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Dear Friends and Colleagues,

It was around this time last year that we collectively watched in awe as the Artemis I rocket launched from the Kennedy Space Center. At the University of Central Florida, just miles away from the action, we were afforded a front-row seat to the history-making liftoff. Many of our alumni had an even closer view of Artemis I as they contributed their hard work to the construction, testing and recovery of the SLS and Orion spacecraft.

In the following pages, you'll see how our AlumKnights left their mark on the first Artemis mission, and you'll meet some of the students and faculty who are lending their expertise to the design of Gateway and the future lunar camp that NASA plans to build.

But our efforts this past year were not focused on Artemis alone. Professor Tuhin Das was awarded a $3.3 million grant from the Advanced Research Projects Agency–Energy to create software that can simulate the rough conditions offshore floating wind turbines are exposed to. Assistant Professor Luigi Perotti was granted a National Science Foundation CAREER award to study the mechanics of the heart at the micro level to better understand cardiac function and dysfunction at the macro level. And Professor Subith Vasu is part of a two-person team at UCF that is leading the university’s efforts in a $25 million national consortium on nuclear forensics.

Our faculty also launched the university’s doctoral degree in biomedical engineering, a program that has been many years in the making, and I congratulate them on this effort. The program, and our collaboration with the UCF College of Medicine, is detailed in this issue.

Our alumni are also paving innovative paths forward in the industry. Abhishek Sastri ’20 has received support from Blue Origin for his efforts to create a coolant in microgravity that can make data centers more energy efficient. Eduarda Ferriera ’19 has built an artificial intelligence-based platform that can help users crush their goals. And Cody Nichoson ’21 is diving into a new career focused on unmanned underwater vehicles.

As always, I hope you enjoy this issue of Momentum, and I encourage you to follow the department’s efforts and engage with us @ucfmae.

Cheers,

Yoav Peles
Professor and Department Chair
UCF Department of Mechanical and Aerospace Engineering
TO THE MOON AND BACK

NASA’s Artemis missions aim to return astronauts to the moon — and UCF Knights will send them into orbit. Meet the mechanical and aerospace researchers, students and alumni who are helping NASA take the next giant steps for mankind.

Photo by Ben Bair ’19
Approximately 30% of Kennedy Space Center employees are UCF Knights. These are just a few of the AlumKnights who were involved with the Artemis I launch.

Photos courtesy of Brandon Kutchera, Paris Bishop, Laura Poliah and NASA

Brandon Kutchera ’19

Kutchera’s team was responsible for the ground support cameras and the control and recording systems used to capture the launch. Most of the close-up images of the Space Launch System seen during the broadcast came from those cameras.

Breanne Rohloff ’19 and Dan Zapata ’15 ’18MS

The MAE alums drive the 26-foot crawler that delivered the SLS and Orion spacecraft from the Vehicle Assembly Building to the launchpad.
AMANDA STEVENSON ’08 ’11MS

For Artemis I, Stevenson worked on the European Service Module and served as a systems engineer for the Orion spacecraft. She’s now the lead for the Artemis II service module assembly and holds the title of Orion spacecraft operations engineer.

LAURA POLIAH ’10 ’12MS

Poliah’s team played a key role in testing the Orion spacecraft. They ran thermal, vacuum and acoustic tests to ensure the systems were in working order after assembly. The tests also ensure the spacecraft is sound for astronauts on the Artemis II mission and beyond.
When the Space Launch System (SLS) rocket and Orion spacecraft finally launched from the Kennedy Space Center as part of the Artemis 1 mission, it was a triumph for NASA and for the UCF alumni who contributed to its development. More than 30 alumni worked on the project, including Ben Bair ’19, a fluids design engineer for Jacobs, which is the largest contractor at KSC supporting NASA’s Exploration Ground Systems.

Bair, who earned a bachelor’s in mechanical engineering at UCF, says that being a part of this historic launch with his fellow Knights is a great experience.

“It’s great recognizing old classmates, working with them and continuing to learn our careers day in and day out,” Bair says. “It adds a layer of camaraderie unlike anywhere else, knowing we all earned our engineering skills at UCF and are now carrying the torch for the Artemis program.”

As a fluids design engineer, Bair had the opportunity to work on several aspects of the Artemis launches, including the pneumatic pressure systems for the SLS, fluids analysis for flow and pressure projections, and the ocean landing and recovery of the Orion spacecraft.

