

A woman with dark hair, wearing a white lab coat, safety glasses, and a light blue surgical mask, is working in a laboratory. She is wearing blue nitrile gloves and using a pipette to transfer liquid into a multi-well plate. The background shows laboratory shelves with various bottles and equipment.

OFFICE OF RESEARCH 2020-2021 ANNUAL REPORT

CONTENTS

From the Vice President of Research	2
UCF COLLEGES	
College of Arts and Humanities	4
Burnett Honors College	9
College of Business	13
College of Community Innovation and Education	18
College of Engineering and Computer Science	23
College of Graduate Studies	28
College of Health Professions and Sciences	32
College of Medicine	36
College of Nursing	40
College of Optics and Photonics	44
Rosen College of Hospitality Management	48
College of Sciences	53
College of Undergraduate Studies	57
RESEARCH CENTERS	
Center for Research in Computer Vision	61
Florida Space Institute	63
Florida Solar Energy Center	66
Limbitless Solutions	68
NanoScience Technology Center	71

FACULTY CLUSTERS	
Biionix	75
Cyber Security and Privacy	78
Disability Aging and Technology	80
Geonomics and Bioinformatic	82
Learning Sciences	85
Renewable Energy and Chemical Transformation	88
Resilient Intelligent and Sustainable Energy Systems	91
Sustainable Coastal Systems	94
Violence Against Women	97
FACTS AND STATISTICS	
Technology Transfer 2020	101
Key Funding Sources	102
Types of Funding	103
Fiscal Year 2020 Research Activity	104
Technology Transfer 2021	106
Awards by Unit	107
Research funding Over Time	108
Top Performers in 2021	109
Media Highlights 2020	110
Acknowledgments	111



FROM THE VICE PRESIDENT OF RESEARCH

Friends,

UCF researchers have been helping solve local, national, and international problems and enriching our human experience since the university’s inception.

It was a three-time UCF graduate who helped create one of the vaccines against COVID. And while UCF didn’t fly aboard the rocket that took the first non-astronauts into space, our scientists and engineers are working with commercial companies and government agencies to pioneer the tools we need to make sure we can travel safely and eventually live on other planets.

In the 2020-2021 Office of Research Annual Report, you will find 2020 statistics broken down in all sorts of ways and data from fiscal 2021. You also will read about some inspiring research that’s changing the world.

What you won’t find is how the Office of Research facilitates faculty and student research. This includes research administration – the process needed to submit proposals and, when awarded, the process for setting up grants and contracts to fund projects (and making sure we actually get paid for our work). It also includes ensuring compliance with local, state, and federal regulations. My office also finds ways to fund needs, such as big equipment, that will enhance our research enterprise. We work with lawyers, IP experts, and contract specialists to ensure researchers can pursue their passions, wherever those might take them. We also provide faculty and leadership recommendations for policies and areas of opportunity for further advancement.

As we look to become America’s leading public metropolitan research university, I want to take a moment to share how far we’ve come since I arrived five years ago.

- Revamped the entire research administration process and made it digital through Project Wahoo. A few pieces are still missing and we still do not have a seamless system. Missing pieces are being added, and interfaces with university systems will be in place when the Knight Vision project concludes in a few years.

- Created new funding opportunities including launching UCF’s first larger-scale SEED funding program with support from the Provost Office. Approximately \$1 million was available in AY 2019-2020 and again in AY 2020-2021, and a new call for proposals will be announced before the end of the year for round 3. Equipment funds were also made available, with these requiring a match from the departments or colleges.
- Reorganized and enhanced support to faculty through our Research Development team.
- Created the Office of Research Faculty Fellow position to find ways to improve services provided in research administration. The fellow has advised us and helped create programs to support faculty conducting research, many of them focused on individual career awards.
- Aligned research compliance, export control, IRB, IACUC, and other units to provide better service and monitoring.
- Launched the Departmental Administration Research Focus (DARF) group to better collaborate and communicate with research administrators across campus, especially as we looked to implement new policies.
- Created teams and programs in OR to help faculty work on large proposals, and to support some faculty as they worked on them. One success to share: a record 12 NSF CAREER awards in 2020.
- Centralized UCF’s Microfabrication, Mechanical Manufacturing and Physical Science Cryogenic NMR Facilities in Office of Research-supported shared facilities overseen by a faculty committee.
- Developed a PI Handbook for Proposals and Awards and began annual reports, which had been discontinued before my arrival.

- Established a Communications Team, which placed more than 7,670 research stories in the media from 2018-2020, many of them in nationally known and recognized outlets.
- Established bi-weekly meetings with associate deans of research; together we’ve tackled several challenges including a response to the pandemic that, for the most part, kept research labs operating while minimizing risk.
- Increased grants and contract awards from \$148.8 million in fiscal year 2016 to \$212 million in fiscal year 2021, despite a worldwide pandemic, government shutdowns, and various other local and national obstacles.
- Launched a website portal to share research information and promote interdisciplinary collaboration with the support of the Provost Office.
- Expanded the research cyberinfrastructure at UCF to support research faculty with increased access to consultation, software, and big data resources, as well as working to improve the security of our research data.

All these changes could not have been possible without a team of more than 100 unsung heroes in my office and your colleges who support research administration operations every day. I wanted to give them a shout-out for helping us continue to progress toward greatness. They play a pivotal role in the successes we share in this report.

Together we have all achieved much, and we are primed for even greater success.

Cordially,

Liz



Elizabeth Klonoff
Vice President for the Office of Research
Dean of the College of Graduate Studies

A background image showing a woman with long dark hair, wearing a white lab coat over a red top, working in a laboratory. She is looking down at a piece of equipment. The image is faded and serves as a backdrop for the text.

UCF COLLEGES

Research Stories with Impact



Powering Up Humanities with Digital Research

By: Nicole Wills '20

What does an exhibit exploring daily life in Florida’s African American communities have in common with the revival of an 18th century dictionary? Both serve as stellar examples of the interweaving of the humanities and the digital realm — and both were made possible through UCF’s Center for Humanities and Digital Research (CHDR).

CHDR is a collaborative research hub in the College of Arts and Humanities. Since 2007, CHDR has served as an engine for cross-disciplinary collaboration, multi-institutional partnerships, sponsored research and publication, community engagement, and public humanities programming.

“We have special strength in the digital humanities — that is, the application of digital tools to humanities research,” explains Bruce Janz, co-director of the center. “That might mean creating databases of literary works, curating the creative and humanistic products of cultures and communities, designing interfaces for accessing humanities materials, producing games that teach historical events, or producing innovative publications.”



We have special strength in the digital humanities — that is, the application of digital tools to humanities research.



Connie Lester, associate professor of history and director of the Regional Initiative for Collecting the History, Experiences and Stories (RICHERS) digital archiving project, collaborated with CHDR on Bending Toward Justice, an interdisciplinary, digital project that seeks to understand how African Americans have “bent” the arc toward justice through their everyday lives and under extraordinary conditions.

“Bending Toward Justice is the outgrowth of the RICHERS digital archiving project,” says Lester. “RICHERS has always had a working relationship with CHDR, and this project is no exception.”

Bending Toward Justice takes its name from a quote by the 19th century abolitionist minister Theodore Parker: “I do not pretend to understand the moral universe; the arc is a long one, my eye reaches but little ways; I cannot calculate the curve and complete the figure by the experience of sight; I can divine it by conscience. And from what I see I am sure it bends toward justice.”

Martin Luther King Jr. would later modify this quote during the Civil Rights Movement when he declared that “the arc of the moral universe is long, but it bends toward justice.”

In both forms, the quote refers to the notion that a passive wait for justice will be rewarded. The Bending Toward Justice project, however, interprets this differently: its digital exhibits instead document the efforts of ordinary men and women, whose daily persistence and rebellion against injustice made advancement along this arc possible.

The digital exhibit features artifacts, photos, documents, oral histories, and personal objects. One portion of the exhibit focuses on the Ocoee Massacre that occurred on November 2, 1920. During this event, a white mob lynched and killed 30–35 African Americans in Ocoee to suppress black voting. After the violent massacre, which resulted in almost 400 African American residents fleeing as fires burned down their homes, properties, and churches, Ocoee became an all-white city for over 50 years.

“Part of CHDR’s mission includes research, publication, community engagement, and public programming,” says Amy Giroux, associate director of CHDR. “Bending Toward Justice is a community remembrance of a difficult time in both local and national history. The first exhibit of the project is intended to be a recounting of events in Ocoee at the time of the 1920 election and its aftermath.”

“The study of Ocoee also enables us to see that Black citizens did not simply wait for a day of justice,” adds Lester. “Denied a political voice, they organized their community through their churches and fraternal organizations to meet social and economic needs. They used the weapons of the oppressed to fight for their rights as citizens.” If the Bending Toward Justice



initiative serves as a perfect example of how digital tools can be used to understand the present, the revival of Samuel Johnson’s A Dictionary of the English Language demonstrates how researchers of the humanities can look to the digital realm to preserve the past. Associate Professor of English Beth Rapp Young collaborated with CHDR over the course of three years to create the first completely online, and fully searchable version of the dictionary, considered one of the most influential works of English literature. In addition to its comprehensive entries, the 18th century text is noted for its witty, memorable definitions and illustrative quotations. When Young approached her colleagues at CHDR about setting up the project, they embarked on writing an NEH Humanities Collections and Reference Resource (HCRR) grant proposal, resulting in a \$350,000 grant from the agency.

“Johnson’s dictionary is a prime example of an online archival site for public use, both in the sense of a dictionary, but also in the sense of a site of research,” explains Giroux. “It supports long-term sustainability and accessibility of an archival source with the research component built-in.”

Young’s team received their first working set of scans of the dictionary from the Warren N. and Suzanne B. Cordell Collection of Dictionaries at Indiana State University. When the team realized they would need a new set of scans for technological reasons, the George A. Smathers Libraries at the University of Florida created

them. The Lexicons of Early Modern English (LEME) project at the University of Toronto allowed Young’s team to use a transcription of the dictionary that they had commissioned. The team proofed this text and added additional coding to enable searching through the work and linking to the Library of Congress records. Through these collaborations, Young’s team built a custom database to provide sophisticated search functions for those looking to peruse the digital world of words.

“It’s such an important text that I was shocked to discover that it wasn’t already available in an accessible online format,” explains Young. “Scholars had been relying on slow-loading image scans (difficult to use), or an obsolete CD-ROM edition (not compatible with current equipment), or printed library copies. We are making this text much more accessible for everyone.”

The digital version of A Dictionary of the English Language was made public on April 15, the 266th anniversary of the first edition’s publication. But the work will not stop there; Young’s researchers have plans for regular updates to the website, including user accounts, improved search functions, facsimile images of every entry displayed alongside the transcription, transcriptions of Johnson’s dictionary essays, and another complete dictionary edition from 1773.

“This project would not exist without CHDR,” says Young. “When I originally started working on this site, it had been a crowd-sourced project with inherent limitations. CHDR helped inspire me to envision a new site, a resource that would have scholarly credibility. Our site will enable new kinds of research — both research about the dictionary itself, and research about the 18th century when the dictionary was produced. And CHDR is providing a lot of the technological know-how to make the vision a reality.”

From documenting the ordinary citizens who persevered against injustice to preserving a historic dictionary, CHDR’s work is exemplary of how digital tools can bolster humanities research.

“The digital can help us to ask better questions about being human,” explains Janz. “It can help to put us in the perspective of another person or group, or in another time or place. And the digital gives us the opportunity to connect with disciplines that tend to not

foreground the humanities element to their work. The humanities do not often come to the foreground in, say, engineering or physics or biology, but by working with digital tools, we can often find the space where useful conversations can happen, and shared questions can be asked.”

More exciting work is on the horizon. Last year, National Endowment for the Humanities (NEH) awarded CHDR a \$193,736 Infrastructure and Capacity Building Challenge grant to expand its work.



The digital can help us to ask better questions about being human.



“The NEH matching grant will triple our research space to nearly 3,000 square feet and allow us to purchase high-end scanning, video, audio, and other equipment and related software,” says Mark Kamrath, co-director of CHDR. “This more flexible and functional space will also increase the number of faculty and students who are learning design, programming, and digital archiving skills, and greatly strengthen our ability to create academic and public partnerships, to integrate student research into academic projects, and to disseminate digital humanities work among academics and the general public.”

In addition, the grant will allow CHDR to incorporate public education in the form of workshops, invited speakers, and conferences as a great part of the center’s mission, especially regarding outreach with underserved communities in the Orlando area.



\$1.21M

In grant funding awarded to the
College of Arts and Humanities

2020
2019

1.21\$M

\$1.65M

\$873,901
Federal

\$31,498
State and Local

\$313,332
Industry and Other



Sage Tokach

Theatre MFA, Theatre for Young Audiences Track

Career Aspiration: Run an outdoor theatre education program that provides financially accessible opportunities for young people to spend time outside and share their stories.

Research: Tokach, a native of Kansas, is investigating how the environment affects youth theatre. By utilizing the outdoors as a space for sensory exploration and theatrical storytelling, she examines the ways outdoor experiences can help create a student-led process that disrupts traditional power dynamics and encourages young people to ask questions that guide their

“The most beautiful hikes often require extensive physical labor, and the most impactful stories often require vulnerability and discomfort.”

own journey. One of Tokach’s hobbies is hiking in natural surroundings, which is where she drew her inspiration for her research. She says she feels most centered and engaged when hiking and spending time in nature, and she discovered similarities between outdoor recreation and theatre. Both fields involve community building, teamwork, communication, and storytelling. Though research shows the positive effects of theatre and time outside on children, these experiences are also often inaccessible to young people because of insufficient funding, transportation, or adult support. Tokach wants to provide accessible opportunities for youth to

explore outside and share their stories. While at UCF Tokach directed various plays including The Grumpiest Boy in the World for Theatre UCF. The show toured schools and was showcased at UCF Celebrates the Arts 2021. “The most beautiful hikes often require extensive physical labor, and the most impactful stories often require vulnerability and discomfort. In my research, I have grown the most when things do not go according to plan. I have learned that preparation is essential, but it is also important to let go of control sometimes and allow my students and environment to affect the process. I always end with more questions than when I began.”

