

# Summer/Fall 2024 Recognition of Graduates



December 6, 2024



Summer/Fall 2024 PRC Graduate Recognition

This fall, we celebrate our newest alumni achieving four PhD degrees, six Master's degrees, and three Bachelor's degrees supported by programs at the UAH Propulsion Research Center. New graduates, as you continue your studies or enter the workforce, take pride in all of our UAH alumni who have gone before you to establish an excellent reputation for the PRC. Also, take a moment to express your appreciation to the people who have provided outstanding mentorship and opportunities for you to build relationships, gain an exceptional education, and participate in cutting-edge research projects. Remember that our most important community value is to *"Keep our relationships more important than tasks or problems (or winning)."* We wish all the graduates a successful and enjoyable future. Call on us in the future. We look forward to hearing from you.

Robert a Inderich

Director, UAH Propulsion Research Center



Professor of Mechanical and Aerospace Engineering

Lunch Catered by

MASON DIXON

## Dr. Sys RO hu: wo the wit lea

Alexander Bendoyro Bay Area, CA

#### **Dr. Alexander Bendoyro** is receiving a Doctor of Philosophy degree in Aerospace Systems Engineering. Alexander completed his dissertation on "NUCLEAR FISSION ROVERS FOR SURFACE EXPLORATION." He explained, "I investigate the feasibility and human impact of nuclear fission-powered rovers for lunar and Martian missions; I also work out the benefits to human exploration and scientific potential by substituting these rovers into NASA baseline architectures." Alexander remembered, "I got involved

**Recognition of Doctoral Graduates** 

with the Propulsion Research Center, receiving guidance from Dr. Dale Thomas and learning more about the research that occurs at UAH from other students." He added, "I appreciate all of the faculty that comprise my graduate committee along with my research cohort; it is working with them that helped me through this program."

**Dr. Dale Thomas,** his advisor, said, "in his doctoral research, Alex displayed his characteristic independent streak. When I discussed his research topic in space nuclear propulsion, he wanted to research surface propulsion, as in a nuclear reactor-powered pressurized surface rover for the astronauts. Think Winnebago on steroids. Our research sponsor (NASA) OK'd the topic, and Alex ran with it. And it would not surprise me if that ends up being the solution that NASA adapts for their exploration architecture. Alex was a pleasure to work with, and I look forward to working with him as a colleague.

Dr. Bendoyro intends to publish additional research and to improve the skills he has learned in this program, then use this knowledge for real-world applications.



Swarnalatha Kathalagiri Vasantha Kumar *Karnataka, India*  Dr. Swarnalatha Kathalagiri Vasantha Kumar is receiving a Doctor of Philosophy degree in Aerospace Systems Engineering. Swarnalatha completed her dissertation on " "NONLINEAR DYNAMICS OF ACOUSTIC FLUCTUATION IN ONE-DEMENTIONAL DUCTS WITH AND WITHOUT UNSTEADY COMBUSTION." Swarnalatha explained, "In this research, we have developed nonlinear dynamic models of acoustic-pressure fluctuations and rate-of-heat fluctuations in combustion chambers using the first principles." She recalled, "I got involved with PRC because of Dr. Frederick, who was my advisor for my Master's degree. Later, I was a part of PRCSA and involved myself in many outreach activities like Girl-Science-and-Engineering-Day and NASA-in-park etc." Swarnalatha stated, "it is hard to express my gratitude in a few sentences. But everyone at PRC is extremely welcoming and facilitating. She continued, "My special thanks to Dr. Frederick, Dr. Lineberry, and Mr. Tony Hall for all the guidance and help." Dr. Rani, her advisor, said, "my best wishes to her." Dr. Frederick said, "Swarnalatha is an enthusiastic and hard-working student who has pursued her dream



of a PhD. We are all very proud of this achievement and look forward to seeing her achievements as she starts her professional career.

Dr. Kumar plans to seek opportunities to contribute to the Indian space sector.