“For landing and recovery operations, we provide inflatable equipment similar to what Tom Hanks was rescued in at the end of the movie ‘Apollo 13,’” Bair says. “My department covers all of the fluids systems for Artemis, and I have had the unique opportunity to contribute to most of those systems, gaining a variety of valuable experiences and knowledge through every single one.”

Bair started his career at Jacobs through a summer internship that lasted throughout his senior year of college. That internship turned into a full-time job that continues his family’s legacy at the Kennedy Space Center. His mother, an administrative assistant, and his father, a safety professional, met during their work on the Space Shuttle program. His grandfather also worked on the Space Shuttle program as well as the Apollo-Soyuz mission.

When Bair isn’t working on Artemis or other spacecrafts, he’s capturing launch activities in photos that he posts to his Twitter account, @Bair_Witness, and that NASA often shares on its social media accounts. He says that he’s always had an interest in photography and he developed his skills behind the camera during his time at UCF.

“I started focusing on rocket photography once I started taking engineering classes,” Bair says.
“Taking photos added a layer of connection to what I was studying at the time.”

The amateur photographer says he enjoys the challenge of manually setting up the camera, capturing the right moment and editing the final image to perfection. He’s captured many rocket launches before, but the Artemis 1 launch was a chance to capture history in the making.

“SLS is the largest and most powerful rocket in existence and the Artemis program is the greatest application of minds, resources and international cooperation in the history of humanity,” Bair says. “I have a unique perspective from my position as an engineer. I only hope my photos can capture a glimpse into it for everyone who has contributed and for the wider world.”

As an engineer, Bair has a firsthand view of the innovation, changes and progress within the aerospace industry. He not only knows how rocket systems work, but how the internal systems among space companies and agencies work. With his engineering eye at the viewfinder, he brings the work at KSC into focus for the rest of the world to see.

“Taking photos allows me to focus this energy and share the big picture with the with family, friends and the wider world who may otherwise not have a direct link to the program,” Bair says. “Even if it’s just one glimpse of one photo — if someone learns about our return to the moon through just that — it makes it all worth it.”

Written by Marisa Ramiccio
Photos courtesy of Ben Bair and Tracy Yates/Jacobs

See more of Bair’s photography at bit.ly/benbair.

A University of Central Florida aerospace engineering doctoral student is beginning a year-long project that could lead to a better design of space station systems, including Gateway, the planned lunar outpost that will serve as a vital component of the Artemis program.

The student, Taylor Peterson, will complete her research through the James A. Abrahamson Space Leader Fellowship, which is sponsored by the International Space Station U.S. National Laboratory through the Center for Advancement of Science in Space (CASIS). The fellowship is designed to introduce undergraduate and early-stage graduate students from underrepresented groups to space research and technology development. She is one of three students from across the U.S. who were selected to participate. Each fellow receives a $5,000 stipend and is paired with a mentor from CASIS and a subject matter expert from their field of study. Each fellow also completes a research project that aims to advance the mission of the ISS National Lab.

Peterson’s research will focus on the boiling effect of super-cooled cryogenic propellant in microgravity. Her advisor at UCF is aerospace engineering Associate Professor Michael Kinzel.

“The goal of my research is to study the behavior of this boiling with computational fluid dynamics and structural responses and relate them to systems used on the ISS,” Peterson says. “With the Artemis program gaining traction, this data will be critical in understanding how to better design our systems, especially in spots where the fluid flow becomes extremely complex.”
UCF Researchers Create Lunar Regolith Bricks That Could Be Used to Construct Artemis Base Camp

As part of NASA’s Artemis program to establish a long-term presence on the moon, it aims to build an Artemis base camp that includes a modern lunar cabin, rover and mobile home. This fixed habitat could potentially be constructed with bricks made of lunar regolith and saltwater, thanks to a recent discovery from a team of UCF researchers.

Associate Professor Ranajay Ghosh of UCF’s Department of Mechanical and Aerospace Engineering and his research group found that 3D-printed bricks of lunar regolith can withstand the extreme environments of space and are a good candidate for cosmic construction projects. Lunar regolith is the loose dust, rocks and materials that cover the moon’s surface.

The results of their experiments are detailed in a recent issue of *Ceramics International* and were also featured in *New Scientist* magazine prior to publication.

“It is always an honor to be able to publish our work in a prestigious journal such as *Ceramics International*, and we are quite delighted that *New Scientist* picked our research to publish in their magazine,” Ghosh says. “Considering UCF’s special place as a space grant university, we feel privileged to contribute to the great tradition of scientific knowledge.”