▶ Top Faculty Sponsored Research

- Kerry Purmensky
- Florin Mihai
- Sonia Stephens
- Stephen Fiore
- Keri Watson

▶ Top Published Faculty

- Stephen Fiore
- Luis Favela
- Sonia Stephens
- Elizabeth Horn
- Jonathan Beever

* Data provided by Academic Analytics for tenure and tenure-earning faculty.
* Publications include books, articles, and conference proceedings for calendar year 2020.



A Record Year of National Awards for Burnett Honors Students

By: Padmini Coopamah Waldron

Zachary Stein '20 is an Aerospace Engineering major who researched the effect of molten sand on jet engine turbine blade coatings.

Jenna Dovydaitis '20, a Political Science and Biology double major, traveled to Iraqi Kurdistan to study how the use of chemical weapons by Iraq's government in the late 1980s had affected health, societal and economic well-being among the local population.

Omar El Merhebi '21, a biology major, hopes to develop a low-cost HIV test for developing countries.

Riley Shurack '21 is a Health Sciences major who compared the outcomes of in-person and remote-learning programs in teaching adolescents with autism spectrum disorder modified nutrition behaviors during the COVID-19 pandemic.

What do these four students have in common? They, and several of their peers, are Burnett Honors College (BHC) Scholars who participated in the Honors Undergraduate Thesis (HUT) program, the oldest and most prestigious structured research program at UCF. The students' research was instrumental in qualifying them for prestigious national awards, top graduate programs, and post-baccalaureate opportunities. These include a National Science Foundation Graduate Research Fellowship, a seat at the David Geffen School of Medicine at UCLA, a fellowship in one of Dr. Anthony Fauci's laboratories at the National Institutes of Health, and a Fulbright Scholarship.



The students' research was instrumental in qualifying them for prestigious national awards, top graduate programs, and post-baccalaureate opportunities.



In 2020, the college saw a record number of students earn national research-based awards.

- For the first time, UCF was named a Top-Producing Institution by the Chronicle of Higher Education for the Fulbright Student Program. Twelve UCF students were awarded Fulbright Scholarships to carry out graduate research or teach English overseas. Of these, five (41.7 percent) were BHC Scholars.
- 16 students, a new record, obtained NSF Graduate Research Fellowships. This includes 10 (62.5 percent) BHC Scholars.
- Four UCF students received the Goldwater Scholarship. Three of them (75 percent) are BHC scholars.
- Two UCF students, both BHC Scholars, won Astronaut Scholarships.

College leaders say that the Honors thesis program gives candidates an edge when going after these highly competitive awards.

Percentage of 2020 Major Award Recipients Who Participated in the HUT Program

	Fulbright	NSF GRF	Goldwater	Astronaut
% Recipients HUT Participants	42%	44%	67%	100%

HUT Program

Structured as an original, independent research or creative project in which participants write, defend, and publish their work, the HUT program allows students to dive deep into a topic of interest and demonstrate the capacity for high-quality autonomous work.

For example, Stein, the recipient of both a Fulbright Scholarship and an NSF GRF, traveled to the German Aerospace Center in Cologne, Germany, thanks to a National Science Foundation International Research Experiences for Students (IRES) award in summer 2019. This enabled him to learn from and work with some of the foremost experts in his field to understand the effects of sand ingress on jet engine turbine blade coatings and how to mitigate those impacts on high-temperature coatings. His research was focused on investigating new coating configurations for turbine blades resistant to infiltration by contaminants like





sand and ash. After his return, Stein participated in UCF's Summer Undergraduate Research Fellowship program and presented his work at its Showcase of Undergraduate Research Excellence. All these opportunities laid the foundation that furthered.

Stein's independent project- his Honors Undergraduate Thesis, the results of which have been published in the Journal of Materials Research with him as the first author.

Stein is now back in Cologne continuing his research which, according to his advisor, Seetha Raghavan, is a "high-priority area in aerospace engineering."



Undergraduate research is the cornerstone of nurturing creativity.



Jacob Howard '21, who will be starting medical school at Yale University in Fall 2021, had three years' worth of research experience at UCF and an Honors thesis that combines his majors in Biomedical Sciences and Philosophy. In 2019, he participated in the Yale Summer Bioethics Program, a National Science Foundation-funded Research Experiences for Undergraduates (REU) site, where he researched robotic surgery and ethics. This experience led directly to his Honors thesis research on the ethics of medical stapling given the level of adverse outcomes (injuries and deaths) from its use. His work has been accepted and/or presented at several academic conferences, including the 14th World Conference on Bioethics, Medical Ethics, and Health Law, held in Porto, Portugal, March 8-11, 2021. Howard was the 2021 recipient of a Founders' Day award for Outstanding Honors Undergraduate Thesis.

Howard's thesis was possible because in spring 2019 the college gave students the option to pursue an interdisciplinary thesis in recognition of the growing importance of interdisciplinary research. This new alternative has allowed students to explore research topics and work with professors previously not available to them.

Another example is El Merhebi '21, a Biology major, who worked under the supervision of two Chemistry professors, Karin Chumbimuni-Torres and Yulia Gerasimova. The provided guidance as El Merhebi carried out his thesis research on the development of a low-cost HIV test that can detect the viral subtypes that are more prevalent in developing regions.

In the 2020-2021 academic year, the interdisciplinary thesis accounted for nearly 20 percent of Honors theses in the Burnett Honors College, up from 14.4 percent just a year earlier. It is especially popular among STEM majors, who represent two-thirds of those who take advantage of the option.

"Undergraduate research is the cornerstone of nurturing creativity," says Sheila Piñeres, Dean of the Burnett Honors College. "It is through the Honors thesis that BHC Scholars not only ask the interesting questions, but also have the time to engage fully in the process of finding results. UCF and Office of Research support of Honors undergraduate research, through ensuring students have access to labs and cutting-edge faculty, have been instrumental to the success of our students."



Abigail Reynolds

Political Science

Career Aspiration: Work at the U.S. State Department with the Senate Foreign Relations Committee or the US Agency for International Development as a political or foreign policy analyst for the African region.

Research: After interning in UCF's Office with Global Perspectives in summer 2020, Reynolds became interested in how diseases impact democracy in sub-Saharan Africa. In light of the COVID-19 pandemic, it has become increasingly important to understand the potential impact of disease burdens (and a government's response to them) on the state of democracy around the world, she says. By identifying past relationships between particular kinds of diseases and manifestations of democracy, a baseline can be established from which to project expectations about the ways in which emerging diseases like COVID-19 will impact the practice of democracy. Reynolds will also be traveling to Tanzania in the fall semester to learn Swahili through the Boren Scholarship.

"UCF has provided mentors and opportunities that have markedly shaped my career's direction and have begun preparing me to pursue my dream career as a foreign policy analyst for the African region. My UCF mentors, including Dr. Tyler Fisher, Ambassador Harriet Elam-Thomas, Dr. Jonathan Powell, and a handful of UCF alumni, have contributed



UCF has provided mentors and opportunities that have markedly shaped my career's direction...



to my growth academically, professionally, and personally. Each one of these amazing individuals has contributed something unique to my undergraduate experience, which I will carry forward into my career in international relations."



Combating Bad Behavior, Mistreatment in the Workplace

By: Erika Hodges

As the world returns to a post-pandemic workplace, the gossip, stress, rudeness, bullying, and lack of appreciation often found at the office are likely to return, too. But researchers at UCF College of Business say that does not have to be the case.

Whether it's a rude co-worker, a horrible boss, or an ungrateful employee, UCF management professors Maureen Ambrose and Shannon Taylor are uncovering ways to combat bad behavior in the workplace. This past year Ambrose and Taylor published multiple studies, including a joint paper, that focused on incivility in the workplace, its impact on employees, supervisors, and a company's bottom line. The study also provided potential solutions and tactics to defuse incivility.

The Power of Gratitude

Taking a cue from Jimmy Fallon's Thank You Notes segment on The Tonight Show, doctoral student Lauren Locklear joined Ambrose and Taylor to show that spending a few minutes a day writing about what you are grateful for can make you less of a jerk at work.

"Gratitude interventions are exercises designed to increase your focus on the positive things in your life. One intervention involves writing down a list of things you are thankful for each day," Taylor says. "That simple action can change your outlook, your approach to work, and the way your co-workers see you."



That simple action can change your outlook, your approach to work, and the way your co-workers see you.



Workplace mistreatment can cost organizations millions of dollars each year in productivity loss, employee turnover, and litigation. Bullying, gossip, and exclusion or ostracism have been shown to negatively impact physical health, job performance, and job satisfaction.

"While organizations spend quite a bit of time and money to improve employee behavior, there are not a lot of known tools available to make the needed changes," says Locklear, who successfully defended her dissertation in May. "We found the gratitude journal is a simple, inexpensive intervention that can have a significant impact on changing employee behavior for the better."

For two weeks, study participants spent a few minutes a day jotting down the things, people, and events they were grateful for – and as a result, their coworkers reported that they engaged in fewer rude, gossiping, and ostracizing behaviors. The study was published in the Journal of Applied Psychology and covered by the Harvard Business Review and Psychology Today.

Bosses Need Love, Too

While previous research tended to focus on supervisors' impact on employees, Ambrose flipped the script with a study that looked at how the boss responds to feelings of appreciation. Ambrose, who teamed up with Clemson University professor and UCF alumna Sharon Sheridan for the study, suggests when supervisors feel appreciated, it gives them a boost of energy and optimism. In the end, that's good for employees and the organization's bottom line.

"Based on theory, we knew feeling appreciated by another person sends a strong signal that you are positively regarded, and feelings of positive regard evoke a sense of vigor -- or high energy," says Ambrose, who is the Gordon J. Barnett Professor of Business Ethics and a UCF Pegasus Professor. "This is important because research indicates when people possess higher levels of resources, in this case, energy, they are better able to maintain a positive outlook and engage in positive behaviors at work. We know when supervisors have feelings of depletion – or low energy – negative things happen. For example, when bosses have low energy, they engage in more abusive supervision, creating worse workplaces for their employees."

The study asked supervisors to respond to surveys twice a day for 10 consecutive workdays. Each day participants recorded how



much they felt appreciated by their subordinates, how energetic they felt, and how it affected them personally (sense of optimism and life satisfaction) and professionally (job satisfaction). On days supervisors felt more appreciated, they had more energy, which translated into higher levels of optimism, life satisfaction, job satisfaction, and helping.

"Our study also found that feeling appreciated by employees was positively related, via energy, to supervisors' psychological well-being. Psychological well-being can buffer individuals from the negative effects of job stress," says Ambrose, whose study was published in the Journal of Management and featured in a column in the LA Times.

Eradicating Rudeness at Work

While prior research showed 98 percent of employees experience rude behavior at work, a new study co-authored by Taylor and Locklear suggests a large majority of workplace relationships are not characterized by rudeness.

Researchers found that while most employees experience rudeness at work, these experiences came from a small number of co-workers. The study examined rude behavior among restaurant, manufacturing, and office workers. Only 16 percent of workplace relationships were characterized by rude behavior.



“Because prior research suggests workplace mistreatment is harmful and widespread, it is often called an epidemic, but our findings show that rude behavior is less like the flu and more like cholera,” Taylor says. “It is still harmful, but far less common, and outbreaks are often traced to a single source – much like a contaminated water pump.”

Across all study groups, researchers found that unique relationships between colleagues have just as strong an influence in determining whether workers will be rude to one another.

“Most people do experience rude behavior, but most of their relationships are not characterized by rudeness,” Taylor says.

Behavioral expectations and workplace culture play a key role in influencing employee mistreatment. But an employee’s perceptions about how their colleagues should treat each other have a stronger impact on rude behavior than an employee’s perceptions about how their colleagues actually treat each other.

“Employees’ beliefs about what is ‘right and wrong’ at work have a big impact on what happens on the job,” Locklear says. “Employers should ensure there are strong norms for respect and civility in the workplace. Having a zero-tolerance policy for these rude behaviors is key to stopping mistreatment in its tracks.”

While the study was conducted prior to the COVID-19 pandemic, Taylor says his team’s findings are just as applicable to remote work environments.

“As employees return to work on-site, our study suggests developing and maintaining good relationships with co-workers is important now more than ever,” he says.

Good Stress vs. Bad Stress

Lessening job stress on employees can have a significant financial impact on a business. The American Institute of Stress estimates that job stress costs the U.S. industry more than \$300 billion a year in absenteeism, turnover, diminished productivity, and medical, legal, and insurance costs.

A chance to rise to the challenge at work, while stressful, can lead to a promotion or raise for the employee when successful. But if that big project or assignment is not well communicated, employees are more likely to perform poorly and act out on the job, according to another study by Taylor.

“Being given more responsibilities is stressful, but rewarding for employees,” Taylor says. “However, it can become a hindrance for employees who can’t predict or plan for these new responsibilities.”

The study categorized stressors into two types: 1. Challenge Stressors representing obstacles that lead to higher learning and

achievement, and 2. Hindrance Stressors that interfere with personal accomplishments or goal attainment – think bureaucratic red tape, office politics, or job insecurity.

“When employees can’t get a sense of what their stress level or workloads are going to be from week to week, it causes a challenging opportunity to become a burden,” he says. “Under poor leadership, employees worry more, lose focus, break rules, and are less helpful to co-workers.”

The study surveyed more than 150 employees from the restaurant industry for eight weeks. Participants were asked about their perceived stress levels and whether their stress had positively contributed to their professional goals. Employees who experienced wavering levels of challenge stressors were less attentive, more anxious, and had trouble completing tasks.