Brian Taylor *Okawville, IL*  **Dr. Brian Dale Taylor** is receiving a Doctor of Philosophy degree in Mechanical Engineering. He completed his dissertation on "LINER IMPLOSION OF MAGNETO-INERTIAL FUSION PLASMAS ACROSS THE PERIODIC TABLE." He said, "his work studied liner-driven z-pinch implosions for magneto-inertial fusion energy in which the atomic number of the liner was varied across the periodic table. This work demonstrates that implosion dynamics change significantly due to a changing equation of state. Therefore, conditions may be tailored to facilitate use of heavy elements in liners to enable system-level configurations of in-space fusion propulsion systems or hybrid fission-fusion propulsion." Brian recalls, "he became involved with the PRC through the joint work with NASA on the Pulsed Fission Fusion (PuFF) propulsion engine." Brian stated, "I appreciated the friendly and supportive nature of the PRC community." Brian added, "he grew up in rural Okawville, IL. He now lives with his wife and children in Huntsville, AL."

**Dr. Cassibry,** his advisor, said, "Brian is an exceptionally hard-working, creative, diligent, and persistent scientist. He was one of the most prolific writers I have ever had, producing several peer-reviewed publications with several others in various stages of preparation. He was able to mature our 3D electromagnetic and plasma physics code to predictively model fusion-relevant z-pinches, a common embodiment of thermonuclear fusion using pulsed power. Before the pandemic, he was also instrumental in refurbishing pulsed power equipment when our lab was on the arsenal. A significant portion of our current modeling work and pulsed power experiments are an outgrowth of my collaboration with Brian during his tenure as a graduate student with us."

Brian plans to "continue to pursue the advancement of propulsion technologies for space exploration in his work at NASA."



Andrew Walsten *Mulvane, KS*  **Dr. Andrew Walsten** is receiving a Doctor of Philosophy in Aerospace Systems Engineering. He completed his dissertation on "ANALYSIS OF A MAGNETICALLY ENHANCED MICROWAVE POWERED SPLIT-RING RESONATOR PLASMA SOURCE FOR MICROPROPULSION." He explained, "my work focused on characterizing a microwave plasma source and then implementing it into a micro two-stage Hall thruster." He remembered, "I applied for grad school here and was offered a GRA position." Andrew said, "I will miss having Tony around to ask for help when something breaks or doesn't work." **Dr. Gabe Xu,** his advisor, said that Andrew's presence would be missed in the lab. He was always the person you could go to, and he knew where everything was. He was smart, did good work, and was modest about it. He is a trusted and respected colleague, and I wish him all the best and hopefully, we'll see each other around still.

Dr. Andrew Walsteen has accepted a position with the Research Institute, where he will work with the US Army SMDC on directed energy.



# **Recognition of Master's Students**

Grayson Fulmer Montevallo, AL	Grayson Fulmer is receiving a Master's in Mechanical Engineering. He is completing a non-thesis program after a fruitful stint of research as an undergraduate under Dr. Ligrani. He greatly appreciates Dr. Ligrani's tutelage during his research and the valuable knowledge and experience he acquired during his time with the PRC. Dr. Ligrani, his advisor, said, "Grayson was involved in investigations related to SURFACE HEAT TRANSFER CHARACTERISTICS OF A TRANSONIC TURBINE SQUEALER BLADE TIP. His research was innovative and unique as it involved new knowledge and understanding of novel film cooling configurations for improved thermal protection of the tips of transonic turbine blades with a squealer recess and rim. Grayson's research results have provided important knowledge advancements of thermal transport phenomena in transonic flows. His work is not only currently being used for improved designs of gas turbine engine components but is already becoming widely cited in the archival literature. He is currently co-author on multiple archival journal publications." Grayson has worked full-time with the local Huntsville startup Concordia Technologies Inc. while pursuing his Master's. He plans to support and expand Concordia's hypersonic analysis, research, and development capabilities.
Anthony Michael Ciccarelli Huntsville, AL	Anthony Michael Ciccarelli is receiving a Master's in Aerospace Systems Engineering. Dr. Phillip Ligrani, his advisor, said, "Anthony was involved in our currently-funded National Science Foundation project, which is related to thermal transport and heat transfer within shock wave flow environments. Anthony's contributions to the project provided a new understanding of the interactions between a normal shock wave and the downstream shock wave leg associated with a lambda foot. Consequently, Anthony produced a fascinating BS Capstone Honors Thesis titled "Investigation of unsteadiness associated with a normal shock wave and a lambda foot." He is also co-author of an archival journal paper that has been accepted and is soon to appear in the journal Shock Waves." Anthony Michael has accepted a position at SpaceX as a Dynamics Engineer on the Starship program and is excited to build a career in rocketry and space exploration.
Garrett Cobb Pine Island, MN	<b>Garrett Cobb</b> is receiving a Master's in Aerospace Systems Engineering. He completed a non-thesis program under the guidance of Dr. Gabe Xu. Garrett said, "I investigated steady state diodicity and transient recovery time response due to shock wave disruption of single elements fluid diode injectors." He remembered, "when I was looking at grad schools during my senior year of undergrad, I watched a Smarter Everyday episode, and Destin mentioned the Propulsion Research Center at UAH. I decided to investigate further, and the research aligned with what I was looking for in graduate school. I reached out to Dr. Xu, and luckily he had positions available doing rotating detonation engine research!" Garrett stated, "Tony and Dr. Lineberry are the real engine behind the day-to-day operations of the PRC." He added, "Their help and guidance have been crucial to setting up and performing everything from small experiments to engine hot fires."



