Summer-Fall 2019 Recognition of Graduates

December 4, 2019





Propulsion Research Center Spring 2019 Graduate Recognition. *Pictured above are students, staff, faculty, and stakeholders of the UAH Propulsion Research Center at the reception for the spring 2019 graduate recognition. Photo by Michael Mercier | UAH*

This fall we celebrate our students achieving one PhD., eight master's degrees, and seven bachelor's degrees supported in part by research at the UAH Propulsion Research Center. We also honor those who support our students and faculty. New graduates, as you continue your studies or enter the workforce, take pride in all the people who have made UAH and the PRC an outstanding place for you to build relationships, gain an exceptional education in propulsion and engineering, and participate in cutting-edge research projects. Always remember, as we face new challenges each day, to *"Keep your relationships more important than tasks or problems."* We wish all the graduates and those starting new endeavors a successful and enjoyable future. Call on us in the future. We look forward to hearing from you.

Dr. Robert Frederick, PRC Director, December 4, 2019

Summer - Fall 2019 PRC Graduate Recognition Program

Welcome

Dr. Robert Frederick, PRC Director Holiday Cheer, Dr. James K. Baird, Professor of Chemistry

PRC Founders Award

Presented to Linda Marion by Dr. Robert Frederick, PRC Director

Address: "Leaning Forward in Life to Success (Be a Weirdo)"

Dr. Shery Welsh Deputy Director, S&T, Advanced Technology Directorate Missile Defense Agency

Recognition of Graduates

Ph.D. Students

Masters Students

Undergraduate Students

Special Music

Have Yourself a Merry Little Christmas In Memory of Melvin Rogers

Reception

Snacks and Treats will Follow the Program at the JRC

UAH Propulsion Research Center Huntsville, Alabama

PRC Founders Award



Linda Marion PRC Founders Award

UAH established the PRC in 1991 with four critical new positions. Dr. Clark W. Hawk started as PRC Director and Professor of MAE, Dr. Hugh W. Coleman came as Eminent Scholar of Propulsion and Professor of MAE, Dr. Robert Frederick began as an Assistant Professor of MAE, and Linda Marion came onboard as the PRC Administrative Assistant. During those formative years, Linda Marion did all of the administrative work, new student orientation, meeting management, customer relations, and other duties as required that helped the PRC team establish itself at UAH. Linda's excellent work and dedication to every person helped bring the PRC from an idea to a fully functioning and productive team of students, faculty, and staff. *"For her love, care, and significant contributions to successfully laying the foundations of the PRC Family, the UAH Propulsion Research Center Director recognizes Linda Marion with the PRC Founders Award."*



Guest Speaker: Dr. Shery Welsh



Dr. Shery Welsh

Deputy Director S&T Advanced Technology Directorate Missile Defense Agency **Dr. Shery Welsh** earned her Ph.D. in the Tri-Campus Materials Science program from the University of Alabama, the University of Alabama in Huntsville, and the University of Alabama in Birmingham. She has accumulated over 33 years of experience from the DoD as a federal employee for the United States Air Force and the Missile Defense Agency.

Dr. Welsh is currently the Deputy Director, Science & Technology, for the Missile Defense Agency. She seeks out cutting edge technology from across the world within Industry and the National Laboratories to advance technologies to benefit the Warfighter.

Her previous assignments in the Missile Defense Agency include Chief Engineer for the Airborne Laser Program, Director of Target and Countermeasure Requirements, Chief Scientist for the Interceptor Knowledge Center and Chief Engineer for the Advanced Technology Program Office.

Dr. Welsh's 20 years working for the Air Force afforded her the opportunity to work many programs such as the C-130U Gunship, C-17, Joint Strike Fighter, F-16, B-2, F-22, Airborne Laser, and the Wide-body Aerial Sensor Platform.

Her accomplishments also include three published articles in major scientific journals, two Rising Star Awards from the Missile Defense Agency and Engineer of the Year from the Air Force.