As employees return to work on-site, our study suggests developing and maintaining good relationships with co-workers is important now more than ever.

In the second part of the study, researchers surveyed 325 employees of a public university in the U.S. Like the first group, participants were asked to assess their stress levels from week to week and indicate how prepared they felt for upcoming challenges at work. Employee well-being showed similar declines when challenge stressors varied throughout the study.

“Managers want their employees to feel some energizing stress to help them develop, but that stress needs to be predictable, or it will hurt their growth,” Taylor says. “The benefits of positive, challenge stressors only occur when managers provide consistent and predictable opportunities for achievement and learning.”

\$215,739

In grant funding awarded to the
College of Business

\$215,739
Federal





Parker Rendell

Marketing

Career Aspiration: To work and grow with the marketing agency he recently joined and to go back to school for a master's degree relating to marketing or data management.

Research: The pandemic gave Rendell an opportunity to pursue his interest in consumer psychology and how brands can connect with consumers and create long-term relationships. In researching consumer shopping habits during the pandemic, he found that people became less brand loyal, preferring to purchase any available item rather than searching for a particular brand.

I believe that UCF's College of Business is well recognized by many employers as a very successful program.

"My favorite part about the College of Business is the connections and reputation it has with employers both in the Orlando area and outside of the state of Florida. I believe that UCF's College of Business is well recognized by many employers as a very successful program. This allows students to stand out greatly in their job search process."



▶ Top Faculty Sponsored Research

- Clay Posey
- Sevil Sonmez

▶ Top Published Faculty

- James Combs
- Dana Joseph
- Gregory Trompeter
- Carlton Harrison
- Alex Rubenstein

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



UCF Research Focuses on Transforming Teacher and Leadership Preparation for K-12 Mathematics Teachers

By: D'Ann Rawlinson

Sarah Bush is leading efforts to help transform the way K-12 students learn and experience mathematics. She’s reimagining teacher preparation and leadership development for preservice and in-service mathematics educators through multi-institutional research and partnerships.

“We need to prepare future and practicing educators to teach and lead in ways that value all students’ contributions and leverages those contributions by building off students’ strengths rather than teaching from a deficit perspective,” says Bush, a professor of K-12 STEM education in the School of Teacher Education.

There is a national focus on broadening access to high-quality education in K-12 so that all students can succeed and, if desired, pursue careers in STEM fields.

“Not every student will select a STEM career,” says Bush. “But mathematics shouldn’t be a gatekeeper; instead, mathematics should be a gateway where all students have STEM options, and if they choose differently, they will still be equipped with STEM literacy to enhance their personal and professional lives.”

As the principal investigator of two National Science Foundation (NSF) grants, Bush, in collaboration with interdisciplinary and multi-institutional research teams, is leading projects aimed at transforming mathematics education in K-12 schools through an

initial teacher preparation program for secondary mathematics education as well as a specialized doctoral program and a teacher leader academy to enhance instructional leadership capacities within Title I schools.

“For both projects, we aim to empower our preservice and expert teachers to teach in a way that every K-12 student feels that they can be a learner and doer of mathematics, have a voice in the classroom, and that their contributions matter,” says Bush. “Teachers humanize education when they connect mathematics to students’ everyday lives through their unique lived experiences and interests.”

However, this shift cannot be achieved in isolation. Both projects are collaborating with different stakeholder groups such as school and district administrators, teachers and instructional coaches, nonprofit organizations, preservice teachers, and faculty members across multiple institutions. “It takes all stakeholders to be on board with a consistent commitment to improving access and equity in all K-12 mathematics classrooms,” says Bush.



It takes all stakeholders to be on board with a consistent commitment to improving access and equity in all K-12 mathematics classrooms.



Bridging Coursework, Internship Experiences, and Community

Bush is working with a team of researchers from the University of Central Florida, University of Maryland Baltimore County, University of Kentucky, and Berea College to restructure secondary mathematics teacher education preparation programs. The team is integrating the highly collaborative professional development framework they created into participating students’ coursework and internship experiences. The framework provides students with opportunities to study their own practice during

group meetings with a supportive community of mentor teachers, internship coordinators, and faculty stakeholders.

Launched in August 2020, the project will span four years and includes the secondary mathematics education undergraduate programs from the four institutions. The researchers are examining the framework’s impact on prospective and new teachers’ knowledge and classroom practice and aligning it with dismantling inequitable practices in mathematics education, such as grouping students based on perceived academic ability thus limiting many students’ exposure to high-quality STEM instruction and learning experiences. The findings will guide teacher preparation programs by creating a national model.

One of the salient features of the framework is the use of networked improvement communities: where prospective teachers, practitioners, and researchers work together to identify and solve current classroom challenges in a cyclical manner.

Each month, a group of prospective teachers, mathematics education faculty and researchers, university-level internship coordinators, and school-based mentor teachers meets virtually and creates plans focused on the current challenges the prospective teachers are experiencing in their classrooms. Plans are implemented with 6-12th grade students; then, the group comes back to discuss team findings. The next steps are decided, and the cycle starts again.

The initial cohort completed their first year of participation during the COVID-19 pandemic, and data from the early focus groups showed that all stakeholders valued the community meetings.

“Our prospective teachers and school-based mentor teachers reported that the collective experience helped them navigate the challenges of teaching and interning during the unexpected,” says Bush. “They learned that they weren’t the only ones struggling with similar issues in the classroom, and they appreciated that we focused on solutions to real-time problems, such as identifying strategies to teach and engage students face-to-face and online synchronously.”





With the first year of implementation completed, the initial cohort of prospective teachers will continue with the project as new teachers. Their engagement will be followed during the network community meetings during Years 2 – 4 of the study. A new cohort of prospective teachers will begin this fall.

This NSF research project is supported by a \$3 million grant with UCF’s portion totaling \$1 million. In addition to Bush, the UCF research team includes co-principal investigators Farshid Safi, associate professor of mathematics education, and Janet Andreasen, senior lecturer of mathematics education.

Building Instructional Leadership Capacity through Doctoral Education

To build instructional leadership capacity within K-8 mathematics, Bush and UCF faculty members are collaborating with Orange County Public Schools (OCPS) and nonprofit partner City Year Orlando to launch the UCF-OCPS Noyce Teacher Leader Academy. It will take place alongside a new doctoral-level program designed to develop teacher leaders who will advocate and support administrators and teachers of mathematics to implement policies, practices, and programs that lead to quality and equitable mathematics instruction. The program launches in fall 2021.

Fifteen teachers will be selected to participate as UCF-OCPS Noyce fellows. The project team is looking for candidates who belong to historically underrepresented populations in STEM, work in Title I schools, and exhibit strong mathematical content and pedagogical knowledge. The grant will provide fellows with a \$10K annual salary supplement for five years as they pursue an education doctorate at UCF specializing in K-8 mathematics education.

As part of the UCF-OCPS Noyce Teacher Leader Academy, the fellows will work with mathematics teachers as well as school and district administrators. Through a gradual increase of responsibility, the fellows will coach and deliver workshops at the school and district level.

“We are excited about the potential of the teacher leader academy,” says Bush. “Not only will teaching be professionalized for the 15 fellows, but they will also develop knowledge and experience to lead and lift up mathematics teachers across their district by advocating for quality and equitable practices so all students will succeed in mathematics.”

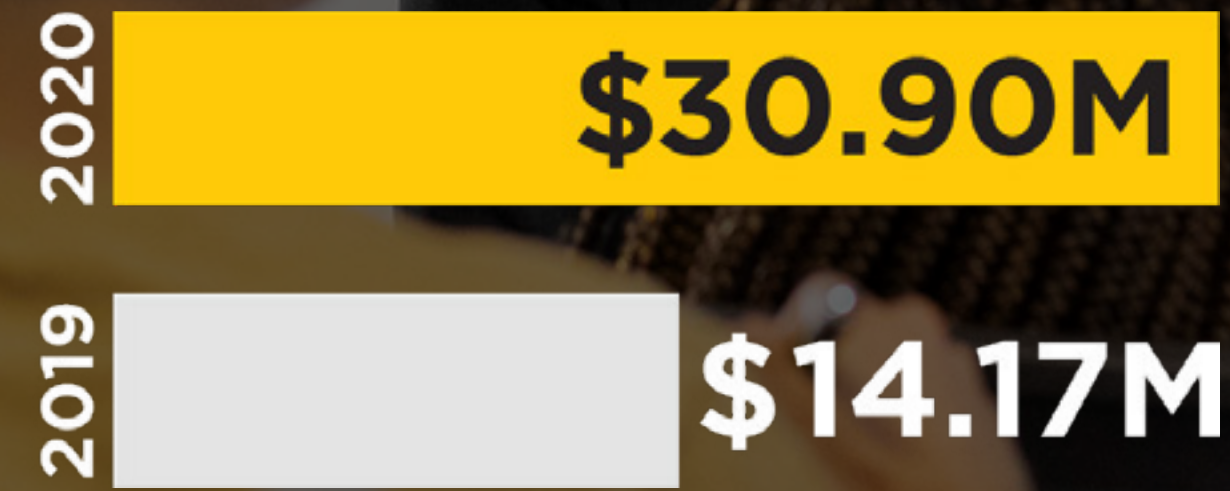
The project is supported by a \$1.5 million NSF grant. In addition to Bush, the UCF team includes co-principal investigators Juli Dixon, professor of mathematics education; Lisa Brooks, associate lecturer of mathematics education; Malcolm Butler, director of the School of Teacher Education; and Brian Moore, associate professor of mathematics in the College of Science.

“
...they will also develop knowledge and experience to lead and lift up mathematics teachers across their district by advocating for quality and equitable practices...
”

Bush received her PhD in curriculum and instruction with a specialization in mathematics education from the University of Louisville. Since 2015, Bush’s research has been supported by more than \$6.2 million in externally funded projects from NASA, the NSF, and through Mathematics and Science Partnership funding. She was the lead writer of the middle school volume of the National Council of Teachers of Mathematics’ Catalyzing Change series, which addresses inequitable policies, practices, and structures in mathematics education and provides mathematics educators and stakeholders with a framework to enact change. Bush joined UCF in 2017.

\$30.90M

In grant funding awarded to the
College of Community Innovation
and Education



\$8.75M
Federal

\$22.10M
State and Local

\$1.04M
Industry and Other



Daniel Edelen

Education PhD, Elementary Education Track with a focus in Mathematics Education

Career Aspiration: Become an Assistant Professor of Elementary Mathematics Education or STEM Education at an innovative public research university so he can pursue ethnographic research in elementary mathematics classrooms and teach courses to current and aspiring elementary school teachers.

Research: Daniel Edelen, of Kentucky, was an elementary school teacher for three years (grades 2nd, 3rd, 4th and 5th). He was intrigued with how children interact to construct ideas in

...we must continue to research and understand better ways to meet the unique needs of students...

the classroom. It was during these years that he became enthralled in the subtle nuances that come together to create learning moments for students. That's what led him to UCF and research. He's been working with his mentor – Professor Sarah Bush – for the past nine years. Edelen's current research examines how elementary school students co-construct their understanding of mathematics in the classroom and other spaces. Specifically, he is curious about how students come together to create cultures for learning and how power relationships influence which students get to author mathematical ideas and lead classroom discussions.

“Within the field of mathematics education research, we constantly need to be better informed to ultimately meet the needs of each and every learner. People often joke that mathematics has changed, in reality, it has not, but the way we teach mathematics has and it really should continue to change. As a field, our goal is to provide a just and equitable education to all learners, thus, we must continue to research and understand better ways to meet the unique needs of students and do so from a strengths-based approach so that mathematics is not a gatekeeper but a subject that invites every learner to explore and make sense of their worlds.”

▶ Top Faculty Sponsored Research

- Paula Kohler
- Amy Ellis
- Marisa Macy
- Dalena Taylor
- Sejal Barden

▶ Top Published Faculty

- Sarah Bush
- James Ray
- Samuel Towne
- Barbara Andraka-Christou
- Ryan Labrecque
- Naim Kapucu

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



From Social Simulation to Sarcasm

UCF's Artificial Intelligence Research Addresses National Priorities

By: Kimberly J. Lewis

At the forefront of the nation’s technology priorities is the field of artificial intelligence (AI): the use of complex algorithms that empower computers to analyze and interpret massive amounts of data, recognize patterns, and perform tasks faster, more precisely and more efficiently than human ability. College of Engineering and Computer Science researchers are leading UCF’s efforts to advance AI for industry, defense, and society.

Private companies use the power of AI to gain valuable, competitive information about consumer preferences and trends, to interact with customers and influence their decisions. Increasingly, companies are also creating virtual agents using AI that can perform human-like tasks.

Governments around the world use AI to gather insights and to influence large populations, a tactic that can be used to gain advantage against foreign adversaries. Information warfare – including the use of AI to deliberately spread misinformation at alarming speed – is an increasing national security threat and is among the reasons why the U.S. Department of Defense is prioritizing funding for AI research as part of its cybersecurity initiatives.

UCF faculty are advancing AI and applying it to a host of areas that help avoid things like information manipulation to collapsing bridges.



In recent years, UCF has landed several large, competitive awards from the Defense Advanced Research Projects Agency (DARPA), with Ivan Garibay, leading the way.

Garibay, an associate professor in the Department of Industrial Engineering and Management Systems, directs UCF’s Artificial Intelligence and Big Data Initiative, leads the master’s degree program in data analytics, and the Complex Adaptive Systems Laboratory.

In these roles, Garibay collaborates across the university to leverage UCF’s strengths in data science, social science, and AI to advance computational power through simulations.

“UCF’s strength is where social science intersects with data science. We have the strength in social systems.”



UCF’s strength is where social science intersects with data science. We have the strength in social systems.



In 2017, Garibay landed a \$6.2 million award to lead DARPA’s SocialSim project to develop a comprehensive, realistic, at-scale computational simulation of online social behavior to show how information spreads and evolves, using new methods developed at UCF.