	<b>Dr. Gabe Xu,</b> his advisor, said, "Garrett has a passion for propulsion. He would always share cool things he read or saw in space and propulsion. He did a great job designing the injector manifold for the RDE and studying fluidic diodes. I know he'll continue to do great work in propulsion and RDEs." <b>Garrett Cobb is pursuing his PhD at UAH with Dr. Bennewitz.</b>
Chase Herrin Memphis, TN	<ul> <li>Chase Herrin is receiving his Master's in Aerospace Systems Engineering. Chase stated, "I work under Dr. Ligrani doing research for NASA. We are investigating how different polishing techniques on additively manufactured blades affect their pressure profile and the downstream wake." He remembered, "I got involved with the PRC through my MATRIX scholarship, which paid for me to do undergraduate research." Chase added, "I really appreciate Dr. Ligrani and Dr. Lineberry for their mentorship and the immense amount of help they have given me during the past few years."</li> <li>Dr. Phillip Ligrani, his advisor, said "Chase is currently involved in the project 'AERODYNAMIC LOSS VARIATIONS WITH TURBINE BLADE SURFACE FINISH," which is currently funded by the NASA Marshall Space Flight Center. Chase has been involved in the set-up, development, and use of the transonic facility involved with this effort, including the instrumentation, data acquisition programs and software, and analysis of experimental data obtained as part of the effort. Because of his excellent research accomplishments to date, he is co-author on an archival journal paper which is currently submitted to be considered for publication in the AIAA Journal of Spacecraft and Rockets."</li> </ul>
With the second secon	<ul> <li>Dylan Schiff is receiving a Master's in Aerospace Systems Engineering. He completed a non-thesis program under the guidance of Dr. Gang Wang. Dylan explained, "I worked under Dr. Gang Wang for undergrad." He continued, "During my time working under Dr. Wang, I assisted in the research of triboelectric nanogenerators, particularly with the focus of making acoustic sensors." Dylan recalled, "I started volunteering my time with Dr. Wang over the summer on his projects which culminated with me being hired as a research assistant that fall." He stated, "I really appreciate the opportunity to begin my career in real-world engineering."</li> <li>Dr. Gang Wang, his advisor, said, "Dylan showed his design talent in the project. In addition, he built the prototype and conducted comprehensive experiments to characterize the performance. Thanks for your contribution to our project. Best in your future endeavors."</li> <li>Dylan would like to take a lecturing position with the school, as he thinks it would be fun to see this from another perspective.</li> </ul>





**David Tutunzhiu** is receiving a Master's in Aerospace Systems Engineering. He completed a non-thesis program under the guidance of Dr. Gabe Xu. He added, "in my time as an undergrad, I worked at the PRC under Dr. Frederick to support the testing and research being done by his students; however, I was capable, learning everything I could along the way from the hardworking and talented people around me." He continued, "as I transitioned to graduate school, I also moved over into Dr. Xu's lab to assist with RDE testing and development, pursuing investigations of temperature measurement from passive light emissions and the development of hardware for wave propagation experiments." He stated, "I most appreciated the attitude of learning and collaboration shared across both labs, and I thank everyone for the opportunities they exposed me to and the learning experiences we shared."

**Dr. Gabe Xu**, his advisor, said, "David was the guy who could build anything. His machining experience was crucial for the RDE project to manufacture the various parts we needed. He was also critical to running our engine tests throughout the last year. I hope his time in the PRC was interesting and beneficial for him and his career."

David has accepted a full-time position with Blue Origin.

