

JACOB A. ROGERS

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EDUCATION

Texas A&M University

2019–2023

J. Mike Walker '66 Department of Mechanical Engineering
PhD in Mechanical Engineering, GPA: 4.0
Fellow, National Science Foundation
President, MEGSO | Graduate Ambassador, TAMU MEEN

Mississippi State University

2015–2019

Bagley College of Engineering | Shackouls Honors College
BS in Aerospace Engineering, *Concentration in Astronautics*, GPA: 4.0

RESEARCH EXPERIENCE

Hypervelocity Impact (HVI), Hypersonic, and Novel Materials Research

May 2020 – present

National Science Foundation Fellow, Advisor(s): Dr. Thomas Lacy & Dr. Justin Wilkerson

- Researching HVI phenomena and lightweight, strain-rate-tuned materials and material structures that are tailored to maximize hypervelocity/hypersonic energy dissipation for military and space applications.
- Probing the effects of crystallinity and molecular structure on the energy dissipation observed upon subjecting polyethylenes (PEs) to HVIs at normal and oblique angles over the velocity range attainable.
- Studying HVIs to PEs at various temperatures, thicknesses, lamination, *etc.*
- Using experimental results and material characterization in conjunction with MD simulations to understand PE damage response fundamentally and to construct, validate, and inform multi-scale material computational models.
- Investigating environmental effects (*e.g.*, ice, snow, rain, volcanic dust) on hypersonic/hypervelocity projectiles/vehicles. Shock-shock, shock-particle, shock-projectile, and impact interactions are being probed.
- Developing novel high-rate diagnostic (ultra-high speed schlieren imaging, multi-angle imaging, *etc.*) and experimental (*e.g.*, hypervelocity simultaneously launched, distributed particles) methods.
- Managing a team of ~20 HVIL graduate and undergraduate student researchers.
- Mentoring multiple year-long capstone design teams in designing, developing, and implementing HVIL equipment.
- Conducted over 270 full-scale HVI and hypersonic experiments (as of 04/2022) for various research applications.
- Responsible for developing and maintain the **Materials for Extreme Environments/HVIL research website**.
- Other projects include studying HVI impact phenomena to additional materials/structures (*e.g.*, composites, polymers, metals, concretes, ceramics), investigating HVI-induced shock waves in biomimetic materials, *etc.*

HVI Research and Laboratory Development

July 2019 – May 2020

Texas A&M University, Graduate Research Assistant, Advisor(s): Dr. Thomas Lacy & Dr. Justin Wilkerson

- Led the effort to establish the TAMU Hypervelocity Impact Laboratory (HVIL) that is currently being used to study the effects of hypervelocity (1.5–8.0 km/s) impacts on metals, composites, polymers, soft materials, *etc.*
- Oversaw the complete installation and calibration of the 12.7 mm bore two-stage light gas gun (2SLGG), corresponding aeroballistic range, and supporting diagnostic instruments.
- Led six undergraduate design team students in designing, developing, and fabricating a robust specimen fixture capable of facing the harsh environment resulting from HVIs.
- The TAMU HVIL has been fully operational since January 2020 and is equipped with a 2SLGG and modern diagnostic instruments, including ultra-high speed camera (10M fps), flash X-ray system, *etc.* Please see the HVIL [research page](#) for more details.

HVI Testing on Polymeric Materials

Jan 2018 – Dec 2018

Mississippi State University, Advisor(s): Dr. Thomas E. Lacy Jr., PE & Hunter Bowering

- Researched the effects of hypervelocity (3–7 km/s) impacts on polymeric materials to develop tailored lightweight material structures to arrest hypervelocity projectiles.
- Analyzed impacted specimens for energy dissipation using energy estimation methods, post-impact forensic techniques, and *in-situ* images from a high speed (5 million fps) camera.
- Assisted in the development and installation of a 5.6 mm bore 2SLGG capable of accelerating 4 mm projectiles to 2–7 km/s. Conducted ~50 full-scale experiments.