He also is co-principle investigator on a \$1.5 million award from DARPA to lead a project involving artificial social intelligence (ASIST Program), working with UCF Professor Stephen Fiore a leading expert in cognitive sciences.

In 2021, Garibay’s work using AI to detect sarcasm in social media, also funded by DARPA, was published in the journal Entropy. His team developed a technique that accurately detects sarcasm in social media text.

The team, which includes computer science doctoral student Ramya Akula, began working on this problem under a DARPA grant that supports the organization’s Computational Simulation of Online Social Behavior program. They taught their computer model to find patterns that often indicate sarcasm and combined that with teaching the program to correctly pick out cue words in sequences that were more likely to indicate sarcasm. They taught the model to do this by feeding it large data sets and then checked its accuracy.

Garibay is a two-time UCF alumnus, with a doctorate (2004) and master’s degree (2000) in computer science. He is the Founding Director of UCF I-Corps program which transforms technology into entrepreneurial startups. He holds affiliated appointments in the Department of Computer Science and the School of Modeling, Simulation and Training.

Several other engineering and computer science faculty and students are expanding the use of AI. Here’s just a few of them:

Monitoring Structural Safety

Professor Necati Catbas, Department of Civil, Environmental and Construction Engineering

Catbas, founding director of the Civil Infrastructure Technologies for Resilience and Safety research lab, was awarded a \$1.2 million grant – with researchers at the University of South Florida – from the federal government to assess the safety of U.S. bridges. The work involves using artificial intelligence to analyze large amounts of data gathered from sensors on the structures to proactively track and monitor structures and help identify potential failures before the next building inspection.



Discovering COVID-Killing Nanoparticles

Assistant Professor Ozlem Garibay, Department of Industrial Engineering and Management Systems

Garibay, founding director of UCF's Human-Centered Artificial Intelligence research lab, is working with Professor Sudipta Seal, Department of Materials Science and Engineering, to design nanoparticles in a novel way, assisted by artificial intelligence. By using deep neural networks and large molecular interaction datasets, they are working to find novel nanoparticles that can bind to the covid-19 virus more effectively to create anti-viral materials.

Extended Video Analysis

Doctoral Student Kevin Duarte, UCF Center for Research in Computer Vision

Duarte's graduate work involves creating algorithms to perform high-volume video analysis, such as identifying and tracking behaviors in long security videos. Duarte was on the UCF team that won a World Title in the Activities in Extended Video Challenge for 2020, sponsored by the U.S. Department of Commerce's National Institute of Standards and Technology. Top computer vision teams from around the world, including teams from IBM, Massachusetts Institute of Technology, Carnegie Mellon University, and Purdue University competed in the challenge.

Better Bots for Better Customer Service

Assistant Professor Johnathan Mell, Department of Computer Science

Mell uses AI in his work designing socially aware agents for automated negotiation, such as digital personal assistants, or automated customer service agents. "Many social tasks can be modeled as negotiations," says Mell, "And the agents that engage in them require advanced social intelligence." His work includes cross-cultural features and temporal effects to make automated negotiators, as well as emotive and realistic virtual characters. These advanced "social AIs" can be used as commercial assistants, in teaching and training programs for students, and as cutting-edge characters in games and entertainment applications.

Predicting Biomechanical Metrics

Associate Professor Helen Huang, Department of Mechanical and Aerospace Engineering

Huang is using her 2020 NSF CAREER Award to develop new methods to leverage electroencephalography data to non-invasively study brain and non-brain electrical activity during walking and dynamic movements. One objective is to evaluate multiple machine learning techniques to predict biomechanical metrics (gait symmetry, eye gaze fixation, and metabolic cost) from EEG source signals. The work will aid scientists' understanding about the underlying deficits in mobility and cognition that occur with aging and disease.

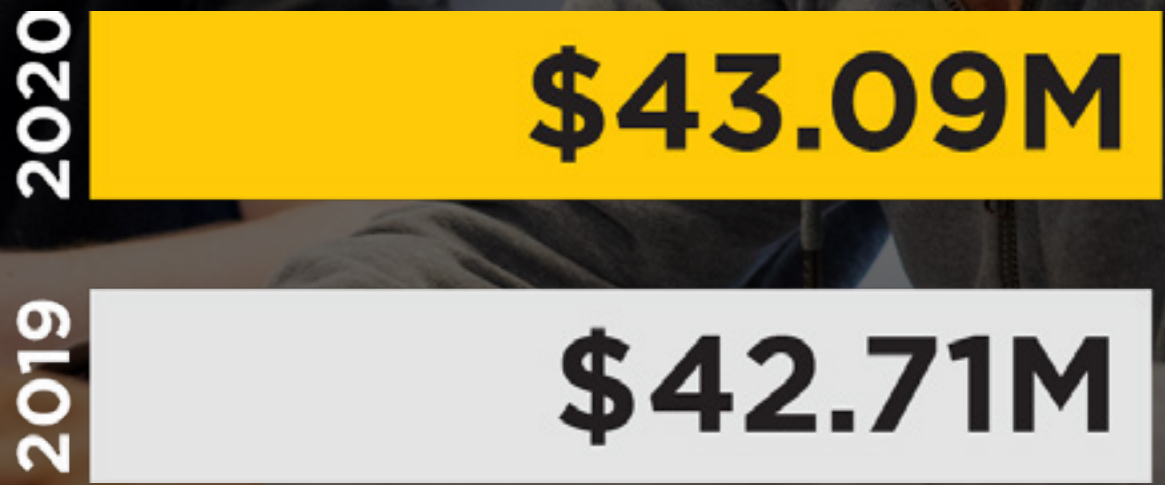
Smart Manufacturing

Assistant Professor Dazhong Wu, Department of Mechanical and Aerospace Engineering

Wu has developed data-driven predictive modeling tools that enable smart manufacturing, such as predicting the mechanical properties of 3D-printed parts, cell viability in bioprinting and melt-pool temperature in metal additive manufacturing. In the future, says Wu, the knowledge extracted by physics-guided AI techniques will enable machines equipped with low-cost sensors to make real-time decisions automatically. Wu also has developed novel fog-computing-based, real-time monitoring systems that detect faults in manufacturing equipment and machines.

\$43.09M

In grant funding awarded to
the College of Engineering and
Computer Science



\$24.78M
Federal

\$6.74M
State and Local

\$11.58M
Industry and Other



Jaden Chambers

Mechanical Engineering

Career Aspiration: Design robotics for space mission.

Research: The West Palm Beach native has been interested in the space race ever since he joined the SECME (Science, Engineering, Communication, Mathematics, Enrichment) club at his elementary school. The club introduced him to robotic design and various engineering projects, including solar vehicles, bottle rockets, and mouse-trap cars. That's when Chambers realized that engineering was the best way to eventually get a job in the space industry. He enrolled at UCF because of the College of

“UCF opens the door to so many opportunities for aspiring engineers.”

Engineering and Computer Science's reputation and its proximity to NASA's Kennedy Space Center. His advice to students is to get involved in clubs as soon as you are on campus. For him, the American Institute of Aeronautics and Astronautics (AIAA) student chapter, which he joined his freshman year, has been vital to his success. The club gave him the opportunity to work on quadcopter, airplane and hovercraft design and high-powered rocketry. The club also participated in NASA Big Idea Challenge, where they brainstormed ways to mitigate moon dust. Chambers credits the club with providing him with the hands-on experience he needed to be

competitive enough to land an internship with NASA's Kennedy Space Center in January 2021. He hopes to land a job in robotic design for space missions after he graduates in 2023.

“UCF opens the door to so many opportunities for aspiring engineers. The number of events that the university has is amazing for networking. The tabling event has been major for me. Here, students of any major can find a club that fits their interests and puts them on the path for success. Through this event, I was introduced to AIAA, which gave me the teamwork and CAD foundation I needed and helped me receive an early engineering experience, solidifying the notion that it is what I wanted to do.”

▶ Top Faculty Sponsored Research

- Michael Proctor
- Ni-bin Chang
- Kareem Ahmed
- Mohamed Abdel-Aty
- Zhihua Qu

▶ Top Published Faculty

- Kareem Ahmed
- Mohamed Abdel-Aty
- Subith Vasu Sumathi
- Pamela Wisniewski
- Waldemar Karwowski

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



Providing the Graduate Experience

By: Zenaida Gonzalez Kotala



The College of Graduate Studies provides an array of services to support UCF's more than 10,000 graduate students from around the world.

Graduate students are essential to a thriving research university. They are critical to the development of new scientific knowledge and innovation. They also help teach undergraduate courses and often lead teams under the direction of faculty. Once they graduate, they often go on to lead research teams in government agencies or commercial companies.

The college is focused on helping students successfully complete their graduate degree programs. That means assisting them from matriculation through thesis and dissertation work and then onto graduation. Special resources from workshops to the Graduate Student Center in Trevor Colbourn Hall are available to students during their academic journey.

For example, last year 2,476 students attended 181 Pathways to Success workshop sessions that covered everything from avoiding plagiarism to presenting at conferences. More than 9,000 students also visited or reserved meeting space at the Graduate Student Center.

Students are also eligible for financial assistance through fellowships and assistantships. More than 170 graduate students received fellowships, some worth up to \$25,000 a year. Another 1,600 full-time enrolled graduate students served as graduate teaching assistants, graduate research assistants or graduate assistants.

The college also works with every unit on campus that impacts a students' academic journey including college departments, financial services, UCF Global, and student conduct if necessary. This group also works on graduate policies to make the experience a consistent one.

The college also works closely with various departments and groups, including Graduate Faculty, to enhance the graduate student experience. The emphasis in all this group's interactions is fairness, consistency, efficiency, and accuracy. In 2019-2020, this impacted in some way all 10,000 plus graduate students at UCF and the faculty who taught more than 7,000 graduate courses and successfully mentored 3,135 students to degree or certificate completion, including 305 research doctorates.

The College also offers:

- Student Scholar Symposium
- Annual Student Research Week co-sponsor
- Diverse Opportunity Academic Program
- Three Minute Thesis Competition (3MT)
- Virtual Grad Fair Series
- Pathways to Success Professional and Personal Development
- Thesis and Dissertation review resources
- Student presentation grants to attend scientific conferences or conduct field research
- Access to online research data management resources
- Web features about graduate students and faculty



Emily Ross

Clinical Psychology PhD

Career Aspiration: Career in an academic medical center where she can conduct research and work clinically with individuals with physical and psychological diagnoses.

Research: Emily Ross is focused on patient-reported outcomes to investigate the role of health perceptions and psychosocial risk factors for chronic illnesses. She has received funding from the College of Graduate Studies to publish her manuscript *Gastrointestinal health: An investigation of mediating effects on mood and quality of life in the Health Psychology Open journal*.

I was confident I could receive excellent clinical training to become a clinical psychologist, as well as gain research experience in Health Psychology.

Ross began her journey at UCF by earning her bachelor's in Psychology and has been an advocate of the university since the start. "I am a big fan of UCF and believe it has an excellent reputation for academic excellence, research, and collaborative efforts," she says. Although Ross received a degree in Psychology, it didn't

begin here. Planning to become an optometrist, switched from Health Sciences to Psychology after a clinical internship at an optometrist's office expanded her perspective. "I found that what I enjoyed most was conversing with the patients and learning about them. I started taking psychology coursework and found I was extremely interested in the topics, particularly in abnormal and clinical psychology. I changed my major to Psychology, and the rest is history," she says.

Currently, in the Clinical Psychology PhD program, she was drawn to the program at UCF because of the scientist-practitioner model. This model trains students to generate and integrate scientific knowledge to further the field. "I was confident I could receive excellent clinical training to become a clinical psychologist, as well as gain research experience in Health Psychology."



Michael Tadesse

Civil Engineering PhD

Career Aspiration: Water resources engineering and data-driven modeling, particularly in the areas of coastal and river flooding.

Research: Michael Getachew Tadesse has been working with Assistant Professor Thomas Wahl to model storm surges. A problem around the world, storm surges batter coastlines and can destroy roadways and homes. Understanding how surges might form and develop; means looking at the past to determine patterns and potentially predict future behavior. Tadesse has created a database using atmospheric and oceanic variables to infer missing storm surge data. Before his research, global historical data on storm surges did not date back far enough.

It’s a humbling experience to be able to contribute to the scientific community.

Tadesse grew up in Addis Ababa, Ethiopia. Ethiopia is home to the Danakil Depression, one of the hottest, driest, and lowest places on the planet. It’s no shock Tadesse chose a career in something so environmentally conscious as water resources engineering. After receiving his Bachelor of Science for Civil and Environmental Engineering in his hometown, Tadesse traveled across Europe, studying flood risk management in five countries (Germany, the Netherlands, Spain, Slovenia, and Denmark).

Tadesse’s work was published in Nature Scientific Data earlier this year.

“It’s a humbling experience to be able to contribute to the scientific community. It gives me great pleasure to see that my research adds value to the grand scheme of understanding extreme sea-level events such as storm surges and how we can adapt to them accordingly,” he says.



Associate Professor Advances Interventions for Suicide Prevention

By: Megan Pabian



For more than a decade, Kim Gryglewicz, an associate professor in the School of Social Work, has dedicated her life to understanding what triggers suicides and how to help prevent them.

Gryglewicz lost two of her cousins to suicide. She hopes to help spare families and loved ones from the crushing pain that happens when someone takes their own life.

“It is difficult to describe the emotions and feelings families go through when trying to understand and cope with losing a loved one to suicide,” Gryglewicz says. “Many families, including my own, have struggled with trying to understand ‘why.’ Understanding the etiology of suicide and trying to find innovative interventions to prevent suicide is my lifelong goal.”

Since arriving at UCF in 2014, Gryglewicz has focused her research efforts on tackling the suicide crisis that in 2019 alone took more than 47,000 lives. Her expertise has led to more than \$9.7 million in research funding.

