19. Xing, C., **Munro, T.**, Jensen, C., and Ban, H., “Analysis of the Electrothermal Technique for Thermal Property Characterization of Thin Fibers,” *Measurement Science and Technology*, **24**(10), pp. 105603, 2013.
20. **Munro, T.R.**, Ban, H., “Jet Flow Behavior Observed during Microgravity Boiling,” *The Journal of the Utah Academy of Sciences, Arts, and Letters*, **88**, 2013.
21. **Munro, T.**, Fassmann, A., and Ban, H., “Surface Geometry and Heat Flux Effect on Thin Wire Nucleate Pool Boiling of Subcooled Water in Microgravity,” *The Journal of the Utah Academy of Sciences, Arts, and Letters*, **87**, 2012.

Journals – Under Review

1. Colton, J.[‡], Kulberg, J.[†], Gregory, C.[‡], and **Munro, T.**, “Temperature Reconstruction from Fluorescent Images via Different Neural Network Architecture”, WACV2021, Submitted June 12, 2020.

Journals – In Preparation

1. Sanchez, D.[†], Wilkerson, M.[‡], Seneca, M.[‡], Nordin, G., and **Munro, T.**, “Temperature Control of 3D-printed Microfluidic Devices using a Multi-Material Approach”, *Biomicrofluidics*, Submitted Nov 15, 2019.
2. Hartvigsen, P.[†], Merritt, B.[‡], Fleming, A., Ban, H., and **Munro, T.**, “Viability of Using Raman Thermometry to Determine the Thermal Conductivity of Uranium Dioxide (UO₂)”, *Journal of Nuclear Materials*, Submitted 2020.

Peer Reviewed Conference Proceedings

1. Sanchez, D., Nordin, G., and **Munro, T.**, “Microfluidic Temperature Behavior in a Multi-Material 3D Printed Chip,” IMECE2019-11470, ASME IMECE, Salt Lake City, UT, November 11-14, 2019.
 - a. Awarded Best Paper, MEMS Engineering Division

2. Thorum, A., Page, L., **Munro, T.**, Allred, D., Hua, Z., and Hurley, D., “Thermal Properties of Thin Film Uranium Oxides and Thorium Oxides,” IMECE2019-11699, ASME IMECE, Salt Lake City, UT, November 11-14, 2019.
3. **Munro, T.**, “Breaking tradition: How complementary methods can extend thermal conductivity measurements into new applications,” Proceedings of the 34th International Thermal Conductivity Conference, DEStech Publications Inc., 2020.
4. Hayden, S.[†], and **Munro, T.**, “Thermal Diffusivity Measurements with Fluorescent Scanning Microscope,” Transactions of the American Nuclear Society, ANS Winter Meeting, Orlando, Florida, November 11 - November 15, 2018.
5. Hayden, S.[†], Haddock, R.[‡], and **Munro, T.**, “Simulated Thermal Characterization of Materials via a Blu-ray Based Scanning Fluorescence Microscope,” Proceedings of the 33rd International Thermal Conductivity Conference, pp. 170-178, DEStech Publications Inc., 2018.
6. Gardner, L., **Munro, T.**, Villarreal, Z., Harris, K., Fronk, T., and Ban, H., “Laser Flash Measurements on Thermal Conductivity of Bio-Fiber (Kenaf) Reinforced Composites,” Proceedings of the 32nd International Thermal Conductivity Conference, pp. 61-68, DEStech Publications Inc., 2018.
7. Hayden, S.[†], and **Munro, T.**, “Thermal Characterization of Materials Via a Blu-ray Based Scanning Fluorescence Microscope,” Transactions of the American Nuclear Society, ANS Winter Meeting, Washington D.C., October 29 - November 2, 2017.
8. **Munro, T.**, Xing, C., Harris, K., and Ban, H., “Thermal Conductivity and Diffusivity for SiC Fibers for use in ATF Cladding Composites,” Transactions of the American Nuclear Society, Vol. 115, ANS Winter Meeting, Las Vegas, Nevada, November 6-10, 2016.
9. **Munro, T.**, Xing, C., Ban, H., Copeland, C., Lewis, R., and Glorieux, C., “Thermal Property Measurement of Thin Fibers – A Direct Approach,” International Mechanical Engineering Congress and Exposition, Houston, Texas, November 15-21, 2015.
10. **Munro, T.**, Xing, C., Marquette, A., Ban, H., Copeland, C., and Lewis, R., “Description of Test Setup and Approach to Measure Thermal Properties of Natural and Synthetic Spider Silks at Cryogenic Temperatures,” International Mechanical Engineering Congress and Exposition, San Diego, California, November 15-21, 2013.
11. **Munro, T.**, Xing, C., Copeland, C., Ban, H., and Lewis, R., “Probing the Mysteries of Spider Silk’s Uncharacteristically High Thermal Diffusivity,” ASME Summer Heat Transfer Conference, Minneapolis, Minnesota, July 14-19, 2013.
12. Xing, C., **Munro, T.**, Jensen, C., And Ban, H., “Parametric Study on the Effect of Radiation Heat Loss and Nonconstant Heating in the Electrothermal Technique for Micro- to Nano-scale Fine Fiber Thermal Property Measurement,” MicroTech Conference, Gaylord National Harbor, Maryland, May 12-15, 2013.
13. **Munro, T.**, Xing, C., Jensen, C., Copeland, C., Ban, H., and Lewis, R., “Characterizing Thermal Diffusivity of Synthetic Spider Silk using Improved Transient Electrothermal Technique,” MicroTech Conference, Gaylord National Harbor, Maryland, May 12-15, 2013.
14. **Munro, T.**, Ban, H., “Jet Flow Behavior Observed during Microgravity Boiling,” 18th Annual Rocky Mountain NASA Space Grant Consortium Fellowship Symposium, Utah State University, Logan, Uah, May 9, 2012.