Robust and Accurate Indoor Positioning System Development

Jan 2018 – May 2019

Mississippi State University, Advisor(s): Dr. Donghoon Kim

- Constructed indoor positioning system using ultra-wide band (UWB) ranging sensors.
- Researched ways to reduce sensor noise and make the IPS a more accurate and robust environment.
- Modified extended Kalman filter algorithm for implementation in dynamic scenarios.
- Successfully implemented modified Kalman filtering algorithms with updating measurement error covariance distributions to UWB sensors to decrease noise and provide sub-centimeter accurate positioning.

Innovative CubeSat Development

Aug 2016 – Aug 2017

Mississippi State University, Advisor(s): Dr. Keith Koenig

- Designed satellites consisting of structure, avionics, mechanisms, and autonomous computer systems.
- Designed and 3D printed mechanisms and structures in house to allow customization and reduce costs.
- Constructed multiple fully-functioning prototypes and tested them using high-altitude weather balloons.

PROFESSIONAL EXPERIENCE

NASA Marshall Space Flight Center | Intern | Huntsville, AL

May 2017 – Aug 2017

- Systems engineering and integration for the Space Launch System (SLS) for Validation and Verification.
- Worked on Function Integration Task (FIT) Team to implement SLS-allocated ESD Requirements.
- Developed code that increased autonomy in functional mapping that is currently being implemented.
- Presented accomplishments to FIT Team, branch chief, and NASA MSFC Summer Internship Seminar.

Mississippi State University | Teaching Assistant | Starkville, MS

Aug 2016 – Dec 2017

- Taught 120+ aerospace students CAD (SolidWorks and Creo) software.
- Instructed students on data acquisition and analysis.
- Designed and graded various CAD projects (satellites, rockets, aircraft).
- Designed and aided with design build test (DBT) projects to teach students the engineering/design process.

SKILLS & INTERESTS

MATLAB | expert

LaTeX | expert

Fortran | proficient

Arduino | proficient

Visual Basic | proficient

SolidWorks & Creo | expert

AGI STK | proficient

LabView | proficient

MS Visio | basic

Mathematica | proficient

Other Skills: data presentation, data collection, statistical analysis, finite element analysis, flash X-ray imaging, ultra-high speed diagnostics, prototyping, carpentry, machining, additive manufacturing, laboratory management, mentoring, editing/reviewing, website design

Research Interests: solid mechanics, hypervelocity impacts, hypersonics, ultra-high strain rate materials, micrometeoroid/orbital debris (MMOD) impacts, materials for extreme environments

EDITORIAL SERVICE

- *Review of Scientific Instruments*, AIP, (2022–present).
- *Journal of Dynamic Behavior of Materials*, Springer, (2022–present).
- *IEEE Transactions on Aerospace and Electronic Systems*, IEEE, (2022–present).

MEMBERSHIP & INVOLVEMENT

- **Committee Member**, TAMU Mechanical Engineering Graduate Studies Committee, Aug 2022 – Present.

Description: A departmental committee (8 faculty members and 2 graduate students) whose goal is to address various issues and topics of interest within the graduate program, including graduate courses, program fees/budgets, etc.

- **President**, Mechanical Engineering Graduate Student Organization (MEGSO), May 2022 – Present.

Description: Host social and technical events to support graduate students. Recruited a diverse set of officers (18 men and women in various research fields). Develop relevant resources (e.g., MEGSO website). Departmental organization.