“Kim is an incredibly productive researcher in our college with a laser focus on her research mission to contribute to both the scientific understanding and prevention of suicide,” says Jennifer Kent-Walsh, associate dean of research for the College of Health Professions and Sciences. “The impact of this focus cannot be underestimated as she works tirelessly to address such a high-stakes public health issue and to provide critical supports for all involved stakeholders in our community and far beyond.”

As the co-director of the Center for Behavioral Health Research and Training, Gryglewicz fosters collaborations with faculty and community stakeholders interested in behavioral health research. She also mentors both undergraduate and graduate students involved in her research.

“My hope is that one day, either through research or clinical work, these students will continue to carry the torch to make a difference in the lives of those experiencing thoughts of suicide or mental health problems,” Gryglewicz says.

According to the Centers for Disease Control and Prevention, death by suicide rose by nearly 30 percent from 1999 to 2016, and suicide risk factors continue to intensify with the health, social, and economic challenges inherent within the ongoing pandemic.

In 2017, Gryglewicz and the School of Social Work partnered with AdventHealth in Orlando on a multi-year, \$1.45 million pilot program funded by the federal Substance Abuse and Mental Health Services Administration to study the effects of suicide-prevention screening on emergency-room patients. Since then, healthcare professionals have been screening adults.

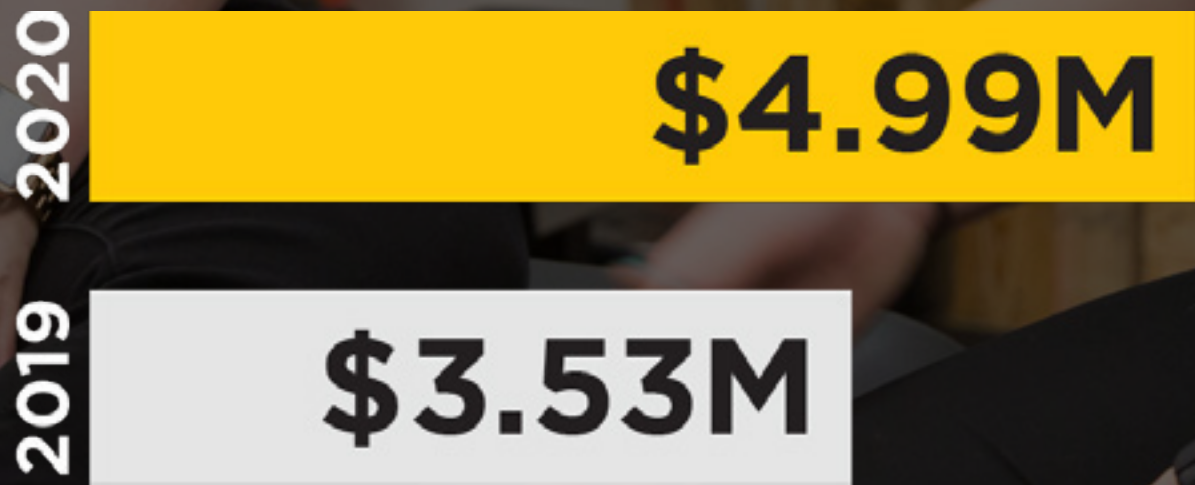
“

Kim is an incredibly productive researcher in our college with a laser focus on her research mission to contribute to both the scientific understanding and prevention of suicide.

”

\$4.99M

In grant funding awarded to the
College of Health Professions
and Sciences



\$932,433
Federal

\$2.35M
State and Local

\$1.70M
Industry and Other



Kylie Harmon

Education PhD, Exercise Physiology Track

Career Aspiration: To work at a university as a professor and researcher.

Research: The New York native is investigating how the brain, nervous system, and muscles work together to impact strength and function as we age or recover from periods of disuse. While it's crucially important to preserve muscle mass to maintain strength, Harmon is interested in the changes that occur in the brain and spinal cord that may also affect strength.

"Research is not easy. Sometimes it is hard and messy, and complicated, and nothing is working,

and it can be frustrating. But there is value in the process – it's where we learn. The cumulative experiences are more important than the results from any single study. In the kind of work we do, good research takes time. It takes effort and attention to detail. If we want to impact the field and be able to stand by the quality of our work, we have to take the complex route and know that it will be worth it. I could not be in a better place than UCF to prepare me for my dream career. Most of the people around me have my dream career. My mentor and other faculty members that I've been fortunate to work with are at the top of their fields, widely published, great professors, and even better people.

They take a huge interest in helping to prepare their students for future careers...Having a great group of people to learn from is the best preparation there is.



**Research is not easy. Sometimes it is hard and messy ...
But there is value in the process - it's where we learn...**



► Top Faculty Sponsored Research

- Terri Daly Burns
- Kimberley Gryglewicz
- Julie Steen
- Jennifer Kent-Walsh
- May Lou Brunell

► Top Published Faculty

- Keith Brazendale
- David Fukuda
- Jeanette Garcia
- Jeffrey Stout
- Ethan Hill
- Matthew Stock

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



Fighting Drug Resistant Infections with Cereal

By: Christin Senior

As the world evolves, so do bacteria, viruses, and parasites that trigger many uncomfortable and often fatal diseases. Many of these organisms are mutating or evolving over time and are becoming drug-resistant, meaning long-standing medicines often don't work.

That's a problem for people's health and something physicians have been warning patients about for years. That's one reason why the National Institutes of Health established the Antibacterial Resistance Leadership Group in 2013 and has been funding researchers trying to figure out how to outsmart these invaders.

That's where UCF infectious disease specialist Debopam Chakrabarti comes in. The College of Medicine researcher is using moldy breakfast cereal to help find more effective ways of dealing with one of the world's deadliest diseases – malaria. Debopam Chakrabarti, an infectious disease specialist at UCF, is using fungus-derived compounds to gain new knowledge about this long-standing parasite that's becoming increasingly resistant to current drugs. While not a huge threat in the United States, malaria is a killer, especially in sub-Saharan Africa.



There is a pressing need for novel therapeutic options to treat multidrug-resistant malaria ... Current therapies are very effective against malaria, but the problem is the parasite is developing resistance.



According to the World Health Organization, malaria is responsible for more than 409,000 deaths per year, and roughly 80 percent of these deaths occur in children under age 5. The disease is transmitted through the bite of an Anopheles mosquito carrying the Plasmodium parasite. Patients with malaria often experience fever, chills, and flu-like symptoms and without treatment may die.

Chakrabarti has partnered with Robert Cichewicz, a natural-product chemist from the University of Oklahoma, who has collected over 65,000 fungal isolates — primarily through



crowdsourced soil sample collection. During his early culturing efforts, Cichewicz discovered that the doughnut-shaped cereal, Cheerios, provides the ideal growing condition to cultivate these fungi. At the Chakrabarti lab, the fungal byproducts are studied for their ability to kill Plasmodium, the parasite that causes malaria.

The sugar in Cheerios provides a stable nutritional source for the fungi, and the cereal's symmetry in size and shape provides a precise, uniform growing environment. Small variations in media can alter fungal growth, meaning researchers can't consistently produce the same set of results with each experiment unless the growing material is homogeneous from batch to batch as with Cheerios.

The team has so far screened over 4,000 fungal species extracts, as well as pure compounds derived from fungi. Their preliminary

screening has identified more than 150 fungal extracts and compounds with potent antiplasmodial activities.

Their five-year project, which began in 2020, hopes to narrow this number to 25 lead compounds with verified antimalarial benefits at various stages of infection, which can be developed into therapeutic drugs. Once the active fungal component is isolated, the UCF team will study them to understand their chemical mechanisms and screen them for toxicity.

The National Institutes of Health (NIH) funded Chakrabarti's research through a \$3.8 million grant.

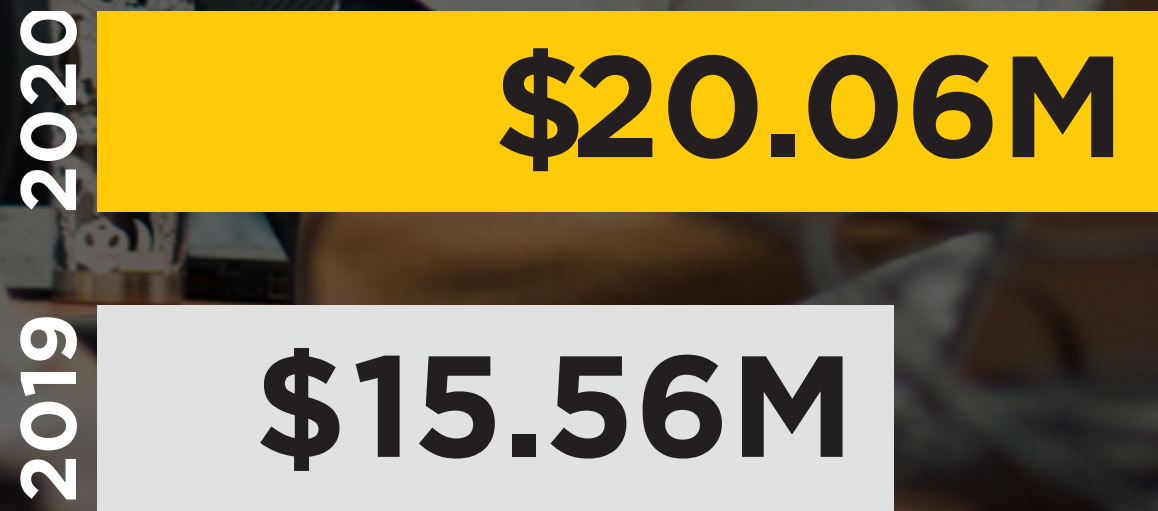
"There is a pressing need for novel therapeutic options to treat multidrug-resistant malaria," Chakrabarti says. "Current therapies are very effective against malaria, but the problem is the parasite is developing resistance. And so even though this will be a long and tedious project, it's important to have new drugs being developed in the pipeline and play our part in contributing to the global malaria elimination campaign."

Infectious disease researcher Kyle Rohde is also using fungi as a weapon against another drug-resistant infection - tuberculosis. Through a partnership with Florida Atlantic University's Harbor Branch Oceanographic Institute, his lab team screens extracts derived from fungi growing on sea sponges and other marine organisms for their ability to kill the bacteria that causes tuberculosis - a highly contagious disease that is one of the top 10 causes of death worldwide.

"One of the biggest problems is the lack of effective treatments," Rohde says. "Tuberculosis is very difficult to treat and in most cases, takes six to nine months of taking at least four drugs daily. And most of the drugs we have only kill bacteria that are trying to replicate, so we need drugs that can kill those dormant, drug-resistant ones."

\$20.06M

In grant funding awarded to the
College of Medicine



\$13.23M
Federal

\$3.09M
State and Local

\$3.73M
Industry and Other



Gabriel Krivenko

First-Generation and Third-Year Medical Student

Career Aspiration: Pediatric Cardiologist

Research: The Baltimore native, who grew up speaking Russian, is all about helping prevent tragedies. It’s what led him to work alongside cardiologists at Nemours Children’s Hospital who are investigating sudden cardiac death among athletes. Sudden Cardiac Death (SCD) is triggered by lethal electrical heart rhythms that often go undetected, especially in young people. A student at Cocoa Beach High School in Brevard County, Florida collapsed during a soccer match and died from SCD a few years

ago. The non-profit, Who We Play For, worked with the school district, which led the district to require electrocardiogram testing before students are allowed to play sports. Brevard is among the first districts in the nation to require

“

I want to become a doctor because my maternal grandfather died of a misdiagnosis.

”

testing. Krivenko is collecting data from the screening of the district’s middle and high school

student athletes to determine whether the screenings are effective at identifying students who have the potential heart issue early, thus preventing another tragedy.

“I want to become a doctor because my maternal grandfather died of a misdiagnosis. I never had the privilege of meeting him, but I still sense how this tragedy has affected my family. My goal is to prevent other families from experiencing what my mother had to experience when she lost her dad.”

► Top Faculty Sponsored Research

- Hongxia Zhou
- Xugang Xia
- Griffith Parks
- Debopam Chakrabarti
- Amber Southwell

► Top Published Faculty

- Michal Masternak
- Saleh Naser
- Chandrakala Aluganti Narasimhulu
- Zixi Cheng
- Xiaoman Li
- Ratna Chakrabarti

* Data provided by Academic Analytics for tenure and tenure-earning faculty.
* Publications include books, articles, and conference proceedings for calendar year 2020.



From Social Stressors to Social Distancing

By: Julie Harper and Carolyn Petgano

While working as a labor and delivery nurse in a hospital outside of Chicago, Illinois, Carmen Giurgescu witnessed firsthand the health disparities among pregnant Black women.

“You could see the higher levels of stress Black women were experiencing as well as see the outcomes, with higher rates of preterm births and pregnancy complications,” she says.

Today, 25 years later, those health disparities are still present in the U.S. It’s a staggering statistic. Pregnant Black women have a 50 percent higher chance of experiencing a preterm birth, when a baby is born before 37 weeks, than white women, according to the U.S. Centers for Disease Control and Prevention. Babies born prematurely have a higher risk of disability or death.

It’s why Dr. Giurgescu, a certified women’s health care nurse practitioner and associate dean for research in UCF’s College of Nursing, has devoted her research to improve outcomes for Black women and their babies.

Giurgescu is currently leading two National Institutes of Health (NIH)-funded research projects to identify factors related to the high rate of preterm births among Black women. She is the principal investigator on a \$3.8 million R01 study examining the effects of social stressors and systemic inflammation on preterm birth in Black women, and co-principal investigator on a \$1.8 million study examining paternal role in adverse birth outcomes in Black families.



Pregnant Black women have a 50 percent higher chance of experiencing a preterm birth, when a baby is born before 37 weeks, than white women, according to the U.S. Centers for Disease Control and Prevention.