UAH Propulsion Research Center Huntsville, Alabama

Recognition of Doctoral Graduates



Dr. Tyler Englestad Pinehurst, NC Tyler completed a dissertation entitled, "*Study of Effects of Rigid Body Vibrations on External Hypersonic Flow using Smoothed Particle Hydrodynamics*," with **Dr. Jason Cassibry**, Associate Professor, as his advisor. Tyler said, "Throughout my long and tenuous topic selection and personal problems, he stuck with me and offered encouragement and advice. I have never met a more dedicated educator, mentor, and friend throughout my academic career. I am proud to call him my advisor." Dr. Cassibry said, "I am so proud of Dr. Englested. He greatly augmented our 3D simulation tool to enable modeling of hypersonic aircraft. He made important advancements for the smooth particle hydrodynamic method for shock capturing, steady external flow, and characterization of instrument noise due to vibrations. He is a brilliant man, and more importantly, one of the friendliest students I have ever advised." **Tyler currently works as a Research Scientist evaluating hypersonic technologies for the DoD.**

Recognition of Master's Graduates



Hayden Arceneaux, MSEME St. Francisville, LA Hayden completed a thesis titled "*High-Order Hybrid Roe-WENO Schemes for Interface Advective Flux Reconstruction*," with **Dr. Sarma Rani**, Associate Professor, as his advisor. Hayden said "UAH has provided me great opportunities to expand my horizons. Helpful professors, great classmates, and my wonderful advisor Dr. Rani made this a fantastic experience for me." **Hayden has accepted a job as an aerothermal engineer at i3 starting in December of 2019**.

Dr. Rani said, "Hayden performed novel, fundamental research on the development of higher order (in space) hybrid Roe-WENO schemes for the numerical solution of dominantly hyperbolic partial differential equations. His thesis research provides important insights into the extension of existing Roe-MUSCL schemes to higher order spatial accuracy. Hayden demonstrated a high level of commitment in learning about the intricate Roe schemes, WENO schemes, combining Roe and WENO into the hybrid Roe-WENO scheme, and applying it to a number of canonical problems. He is an extremely quick learner, and is excellent at applying his knowledge to novel problems.



Sattik Basu, MSASE Kolkata, India Sattik completed a thesis entitled, "On the Neumann Boundary Condition for the Acoustic-wave Helmholtz Equation, and the Relationship between Pressure and Density Fluctuations," under the supervision of **Dr. Sarma Rani**, Associate Professor. Sattik says, "Dr. Rani helped me give insightful direction many times in the past two years. Thus continuing my education by pursuing a PhD degree under him was a 'no brainer.'" **Sattik is already continuing a Ph.D. program under Dr. Rani pursuing a PhD.**

Dr. Sarma Rani said, "Sattik's thesis stands out because it is entirely theoretical in nature. Sattik demonstrated extraordinary diligence in learning acoustics, and then applying it to develop the acoustic wave equations for the most generalized cases of inhomogeneous media, which involve spatial gradients in the mean temperature and density, mean axial velocity, and cross-sectional area. Such a general analysis of the acoustic wave equation had not been performed before Sattik's thesis. Many of the analytical methods developed in Sattik's thesis are a testament to his hard work, his high degree of comfort in performing analytical work, and his ability to convert broad research inputs from his advisor into specific executables and results."

UAH Propulsion Research Center Huntsville, Alabama



Recognition Undergraduate Graduates



Prathmesh Anantwar, BSME Pune, India



Avery Fairbanks, BSAE Section, AL



Jacqueline Bryant, BSME Jared Ford, BSME Brantlee Jackson, BSME Jon Martin, BSME Brian Wagner, BSAE

Prathmesh has completed the coursework required for a Bachelor of Science in Mechanical Engineering. He has performed research as an Undergraduate Research Assistant under the supervision of **Dr. Kavan Hazeli**, Assistant Professor, Prathmesh worked on lattice structures composed of additively manufactured Nickel-Based Super Alloy Inconel 718.

Dr. Hazeli stated, "Prathmesh's transition from an undergraduate researcher to a high-quality independent and responsible researcher has set a remarkable example." **Prathmesh plans to pursue a Masters Degree at UAH under the** guidance of Dr. Kavan Hazeli.

Avery Fairbanks graduated cum laude with a Bachelor of Science in Aerospace Engineering. He has been an Undergraduate Research Assistant under **Dr**. **Phillip Ligrani**, Professor/Eminent Scholar, since February of 2018 and has helped with several of Dr. Ligrani's research projects. He is also completing his honors thesis with Dr. Ligrani. Avery said, "I am thankful to have worked with such talented and all-around great people." Avery Fairbanks has been working with Dr. Ligrani as an Undergraduate Research Assistant on several projects over the past two years.

Dr. Ligrani noted, "His efforts and accomplishments have been consistently excellent, as they have supported the development of experimental facilities, software and capabilities. Avery's most notable accomplishments include the development, assembly, testing, and programming of two different traversing systems. More recently, he has been involved in the acquisition of experimental data for a combined louver / effusion cooling system for a combustor liner."