- **Graduate Ambassador**, Mechanical Engineering Graduate Student Ambassador Program, Nov 2021 – Present.
Description: Provide a peer-to-peer perspective to prospective and current graduate students, as well as offer counsel and advice from a unique perspective. This role was served as part of a departmental organization.
- **Tech. Affairs V.P.**, Mechanical Engineering Graduate Student Organization (MEGSO), Aug 2021 – May 2022.
Description: Oversaw all MEGSO technical resource development and events, including the annual research poster competition. This role was served as part of a departmental organization.
- **Website Developer/Manager**, Hypervelocity Impact Laboratory (HVIL), June 2020 – Present.
Description: Designed and developed the Materials for Extreme Environments (MEE) and Hypervelocity Impact Laboratory website. Currently manage changes/updates to the website, including publications, news, and events postings.
- **Senior Capstone Design Team Mentor**, TAMU College of Engineering, Aug 2019 – Present.
Description: Mentor and guide roughly 3 undergraduate design teams per year working on year-long senior capstone projects. This position was/is served through my lab/group, the Hypervelocity Impact Laboratory.
- **Sigma Xi Scientific Research Honor Society Member**, TAMU, June 2020 – Present.
- **Student/Researcher Member**, International Ballistic Society (IBS), April 2020 – Present.
- **Student/Researcher Member**, American Society of Mechanical Engineers (ASME), April 2020 – Present.
- **Nominee and Student/Researcher Member** Tau Beta Pi Honors Society, April 2018 – Present.
- **Nominee and Student/Researcher Member** Phi Kappa Phi Honors Society, August 2017 – Present.
- **Nominee, Member, and Secretary (2017–2018)**, Sigma Gamma Tau Honors Society, August 2016 – Present.
- **Member and Treasurer (2016–2017)**, American Institute of Aeronautics/Astronautics, January 2016 – Present.
- **Chief Design Engineer**, Mississippi State University CubeSat Team, May 2016 – August 2017.

HONORS & AWARDS

- **J. Mike Walker '66 Impact Award**, Department of Mechanical Engineering, TAMU, October 2022.
Description: Competitive award given to two male and two female graduate students (\$5,000 each). Awardees must demonstrate academic/scholarly achievements, as well as have leadership and/or entrepreneurial focus/experience.
- **Alex Charters Student Scholar Award**, Hypervelocity Impact Society (HVIS), June 2022.
Description: Competitive \$1,000 award granted to eligible students through a nomination and application evaluation.
- **2022 ARA Student Award**, Aeroballistic Range Association (ARA), June 2022.
Description: Competitive \$1,500 award granted to eligible students through a nomination and application evaluation.
- **Graduate Student Travel Award**, TAMU Department of Mechanical Engineering, July 2022.
Description: Graduate student award (\$750) to support travel to conferences and other professional meetings.
- **Student Excellence Award**, University Consortium for Applied Hypersonics (UCAH), March 2022.
Description: Competitive award and recognition provided to best presenter/presentation at UCAH Forum.
- **Graduate Research Fellowship Program (GRFP)**, National Science Foundation (NSF), April 2020 – Present.
Description: Nationally competitive 5-year fellowship with 3 years of support: \$37,000 (stipend) + \$12,000 (tuition).
- **Graduate Summer Research Grant**, TAMU Department of Mechanical Engineering, April 2020.
Description: Competitive awards (\$5,300) provided to graduate students through a nomination and proposal evaluation.
- **Graduate Merit Fellowship**, TAMU Department of Mechanical Engineering, April 2019.
Description: Competitive graduate fellowship awarded in initial funding package (\$19,000 distributed over 3 years).
- **Graduate Invitational Recipient**, TAMU Department of Mechanical Engineering, April 2019.
Description: An event provided to top incoming graduate students as an opportunity to explore TAMU resources.
- **SMART Scholarship**, DoD Science, Mathematics, & Research for Transformation Program, April 2019.
Description: Competitive fellowship that provides tuition, annual stipends, etc. Declined due to receipt of NSF award.
- **Student of the Year Award**, Mississippi State University Dept. of Aerospace Engineering, April 2019.
- **Stephen D. Lee Scholar Award**, Mississippi State University, April 2019.
- **First Place Presentation Award**, Mississippi State University Spring Research Symposium, April 2019.
- **First Place Presentation Award**, Mississippi State University Summer Research Symposium, August 2019.
- **Engineering Research Fellowship**, Mississippi State University, September 2018 – May 2019.
- **Honors Research Fellowship**, Mississippi State University Shackouls Honors College, May 2018 – May 2019.
- **NASA Space Grant Recipient**, Mississippi State University, January 2016 – May 2019.
- **Valedictorian Scholarship**, Mississippi State University, August 2015 – May 2019.
- **Get 2 College Scholarship**, Mississippi State University, August 2015 – August 2016.