Determining Stress Sources to Reduce Risk

Prior research has shown that women who live in neighborhoods with high poverty rates have a higher risk of preterm birth compared to those who live in better neighborhoods.

Giurgescu says what has not been studied are women’s perceptions of their environment.

“There may be two women living in the same neighborhood, but they may experience it differently, and they may have different stress levels based on those perceptions,” Giurgescu says.

The researchers will examine if perceived social stressors, such as living in a disadvantaged neighborhood or experiencing racial discrimination, increase psychological stress and depressive symptoms resulting in greater systemic inflammation and increased risk for preterm birth among Black women. Research is currently underway, recruiting participants in Detroit, Michigan; Columbus, Ohio; and Orlando, Florida.

“My hope is to raise awareness about the disparity in preterm birth, and factors that may relate to preterm birth, among Black families to develop interventions that have the potential to improve birth outcomes,” Giurgescu says. “For clinicians to consider not just the medical history, but also the social determinants of health when we assess a woman’s life and a woman’s pregnancy.”

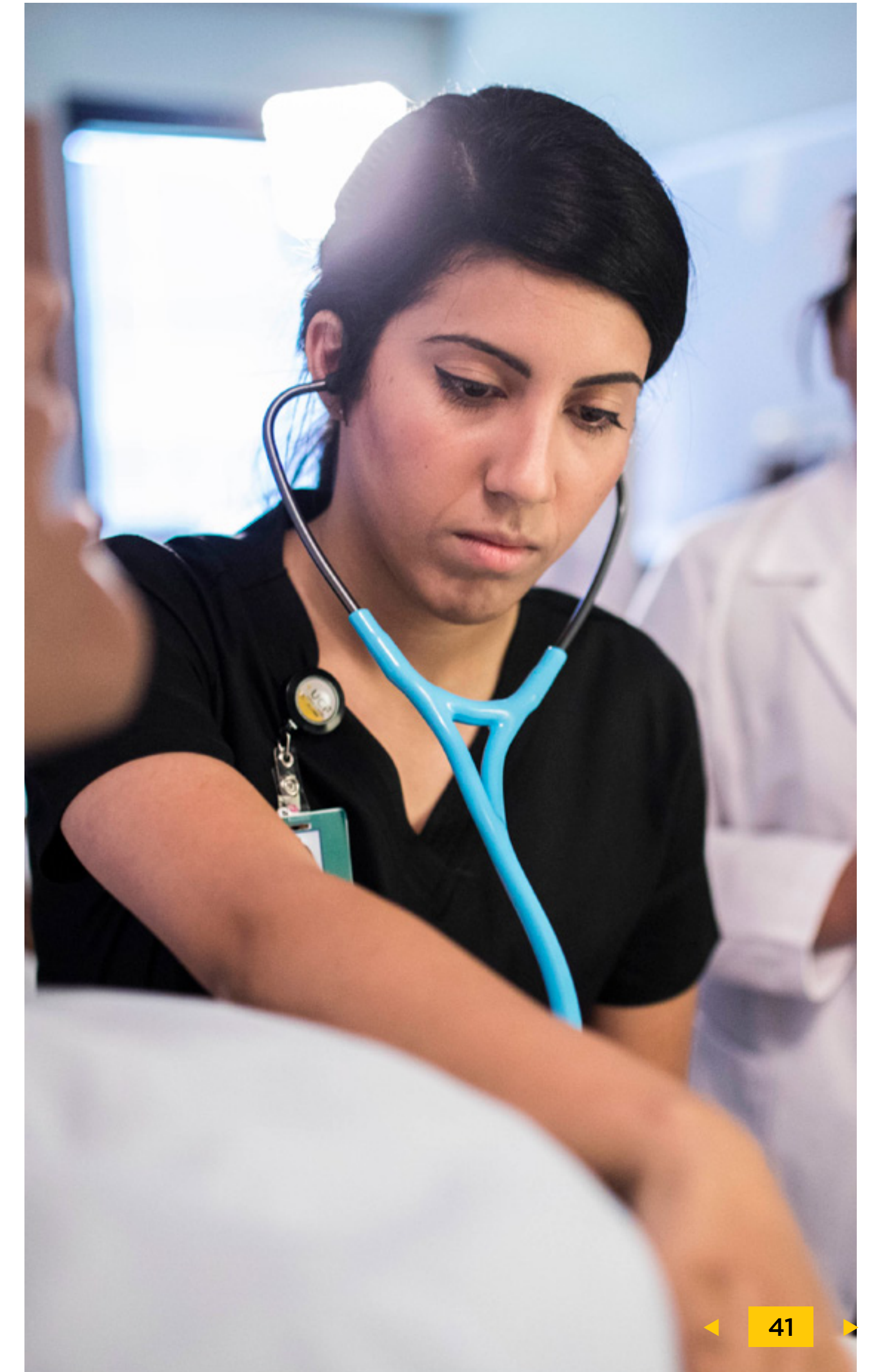
Nation’s First Examining Experiences During A Pandemic

This past year, Giurgescu was also awarded \$486,000 in supplemental funding from the NIH to explore pregnant Black women’s experiences during the COVID-19 pandemic. “No published research has examined pregnant Black women’s experiences during a viral pandemic such as the one we are experiencing,” she says.

Black women are especially vulnerable during the pandemic. Racial disparities in COVID-19 prevalence and death rates among Blacks, challenges to social distancing, economic hardship, and discrimination in testing and healthcare may increase stress that Black women experience.

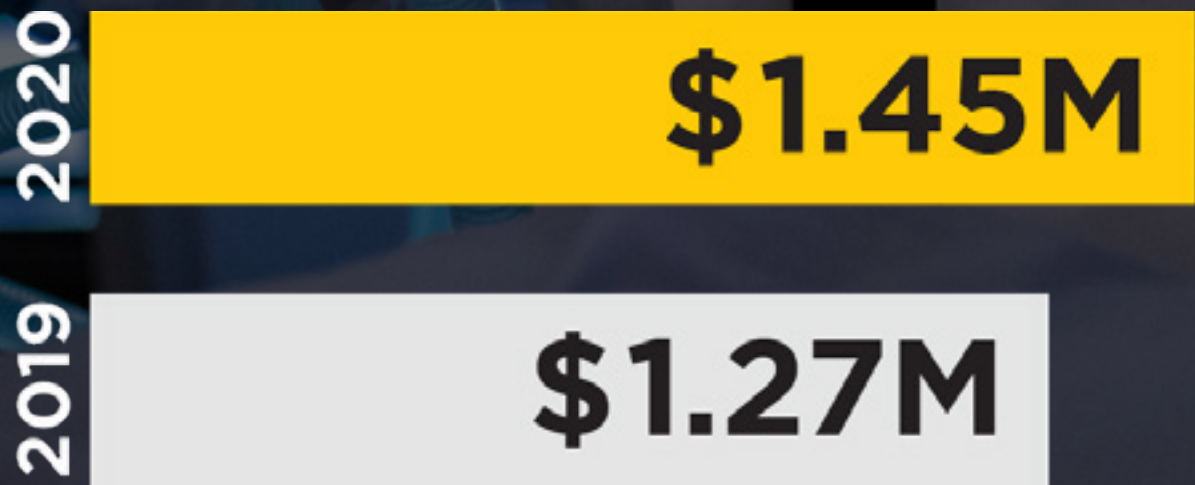
“We have rich data for these women before the pandemic,” says Giurgescu. More than 600 Black women were already participating in the NIH R01 study prior to the pandemic. The supplement expanded the research by examining the experiences

of these women during the pandemic and will compare their psychological distress and other factors pre-pandemic and during the pandemic.



\$1.45M

In grant funding awarded to the
College of Nursing



\$987,425
Federal

\$193,186
State and Local

\$348,145
Industry and Other



Shelley Jones

Nursing BSN

Career Aspiration: Earn a doctoral degree to become a college professor and researcher.

Research: Shelley Jones already works as a labor and delivery nurse at a local hospital, but she is working toward eventually earning a



UCF has given me the opportunity to conduct research with incredible and passionate researchers in my field.



doctoral degree so she can teach future nurses and conduct research based on her experience in the field. The California native is compiling and analyzing peer-reviewed articles on the subject of nursing education related to LGBTQ health care. Her goal is to be able to offer modifications specific to nursing education that have the potential to make a profound impact on the day-to-day care future nurses provide to their LGBTQ patients and decrease the health care disparity that currently exists. Jones came up with the research topic from observations throughout her career as well as her personal experience as a lesbian patient.

“One of the basic tenets of nursing is the use of evidence-based practice. Research guides us and helps to identify best practices and is therefore vital for the field of nursing. UCF has given me the opportunity to conduct research with incredible and passionate researchers in my field. With their collaboration, I believe that we can help to elicit change in nursing education related to LGBTQ patients.”

▶ Top Faculty Sponsored Research

- Carmen Giurgescu
- Melanie Keiffer
- Gregory Welch
- Susan Chase
- Francisco Guido-Sanz

▶ Top Published Faculty

- Gregory Welch
- Desiree Diaz
- Mindi Anderson
- Victoria Loerzel
- Christopher Blackwell
- Brian Peach

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



CREOL Researchers Developing Microscope to Map Genes and Proteins in Four Dimensions

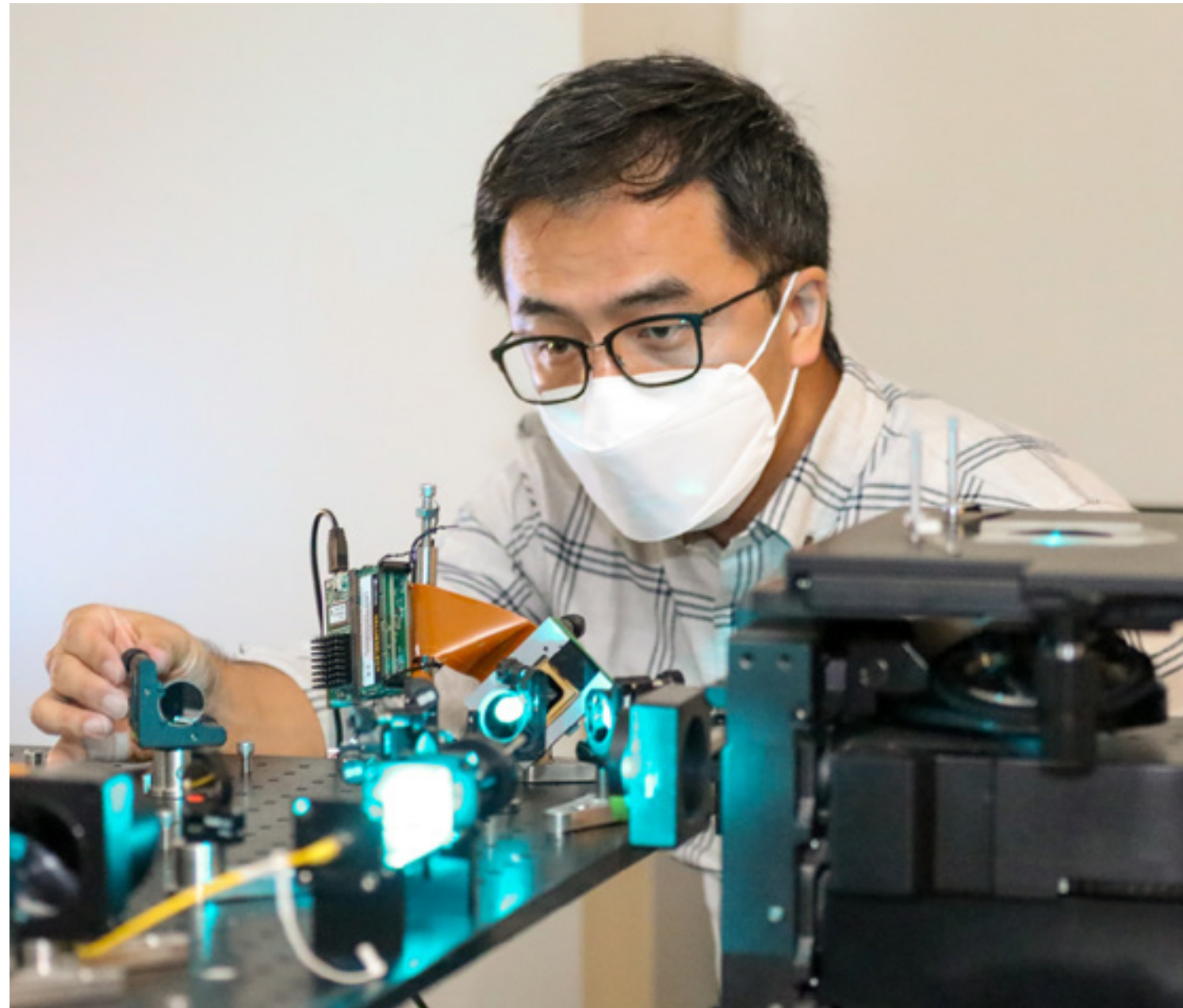
By: Kyle Martin

A global partnership bridging biology and optics promises exciting breakthroughs in clear, real-time imaging of a cell's nucleus and its role in disease.

UCF's Optics and Photonics Assistant Professor Kyu Young Han joins around 200 scientists pursuing the development of a microscope capable of mapping genes and proteins in four dimensions. That objective is funded by a five-year, \$4.2 million grant linked to the National Institutes of Health's 4D Nucleome Program (4DN).

Today's work is the latest step in work launched more than 30 years ago as the Human Genome Project. Successfully mapping all genes of Homo sapiens in 2003 laid the foundation for projects like 4DN to continue probing and understanding the development of diseases, cancer, and infectious agents like viruses.

With the proof of concept near completion, the next step will be reducing the vibrations that currently muddy the images at tenths



of a nanometer resolution. The end goal is a microscope that offers high-resolution and high throughput at an affordable cost. "Eventually we'll decrease imaging time from several days to several hours," he says.