To create the bricks, Ghosh’s team in the Complex Structures and Mechanics of Solids (COSMOS) Lab used a combination of 3D printing and binder jet technology (BJT), an additive manufacturing method that forces out a liquid binding agent onto a bed of powder. In Ghosh’s experiments, the binding agent was saltwater, and the powder was regolith made by UCF’s Exolith Lab.

“BJT is uniquely suitable for ceramic-like materials that are difficult to melt with a laser,” Ghosh says. “Therefore, it has great potential for regolith-based extraterrestrial manufacturing in a sustainable way to produce parts, components and construction structures.”

The BJT process resulted in weak cylindrical bricks called green parts that were then baked at high temperatures to produce a stronger structure. Bricks baked at lower temperatures crumbled, but those exposed to heat of up to 1200 degrees Celsius were able to withstand pressure of up to 250 million times the Earth’s atmosphere.

Ghosh says the work paves a path for the use of BJT in the construction of materials and structures in space. Their findings also demonstrate that off-world structures can be built using resources found in space, which can drastically reduce the need to transport building materials for missions like Artemis.

“This research contributes to the ongoing debate in the space exploration community on finding the balance between in-situ extraterrestrial resource utilization versus material transported from Earth,” Ghosh says. “The further we develop techniques that utilize the abundance of regolith, the more capability we will have in establishing and expanding base camps on the moon, Mars and other planets in the future.”

The first author of the paper is Peter Warren, Ghosh’s graduate research assistant. Co-authors include mechanical engineering doctoral candidate Nandhini Raju, mechanical engineering alumnus Hossein Ebrahimi ‘21PhD, mechanical engineering doctoral student Milos Krsmanovic, and aerospace engineering professors Seetha Raghavan and Jayanta Kapat.

Ghosh joined UCF in 2016 as an assistant professor in the Department of Mechanical and Aerospace Engineering and is a researcher with MAE’s Center for Advanced Turbomachinery and Energy Research. He manages the Complex Structures and Mechanics of Solids Laboratory, better known as the COSMOS Lab, where he and his team fabricate and design novel materials with the aid of computer models and experiments. He earned his doctorate in mechanical and aerospace engineering from Cornell University in 2010 and is a recipient of the U.S. National Science Foundation CAREER Award.

Written by Marisa Ramiccio
This research was featured in *Popular Science*. To read the story, visit [bit.ly/PopSciUCF](http://bit.ly/PopSciUCF).

To see how the bricks are made, watch the video of our researchers in action at [bit.ly/Regolith](http://bit.ly/Regolith).
As a child, Madisyn Messmore ’22 was fascinated by the human body and how it worked. She planned to become a neurosurgeon, but her career path shifted directions in college when an internship with the UCF-based nonprofit Limbitless Solutions piqued her interest in engineering. After she started the internship, she learned that a family member was dealing with a health problem — and she wanted to find a treatment or cure. But as a senior mechanical engineering major, she didn’t know where to start.

Under the mentorship of Pegasus Professor Alain Kassab, Messmore shifted career paths once again, this time in the direction of biomedical engineering, a field that combines her passions for both medicine and engineering. Now Messmore is one of the first students to pursue a doctoral degree in biomedical engineering at UCF.

The doctorate in biomedical engineering, which launched in Fall 2022, is the newest degree offered through the Department of Mechanical and Aerospace Engineering in the College of Engineering and Computer Science. The program is designed to prepare students for research and development careers in the biomedical industry, government labs and organizations and academia.

Supporting the Industry

The program also supports the demand for a workforce with advanced biomedical engineering knowledge and skills. The U.S. Bureau of Labor Statistics projects that employment of biomedical engineers and bioengineers will increase steadily throughout the decade. Florida is also among the states with the highest employment in this field.

One employer of biomedical engineers is the company .decimal, which manufactures devices and develops software that can assist with the treatment of cancer. Kevin Erhart ’04 ’06MS ’09PhD, the president and chief technology officer of the company, says that the pipeline of students from UCF to industry can be invaluable to small companies like his.

“Having local Ph.D. students engaged in work within our fields of interest would open the door to collaborative projects where students solve novel problems and companies commercialize the results through
their existing sales and marketing channels,” Erhart says. “Students will hopefully be better exposed to real-world research and development and also have opportunities to interact with local companies that would have significant interest in hiring them upon graduation.”

**Opportunities for Growth**

Students are exposed to real-world research opportunities in faculty labs at both CECS and the College of Medicine, and they have the chance to engage in research projects with local medical professionals. Steven Scheller, who joined the program when it launched in Fall 2022, says that it provides an in-depth look at what it takes to design and develop medical devices that doctors and patients use every day.