15. Martineau, R.J., Torres, E.M., Kullberg, J.G., and **Munro, T.R.**, “Analysis of a Thin-Wire Boiling Experiment for Application to Thermal Management Systems,” AIAA Region VI Student Conference, Seattle, Washington, March 29-31, 2012.
16. **Munro, T.**, Fassmann, A., and Ban, H., “Surface Geometry and Heat Flux Effect on Thin Wire Nucleate Pool Boiling of Subcooled Water in Microgravity,” AIAA Region VI Student Conference, San Diego, California, March 24-26, 2011.

Patents

1. US Patent Application PCT/US17/63923 - Methods and Systems for Determining at Least One Thermal Property of a Sample, December 27, 2017.

Invited Presentations

1. **T. Munro**, “The Role of Thermal Transport in Nuclear Energy,” Graduate Seminar at University of New Mexico, Albuquerque, NM, Feb 18, 2020.
2. **T. Munro**, “Nuclear Fuels: Materials in Extreme Environments,” Graduate Seminar, Dept. of Materials Science and Metallurgy, University of Utah, Salt Lake City, UT, Oct 23, 2019.
3. **T. Munro**, “Nuclear Fuels: Physics in Extreme Environments,” Physics Colloquium, Dept. of Physics, Utah State University, Logan, UT, Oct 29, 2019.
4. **T. Munro, Plenary**, “Breaking Tradition: How complementary methods can extend thermal conductivity measurements into new applications,” 34th International Thermal Conductivity Conference (ITCC), Wilmington, DE, June 17-20, 2019.
5. **T. Munro**, “Nuclear Fuels: Physics in Extreme Environments,” Physics Colloquium, Provo, UT, Dec 3, 2018.
6. **T. Munro**, “Thermal Characterization of Materials for Nuclear Applications,” BYU-Idaho Physics Research Group, Rexburg, ID, July 2018.
7. **T. Munro**, “Characterizing the Thermal Behavior of Materials with Advanced Instrumentation,” CARAT Working Meeting, Pittsburg, PA, Oct 2017.
8. **T. Munro**, “Characterizing the Thermal Behavior of Materials with Advanced Instrumentation,” CAES MSI Working Meeting, Boise, ID, Aug 2017.
9. **T. Munro**, “Blu-Ray and Raman Instruments for Thermal Characterization of Materials,” Idaho National Lab, Materials and Fuels Complex, June 2017.
10. **T. Munro**, “Thermal Properties of Natural and Synthetic Spider Silk,” Brigham Young University, February 2016.