Today's work is the latest step in work launched more than 30 years ago as the Human Genome Project.



Tracking and understanding the movement of chromosomes is one objective of a complete microscope. Today's researchers know all the human genome sequences and how they are related to diseases. But this is not the end of the story. Chromosomes that carry genomes move inside the cell and often follow the same path, but how this subtle movement is established and its influence on gene expression level remains unclear. Cracking that mystery holds big potential for advancements in multiple fields, including soft matter physics, genetics, neuroscience, and disease pathology. Other applications include understanding the variations between cell behaviors.

One theory on the organization and movement of chromosomes within the nucleus comes from Andrew Belmont, a close partner on the project from the School of Molecular and Cellular Biology at the University of Illinois at Urbana-Champaign. It's suspected that at least two compartments in the cell nucleus are responsible for gene expression. One is the nuclear speckle periphery, but the other remains a question mark. The answer could come from another partner, Yaron Shav-Tal of Bar-Ilan University in Israel. His expertise lies in RNA movement and transport within cells. Together they plan to shed new light on nuclear dynamics and their impact on the biology of gene regulation.

Blending the disciplines of biology and optics is rewarding for Han, but he started his undergraduate studies with little appreciation for organics. By the time he began pursuing

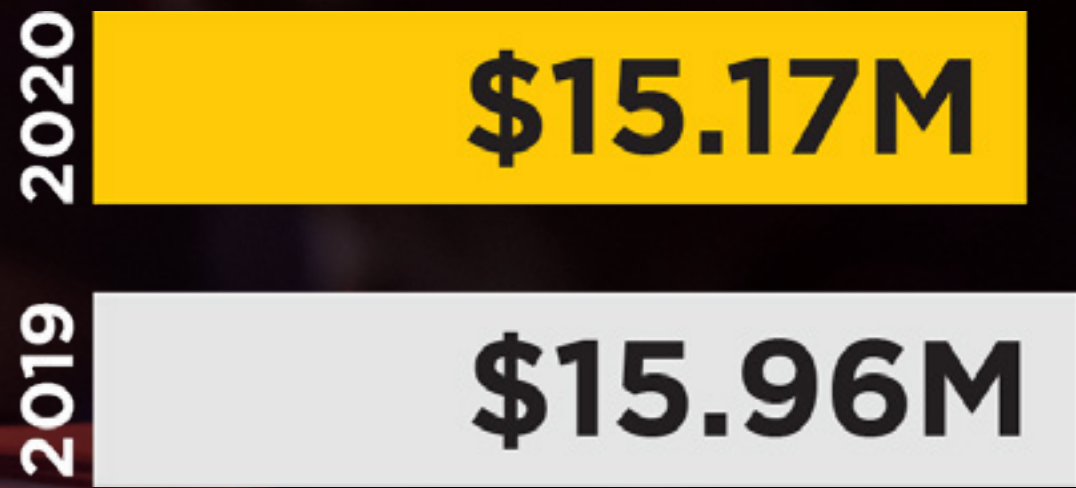
postdoctoral research, he was designing new optical tools for biological applications like studying DNA-protein interactions, RNA imaging in live cells, and revealing nuclear structure in mammalian cells. In 2018, he developed a highly inclined swept tile microscope, which can be used for single-molecule imaging in a very large imaging area.

NIH previously invested in Hans' work in late 2020, through a grant connected to the Maximizing Investigator's Research Award. The award recognizes early-stage investigators and provides \$1.7 million over five years toward the development of a bioengineering tool and imaging system capable of imaging multiple proteins in a single cell. Current techniques require weeks of work; Han, in collaboration with two of his graduate students, Chun-Hung Weng and Jinhan Ren, and researchers from Rutgers University and the University of Illinois, expects to cut that time to 24 hours.



\$15.17M

In grant funding awarded to the
College of Optics and Photonics



\$7.47M
Federal

\$1.18M
State and Local

\$6.52M
Industry and Other



Jessica Peña

Optics and Photonics PhD

Career Aspiration: Laser scientist working in industry or a government lab.

Research: Peña works in CREOL’s Laser Plasma Laboratory. Her research focuses on the propagation of high-energy, ultrashort pulse lasers. These laser pulses are so intense that propagating through air induces breakdown in the air. This results in a long plasma “wire” the width of a human hair. This intense plasma channel has many unusual properties the lab is trying to better understand. Application for this technology ranges from defense to communications to machining. Peña propagates

The most important skills I have developed while conducting research are my problem-solving skills.

these laser plasmas at low pressures and in aerosol dense environments like clouds. She also creates these plasma structures at a kilometer long outdoor range on the Space Coast.

“The most important skills I have developed while conducting research are my problem-solving skills. Lab work requires problem solving on the spot and continually learning how to most efficiently and effectively find solutions to experimental problems. Several other key research components are tied in with this skill. One of these is the importance of collaboration

and teamwork, since everyone approaches experimentation and problem solving differently. Learning to problem solve as a team has been particularly important when working on the 1 km laser range, since experiments there cannot be done alone. Also, I have found that I’ve developed my communication skills while conducting research. Being able to efficiently communicate research at various levels of expertise is important in advancing research projects and producing high-quality research. This can range from communication and discussion within the group to presenting at a technical conference to explaining my research to my family.”

▶ Top Faculty Sponsored Research

- Ayman Abouraddy
- Robert Crabbs
- Martin Richardson
- Guifang Li
- Rodrigo Amezcua Correa

▶ Top Published Faculty

- Shintson Wu
- Kathleen Richardson
- Rodrigo Amezcua Correa
- Demetrios Christodoulides
- Guifang Li

* Data provided by Academic Analytics for tenure and tenure-earning faculty.
* Publications include books, articles, and conference proceedings for calendar year 2020.



From Bloom to Bust: Harmful Algae Blooms and Their Impacts on the Waterfront Economy

By: Sergio Alvarez

Rosen College of Hospitality Management Assistant Professor Sergio Alvarez and his team are examining the costs of harmful algae blooms (HABs) and the mechanics that determine their socio-economic impacts in coastal communities. The Gulf of Mexico Coastal Ocean Observing System (GCOOS) has funded the research that looks at *K. brevis* blooms from 2017-2019 in Florida. Dr. Alvarez wrote a first-person account for this year’s annual report explaining the project.

Clean water is the thread that ties waterfront communities together, drives their economies, and provides a high quality of life for residents and an unforgettable experience for visitors. However, as human activities threaten the world’s waterways in multiple ways, Harmful Algae Bloom (HAB) events pose increasing biological and socio-economic risks. Nutrient runoff from streets, lawns, septic tanks, and farms flows into waterways and leads to eutrophication. In addition, climate change is leading to warmer water temperatures in the ocean and other water bodies. Independently, each of these factors is known to foster the growth of microorganisms that cause HABs. Together, they can provide highly suitable conditions for the occurrence of HABs, raising the prospect for a future where HAB events are more frequent and intense.

Figure 1. The number of months with documented *K. brevis* blooms in Florida has increased notably since record-keeping began in 1878. In the decade between 2008 and 2018, there was an average of 5.5 months per year with reported blooms. Data published by the Florida Fish and Wildlife Conservation Commission.

While shocks like hurricanes receive more attention, the “slow violence” of stressor events such as HABs may hold the answer to building resilient waterfront economies. The state of Florida has recently experienced several HABs, most notably outbreaks of red tide (*Karenia brevis*) and cyanobacteria (*Microcystis* spp., and *Anabaena* spp.), with recent *K. brevis* blooms lasting from October 2017 through February 2019. HABs have become a widespread environmental, economic, and public health problem along with numerous waterfront communities in Florida that are

now having to live with massive fish kills and respiratory irritation caused by toxins released by the harmful algae. However, the true costs of harmful algae blooms (HABs) and the mechanics that determine their socio-economic impacts are for the most part unknown. To better understand the magnitude of these impacts, and the mechanisms through which these impacts develop, the Gulf of Mexico Coastal Ocean Observing System (GCOOS), has funded this interdisciplinary case study of Florida’s 2017-2019 red tide (*Karenia brevis*) bloom. The central objective of the project is the identification of direct, indirect, and induced socio-economic impacts caused by the 2017-2019 *K. brevis* bloom in Florida. A secondary objective of the research is to better understand how information about the harmful algae blooms moves across social media, and how “HAB discourse” on social media may be driving or amplifying economic losses for tourism and the blue economy more broadly.

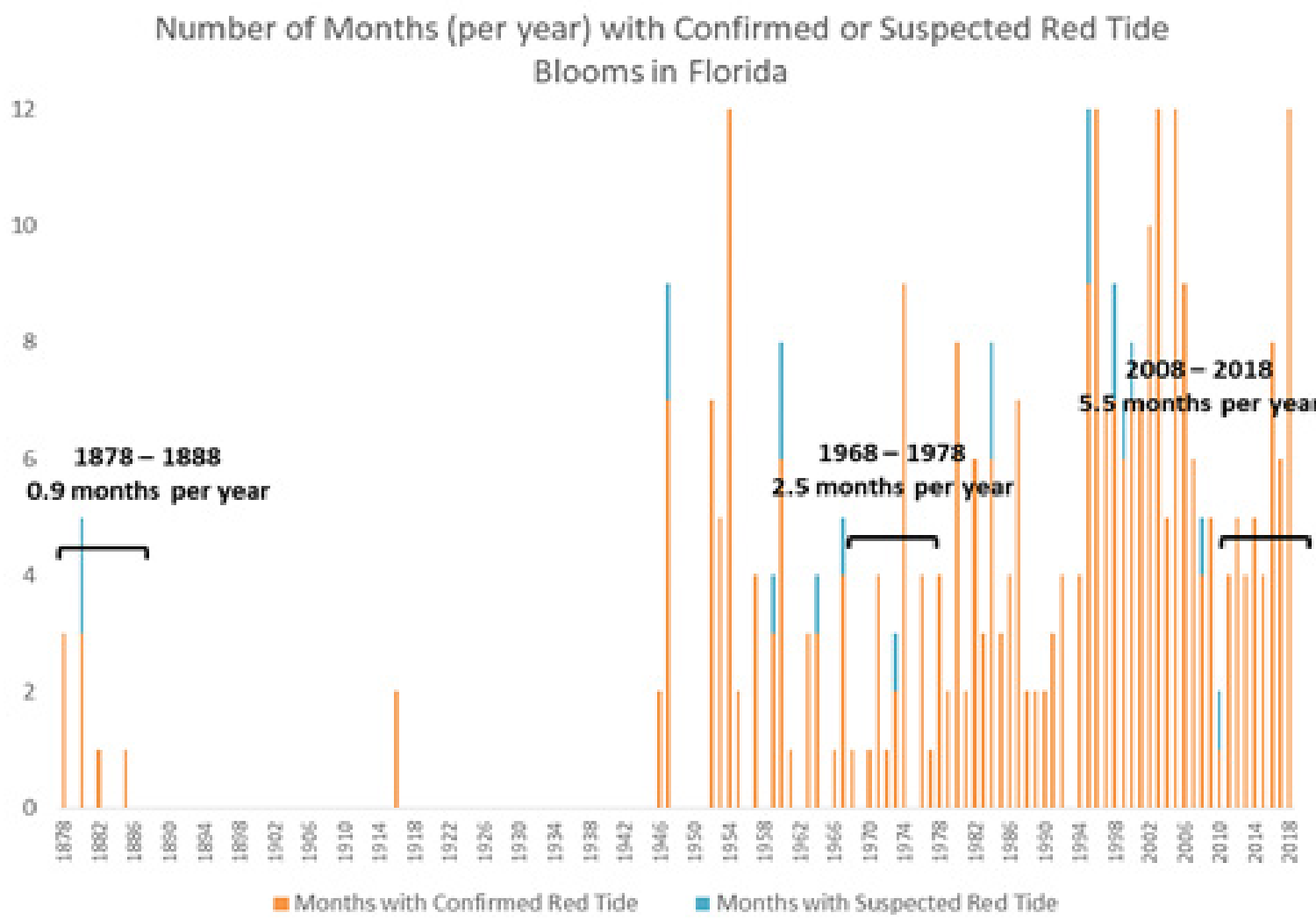


Figure 1.

“We know that harmful algal blooms drive people away from the waterfront,” says Sergio Alvarez, assistant professor with the Rosen College of Hospitality Management, and principal investigator. “With this project, we will identify how Florida’s



red tide has been impacting the economy in terms of reduced sales from different economic sectors. But we are also testing the idea that information from social media could be more of a driver in these impacts than so-called objective measures, like water sampling data.” Dr. Alvarez is leading the econometric component of this research project.

Heather O’Leary, assistant professor in the Department of Anthropology at the University of South Florida, and co-principal investigator of the study is leading the social media analytics component of the project.

“When everyday people make the small-scale and large-scale decisions that ultimately impact Florida’s economy, they’re not necessarily checking biophysical monitoring or formal economic metrics,” she says. “They’re more likely making those decisions by checking with friends and colleagues on social media. By keeping one eye on social media and the other on economic metrics, we’re able to get a better sense of how these interact to make HABs worse or to lessen their impact.”

“

When everyday people make the small-scale and large-scale decisions that ultimately impact Florida’s economy, they’re not necessarily checking biophysical monitoring or formal economic metrics.

”

Once complete, the researcher expects to provide insights that may shape public and decision-maker opinions, and thus lead to policy changes and/or management improvements that are necessary to alleviate the burden on communities affected by HABs. Specifically, the findings of this research will inform discussions on the overall economic costs of the red tide blooms and hence the potential benefits of reducing the incidence and severity of these blooms.

Currently, there is little information of this type available. Thus, this new information about the costs of red tide blooms may help answer questions such as, how much should society spend in ensuring these events are prevented or mitigated in the future?