“In many cases, doctors will have the medical knowledge and desire to improve a device or develop a new device to help fellow medical professionals and patients,” he says. “However, they lack the engineering background and expertise to determine how to go about designing and building a device. I want to be a physician who is able to bridge this gap. I want to have the medical and engineering knowledge and the skills necessary to take an idea I have to invent or improve a medical device, and design, build and test it in order to dramatically improve patients’ lives.”

When it comes to their area of study, students can tailor the degree program to their interests, which Messmore says sets it apart from similar doctoral programs.

“Since biomedical engineering is a very rapidly advancing field and is also so broad, the degree maintains the balance of requiring fundamentals in the field but allowing people to tailor their electives to whatever subfield they wish,” Messmore says. “It’s great because it doesn’t limit anyone to a specific specialty, and you can pursue whatever you desire — biomechanics, biofluids or even regenerative medicine — all while working with world-class faculty.”

Students are also not limited in how they enter the program. Graduates with a master’s degree can apply as can graduates with a bachelor’s degree who would like to earn a master’s degree along the way.

**The First Alum — With More to Come**

Currently, nine students are enrolled in the program, which already boasts its first alumnus. Jinfeng Li ’19MS 22’PhD transferred from the mechanical engineering doctoral program to biomedical doctoral program last fall. He graduated in fall 2022 under the tutelage of Associate Professor Helen Huang.

“Compared to other programs, the biomedical engineering Ph.D. program is a highly interdisciplinary program that trains students to solve biomedical problems with engineering approaches,” Li says. “This program has many faculty members who are rising stars, accompanied with outstanding resources from the main campus and Lake Nona, and offers diverse career opportunities.”

Li may be the first alumnus of the biomedical doctoral program, but he certainly won’t be the last. Tamar Yishay ’20 ’21MS is one future graduate of the program and a current alumna of UCF. She says the program will give her more exposure to the clinical work environment and will allow her to build off of her previous work in the undergraduate biology and master’s in nanotechnology programs.

“As I strive to strengthen and cultivate my niche in the science world, the pursuit of a biomedical engineering Ph.D. will inspire me to continue to develop my identity within the UCF community and to bring about revolutionary contributions to the art of science and medicine,” Yishay says. “Moreover, it provides an exciting journey to healthy living, which is what I hope to embody throughout my career and life.”

Written by Marisa Ramiccio

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**College of Medicine Partnership Fuels Biomedical Program**

When Dr. William DeCampli, a professor of surgery at the UCF College of Medicine, asked his surgical research fellow to find someone at UCF who could help them solve biomedical engineering problems related to congenital heart disease, the fellow suggested Professor Alain Kassab. The result, DeCampli says, is the most productive research partnership of his career.

Nearly 15 years later, the two have tackled a number of major problems in cardiovascular medicine and surgery. They’ve built computational models of the pathological cardiovascular system and of proposed surgical interventions. They’ve published numerous papers and their research has been supported over the years by organizations such as the American Heart Association, Additional Ventures and the Children’s Heart Foundation. Recently, they tackled another endeavor — the design and development of the doctoral degree in biomedical engineering.

Kassab, the director of the UCF biomedical engineering program, credits much of its success to DeCampli’s support and partnership.

“Dr. DeCampli has been a staunch promoter of the BME program ever since we began our collaboration,” Kassab says. “He has been a superb mentor to our graduate and undergraduate students alike.”

To learn more about the UCF biomedical engineering program, visit: bit.ly/UCFBMEVideo.
UCF is one of 16 universities in the U.S. that have formed a consortium on nuclear forensics. The association is supported by a $25 million cooperative agreement with the Department of Energy’s National Nuclear Security Administration.

The goal of the consortium is to engage in research that supports the NNSA’s nuclear security and nonproliferation missions while building a next-generation workforce of nuclear scientists, engineers and researchers. The University of Florida leads the group, which is also comprised of seven national laboratories including Sandia, Los Alamos, Lawrence Berkeley and Oak Ridge.

“The role of universities for nuclear forensics research is to innovate and develop some of the most challenging and fundamental aspects of new technology and methods,” says Keith McManus, the university program manager for defense nuclear nonproliferation research and development at NNSA, in a release.

“Once these basic aspects have been proven at the university level, the Department of Energy’s national laboratories can fulfill their unique role to perform mission-specific research and development that improves on capabilities for adoption by operational enterprises.”