Conference Presentations

Since hiring at BYU

1. John Colton, James Erikson, Charles Lewis, Emma McClure, Derek Sanchez, and **Troy Munro**, American Physical Society March Meeting, “CdTe nanoparticles as non-invasive temperature sensors via machine learning of optical properties”, Denver, CO, March 2-6, 2020.
2. Thorum, A., Page, L., **Munro, T.**, Allred, D., Hua, Z., and Hurley, D., International Mechanical Engineering Congress and Exposition, “Thermal Properties of Thin Film Uranium Oxides and Thorium Oxides,” Salt Lake City, UT, oral presentation, paper accepted (IMECE2019-11699), November 11-14, 2019.
3. Sanchez, D., Nordin, G., and **Munro, T.**, International Mechanical Engineering Congress and Exposition, “Microfluidic Temperature Behavior in a Multi-Material 3D Printed

- Chip,” Salt Lake City, UT, oral presentation, paper accepted (IMECE2019-11470), November 11-14, 2019.
4. C. Emma McClure, James Erikson, Heather Hogg, Katelyn Watson, **Troy Munro**, John Colton, American Physical Society Conference for Undergraduate Women in Physics (APS CUWiP), “Optical Properties of Rhodamine B as a Temperature Sensor,” Utah State University, Logan, UT, Jan 19, 2019.
 5. ANS Winter Meeting, “Thermal Diffusivity Measurements with Fluorescent Scanning Microscope,” Orlando, Florida, oral presentation, paper accepted (Transactions of the American Nuclear Society, Vol. 119), November 11 - November 15, 2018.
 6. Joint ASME AIChE and NIST 20th Symposium on Thermophysical Properties, “Comparison of Raman Thermometry Techniques for Thermophysical Properties of Uranium Dioxide,” Boulder, CO, oral presentation (student), June 24-29, 2018.
 7. ANS Winter Meeting, “Thermal Characterization of Materials Via a Blu-ray Based Scanning Fluorescence Microscope,” Washington D.C., oral presentation, paper accepted (Transactions of the American Nuclear Society, Vol. 117), October 29 - November 2, 2017.
 8. CARAT Meeting, “Characterizing the thermal behavior of materials with new PIE techniques,” Cranberry, Pennsylvania, oral presentation, October 25-27, 2017.
 9. 33rd International Thermal Conductivity Conference (ITCC), “Thermal Characterization of Materials via a Blu-ray Based Scanning Fluorescence Microscope,” Logan, UT, oral presentation, May 16-18, 2017.
 10. 33rd International Thermal Conductivity Conference (ITCC), “Mapping of the Thermal Properties and Molecular Bonding of Ceramic Materials via Complementary Raman Scanning Thermal Microscopy (CRSThM),” Logan, UT, oral presentation, May 16-18, 2017.
 1. ANS Winter Meeting, “Thermal Conductivity and Diffusivity for SiC Fibers for Use in ATF Cladding Composites,” Las Vegas, NV, oral presentation, paper accepted (Transactions of the American Nuclear Society, Vol. 115), November 6-10, 2016.

Before BYU

11. International Mechanical Engineering Congress and Exposition, “Thermal Property Measurement of Thin Fibers – A Direct Approach,” Houston, Texas, oral presentation, paper accepted (IMECE2015-52056), November 13-19, 2015.
12. Joint ASME AIChE and NIST 19th Symposium on Thermophysical Properties, “Thermal Property Measurements of Spider Silks,” Boulder, Colorado, oral presentation, June 21-26, 2015.
13. Joint ASME AIChE and NIST 19th Symposium on Thermophysical Properties, “Photothermal Quantum Dot Fluorescence-Based Thermometry for Thermal Property Determination of Thin Fibers,” Boulder, Colorado, oral presentation, June 21-26, 2015.
14. General Scientific Meeting of the Belgian Physical Society 2014, “Thermal Properties of Synthetic Spider Silk by Photothermal Fluorescence,” Leuven, Belgium, poster presentation, May 28, 2014.
15. SPIE PhD Symposium on Optics, “Thermal Properties of Synthetic Spider Silk by Photothermal Fluorescence,” Leuven, Belgium, poster presentation, January 9-10, 2014.
16. Onderzoeksseminarie Akoestiek en Thermische Fysica, “Exploring the Thermal Properties of Natural and Synthetic Spider Silks,” Leuven, Belgium, oral presentation (Invited) , December 12, 2013.