INVITED TALKS & PRESENTATIONS

- Rogers, J. A., “Materials for Extreme Environments,” *Spring 2022 Engineering Graduate Invitational*, Texas A&M University, College Station, TX, March 3, 2022.

SCIENTIFIC JOURNAL PAPERS & BOOKS

Rogers, J.A., Bass, N., Mead, P.T., Mote, A., Lukasik, G.D., Intardonato, M., Harrison, K., Leaverton, J.D., Kota, K.R., Wilkerson, J.W., Reddy, J.N., Kulatilaka, W.D., and Lacy, Thomas E., “The Texas A&M University Hypervelocity Impact Laboratory: A Modern Aeroballistic Range Facility,” *Review of Scientific Instruments*. Volume 93, 2022, 085106, <https://doi.org/10.1063/5.0088994>. **Editor’s Pick. Featured on journal homepage.**

Rogers, J. A., Mote, A., Mead, P., Harrison, K., Lukasik, G., Kota, K., Kulatilaka, W., Wilkerson, J., Lacy, T., “Hypervelocity Impact Response of Monolithic UHMWPE and HDPE Plates,” *International Journal of Impact Engineering*, Volume 161, 2022, 104081, ISSN 0734-743X, <https://doi.org/10.1016/j.ijimpeng.2021.104081>.

IN PREPARATION

Lukasik, G., **Rogers, J.A.**, Kulatilaka, W.D., Lacy Jr., T.E., “A Method for Tracking Hypervelocity-Impact-Induced Polyethylene Fragments,” In preparation for the *International Journal of Impact Engineering*. March 2022.

Rogers, J.A., Lukasik, G., Mead, P., Mote, A., Martin, B., Wilkerson, J.W., Kulatilaka, W.D., Lacy Jr., T.E., “Mechanics of Hypervelocity Simultaneously Launched Distributed Particles,” In preparation for the *International Journal of Impact Engineering*. August 2022.

Rajagopal, K.R., **Rogers, J.A.**, *An Introduction to the Linearized Theory of Elasticity*, Adapted from Lectures Given by Professor Kumbakonam Rajagopal at Texas A&M University. Lecture notes taken by Jacob Rogers. In preparation. February 2022.

CONFERENCE PROCEEDINGS & PRESENTATIONS

Lukasik, G., Schweizer, C., **Rogers, J.A.**, Lacy Jr., T. E., and Kulatilaka, W. D., 2023, “Ultra-High-Speed Digital In-Line Holography for Three-Dimensional Tracking of Hypervelocity Projectiles,” *Proceedings of the AIAA SciTech 2023 Forum*, National Harbor, MD, January 23–27. Accepted.

Wiest, M., **Rogers, J.A.**, Lukasik, G., Kulatilaka, W.D., Wilkerson, J., and Lacy Jr., T.E., 2023, “Hypervelocity-Impact-Induced Cavitation in Soft Gels,” *Proceedings of the AIAA SciTech 2023 Forum*, National Harbor, MD, January 23–27. Accepted.

Rogers, J.A., Mead, P., Wilkerson, J., Lacy Jr., T.E., and Williams, N., 2023, “Simulating Hypervelocity Impacts to High-Density Polyethylene,” *Proceedings of the AIAA SciTech 2023 Forum*, National Harbor, MD, January 23–27. Accepted.

Rogers, J.A., Mead, P.T., Harrison, K., Mote, A., Lukasik, G., Kulatilaka, W., Wilkerson, J., and Lacy Jr., T.E., 2022, “The Simulation of Hypervelocity Impacts to High-Density Polyethylene,” *Proceedings of the Society of Engineering Science (SES) Annual Technical Meeting*, College Station, TX, October 16–19.

