Michael J. Hargather

Associate Professor of Mechanical Engineering, New Mexico Tech
Research Scientist, Energetic Materials Research and Testing Center (EMRTC)
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Education

Doctor of Philosophy in Mechanical Engineering

- Pennsylvania State University, May 2008
- Dissertation: *Scaling, characterization, and application of gram-range explosive charges to blast testing of materials*
- Advisor: Dr. Gary Settles

Bachelor of Science in Mechanical Engineering, with Honors, Minor in Physics

- Penn State Erie, The Behrend College, May 2004
- Grade Point Average: 3.81
- Honors Thesis: *Molecular dynamics simulation of magnetic nanoparticles in a fluid*
- Honors Research Advisor: Dr. G. William Baxter
- Senior Design Project: *Natural gas pipeline flow regulator*
- Design Advisor: Dr. James Sonnenmeier
- Summer abroad, University College of Northampton, 2003

Academic Employment History

Associate Professor, New Mexico Tech	April 2017 – present
Research Scientist, Energetic Materials Research and Testing Center	Sept. 2013 – present
Assistant Professor, New Mexico Tech	Aug. 2012 – April 2017
Visiting Assistant Professor, New Mexico Tech	Jan. 2012 – July 2012
Research Associate, PSU Exp. and Comp. Convection Laboratory	Aug. 2011 – Dec. 2011
Research Associate, Penn State Gas Dynamics Laboratory	June 2008 – July 2011
Research Assistant, Penn State Gas Dynamics Laboratory	Aug. 2004 – May 2008
Physics Laboratory Instructor, Penn State Erie	Aug. 2002 – May 2004

Teaching Experience

Mechanical Engineering Department, New Mexico Tech, Undergraduate Classes

AE 417 – Aerospace Propulsion	Fa 2014, Fa 2016
ES 111 – Introduction to Programming	Fa 2013, Sp 2015
ES 216 – Fluid Dynamics	Fa 2012
ES 347 – Thermodynamics	Su 2012, Sp 2013, Fa 2013-2017
ES 350 – Heat and Mass Transfer	Sp 2012
EXPL 101L – Introduction to Explosives Laboratory	Sp 2017
EXPL 189L – Introduction to Pyrotechnics Laboratory	Sp 2015
MENG 189 – Introduction to Programming for Mechanical Engineers	Sp 2014
MENG 189 – Aerospace LLC	Sp 2015
MENG 305 – Numerical Methods and Analysis	Fa 2017
MENG 351L – Fluid-Thermal Sciences Laboratory	Sp 2014, Fa 2014
MENG 431 – Fluid and Thermal Systems	Sp 2013-2018
MENG 431L – Fluid and Thermal Systems Laboratory	Sp 2015-2018

Teaching Experience (continued)

Mechanical Engineering Department, New Mexico Tech, Graduate Classes

- MENG 556 / AE 420 – Compressible Flow — Sp 2016-2018
- MENG 560 – Combustion — Fa 2012
- MENG 585 – Graduate Research Seminar — Sp 2012, Fa 2012, Sp 2016
- MENG 586 / AE 491 – Introduction to Digital Image Processing — Fa 2015

Instructor, Mechanical and Nuclear Eng. Dept., Pennsylvania State University

- ME 320 – Fluid Dynamics — Fa 2012, Fa 2008
- ME 420 – Compressible Flow I — Sp 2011
- ME 520 – Compressible Flow II — Fa 2010
- ME 300 – Engineering Thermodynamics — Sp 2009
- Developer for a new graduate-level experimental methods course — Su 2011

Graduate Teaching Fellowship, Mechanical and Nuclear Eng. Dept., Pennsylvania State University (faculty mentor: Dr. Eric Marsh)

- ME 201 – Introduction to Thermal Science — Fa 2007, Sp 2008

Laboratory Instructor, Physics Department, Penn State Erie

- PHYS 211L – Mechanics — Sp 2003
- PHYS 212L – Electricity and Magnetism — Fa 2002, Fa 2003, Sp 2004

Student evaluations are available for all courses taught

Research Funding

My research focuses on the development and application of optical techniques to the study of high-speed compressible flows and explosions. My expertise is as an experimental fluid dynamicist, with specialties in optical diagnostics including schlieren and shadowgraph flow visualization, high-speed imaging, explosive characterization, and rocket propulsion.