17. KU Leuven Department of Physics and Astronomy Research@Dept 2013, “Thermal Properties of Synthetic Spider Silk by Photothermal Fluorescence,” Leuven, Belgium, poster presentation, November 26, 2013.
18. Space Dynamics Laboratory IR&D Session, “Thermal Diffusivity of Spider Silks at Cryogenic Temperatures,” Logan, Utah, poster presentation (Invited), June 27, 2013.
19. International Mechanical Engineering Congress and Exposition, “Thermal Properties of Natural and Synthetic Spider Silks at Cryogenic Temperatures,” San Diego, California, oral presentation, November 15-21, 2013.
20. ASME Summer Heat Transfer Conference, “Probing the Mysteries of Spider Silk’s Uncharacteristically High Thermal Diffusivity,” Minneapolis, Minnesota, oral presentation, July 14-19, 2013.
21. MicroTech Conference, “Characterizing Thermal Diffusivity of Synthetic Spider Silk using Improved Transient Electrothermal Technique,” Gaylord National Harbor Maryland, poster presentation, May 12-15, 2013.
22. Intermountain Graduate Research Symposium, “Probing the Mysteries of Spider Silk’s Uncharacteristically High Thermal Diffusivity,” Utah State University, Logan, Utah, oral presentation, April 12, 2013.
23. Synthetic Biomanufacturing Institute Science and Technology Review Winter Meeting, “Thermal Properties of Natural and Synthetic Spider Silks,” Utah State University, Logan, Utah, poster presentation, January 29, 2013.
24. Institute of Biological Engineering Western Regional Conference, “Thermal Diffusivity of Natural and Synthetic Spider Silks,” Utah State University, Logan, Utah, poster presentation, October 26, 2012.
25. nanoUtah, “Thermal Diffusivity of Natural and Synthetic Spider Silks,” University of Utah, Salt Lake City, Utah, poster presentation, October 11-12, 2012.
26. Rocky Mountain NASA Space Grant Consortium Annual Symposium, “Jet Flow Behavior Observed during Microgravity Boiling,” Utah State University, Logan, Utah, oral presentation, May 9, 2012.
27. Intermountain Graduate Research Symposium, “Heater Geometry and Heat Flux Effects on Subcooled, Thin Wire, Nucleate Pool Boiling in Microgravity,” Utah State University, Logan, Utah, oral presentation, April 5-6, 2012.
28. USU Physics Department Colloquium, “Gravitational Effects on Thin-Wire Subcooled Nucleate Boiling Dynamics with Two Dimensional Applications,” Utah State University, Logan, Utah, oral presentation (Invited), September 6, 2011.
29. Rocky Mountain NASA Space Grant Consortium Annual Symposium, “Effects of Microgravity on Thin-Wire Subcooled Nucleate Boiling Dynamics,” Utah State University, Logan, Utah, poster presentation, May 7, 2011.
30. Department of Mechanical Engineering, “Collection of CO₂ from the Martian Atmosphere for use as a Propellant for a Radioisotope Powered Mars Research Vehicle,” Utah State University, Logan, Utah, poster presentation, May 2, 2011.
31. Utah Academy of Sciences, Arts, and Letters 2011 Annual Conference, “Surface Geometry and Heat Flux Effect on Thin Wire Nucleate Pool Boiling of Subcooled Water in Microgravity,” Salt Lake Community College, SLC, UT, oral presentation, April 8, 2011.
32. Utah State University Undergraduate Research Showcase, “Effects of Micro-gravity on Thin-Wire Subcooled Nucleate Boiling Dynamics,” Utah State University, Logan, Utah, poster presentation, March 29, 2011.