Rogers, J.A., Lukasik, G., Martin, B., Mead, P., Mote, A., Wilkerson, J.W., Kulatilaka, W., and Lacy Jr., T.E., 2022, “In-situ Characterization of Hypervelocity Simultaneously Launched Distributed Particles,” *Proceedings of the 16th Hypervelocity Impact Symposium*, Alexandria, VA, September 18–22. **Alex Charters Scholar Award.**

Rogers, J.A., Lukasik, G., Mead, P., Harrison, K., Mote, A., Kota, K.R., Wilkerson, J.W., Kulatilaka, W., and Lacy Jr., T. E., 2022, “The Texas A&M University Hypervelocity Impact Laboratory: A State-of-the-Art Facility for High-Rate Materials Characterization,” *Proceedings of the 16th Hypervelocity Impact Symposium*, Alexandria, VA, September 18–22.

Mead, P., **Rogers, J. A.**, Intardonato, M., Lukasik, G., Wilkerson, J. W., Kulatilaka, W., Vankirk, G. H., and Lacy Jr., T. E., 2022, “Hypervelocity Impact Response of High Performance Concrete Targets of Varying Thickness,” *Proceedings of the 16th Hypervelocity Impact Symposium*, Alexandria, VA, September 18–22.

Rogers, J.A., Lukasik, G., Mead, P., Harrison, K., Mote, A., Kota, K.R., Wilkerson, J.W., Kulatilaka, W., and Lacy, Jr., T.E., 2022, “The Texas A&M University Hypervelocity Impact Laboratory: A Modern Aeroballistic Range Facility for High-Rate Materials Characterization,” *Proceedings of the 71st Aeroballistic Range Association (ARA) Meeting*, Königswinter, Germany, July 31–August 6. **2022 Student Participation Award Recipient.**

Lukasik, G.D., **Rogers, J.A.**, Lacy Jr., T.E., and Kulatilaka, W.D., 2022, “High-Speed Imaging Diagnostics of Hypervelocity Projectile-Water Droplet Interactions,” *Proceedings of the Optica LACSEA 2022 Conference*, Vancouver, Canada, July 11–15.

Rogers, J.A., Martin, B.E., Lukasik, G., Wilkerson, J.W., Kulatilaka, W.D., and Lacy Jr., T.E., 2022 “Hypervelocity Simultaneously Launched Distributed Particles for Studying Environmental Effects on Hypersonic Vehicles,” *Proceedings of the UCAH Spring 2022 Forum*, College Station, TX, March 30–31. **1st Place Award.**

Lukasik, G., **Rogers, J.A.**, Lukasik, G., Kulatilaka, W.D., and Lacy Jr., T.E., 2022, “Application of Digital Particle Tracking and Schlieren Imaging to Study Hypersonic Projectile-Particle Interactions,” *Proceedings of the UCAH Spring 2022 Forum*, College Station, TX, March 30–31.

Intardonato, M., Lukasik, G., **Rogers, J.A.**, Lacy Jr., T.E., and Kulatilaka, W.D., 2022, “A Single-Camera Multi-Angle Imaging Apparatus for High-Rate Materials Testing Applications,” *Proceedings of the UCAH Spring 2022 Forum*, College Station, TX, March 30–31.

Lukasik, G., **Rogers, J.A.**, Kota, Kalyan R., Bowersox, Rodney D., Lacy Jr., T.E., and Kulatilaka, W.D., 2022, “Ultra-Highspeed Optical Diagnostics of Water Droplet Impact, Breakup and Shock Boundary Layer Interactions of Hypervelocity Projectiles,” *Proceedings of the AIAA SciTech 2022 Forum*, San Diego, CA, January 3–7. <https://doi.org/10.2514/6.2022-1656>.

Rogers, J., Mead, P., Harrison, K., Kota, K., Leaverton, J., Lukasik, G., Kulatilaka, W., Wilkerson, J., Lacy Jr., T.E., 2021, “Hypervelocity Impact Response of Polyethylene Plates,” *Proceedings of the AIAA SciTech 2021 Forum*, Virtual, January 11-15 & 19–21. <https://doi.org/10.2514/6.2021-0887>.