Currently funded proposals

- Principal Investigator, "3D BOS imaging of shock wave interactions from multiple explosions", Air Force Research Laboratory via IS4S, 2.5 year, $135,000, Aug. 2016 – Dec. 2018
- Principal Investigator, "Rechargeable battery abuse research", Sandia National Laboratories, 2 years, $100,000, Oct. 2016 – Sept. 2018
- Principal Investigator, "Advanced diagnostics for small scale detonation testing of PETN", Sandia National Laboratories, 2 year, $86,000, Jan. 2017 – Sept. 2018
- Co-Principal Investigator, "Multiphase flow physics for reduced order models", Defense Threat Reduction Agency, 3 years, $325,000 to NMT, PI at University of New Mexico, Mar. 2018 – Mar. 2021
- Co-Principal Investigator, "Reactive nanocomposite materials for enhanced lethality kinetic warheads", MDA SBIR Phase II with Reactive Metals International, Inc, 1.5 years, $152,000 to NMT, Jan. 2018 – Aug. 2019
- Co-Principal Investigator, "Characterization of consolidated tungsten/magnesium composites", ONR SBIR Phase II Option with Reactive Metals International, Inc, 9 months, $80,012 to NMT, Nov. 2017 – Aug. 2018

RESEARCH FUNDING (CONTINUED)

Previously funded proposals

- Co-Principal Investigator, "Optical diagnostics and analysis for multiphase blast", Air Force STTR, 9 months, $75,000 to NMT, July 2017 – April 2018
- Principal Investigator, "Experimental Investigation of Turbulent Mixing in Thermite Explosions", Defense Threat Reduction Agency, **Young Investigator Program (YIP)**, 3 years, $300,000, Sept. 2014 – Dec. 2017
- Principal Investigator, "Fragment Imaging", Sandia National Laboratories, 3 months, $15,000, July 2017 – Sept. 2017
- Co-Principal Investigator, "Characterization of consolidated tungsten/magnesium composites", ONR SBIR with Reactive Metals International, Inc, 9 months, $80,409 to NMT, Nov. 2016 – Sept. 2017
- Principal Investigator, "BOS diagnostics for explosive projectile tests", Lawrence Livermore National Laboratory, 3 months, $15,000, July 2017 – Sept. 2017
- Principal Investigator, "Combustible polymer testing", Sandia National Laboratories, 9 months, $20,000, Nov. 2016 – May 2017
- Co-Principal Investigator (PI: ALERT Center of Excellence), "Creation of procedures and methodology to understand and measure sampling efficiency and baseline", Department of Homeland Security, 1 year, $105,000 (allocation to NMT), Oct. 2015 – Sept. 2016
- Co-Principal Investigator, "Agile optical methods for fireball species and particle characterization", DTRA SBIR with Spectral Energies, LLC, 6 months, $20,000 to NMT, Sept. 2016 – March 2017
- Principal Investigator, "Small-scale testing of metal fluoropolymers", Tetramer Technologies, LLC, 3 months, $4,000, June 2016 – Aug. 2016
- Principal Investigator, "nMx Explosive Testing", nanoMetallix, 3 months, $5,000, July 2016 – Sept. 2016
- Principal Investigator, "Propulsion Technology: Rocket Test Stand Design and Implementation", Sandia National Laboratories, 3 years, $120,000, Jan. 2014 – Sept. 2016
- Principal Investigator, "Schlieren imaging of battery failures", Office of Naval Research, 10 months, $40,000, June 2015 – March 2016
- Co-Principal Investigator (PI: Dr. Sivaram Gogineni), "Multi-camera BOS imaging for arena test measurement", Air Force SBIR with Spectral Energies, LLC, 9 months, $150,000 ($46,000 to NMT), June 2015 – Feb. 2016
- Principal Investigator, "Additive manufacturing for rocket motors", Los Alamos National Laboratory, 3 months, $20,000, 2015
- Principal Investigator, "Experimental rocket motor launch testing", Los Alamos National Laboratory, 1 month, $11,500, 2014
- Co-Principal Investigator (PI: Dr. Sivaram Gogineni), "Stereoscopic retroreflective shadowgraph system for warhead characterization", Navy SBIR with Spectral Energies, LLC, 6 month Phase 1, $75,000 ($25,000 to NMT), 2014
- Principal Investigator, "Focusing schlieren investigation of a spray flow", Spectral Energies, LLC, 4 months, $7,500, 2013
- Principal Investigator, "Retroreflective shadowgraph system design", Sandia National Laboratories, 4 months, $33,000, 2013

Research Funding (continued)

Previously funded proposals (continued)