33. AIAA Region VI Student Conference, "Surface Geometry and Heat Flux Effect on Thin Wire Nucleate Pool Boiling of Subcooled Water in Microgravity," San Diego State University San Diego, California, oral presentation, March 24-26, 2011.
34. AIAA Region VI Student Conference, "Boil, Boil, Toil, and Trouble - Connecting with the Community through Microgravity Boiling Experiments," San Diego State University San Diego, California, oral presentation, March 24-26, 2011.
35. Utah Conference on Undergraduate Research, "The Design and Construction of a Microgravity Boiling Experiment," Weber State University, Ogden, Utah, oral presentation, February 18, 2011.
36. Research on Capitol Hill, "Effects of Micro-gravity on Thin-Wire Subcooled Nucleate Boiling Dynamics," Utah State Capitol, SLC, UT, poster presentation, January 26, 2011.
37. Utah Section of the AIAA, "Gravitational Effects on Thin-Wire Subcooled Nucleate Boiling Dynamics," USU, Logan, Utah, oral presentation, January 20, 2011.
38. USU Physics Department Colloquium, "Gravitational Effects on Thin-Wire Subcooled Nucleate Boiling Dynamics," USU, Logan, Utah, oral presentation (Invited), October 19, 2010.
39. Rocky Mountain NASA Space Grant Consortium Annual Symposium, "Photoelectric Charging by Ultraviolet Light of a Lunar Dust Simulant in a Microgravity Environment," Utah State University, Logan, Utah, poster presentation, May 4, 2009.
40. Utah State University Undergraduate Research Showcase, "Photoelectric Charging by Ultraviolet Light of a Lunar Dust Simulant in a Microgravity Environment," Utah State University, Logan, Utah, poster presentation, March 31, 2009.
41. Weber State Physics Department Colloquium, "USU Microgravity Research Team CubeSat Project," Weber State University, Ogden, UT, oral presentation (Invited), March 27, 2008.

Technical Reports

- "Final Report for FUNBOE Follow-Up Nucleate Boiling On-flight Experiment Proposal 2.5," ID – 2012-25377, NASA Reduced Gravity Office, Johnson Space Center, Sept 12, 2012.
- "Final Report for FUNBOE Follow-Up Nucleate Boiling On-flight Experiment Proposal 2.0," ID – 2011-25275, NASA Reduced Gravity Office, Johnson Space Center, August 2, 2011.
- "Collection of CO₂ from the Martian Atmosphere for use as a Propellant for a Radioisotope Powered Mars Research Vehicle," Center for Space Nuclear Research, INL, Idaho Falls, Utah, May 2, 2011.
- "Final Report for FUNBOE Follow-Up Nucleate Boiling On-flight Experiment Proposal," ID – 2010-2051, NASA Reduced Gravity Office, Johnson Space Center, August 4, 2010.

Professional Service

Associate Editor

- International Journal of Thermophysics (2020-present)

Journal Reviewer

- ACS Materials Letters (2019-present)
- ACS Sustainable Chemistry and Engineering (2019-present)
- Journal of Nuclear Materials (2019-present)
- Acta Biomaterialia (2018-present)

- Review of Scientific Instruments (2017-present)
- Measurement Science and Technology (2017-present)
- Nuclear Technology (2017-present)
- Measurements (2017-present)
- International Journal of Heat and Mass Transfer (2017-present)
- Optical Letters (2016-present)
- Applied Thermal Engineering (2013)
- International Thermal Conductivity Conference – 2017, 2019
- ANS – 2017, 2019 Student Conference
- ASME – 2013 Summer Heat Transfer Conference, 2015 IMECE Conference
- AIAA – 2013 Region VI Student Conference

Funding Agency Reviewer

- DOE Nuclear Energy SBIR (2019-present)
- DOE NEUP – Nuclear Energy University Partnership (2017-present)
- NSUF – Nuclear Science User Facility (2017-present)

Conference Service

- Session Chair – ANS Winter 2018, 2019
- Session Organizer – ASME IMECE 2019
- Biomedical Engineering Western Regional Conference, Session Moderator, Imaging and Optics Session, BYU, Provo, UT, Jan 19, 2017
- ANS Decommissioning, Decontamination & Reutilization Topical Meeting, Session Host, Idaho Falls, ID, September 2, 2010

Misc

- Graduate Student University Council Representative, USU 2015-2016.
- STEM outreach organizer for program that has visited over 74 classrooms, brought K-12 students to USU, and met with over 9,000 students and community members, 2008-2016.

University Service

- 2016 Department Unit Review
- Writing Group organizer
- ORCA reviewer
- Graduate Committee
- ME EN 362 Course Committee
- ME EN 340 Course Committee
- ME EN 250 Course Committee
- PhD Coursework Committee

Memberships

- American Chemical Society (ACS), 2019-present
- American Nuclear Society (ANS), 2016-present
- Society of Photographic Instrumentation Engineers (SPIE), 2014-present
- American Society of Mechanical Engineers (ASME), 2009-present
- Tau Beta Pi Engineering Honor Society, 2009-present
- American Institute of Aeronautics and Astronautics (AIAA), 2010-2015