Lukasik, G., **Rogers, J.**, Kota, K., Wilkerson, J., Lacy Jr., T.E., Kulatilaka, W., 2021, “Application of Digital Particle Tracking and Schlieren Imaging to Study Debris Cloud and Shockwave Formation During Hypervelocity Impacts,” *Proceedings of the AIAA SciTech 2021 Forum*, Virtual, January 11–15 & 19–21. <https://doi.org/10.2514/6.2021-0725>.

Harrison, K., Kota, K., **Rogers, J.**, Mead, P., Mote, A., Kulatilaka, W., Wilkerson, J., Lacy Jr., T. E., 2021, “Hypervelocity Impact Response of Stitched CFRP Laminates,” *Proceedings of the 2021 American Society for Composites Conference*, Virtual, September 14–18. <https://doi.org/10.12783/asc36/35800>.

Rogers, J. “Robust Positioning for Autonomous Platforms Using Adaptive Measurement Noise Covariance Distributions.” Mississippi State University 2019 Spring Research Symposium, April 16, 2019, Starkville, MS, US. **1st Place Award.**

Topic: simulation and experimental results further validating the robust adaptive measurement noise covariance distributions modifications to the Kalman filter.

Rogers, J. “Accurate and Cost-Efficient Indoor Positioning System.” Mississippi State University 2018 Summer Research Symposium, August 1, 2018, Starkville, MS, US. **1st Place Award.**

Topic: robust positioning for autonomous platforms using adaptive measurement noise covariance distributions modifications to the Kalman filter.

Rogers, J. “Space Launch System (SLS) Block 1 Functional Integration.” NASA Marshall Space Flight Center 2017 Intern Symposium. August 3, 2017, Huntsville, AL, US.

Topic: additions to the FIT team and algorithms written for autonomous function-requirement matching.

Rogers, J.*, McCandless, M., Harris, K. “CubeSat for Photographing the 2017 Solar Eclipse.” Mississippi State University 2016 Summer Research Symposium, August 1, 2016, Starkville, MS, US. *Presenter.

Topic: the design and development of a 2U CubeSat for photographing the 2017 solar eclipse.

RELEVANT ACADEMIC COURSES

- **Continuum Mechanics**, Dr. Kumbakonam Rajagopal, Texas A&M University (Grad).
- **The Theory of Elasticity**, Dr. Kumbakonam Rajagopal, Texas A&M University (Grad).
- **Advanced Topics in Elasticity**, Dr. Kumbakonam Rajagopal, Texas A&M University (Grad).
- **Linear Finite Element Methods**, Dr. Thomas Lacy, Jr., Texas A&M University (Grad).
- **Nonlinear Finite Element Analysis**, Dr. J.N. Reddy, Texas A&M University (Grad).
- **Numerical Partial Differential Equations**, Dr. Matthias Maier, Texas A&M University (Grad).
- **Mechanics of Compliant Materials**, Dr. Alan Freed, Texas A&M University (Grad).
- **Modeling & Analysis of Mechanical Systems**, Dr. Sivakumar Rathinam, Texas A&M University (Grad).
- **Multiscale Modeling in Mechanics**, Dr. Justin Wilkerson, Texas A&M University (Grad).
- **Optical Techniques for Engineers**, Dr. Waruna Kulatilaka, Texas A&M University (Grad).
- **Viscoelasticity**, Dr. Alan Freed, Texas A&M University (Grad).
- **Waves, Shocks, & Dynamic Failure**, Dr. Justin Wilkerson, Texas A&M University (Grad).
- **Elements of Composite Materials**, Dr. Thomas Lacy, Texas A&M University (Grad).
- **Compressible Aerodynamics**, Dr. David Thompson, Mississippi State University (Undergrad).
- **Aero Structural Analysis I (Solid Mechanics)**, Dr. Thomas Lacy, Mississippi State University (Undergrad).
- **Aero Structural Analysis II (Energy Methods)**, Dr. Rani Sullivan, Mississippi State University (Undergrad).
- **Vibrations**, Dr. Rani Sullivan, Mississippi State University (Undergrad).
- **Aerospace Structural Design**, Dr. Rani Sullivan, Mississippi State University (Undergrad).

Complete list of engineering/physics courses can be found on [LinkedIn](#) or Transcripts (upon request).