- Principal Investigator, "High-speed shadowgraph imaging of shaped-charge jet formation", Jet Research Center, 8 months, $35,000, 2012
- Principal Investigator, "Multi-scale HME characterization and scaling analysis", Sandia National Laboratories, 1 year, $60,000, 2012
- Co-Principal Investigator (PI: Dr. Karen Thole), "1X scale heat transfer characterization with porous coupons", United Technologies Pratt & Whitney, 6 months, $70,000, 2011
- Co-Principal Investigator (PI: Dr. Gary Settles), "Schlieren based seedless PIV for high frequency cavity flow control applications in large scale wind tunnel facilities", Air Force SBIR Phase II, $315,000, 2009-2010
- Co-Principal Investigator (PI: Dr. Gary Settles), "Schlieren system upgrade for the Trisonic Gasdynamics Facility", Air Force Research Laboratory, 9 months, $50,000, 2009
- Research Collaborator (PI: Dr. Jim Runt), "Elastomeric polymer-by-design to protect the warfighter against traumatic brain injury by diverting the blast induced shock waves from the head", Office of Naval Research, 3 year, $2,200,000, 2009-2012 (participated until December 2011)

Industrial Research and Consulting

President, Hargather Imaging Technologies, LLC, 2015 – present
Consultant, Bangham Engineering, 2015-2016
Consultant, nSight, Inc., 2012
Consultant, Aerolab LLC, 2010-2011
Consultant, Intertek, 2008
Summer Intern, Xerox Corporation, Su 2002, Su 2003, Su 2004

Peer-Reviewed Journal Publications

[1] Mier, F. A., Morales, R., Coultas-McKenney, C. A., Hargather, M. J., Ostanek, J., Overcharge and thermal destructive testing of lithium metal oxide and lithium metal phosphate batteries incorporating optical diagnostics, *Journal of Energy Storage*, 13:378-386, 2017

[2] Settles, G. S., Hargather, M. J., A review of recent developments in schlieren and shadowgraph techniques, *Measurement Science and Technology*, 28:042001, DOI:10.1088/1361-6501/aa5748, 2017

[3] Tobin, J. D., Hargather, M. J., Quantitative schlieren measurement of explosively-driven shock wave density, temperature, and pressure profiles, *Propellants, Explosives, Pyrotechnics*, DOI: 0.1002/prep.201600097, 2016

[4] Mier, F. A., Hargather, M. J., Color gradient background-oriented schlieren imaging *Experiments in Fluids*, 57:95, 2016

[5] Skaggs, M. N., Hargather, M. J., Cooper, M. A., Characterizing pyrotechnic ignitor output with high-speed schlieren imaging, *Shock Waves*, DOI: 10.1007/s00193-016-0640-5, 2016

[6] Giannuzzi, P. M., Hargather, M. J., Doig, G.C., Explosive-driven shock wave and vortex ring interaction with a propane flame, *Shock Waves*, DOI: 10.1007/s00193-016-0627-2, 2016

PEER-REVIEWED JOURNAL PUBLICATIONS (CONTINUED)

[7] Craven, B. A., Hargather, M. J., Volpe, J. A., Frymire, S. P., Settles, G. S., Design of a high-throughput chemical trace detection portal that samples the aerodynamic wake of a walking person, *IEEE Sensors*, 14:1852-1866, 2014

[8] Hargather, M. J., Background-oriented schlieren diagnostics for large-scale explosive testing, *Shock Waves*, 23:529-536, 2013

[9] Hargather, M. J., Settles, G. S., Gogineni, S., Optical diagnostics for characterizing a transitional shear layer over a supersonic cavity, *AIAA Journal*, 51:2977-2982, 2013

[10] Young, R. M., Hargather, M. J., Settles, G. S., Shear stress and particle removal measurements of a round turbulent air jet impinging normally upon a planar wall, *Journal of Aerosol Science*, 62:15-25, 2013

[11] Fulghum, M. R., Hargather, M. J., Settles, G. S., An integrated impactor/detector for a high-throughput explosive trace detection portal, *IEEE Sensors*, 13:1252-1258, 2013

[12] Svingala, F. R., Hargather, M. J., Settles, G. S., Optical techniques for measuring the shock Hugoniot using ballistic projectile and high-explosive shock initiation, *International Journal of Impact Engineering*, 50:76-82, 2012

[13] Hargather, M. J., Settles, G. S., A comparison of three modern quantitative schlieren techniques, *Optics and Lasers in Engineering*, 50:8-17, 2012

[14] Hargather, M. J., Settles, G.S., Background-oriented schlieren visualization of heating and ventilation flows: HVAC-BOS, *HVAC&R Research*, 17(5):771-780, 2011