This is the first NNSA consortium that UCF has joined. Two faculty members — Professor Subith Vasu of the Department of Mechanical and Aerospace Engineering and Assistant Professor Vasileios Anagnostopoulos of the Department of Chemistry — lead the charge for the university. They will work with researchers from other universities in the consortium, including Notre Dame, Clemson and Texas A&M, to address gaps and challenges within different aspects of nuclear forensics research.

“As a member of the consortium, we’ll be conducting research on different aspects of nuclear forensics,” Vasu says. “For example, when you have a nuclear detonation, how do the fireballs interact with the materials and what residuals does it leave?”

Other questions the team will seek to answer include how to determine what materials were used in a nuclear weapon after it’s been detonated, and how to detect a nuclear weapon or materials that may have been smuggled into the country. Vasu says this type of research has renewed relevance due to the war in Ukraine and public interest in whether or not Russia would resort to the use of nuclear weapons.

A separate challenge the NNSA aims to address is the dwindling nuclear forensics workforce. Vasu says that many researchers in this area started their careers in the 1960s and 1970s and are now headed into retirement. Through the consortium, the NNSA can build a pipeline of young professionals who have experience in nuclear forensics.

“Students will do research, have internship opportunities, and when they graduate, they can be employed by the NNSA labs,” Vasu says. “It builds a pipeline for these labs and it’s also very prestigious for students to go work at a national laboratory.”

For UCF, being included in the consortium is an impressive feat. Out of the 16 universities, UCF is the only one without a dedicated nuclear forensics degree program, department or research lab. Vasu says this speaks to the strength of UCF’s reputation for research.

“UCF has been working in this area for several years now, with research in aerospace, computer science and chemistry that can support our future work in nuclear forensics,” he says. “It’s possible that this work could lead to a nuclear forensics program at UCF since we already have the base to create it.”

Written by Marisa Ramiccio

To learn more about Vasu’s research, visit bit.ly/VasuLab.
Three UCF College of Engineering and Computer Science assistant professors, including biomedical engineering Assistant Professor Luigi Perotti, have been named 2023 National Science Foundation Faculty Early Career Development Program (CAREER) award winners. The combined award total is an estimated $1.5 million.

Recipients of this prestigious, early-faculty award exhibit the potential to serve as academic role models in research and education, and lead advances in the mission of their department or organization.

Each UCF awardee is using their expertise to study the core part of a key system — Perotti, the only recipient from the Department of Mechanical and Aerospace Engineering, is studying heart mechanics in relation to health and disease.

Perotti’s project will develop a computational model capable of relating observable macroscopic motion in the heart, such as a cardiac contraction, to its causes at the cellular and tissue levels.

By linking cellular and tissue level mechanics to heart function in health and disease, Perotti’s work can inform investigations of how localized and more widespread abnormalities contribute to cardiac dysfunction across scales.

“If we can link the micro and macroscales more accurately, then we can improve diagnosis and treatment because we can have a more precise, causal link between the changes that happened in the heart,” Perotti says.

To build, test and improve their models, Perotti and his team in the Computational Biomechanics Lab, will use existing literature and acquired magnetic resonance imaging data, like those from Cardiac Diffusion Tensor Imaging and Displacement Encoding with Stimulated Echoes Magnetic Resonance Imaging, or DENSE MRI.

The multiscale computational models will be compared with this experimental data to connect deformation at the cellular and microstructural levels to motion measurable at the tissue and ventricle scales.

“We hope that our results based on microstructural models and imaging data can suggest new quantitative biomarkers to quantify cardiac motion,” Perotti says.

The project will also include outreach to students from local schools to inspire their interest in science, engineering and healthcare.

“Students will be able to hold basic heart models in their hands to understand how the myofiber organizes in a helical structure across the wall and understand how this helical structure is important for cardiac contraction,” Perotti says.

For Perotti, his heart has always been intrigued by coding and biology. His research as a postdoctoral scholar at the University of California, Los Angeles, initially focused on analyzing the maturation of spherical viral shells and how to model their change in shape. However, after his mentor invited him to join a cardiac electrophysiology project, Perotti’s interest in the complex studies of the heart with medical experts intensified.

Since joining UCF in 2019, he continues projects with faculty and students, and says he enjoys the collaborative opportunities the university offers.

“From the time I interviewed for this position, I always had the impression that UCF is very energetic and there is a strong push to grow together,” he says.