Photovoltaic Test Bed (PVTB) Team. This engineering design project started in the spring of 2019 at the University of Alabama in Huntsville, and was overseen by **Dr. Christina Carmen's** in a MAE Capstone Design Class. The purpose of the project was to design and manufacture a photovoltaic test bed with the capability to collect and analyze voltage data from a variety of solar cells. The aim was for researchers at UAH to be able to test prototypes of high efficiency solar cells such as split spectrum cells. The project leveraged the facilities and resources made available by the UAH Propulsion Research Center and was completed using techniques and practices as defined by the National Aeronautics and Space Administration Systems Engineering Handbook. **Dr. James Blackmon** of the PRC was the technical advisor for the project team and the PRC sponsored the acquisition of hardware components. The team members are pursuing entry-level positions in Mechanical Engineering.

Have Yourself a Merry Little (Melvin's) Christmas



Last month we lost our good friend and the host of many PRC Events, Mr. Melvin Rogers. We had planned to have our 4th annual "Have Yourself a Merry Little (Melvins) Christmas." this Friday. In Memory of Mevin, we will have special music today:

Have Yourself a Merry Little Christmas

Have yourself a merry little Christmas Let your heart be light Next year all our troubles will be out of sight Have yourself a merry little Christmas Make the yuletide gay Next year all our troubles will be miles away

Chorus: Once again as in olden days Happy golden days of yore Faithful friends who are dear to us Will be near to us once more

Someday soon we all will be together If the fates allow Until then we'll have to muddle through somehow So have yourself a merry little Christmas now



UAH modeling the spacecraft for NASA's nuclear thermal propulsion idea

Excerpts from an article by Jim Steel, UAH (https://www.uah.edu/prc/news)



Dr. Dale Thomas holds an inert nuclear thermal propulsion fuel sample at the NTREES test facility at Marshall Space Flight Center.

"Nuclear thermal propulsion (NTP) can help achieve the goals of low weight, high power and good economy. An NTP engine uses low enriched uranium (LEU) to heat a lightweight propellant such as liquefied hydrogen to 2,800 degrees Kelvin through channels in the core. The expanding gas exits the providing nozzle. thrust. If something goes awry and the craft crashes to Earth, the engine design and use of LEU reduce the chance of a catastrophic nuclear incident to near zero, as well as making flight safer for the crew."

""The heartbeat of the program at this time is demonstrating that the reactor elements can be manufactured such that they will function in and survive the intense environment internal to the engine," says Dr. Dale Thomas, UAH's eminent scholar in systems engineering, who is the principal investigator for a UAH research grant with NASA's NTP Program Office. Under the management of NASA researcher Dr. Bill Emrich, who teaches nuclear propulsion as an adjunct UAH faculty member, that testing is underway at NASA's Marshall Space Flight Center (MSFC) in the Nuclear Thermal Rocket Element Environmental Simulator (NTREES) facility."

"UAH's Propulsion Research Center (PRC) manages the university's role in the project. The university's Complex Systems Integration Laboratory in its Rotorcraft Systems Engineering and Simulation Center (RSESC) is working closely with MSFC and private contractors to solve the challenges and exploit the opportunities created by a nuclear reactor at the heart of a rocket engine." (full article at <u>https://www.uah.edu/prc</u>)

Thank you to our 2019 Customers

Thanks also go to our recent sponsors: Aerojet Rocketdyne, Alabama Space Grant (NASA), Barber-Nichols, Inc., Boeing, C3 Propulsion, Combustion Research & Flow Tech., Inc., Earth to Sky LLC, Department of the Air Force (USAF), ERC/MSI, Gloyer-Taylor Laboratories (GTL), Hyperion Technology, Hyper V Technologies, Jacobs, IHI Corporation, Manufacturing Technical Solutions (MTS), NASA Headquarters, NASA Goddard Spaceflight Center, NASA Marshall Spaceflight Center (MSFC), McConnell Jones Lanier & Murphy LLP, Northrop Grumman, Science and Technology Applications, LLC, Solar Turbines, Inc., TGV Rockets, Inc., The Missile Defense Agency (MDA), Torch Technologies, State of Alabama, Varian Medical Systems, Incorporated, and Vector (formerly known as Garvey Spacecraft Corp). Grateful acknowledgements to all those potential new collaborators who teamed with us to write proposals last year.

Upcoming Events

- Dec 7 Peace on Earth: Indigo Girls Tickets online at Eventbrite Von Braun Center Concert Hall Dec 16 - UAH Commencement 10:00 AM
- Von Braun Center in the Propst Arena