[15] Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Seedless velocimetry measurements by schlieren image velocimetry, *AIAA Journal*, 49(3): 611-620, 2011

[16] Hargather, M. J., Staymates, M. E., Madalis, M. J., Smith, D. J., Settles, G. S., The internal aerodynamics of cargo containers for trace chemical sampling, *IEEE Sensors Journal*, 11(5): 1184-1193, 2011

[17] Grujicic, M., He, T., Pandurangan, B., Svingala, F. R., Settles, G. S., Hargather, M. J., Experimental characterization and material-model development for microphase-segregated polyurea: An overview, *Journal of Materials Engineering and Performance*, 21 (1): 2-16, 2011

[18] Hargather, M. J., Settles, G. S., Madalis, M. J., Schlieren imaging of loud sounds and weak shock waves in air near the limit of visibility, *Shock Waves*, 20(1): 9-17, 2010

[19] Hargather, M. J., Settles, G. S., Natural-background-oriented schlieren imaging, *Experiments in Fluids*, 48: 59-68, 2010

[20] Hargather, M. J., Settles, G. S., Laboratory-scale techniques for the measurement of a material response to an explosive blast, *International Journal of Impact Engineering*, 36: 940-947, 2009

[21] Hargather, M. J., Settles, G. S., Retroreflective shadowgraph technique for large-scale flow visualization, *Applied Optics*, 48 (22): 4449-4457, 2009

[22] Hargather, M. J., Settles, G. S., Optical measurement and scaling of blasts from gram-range explosive charges, *Shock Waves*, 17: 215-223, 2007

Technical Conference Publications

[1] Winter, K., Hargather, M. J., Mai, C., Diggs, A., Peiris, S., High-speed, refractive imaging of multiple-charge shock-wave interactions and focusing, *JANNAF 48th Combustion Meeting*, 2017

[2] Hargather, M. J., Winter, K., Mai, C., Diggs, A., Peiris, S., High-speed refractive imaging of air blast from multiple charges, *Warheads and Ballistics Symposium*, 2017

[3] Mier, F. A., Hargather, M. J., Ferreira, S., Determining the internal pressure in 18650 format lithium batteries under thermal abuse, *Electrical Energy Storage Applications and Technologies*, paper, 2017

[4] Hargather, M. J., Kimberley, J., Thoma, S. G., Failure and fragmentation of pressed bi-metallic composites, *APS Shock Compression of Condensed Matter*, paper, 2017

[5] Hargather, M. J., Smith, J. L., Anderson, J., Winter, K., Optical diagnostics for energetic materials research, *ASME IMECE*, paper number IMECE2016-67372, 2016

[6] Hargather, M. J., Winter, K., Gogineni, S., Warhead characterization using multi-camera imaging of fragment and shock wave motion, *Warheads and Ballistics Symposium*, 2016

[7] Phillip, J., Youngblodd, S. H., Saul, W. V., Grubelich, M. C., Hargather, M. J., Development and testing of a nitrous-oxide/ethanol bi-propellant rocket engine, *AIAA Propulsion and Energy*, 2016

[8] Hargather, M. J., Winter, K., Gogineni, S., Multi-camera distnstics to measure shock wave and fragment motion in complex environments, *JANNAF 47th Combustion Meeting*, 2016

[9] Anderson, J. A., Smith, J. L., Hargather, M. J., Optical diagnostics to quantify turbulent mixing in post-blast environment, *JANNAF 47th Combustion Meeting*, 2016

[10] Grubelich, M. C., Youngblood, S. H., Hargather, M. J., Saul, W. V., Nitrous oxide ethanol bi-propellant rocket engine and gas generator development and testing, *Space Propulsion*, 2016

[11] Chan, J.E.C., Giannuzzi, P.M., Kabir, K.R., Hargather, M.J., Doig, G.C., Interactions of shock tube exhaust flows with laminar and turbulent flames, AIAA SciTech, 2016

[12] Youngblood, S. H., Hargather, M. J., Grubelich, M. C., Saul, W. V., Computational modeling of a liquid nitrous oxide and ethanol fueled rocket engine, *JANNAF 46th Combustion, 34th Airbreathing Propulsion,34th Exhaust Plume and Signatures, 28th Propulsion Systems Hazards Joint Subcommittee Meeting*, 2014

[13] Hargather, M. J., Canafax, N. B., Stereoscopic retroreflective shadowgraph system for warhead characterization, *JANNAF 46th Combustion, 34th Airbreathing Propulsion,34th Exhaust Plume and Signatures, 28th Propulsion Systems Hazards Joint Subcommittee Meeting*, 2014