### **Recognition of Bachelor's Degree Graduates**



Jonathan "Preston" McMahan *Franklin, TN* 

**Jonathan Preston McMahan** is receiving his Bachelor's degree in Mechanical Engineering. He said, "I have done research for NASA and the University on both micro and macro fluid pumping analysis." Jonathan Preston continued, "I run valves to pressurize the supersonic and transonic wind tunnels when testing. I have also spent the last three months designing and assembling the slow wind tunnel for thermodynamic second law analysis." Jonathan remembered, "Dr. Ligrani advertised a research assistant position to my thermodynamics II class in August 2023; I have been working for him ever since." He stated, "I appreciate Dr. Ligrani as a mentor. He has taught me so much, and he constantly pushes me to do better."

**Dr. Phillip Ligrani** stated, "Preston has been involved in several projects which are underway within our laboratories, including activities which are related to "SURFACE HEAT TRANSFER CHARACTERISTICS OF DIFFERENT TURBINE BLADE TIP GRX-810 ALLOY MATERIAL SURFACE PROCESSING METHODS FOR AM PROPULSION APPLICATIONS," which is currently funded by the NASA Marshall Space Flight Center. Preston's efforts in the laboratory have been exemplary, especially in regard to the development and use of advanced instrumentation, data acquisition programs and software, and analysis of experimental data. Because of these activities, Preston is also a co-author on an archival journal paper, which is currently submitted to be considered for publication in the AIAA Journal of Propulsion and Power."

Jonathan is planning to move to Nashville after he graduates in December.





Angelo Panettieri Knoxville, TN

**Angelo Panettieri** is receiving his Bachelor of Science degree in Mechanical Engineering. Angelo explained, "I'm an undergraduate Student Specialist working on multiple projects at the PRC." He added, "I investigated the use of acoustic levitation to experimentally determine evaporation rates of floating fuel droplets and developed computer tools for modeling and measuring wave characteristics within a rotating detonation rocket engine." Angelo remembered, "I got involved at the PRC when I took Dr. Bennewitz's Thermodynamics I class. He talked about his research, I got interested, and he extended an offer to join his lab." Angelo stated, "I really love collaboration with other people. The PRC staff and Dr. Bennewitz's grad students have been very patient with me, and I've learned a lot over my time with them. I appreciate everyone's willingness to help me get a hang of things."

**Dr. Bennewitz** said, "Angelo has excelled in all of the various projects he has been involved with during his time working with us. Notably, he has been responsible for fully constructing and bringing online our acoustic levitation facility, which provides us with a new research avenue for studying condensed phase processes. Additionally, he has made substantial progress on the development of various signal processing tools for detonation-based engines that will allow for the recognition of the active operating mode using various point measurements in scenarios that do not have direct optical access (e.g., highly constricted geometries, flight applications). He has been an excellent addition to our research team."

Angelo is planning to pursue a Master's Degree in Mechanical Engineering at UAH.



Alex Vaughn Fayetteville, TN

Alex Vaughn is receiving a Bachelor of Science degree in Aerospace Engineering. Alex was employed as a Student Specialist for the Alabama Cube Sat Initiative. He explained, "I assisted in the development of a vibration and thermal vacuum testing program for a senior design project at Auburn University." Alex remembered, "I was hired based on my previous experience in testing as a Pathways Intern at NASA Marshall Space Flight Center." He recalled, "I have often heard the quote, 'If you are the smartest person in the room, then you are in the wrong room.' One could stay in the PRC for many, many years without needing to leave the room. I do hope to return to absorb its invaluable experience and challenging environment!"

**Dr. Dale Thomas** said that Alex was a very active contributor to our small spacecraft effort – the Alabama CubeSat Initiative – which involves multiple universities collaborating across the state of Alabama. He really took the lead on integration and test planning, drawing on his NASA experience. But he also took the opportunity to learn from the experience by exploring connections to other projects in the laboratory involving systems design, integration, and verification in the laboratory. Active learning is a trait that will serve him well in his career; he will be missed in the CSIL.

Alex is planning to return to NASA MSFC's Propulsion Test Division and remain enrolled at UAH to pursue his graduate degrees while establishing his career.





Alex presents on fission rover shielding at a 2024 aerospace conference in Orlando, FL



Swarnalatha working late nights at her office.



Grason with shock-wave holding plate in the UAH Transonic/ Supersonic Wind Tunnel



Garrett with NASA RS-25 Liquid Rocket Engine at Conference in Huntsville, AL



Anthony Michael will start as a Dynamics Engineer at SpaceX on the Starship program



Angelo suspending a liquid droplet in the APECSLab acoustic levitation setup