Written by Mikita Nayee

To learn more about Perotti’s research, visit bit.ly/luigiperotti.
Improving Turbine Design

UCF Researcher Leads $3.3 Million Project to Develop Floating Offshore Wind Turbine Simulators
A University of Central Florida engineering professor is leading a $3.3 million project funded by the Advanced Research Projects Agency-Energy (ARPA-E) to research floating offshore wind turbines.

"My goal is to model floating offshore wind turbines and use the model to explore design improvements while concurrently investigating new ideas for control and sensing, a concept that is termed Control Co-Design," says Tuhin Das, the project’s principal investigator and a professor in UCF’s Department of Mechanical and Aerospace Engineering.

He is working to build a software that simulates effects of external phenomena, such as waves crashing and changing winds, on the floating platform and the turbine system.

Floating offshore wind turbines are designed to diversify the repertoire of energy resources available in the U.S. and help increase the contribution of renewable energy to power grids whose energy demands are steadily increasing.

Das began the work in 2020 with the first phase of the project. His initial funding was $772,000. The researcher’s project recently received a boost with a new $3.3 million grant from ARPA-E to continue the research in phase two for the next three years.

"In phase one, our job was to show the kind of benefits we can bring to the modeling and simulation sector," Das says. "We showed that our results were at par with industry-accepted models and experimental data."

Das’ software platform will become a product that can be hosted on a university web page and be licensed or commercialized, he says.

“We want this product to be mature enough so that at the end of the next three years, researchers from the industry and academia would be able to use this for advancing research in wind turbines," Das says.

To date, very few floating offshore wind-turbine farms are in operation, with the first one located off the coast of Scotland.

Das says he hopes that renewable energy companies can use his software to develop their own technology innovations and create more offshore wind turbines.

The research was proposed in 2019 to develop a simulation software that facilitates concurrent design and control of floating offshore wind turbines, ultimately leading to a wider adoption of this technology.

Das says, since then, the software, which uses acausal modeling as the foundational principle, has had rapid growth and has matured in its predictive capability.

“Acausal modeling takes a declarative approach to modeling governing equations, rather than the conventional approach of using assignment statements," Das says. "Here, the causality is unspecified and determined only during simulation."

He says the approach is well-suited for modeling physical systems since the resulting models represent the physical structure of the modeled system closely.

“It leads to better reusability of models as compared to those containing assignment statements,” Das says.

A feature of acausal modeling is bidirectional data flow between the ports of connected component models, he says.

In phase one, Das collaborated with researchers at the University of Maine who have been generating experimental data for the project and the National Renewable Energy Laboratory who have collaborated in validating the software.

Das’ team at UCF currently consists of multiple UCF graduate students and one postdoctoral research scholar.

“We are planning to work extremely hard the next few years, with some increase in student involvement, and by involving professionals that are well versed with software development," Das says.

Das earned his doctoral and master’s degrees, both in mechanical engineering, from Michigan State University. He joined UCF’s Department of Mechanical and Aerospace Engineering, part of the College of Engineering and Computer Science, in 2011.

Written by Beatriz Nina Rebeiro Oliveira

To learn more about Das’ research, visit mae.ucf.edu/TDas.
Under the ocean lies a mysterious world of sea creatures, coral reefs, aquatic plants...and underwater robots. Those robots aren’t toy fish or mechanical sharks used in films, but rather unmanned underwater vehicles (UUVs) used by research organizations and the military.

UCF alumnus Cody Nichoson ’21 is the newest member of the team that develops UUVs at The University of Texas at Austin. He uses his knowledge of mechanical engineering and his passion for robotic systems to design and program the behavior of underwater vehicles created at the Advanced Technology Laboratory, one of four labs that compose the Applied Research Laboratories at UT Austin.

“Though much of my work is software-based, there is a significant fieldwork component necessary to both test the autonomous behaviors and ultimately assist in the deployment of our systems wherever our customers may need them,” Nichoson said. “So in between working on software development in the office, I also find myself out at Lake Travis in Austin or around the U.S. deploying our underwater vehicles and testing new behaviors.”

Although Nichoson’s professional world now revolves around robotics, he didn’t plan to work in that area. After transferring to UCF during his sophomore year, he settled into the mechanical engineering major to gain a broad set of skills that could serve him in various industries. But once he discovered the minor in intelligent robotic systems, he realized there was only one field that he wanted to work in.

“As it turns out, the few classes I took to earn that minor sparked an entirely new interest within me and opened my eyes to a whole new potential career path,” Nichoson said. “I eventually pivoted my entire career trajectory to blend my mechanical engineering background with a software-oriented future and went on to earn a master’s degree in robotics at Northwestern.”