[14] Hargather, M. J., Hussan, S., Quinlin, M., Jacomb-Hood, T., Francis, Z., Seneca, C., Fernando, R., Fluid dynamics dimensional analysis take-home experiment using paper airplanes, *ASEE Annual Conference*, 2013

[15] Hargather, M. J., Thole, K. A., Characterization of flow through porous metals, *ASME Turbo Expo*, paper GT2013-94945, 2013

[16] Svingala, F. R., Hargather, M. J., Settles, G. S., Modern optical methods for determining the shock Hugoniot of transparent solids, *28th International Symposium on Shock Waves*, 2011

Technical Conference Publications (continued)

[17] Hargather, M. J., Settles, G. S., Recent developments in schlieren and shadowgraphy, *27th AIAA Aerodynamic Measurement Technology and Ground Testing Conference*, paper AIAA-2010-4206, 2010

[18] Hargather, M. J., Settles, G. S., Background-oriented schlieren visualization of heating and ventilation flows: HVAC-BOS, *14th International Symposium on Flow Visualization*, 2010

[19] Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Gogineni, S., Focusing-schlieren PIV measurements of a supersonic turbulent boundary layer, *47th AIAA Aerospace Sciences Meeting*, paper AIAA-2009-69, 2009

[20] Hargather, M. J., Settles, G. S., Dreibelbis, L. J., Liebner, T. J., Natural-background-oriented schlieren imaging, *13th International Symposium on Flow Visualization*, 2008

[21] Settles, G. S., Hargather, M. J., Madalis, M. J., Schlieren imaging of loud sounds and weak shock waves in air near the limit of visibility, *13th International Symposium on Flow Visualization*, 2008

[22] Hargather, M. J., Settles, G. S., Gatto, J. A., Gram-range explosive blast scaling and associated materials response, *26th International Symposium on Shock Waves*, 2007

[23] Biss, M. M., Settles, G. S., Hargather, M. J., Dodson, L. J., Miller, J. D., High-speed digital shadowgraphy of shock waves from explosions and gunshots, *26th International Symposium on Shock Waves*, 2007

[24] Hargather, M. J., Settles, G. S., Gatto, J. A., Full-scale optical experiments on the explosive failure of a ULD-3 air cargo container, *4th International Aviation Security Technology Symposium*, 2006

[25] Hargather, M. J., Settles, G. S., Gatto, J. A., Optical measurement, characterization, and scaling of blasts from gram-range explosive charges, *4th International Aviation Security Technology Symposium*, 2006

Invited Technical Presentations

1. Explosive characterization using high-speed imaging, presented at New Mexico Tech Petroleum Department Seminar, October 2017
2. Shock waves, turbulence, rockets, and education, presented to New Mexico Tech MENG 110 class, October 2017
3. Three-dimensional shock wave and fragment tracking for warhead characterization, presented at Purdue University, May 2017
4. New Mexico Tech liquid rocket engine facility overview, presented at NASA White Sands, November 2016
5. Overview of refractive imaging techniques for explosive testing, presented at Sandia National Laboratories, August 2016
6. Shock waves, turbulence, rockets, and grad school, presented at NMT ASME Student Chapter Meeting, November 2015
7. Overview of current research in Shock and Gas Dynamics Laboratory at New Mexico Tech, presented at Los Alamos National Laboratory, September 2015
8. Quantitative flow visualization techniques for shock wave measurements, presented at University of New Mexico, March 2015
9. Shock wave visualization and measurement using the Background Oriented Schlieren (BOS) technique, presented at Sandia National Laboratories, June 2014
10. Quantitative flow visualization techniques for compressible flow experiments, presented at Sandia National Laboratories, April 2014

Invited Technical Presentations (continued)

11. Optical measurement of airblast shock wave pressures, presented at Eglin Air Force Base, March 2014
12. Michael Faraday's The Chemical History of a Candle, presented in the New Mexico Tech Mechanical Engineering Graduate Seminar, September 2012
13. Laboratory-scale explosive research, presented at the French-German Research Institute of Saint-Louis, June 2009