- Belgian Physics Society, 2014-2015

Professional Committees

- Materials Science and Technology Division (ANS), 2018-present
 - Treasurer/Secretary, June 2019-present
 - Executive Committee, June 2018-present
 - Standards Committee Liaison, 2018-present
- ASME K-7 Thermophysical Properties Division, 2018-present
 - Vice Chair, Nov 2018-Present

Research Mentoring

Graduate Student Advisement

		Lab Years
McKay Wilkerson	Ph.D., dissertation in progress	2020-Current
Aaron Thorum	B.S./M.S., thesis in progress	2020-Current
Peter Kasper	M.S., thesis in progress	2020-Current
Justin Loose	M.S., thesis in progress	2020-Current
Derek Sanchez	Ph.D., dissertation in progress	2018-Current
Matthew Goodson	M.S., thesis in progress	2018-Current
Peter Hartvigsen	M.S., thesis in progress	2017-Current
Samuel Hayden	M.S., graduated Dec 2018	2017-2018

Current Undergraduate Student Advisement

		Starting Year
Conner Mantz	Volunteer	2020
Ryan Ruth	Volunteer	2020
Joseph Erikson	Volunteer	2020
Brent Edgerton	Research Assistant	2020
Tolex Gregory	Research Assistant	2020
Garrett Hawkins	Research Assistant	2020
McKay Christensen	Research Assistant	2020
Katelyn Peterson	Research Assistant	2020
Peter Kasper	Research Assistant	2020
Stuart Storheim	Research Assistant	2019
Connor Last	Research Assistant	2019
Jace Davis	Research Assistant	2019
Kirsten Steele	Research Assistant	2019
Aaron Thorum	Research Assistant	2019
Erik Barbosa	Research Assistant	2019
Rebecca Prymark	Research Assistant	2019
Zachary Broyles	Research Assistant	2019
Jay Bettinger	Research Assistant	2019
Daniel Ellis	Research Assistant	2019
McKell Miskin	Research Assistant	2019

McKay Wilkerson	Research Assistant	2019
Enqi Luo	Research Assistant	2019
Michael Seneca	Research Assistant	2018
	- Presented at undergraduate conference	
Brian Merritt	497R	2018
	- Presented at undergraduate conference	
Jack Colton	Research Assistant	2017
	- Presented at undergraduate conference	

Former Undergraduate Student Advisement

Starting Year

Gabriel Bradford	Research Assistant	2019
Jacob Redd	Research Assistant	2019
Caelan Osman	Research Assistant	2019
Claire Bird	Research Assistant	2019
Samuel Olds	497R	2019
Zan Aslett	Volunteer	2019
Samantha Stabler	Research Assistant	2018
Samuel Hales	Research Assistant	2018
	- Presented at undergraduate conference	
Matthew Goodson	Research Assistant	2018
	- Presented at undergraduate conference	
Mike Eddington	497R	2018
Jared Magnusson	497R	2018
Kegasi Turbovsky	497R	2018
Colin White	Research Assistant	2018
Jonathan Wagstaff	Research Assistant	2017
Diana Bolanos	Research Assistant	2017
Derek Sanchez	497R	2017
Greg Bird	Research Assistant	2017
Spencer Diehl	Research Assistant	2017
Turner Palombo	Research Assistant	2017
Kevin Roberts	497R	2017
Haden Heath	497R/Research Assistant	2016
Ryker Haddock	Research Assistant	2016
	- Published conference paper, presented at undergraduate conference, patent	

Committee Advisement

Year Graduate

Zachary Sadler, M.S.	2017
Christopher Brooks, M.S.	2019
José Niño, Ph.D.	Current
Sterling Voss, M.S.	Current

Arnold Wright, M.S.	Current
Trent Bates, M.S.	Current

Prior to BYU

Nathaniel Scheelke (Graduate)	2014-2016
Levi Gardner (Graduate)	2015-2016
Luke Scoggins (Undergraduate)	2015-2016
Ben White (Undergraduate/Graduate)	2013-2014
Ty Henrie (Undergraduate)	2015
Jenica Hillyard (SWE Senora Region Collegiate Representative, 2013-2014)	2011-2013
Ryan Martineau (AIAA The Twenty 20s Award, 2014)	2010-2013
Jacob Singleton (Air Force Cadet Research Award, 2014, 1 student nationally)	2011-2013