The Road to Robotics

Nichoson’s UCF education might have set him on the road to robotics, but his internship experiences gave him the skills to succeed in his career. After his freshman year of college, Nichoson landed an internship with the Harbor Branch Oceanographic Institute, where he gained software experience. He developed an algorithm that used live ocean current data to predict the descent trajectory of benthic landers — underwater platforms that contain sensors. The goal was to improve the launch accuracy of the landers so they could be placed more accurately on the ocean floor.

Two years later, Nichoson completed an internship with the Advanced Technology Interactives team at Universal Creative. He built...
prototypes and developed innovative concepts for new interactive experiences at the theme park.

“This internship was by far one of the most exciting and enjoyable work experiences I’ve ever had,” Nichoson said. “It felt like the perfect blend of technological innovation and creative fulfillment that too few engineers have the opportunity to enjoy. Looking back, this internship also gave me some of my earliest hands-on experience with robotics systems, something that obviously turned out to be pretty important for me.”

Advice for Future Engineers

Nichoson also completed internships with the Triumph Group, a manufacturer of aerospace and defense structures, as well as the Air Force Research Laboratory before landing his current position. He says UCF set him up for success and credits the university for giving him the room to explore his interests.

“Though I ended up in a career path that isn’t exactly mechanical in nature, I believe the knowledge and skills I gained during my time at UCF played a massive role in helping me get to where I am today,” Nichoson says. “I think it speaks volumes of an institution that can not only provide its students with the industry-relevant skills you expect from a degree program, but also provide a foundation strong enough to support growth and change across an entire career.”

It wasn’t too long ago that Nichoson was in a UCF classroom, so he offers sound words of advice for current students. He advises future engineers to not compare themselves to others, to just focus on their own self-improvement. He also encourages them to take risks and try new things.

“If you asked me during my senior year where I saw myself in two years, I never would have pictured a master’s degree and a job as a software engineer,” Nichoson says. “Life can feel like a crazy maze sometimes, and a career is no different. Just take things one step at a time, and don’t be afraid to ask weird questions or try new directions if they appeal to you.”

Written by Marisa Ramiccio

Are you a current student or alum? Then join our LinkedIn group: bit.ly/MAEGroup.
Sometimes you need a little bit of motivation to achieve your goals. Instead of relying on lists and planners, vision boards, and even friends and family to help you stay accountable, you can now use an artificial intelligence-based platform built by UCF mechanical engineering alumna Eduarda Ferreira ’19.

That platform, socra, launched at the end of March and has already gained more than 4,000 users. What sets it apart from other goal-setting apps or websites is that it combines advanced AI with a community-driven approach.

“Our AI coach, Socrates, provides tailored guidance, engaging interactions and continuous motivation, enhancing users’ experience,” Ferreira says. “A community-focused approach will allow users to create and share public journeys to collaborate on common goals. As we build the community and roll out new features, socra will become even more valuable in helping users reach their goals.”

Socra is currently in beta testing and users can choose between a free plan with limited daily usage or paid plans with increased daily usage. Although socra is not yet available as an app, Ferreira hopes to develop one by the end of the year.

Users can sign up for the platform online. They’re able to create journeys, set up daily tasks and use checklists to stay organized. Ferreira says some of the more common goals that users aim to accomplish are getting fit and starting a new business. She says that even she has used socra to stay on track throughout the creation process.

Goal achievement isn’t just the purpose of socra — it’s also one of Ferreira’s strengths. As a student, she secured an internship and a co-op with Siemens, experiences that set her on the path toward entrepreneurship.

“At Siemens, my manager noticed my passion for 3D printing and suggested I start my own business,” she says. “I followed that advice, launched a 3D printing company, and later became a contractor for Siemens.”

After she graduated from UCF with her bachelor’s degree in 2019, Ferreira went to work at Texas Instruments, where she balanced her 3D printing business alongside her full-time job. She then sold the business for a profit during the pandemic and moved into a supervisory role at Texas Instruments.

Most recently, Ferreira worked for ICON, a startup focused on 3D-printed construction. She left the company in August to devote her time to socra. She says that her professional experience, along with her education from UCF, taught her valuable lessons that she now uses as a business owner. She specifically credits her engineering leadership class with teaching her a crucial lesson: that creativity can be learned and improved upon.

“Dr. Hoekstra’s techniques, like seeking inspiration in different settings and brainstorming multiple ideas, helped me let go of needing instant perfection,” she says. “This mindset has been crucial in my career, both in my previous companies and now at socra.”