Technical Conference Presentations

1. Bhakta, R., Hargather, M. J., Development of a low-cost multiple diode PIV laser for high-speed flow visualization, *APS Division of Fluid Dynamics Meeting*, Denver, CO, November 2017
2. DiGregorio, S., Lucero, C., Anderson, J., Hargather, M. J., Experimental study of explosively-driven shock wave propagation in scaled two-dimensional geometries, *APS Division of Fluid Dynamics Meeting*, Denver, CO, November 2017
3. Garcia, J. Hargather, M. J., Harrison, J. B., A comparison of microspheres and sediment drag using a Visual Accumulation Tube, *APS Division of Fluid Dynamics Meeting*, Denver, CO, November 2017
4. Mier, F. A., Hargather, M. J., Ferreira, S., Measurement of 18650 format lithium ion battery vent mechanism flow parameters, *APS Division of Fluid Dynamics Meeting*, Denver, CO, November 2017
5. Morales, R., Peguero, J., Hargather, M. J., Schlieren image velocimetry measurements in a rocket engine exhaust plume, *APS Division of Fluid Dynamics Meeting*, Denver, CO, November 2017
6. Winter, K., Hargather, M. J., Mai, C., Diggs, A., Peiris, S., High-speed, refractive imaging of multiple-charge shock-wave interactions and focusing, *JANNAF 48th Combustion Meeting*, Newport News, VA, December 2017
7. Mier, F. A., Hargather, M. J., Ferreira, S., Determining the internal pressure in 18650 format lithium batteries under thermal abuse, *Electrical Energy Storage Applications and Technologies*, San Diego, CA, October 2017
8. Hargather, M. J., Winter, K., Mai, C., Diggs, A., Peiris, S., High-speed refractive imaging of air blast from multiple charges, *Warheads and Ballistics Symposium*, Monterey, CA, August 2017
9. Kimberley, J., Hargather, M. J., Thoma, S. G., Failure and fragmentation of pressed bi-metallic composites, *APS Shock Compression of Condensed Matter*, St. Louis, MO July 2017
10. Coultas-McKenney, C., Hargather, M. J., Analysis of sliding friction during controlled swipe sampling, *Trace Explosives Detection Workshop*, Santa Fe, NM, April 2017
11. Hargather, M. J., Smith, J. L., Anderson, J., Winter, K., Optical diagnostics for energetic materials research, *ASME IMECE*, Phoenix, AZ, November 2016
12. Anderson, J., Hargather, M. J., Optical diagnostics of turbulent mixing in explosively-driven shock tube, *APS Division of Fluid Dynamics*, Portland, OR, November 2016
13. Bhakta, R., Mier, F. A., Castano, N., Thackrah, J., Marquis, T., Garcia, J., Hargather, M. J., Measurement of steady and transient liquid coiling with high-speed video and digital image processing, *APS Division of Fluid Dynamics*, Portland, OR, November 2016
14. Coultas-McKenney, C., Winter, K., Hargather, M. J., High-speed schlieren imaging of rocket exhaust plumes, *APS Division of Fluid Dynamics*, Portland, OR, November 2016

Technical Conference Presentations (continued)

15. Phillip, J., Morales, R., Youngblood, S., Hargather, M., Grubelich, M., Saul, W. V., Liquid rocket engine testing facility at New Mexico Tech, *APS Division of Fluid Dynamics*, Portland, OR, November 2016
16. Hargather, M. J., Overview of refractive imaging techniques for explosive testing, *National Energetic Materials Initiative Meeting*, Socorro, NM, August 2016
17. Hargather, M. J., Winter, K., Gogineni, S., Warhead characterization using multi-camera imaging of fragment and shock wave motion, *Warheads and Ballistics Symposium*, 2016
18. Hargather, M. J., Phillip, J., Youngblodd, S. H., Saul, W. V., Grubelich, M. C., Development and testing of a nitrous-oxide/ethanol bi-propellant rocket engine, *AIAA Propulsion and Energy*, 2016
19. Hargather, M. J., Winter, K., Gogineni, S., Multi-camera distnstics to measure shock wave and fragment motion in complex environments, *JANNAF 47th Combustion Meeting*, 2016
20. Anderson, J. A., Smith, J. L., Hargather, M. J., Optical diagnostics to quantify turbulent mixing in post-blast environment, *JANNAF 47th Combustion Meeting*, 2016
21. Mier, F. A., Hargather, M. J., Color gradient background oriented schlieren imaging, *68th APS Division of Fluid Dynamics Meeting*, 2015
22. Smith, J. L., Hargather, M. J., Experimental investigation of turbulent mixing in post-explosion environment, *68th APS Division of Fluid Dynamics Meeting*, 2015
23. Hargather, M. J., Armstrong, C., Analysis of shock wave propagation from explosives using computational simulations and artificial schlieren imaging, *67th APS Division of Fluid Dynamics Meeting*, 2014
24. Hargather, M. J., Canafax, N. B., Explosive-driven shock wave interaction with a propane flame, *67th APS Division of Fluid Dynamics Meeting*, 2014
25. Smith, J. L., Youngblood, S. H., Hargather, M. J., New applications of focusing schlieren imaging, *67th APS Division of Fluid Dynamics Meeting*, 2014
26. Tobin, J., Hargather, M. J., Quantitative schlieren measurement of shock wave pressure profile, *66th APS Division of Fluid Dynamics Meeting*, 2013
27. Romo, C. P., Hargather, M. J., Background-oriented schlieren measurement of shock wave pressure profile, *66th APS Division of Fluid Dynamics Meeting*, 2013
28. Hargather, M. J., Rockwell, O., Characterization of a magnetohydrodynamic (MHD) shock sensor using schlieren imaging, *66th APS Division of Fluid Dynamics Meeting*, 2013
29. Hargather, M. J., Optical measurement of airblast shock wave parameters, *Shock and Vibration Symposium*, 2013
30. Hargather, M. J., Hussan, S., Quinlin, M., Jacomb-Hood, T., Francis, Z., Seneca, C., Fernando, R., Fluid dynamics dimensional analysis take-home experiment using paper airplanes, *ASEE Annual Conference*, 2013
31. Hargather, M. J., Thole, K. A., Characterization of fluid flow through porous metals, *ASME Turbo Expo*, 2013
32. Hargather, M. J., Settles, G. S., High-volume sampling for explosive trace detection, *Trace Explosives Detection Workshop*, 2011
33. Hargather, M. J., Settles, G. S., Laboratory-scale blast testing and research, *Gordon Research Conference, Energetic Materials*, 2010
34. Hargather, M., J., Settles, G. S., Recent developments in schlieren and shadowgraphy, *27th AIAA Aerodynamic Measurement Technology and Ground Testing Conference*, 2010

Technical Conference Presentations (continued)

35. Hargather, M. J., Settles, G. S., Modern quantitative schlieren techniques, *63rd APS Division of Fluid Dynamics Meeting*, 2010
36. Hargather, M. J., Lawson, M. J., Settles, G. S., The aerodynamics of canine olfaction, *Gordon Research Conference, Detecting Illicit Substances: Explosives and Drugs*, 2009
37. Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Gogineni, S., Focusing-schlieren PIV measurements of a supersonic turbulent boundary layer, *47th AIAA Aerospace Sciences Meeting*, 2009
38. Hargather, M. J., Lawson, M. J., Settles, G. S., Schlieren velocimetry of turbulent flows, *38th AIAA Fluid Dynamics Conference*, 2008
39. Hargather, M. J., Settles, G. S., Background-oriented schlieren (BOS): Techniques and applications for multi-scale flow visualization and measurement, *61st APS Division of Fluid Dynamics Meeting*, 2008
40. Hargather, M. J., Settles, G. S., A midsummer-night's shock wave, *60th APS Division of Fluid Dynamics Meeting*, 2007
41. Hargather, M. J., Settles, G. S., Small-scale materials blast testing using gram-range explosives and air-shock loading, *59th APS Division of Fluid Dynamics Meeting*, 2006
42. Hargather, M. J., Settles, G. S., Determining the TNT equivalence of gram-sized explosive charges using shock-wave shadowgraphy and high-speed video recording, *58th APS Division of Fluid Dynamics Meeting*, 2005

Student Advising

Graduate Research Advising

- F. Austin Mier, PhD in Mechanical Engineering, Jan. 2017 – present, MS May 2018, PhD expected May 2020
- Kyle Winter, PhD in Mechanical Engineering, Jan. 2017 – present, MS expected July 2018, PhD expected May 2020
- Stewart Youngblood, PhD in Mechanical Engineering, Jan. 2018 – present, PhD expected May 2021
- Christian Peterson, PhD in Mechanical Engineering, June 2018 – present, PhD expected May 2022
- Raj Bhakta, MS in Mechanical Engineering, Aug. 2016 – July 2018 (expected)
- John Garcia, MS in Mechanical Engineering, Aug. 2017 – Aug. 2018 (expected)
- Rudy Morales, MS in Mechanical Engineering, Jan. 2017 – July 2018 (expected)
- Kyle Benalil, MS in Mechanical Engineering, Aug. 2017–July 2018 (expected)
- Julio Peguero, MS in Mechanical Engineering, Jan 2018 – May 2019 (expected)
- James Anderson, MS in Mechanical Engineering, Aug. 2015 – May 2017
- Joshua Smith, MS in Mechanical Engineering, Aug. 2014 – May 2016
- Stewart Youngblood, MS in Mechanical Engineering, Aug. 2013 – Sept. 2015
- Michael Shattuck, MS in Mechanical Engineering, Mar. 2012 – Jan. 2015
- Cynthia Romo, MS in Mechanical Engineering, Aug. 2012 – Dec. 2014
- Jesse Tobin, MS in Mechanical Engineering, Aug. 2012 – Aug. 2014
- Megan Tribble, MS in Mechanical Engineering, Aug. 2012 – May 2014