Written by Marisa Ramiccio
A COOL IDEA

UCF Alum Develops Microgravity Coolant for Data Centers, Receives Support From Blue Origin

Abhishek Sastri ’20 built a business on cooling technology for high-performance computers. Now, the UCF mechanical engineering alumnus plans to take the business one step further by developing cooling technology for data centers around the world.

The coolant is unlike anything created on Earth. It’s created in microgravity, and has already received recognition from Blue Origin.

Sastri’s company, Fluix, won the Innovation Award at the inaugural Reef Starter Innovation Challenge, which encourages startups to pitch innovative ideas that could be developed in outer space for the benefit of lives on Earth. The challenge is sponsored by Reef Starter, the innovation engine of Orbital Reef, a Blue Origin-backed space station that will be built in low-Earth orbit and eventually used as a business park.

Out of hundreds of applicants, Fluix was one of 20 startups to be selected for the final round of the challenge, and one of four to win top awards. As an awardee, Sastri received $25,000 and a customized workshop with industry experts.

Sastri has already had the chance to meet with several prominent partners.

“Winning this challenge has helped us build relationships with Blue Origin, our launch partner; Sierra Space, our implementation partner for microgravity experiments; and AWS, the biggest potential data center customer on Earth, where our microgravity-developed coolants can be deployed,” Sastri says. “We have met with them, and they are helping us build a strategy to fly our experiments into space and to implement our solutions into existing data centers.”

Sastri says his focus has shifted to data centers because of the energy they consume. According to the U.S. Department of Energy, data centers can consume 10 to 50 times the amount of energy per floor space of a commercial office building. Overall, they account for 2% of the total energy use in the United States.

The secret to cooling these energy eaters lies in space. The harsh, non-gravity environment actually makes the boiling process for the coolants easier on Earth. In turn, the coolant system can rely on fewer moving parts and reduce energy consumption.

This novel idea not only garnered the support of Blue Origin — it also captured the attention of venture capitalists at the TechCrunch Sessions: Space pitch competition. Fluix competed against two other startups and Sastri’s pitch for the microgravity coolant won. As a result, he’ll have the chance to pitch again, but this time it will be as a member of the TechCrunch Startup Battlefield 200, a group of top startup companies that will be featured at the TechCrunch Disrupt 2023 conference this October.

But this isn’t just a lucky streak for Sastri and his company. Fluix was selected for the Blackstone LaunchPad Summer Startup Fellowship in 2020, which propelled its participation in the 2022 TechStars Industries of the Future accelerator. Sastri also won first place at the inaugural UCF Technology Ventures Symposium in 2021, which included a $10,000 cash prize.

Sastri says the next steps for his energy-saving idea are to find investors, grow his sales and engineering teams, and conduct data center pilot tests.

“This will give us the traction and funding to launch our experiments into space,” Sastri says. “With the existing relationships through the Blue Origin Reef Starter Challenge, we now have a streamlined and expedited path to experiment and bring forth new innovations and secrets unlocked in space.”

Written by Marisa Ramiccio

To learn more about Fluix, visit fluixpro.com.
The UCF Department of Mechanical and Aerospace Engineering has seen tremendous growth over the past several years. From external research funding to program rankings, take note of these impressive numbers.

**MAE BY THE NUMBERS**

- **External Research Funding**
  - 2020-21: $6.12M
  - 2021-22: $8.63M
  - 2022-23: $11.5M

- **Number of faculty with more than $1M annual external funding**: 3

- **No. 1** Supplier of graduates to the aerospace and defense industries

- **No. 2** Preferred supplier of graduates to the aerospace and defense industries

- **No. 55** U.S. News and World Report aerospace engineering graduate program ranking

- **No. 75** U.S. News and World Report mechanical engineering graduate program ranking

- **10** Number of faculty members who have received NSF CAREER awards
DOCTORAL PROGRAMS

Master of Science in Mechanical Engineering

Ph.D. in Mechanical Engineering

Master of Science in Aerospace Engineering

Ph.D. in Aerospace Engineering

Master of Science in Biomedical Engineering

Ph.D. in Biomedical Engineering

UNDERGRADUATE PROGRAMS

Bachelor of Science in Mechanical Engineering

Bachelor of Science in Aerospace Engineering

GRADUATE PROGRAMS

Master of Science in Mechanical Engineering

Master of Science in Aerospace Engineering

Master of Science in Biomedical Engineering

Photo by Ben Bair ‘19