Current Undergraduate Research Advising

- Sara DiGregorio, BS in Chemical Engineering, May 2017 – Dec. 2018 (expected)
- Calla Lang, BS in Mechanical Engineering, July 2017 – May 2020 (expected)

STUDENT ADVISING (CONTINUED)

Faculty Advisor for Mechanical Engineering Design Teams

• Sounding Rocket	Fa 2016 – present, Fa 2012 – Sp 2014
• Energetic Materials 3D Printer	Fa 2015 – Sp 2017
• Portable Drop Hammer	Fa 2014 – Fa 2015
• Explosive Vapor Detection	Fa 2014 – Sp 2015
• Rocket Engine Test Stand	Fa 2013 – Sp 2014
• TATP Remote Synthesis	Fa 2013 – Sp 2014
• Refrigeration Demonstration	Fa 2013 – Fa 2014
• Battery Crush Tester	Sp 2012 – Sp 2013
• Sacred Power Solar Collector	Sp 2012 – Sp 2013

Academic Advisor for more than 30 current undergraduate Mechanical Engineering students
Member of more than 10 graduate committees at New Mexico Tech

TECHNICAL WORKSHOP LEADERSHIP

Founder and Lead Instructor, High-speed digital imaging techniques for blast and impact measurement workshop, June 2014-2018
Instructor, EMRTC High Explosives Principles and Applications course, March 2018
Instructor, FEMA Science of Disasters short course, May 2013-2016

TECHNICAL WORKSHOP PARTICIPATION

Rocket Test Group Meeting, White Sands, New Mexico, Oct. 2015 Rocket Test Group Meeting, China Lake, California, Dec. 2014
Trace Explosives Sampling for Security Applications, Boston, Massachusetts, Aug. 2014
Trace Explosives Detection Workshop, Baltimore, Maryland, Apr. 2010.
Counter IED Technology Assessment Workshop, US DHS, Nov. 2009
Explosive Particle Sampling Workshop, US DHS Transportation Security Lab., Feb. 2009
Fundamentals of Explosives Short Course, University of Rhode Island, May 2008

PROFESSIONAL MEMBERSHIPS

American Society of Mechanical Engineers, Member 2001 – present
American Physical Society, Member 2005 – present
American Institute of Aeronautics and Astronautics, Senior Member 2008 – present
American Society for Engineering Education, Member 2010 – present
National Association of Rocketry, Member 2015 – present

SELECTED MEDIA APPEARANCES

Los Alamos National Lab youtube channel, *Novel Rocket Design Flight Tested* Oct. 2014
Discovery Science Channel show *World's Strangest: Explosions*, June 2014
NPR Science Article "What does sound look like", Apr. 2014
PBS Nova show *Cold Vase JFK*, Nov. 2013
PBS Nova show *Manhunt-Boston Bombers*, May 2013

University Service

Participant in President's Leadership Retreat, and member of several task forces, 2017 – present
Member of Academic Freedom and Tenure Committee, 2017 – present
Member of Regents Faculty Conference Committee, 2013 – 2015
Member of Computing on Campus Committee, 2015 – 2017
Organizer of Research Coffee Hour, 2013-2017
Student Living Learning Community course development and teaching, 2013 – 2015
Member of Collaborative Senior Capstone Course Development Committee, 2014 – 2016
Member of NMT 2015 – 2020 Strategic Planning Committee
Co-Chair of Community of Scholars Task Force, 2013 – 2014
Member of Space Allocation Committee, 2012 – 2014
Regularly attend Faculty Senate meetings at New Mexico Tech

Peer Reviewer

Experiments in Fluids
International Journal of Impact Engineering
Flow Measurement and Instrumentation
Journal of Aerosol Science and Technology
Shock Waves
Propellants, Explosives, Pyrotechnics
Measurement Science and Technology
Ocean Engineering
Aerospace Science and Technology
Journal of Flow Visualization
AIAA Journal