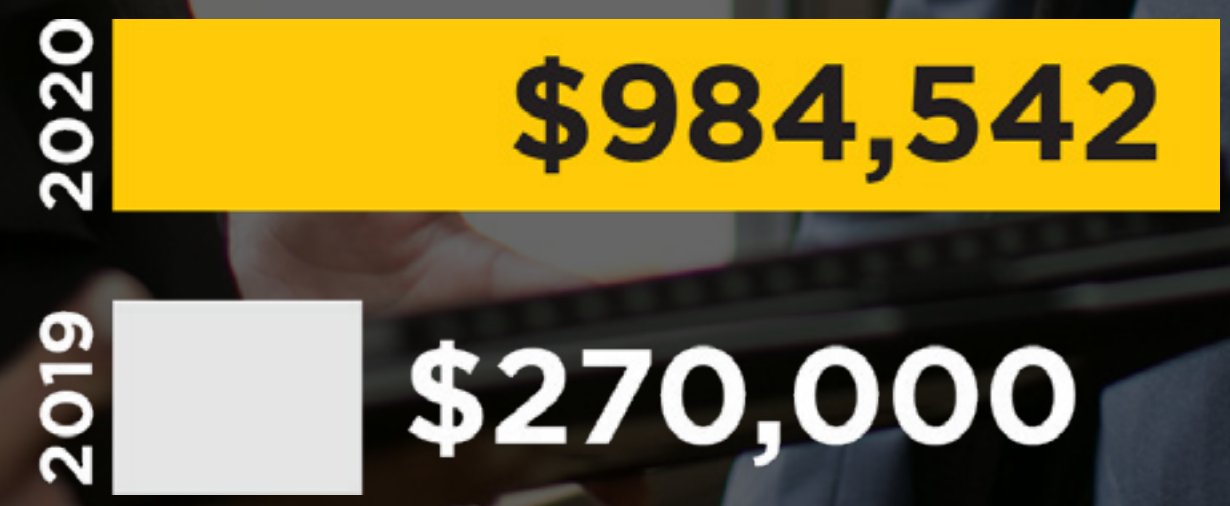
Similarly, by providing information on what economic sectors are most impacted by the red tide blooms, the findings may inform the targeting of strategies and policies to support these sectors and prevent bankruptcies or layoffs. Furthermore, by identifying the economic sectors that suffer the heaviest impacts from the red tide blooms, this information may also inform future research on the impacts to the workforce in these sectors.

“This project has a great value for tourism research as it contributes with an interdisciplinary research framework, which is replicable to all destinations that experience any type of ecological crisis despite the temporal and spatial scale of their impacts,” says Frida Bahja, a doctoral candidate at the Rosen College. Bahja is conducting a social network analysis in the study to better understand the structure of HAB discourse.



\$984,542

In grant funding awarded to the
Rosen College of Hospitality
Management



\$586,539
Federal

\$193,186
State and Local

\$204,816
Industry and Other



Maksim Godovykh

Hospitality Management PhD

Career Aspiration: To establish and run an international multidisciplinary center for tourism impact research that will provide expertise to evaluate and maximize the quality of life, health, and well-being of residents living in tourist destinations around the world.

Research: Godovykh and a team of researchers from Rosen are exploring the positive and negative impacts of tourism development. The team is coming up with recommendations for governments, destination management organizations and other tourist destination stakeholders to improve the quality of life, health,

and well-being of local communities in different types of tourist destinations.

“
... the positive economic impacts of tourism are often outweighed by the negative social, cultural, environmental, and psychological outcomes ...
”

“Tourism is traditionally described as one of the main forces of economic growth for regional and national economies that provides significant earnings and tax revenues, attracts investments, and creates jobs. However, the positive economic

impacts of tourism are often outweighed by the negative social, cultural, environmental, and psychological outcomes for local communities, and I think that it is important to shift the emphasis of tourism statistics from the numbers of visitors and revenues to improving the quality of life, health, and wellbeing of local people. As a result, our research projects aim at developing the methods, measurements, and models to explore the impacts of tourism on residents’ quality of life, health, and well-being for different types of tourist destinations and maximize the positive impacts.”

▶ Top Faculty Sponsored Research

- Sergio Alvarez
- Nan Hua
- Arthur Huang
- Deborah Breiter Terry
- Jeannie Hahm

▶ Top Published Faculty

- Fevzi Okumus
- Asli Tasci
- Xiaoxiao Fu
- Wei Wei
- Tingting Zhang

* Data provided by Academic Analytics for tenure and tenure-earning faculty.
* Publications include books, articles, and conference proceedings for calendar year 2020.



Recycled Potato Chips Proving Successful Method for Oyster Restoration

By: Kyle Martin

Photos By: Linda Walters

An unusual oyster reef fashioned from potato chip byproduct continues to prove its worth after two years of deployment in the Indian River Lagoon.

The manmade reef is an experimental answer to the global overharvesting of shellfish that’s wiped away roughly 85 percent of natural reefs over the past 100 years. Losing oysters leaves shorelines like the ones along Florida’s east coast vulnerable to erosion, pollution, and dwindling biodiversity.

“Harmful algal blooms became frequent after the loss of oysters,” says Pegasus Professor Linda Walters, director of UCF’s Coastal and Estuarine Ecology Lab (CEELAB). “The reefs can stabilize shorelines and provide nutrients to other animals. We need them so that synergy in ecosystem services may be restored.”

CEELAB wanted to rebuild these lost reefs and restore the coastline, but it was critical their methods had no unintended, harmful consequences. They started with plastic mesh, which brought more than 14 million oysters to Mosquito Lagoon waters near New Smyrna Beach.



The reefs can stabilize shorelines and provide nutrients to other animals. We need them so that synergy in ecosystem services may be restored.



Their search for a truly biodegradable material, however, led them to the Netherlands and a company called BESE Ecosystem Restoration Products. BESE-products offered an innovative mesh made from leftover potato starch collected from chip factories that is durable in saltwater and nature friendly. The target lifetime use for the mesh is 5-10 years.

Today, Walters reports the reefs are measuring roughly 1,000 oysters per square meter — the gold standard for success in Mosquito Lagoon. They’re deploying three more BESE reefs over the 2021 summer — the “best indicator that they work,” Walters says.

The 2021 additions bring CEELAB approximately 70 percent toward their goal of restoring the Canaveral National Seashore in northern Mosquito Lagoon to its condition pre-1943. That’s the first year St. Johns River Water Management District took aerial photos of the bay. It’s estimated that boat wakes and storms have decimated 40 percent of its oyster bed acreage since then.

Reef restoration has positively impacted every step of the lagoon’s food chain, from the worms and crabs that live in the mud below the oysters to the fish that inhabit the crevices formed by oyster clusters. This feeds and improves the habitat for threatened and endangered birds, including the American oystercatcher, little blue heron, and tricolored heron. Oyster restoration also stabilizes sediment, allowing seagrass to grow and feed manatees.

Walters compares the BESE reefs to a similar consistency as wood with no significant negative impacts on the sediments of the lagoon. Secondary tests on jute-infused cement structures and shell bags from crab-pot mesh are also showing promise. They were pleased to report on Earth Day 2021 that “our team is 100 percent biodegradable in our restoration materials.”

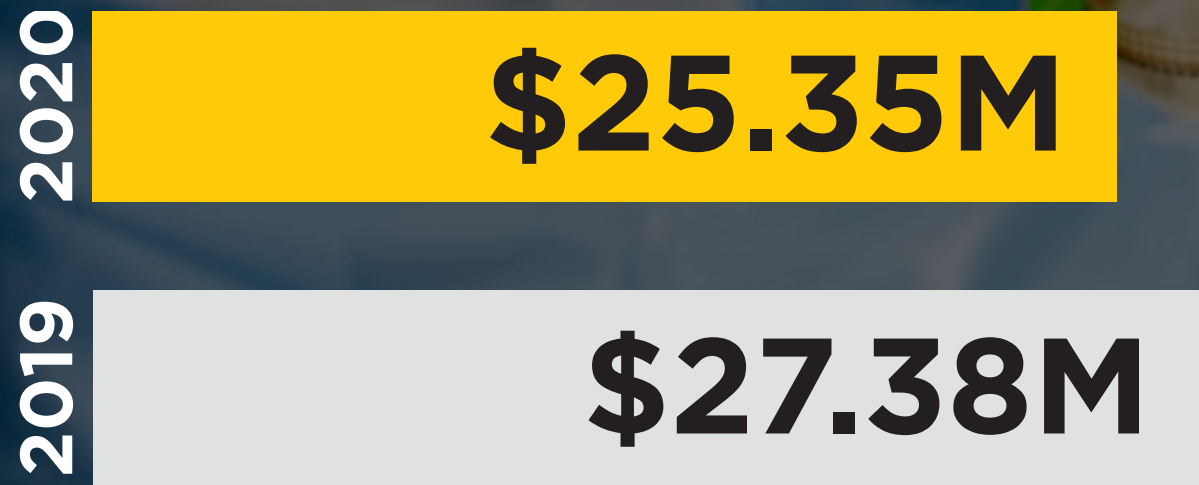
“It’s more work to prepare at a higher cost, but it’s better for the environment and that’s ultimately what we’re all about,” Walters says.

Success on Florida’s coast augers well for similar projects in the U.S. The National Oceanic and Atmospheric Association, for instance, currently funds more than 70 restoration projects in 15 states.



\$25.35M

In grant funding awarded to the
College of Sciences



\$21.33M
Federal

\$1.86M
State and Local

\$2.16M
Industry and Other



Taylor Collore

Anthropology MA

Career Aspiration: To protect cultural resources, propose and complete rehabilitation and restoration projects as a forest archaeologist for the U.S. Forest Service, which is part of the U.S. Department of Agriculture.

Research: Collore, a Tampa native, works with UCF Professor Edward Gonzalez-Tennant to analyze LiDAR data (essentially an aerial photo using lasers) to search for indigenous people's mound sites within the Ocala National Forest. This type of analysis allows Collore to see elevation changes beneath the dense tree canopies in the forest that indicate mound sites.

“Collore’s goal is to find mound sites that can be protected and which will help better understand an important part of Florida’s history.”

Mound sites served various purposes for indigenous people for more than 6000 years including terraforming, burial practices, and ritual sites. Many mound sites were made using snail and shellfish shells, but in the early 20th century many were destroyed to use the shell as road fill. Collore’s goal is to find mound sites that can be protected and which will help better understand an important part of Florida’s history.

Collore discovered his passion almost by accident. He spent several years in the Navy as

a mechanical nuclear operator. When he left the Navy he pursued a bachelor’s degree in criminal justice after being inspired by the early days of the Black Lives movement. To finish his degree, he had to complete one more science elective, which was in anthropology. The rest is history. When arriving at UCF, he was focused on Maya Archaeology, “but a field visit to Belize fell through when Covid hit and an opportunity to join Dr. Edward Gonzalez-Tennant, in the Ocala National Forest arose. I initially came to him to discuss photogrammetry technology, which he is an expert in, and he showed me some of his preliminary LiDAR data and I was hooked from then on.”

► Top Faculty Sponsored Research

- Yan Fernandez
- Enrique Del Barco
- Daniel Britt
- Talat Rahman
- Xiaohu Xia

► Top Published Faculty

- Kuppalapalle Vajravelu
- Abdelkader Kara
- Robert Dvorak
- Peter Hancock
- Talat Rahman

* Data provided by Academic Analytics for tenure and tenure-earning faculty.

* Publications include books, articles, and conference proceedings for calendar year 2020.



Coursework + High Impact Learning Experiences Are a Winning Combination

By: Barbara Smith

The Division of Student Learning and Academic Success (SLAS) prepares students for what's next. It guides undergraduates throughout their time at UCF by helping them explore majors, register for classes, and succeed in college-level courses. The division dedicates significant resources to help students learn in real-world settings through high-impact practice experiences including internships, study abroad, and undergraduate research.

For students who plan to attend graduate or professional school, SLAS helps them consider their options, create an academic plan, and navigate the application process. Its Academic Advancement Programs (AAP) has a proven track record of enabling students to gain admission to top doctoral programs across the world. In fact, in the last five years, more than 50 percent of UCF students who received prestigious awards were AAP students and alumni. Fifty-three percent received an NSF Graduate Research Fellowship and 77 percent are Goldwater scholars.

"Education is not one-size-fits-all," says Theodorea Regina Berry, vice provost, Student Learning and Academic Success and dean, College of Undergraduate Studies. "Each student comes to UCF with an idea of what they want to accomplish in college and beyond. The division helps them to create tangible goals and achieve them."



Each student comes to UCF with an idea of what they want to accomplish in college and beyond. The division helps them to create tangible goals and achieve them.



Victoria Alexander '21 is just one example. She was a McNair Scholar, part of the AAP, and an Interdisciplinary Studies (IDS) major. Alexander knew that she wanted to work with children but was having difficulty finding the major with the right fit.

"In the beginning, not understanding the depths of what I wanted to pursue was my biggest challenge," she explained. "I realized after spending time in some courses that I needed to course-

correct and had to change around my minor and areas of study a couple of times. Thankfully, some people helped me along the way."

With guidance from an advisor, Alexander selected the IDS program. Offered by the College of Undergraduate Studies (CUGS), the program allows students to build an individualized academic path from over 7,000 possible areas of study and minor combinations. The result is graduates with broader perspectives from which to gain insights, strategize, and problem-solve. CUGS's other majors are Environmental Studies and Integrative General Studies.

Delaney McLinden, who is going into her fourth year, is another example of how SLAS and CUGS is allowing her to forge her path to academic, professional, and personal success. An IDS major, her areas of study are chemistry and biomedical sciences, with a minor in medical anthropology. She decided to pursue a career in medicine because she enjoys science and was enthralled by the anatomy and biology courses she took in her first year of college.

"I've always been interested in a lot of different subjects, so I wanted to have space in my schedule to study anthropology, take extra courses in psychology and explore other areas," said McLinden. "With the Interdisciplinary Studies major, I get the chance to do that and have the college experience I wanted."

In addition to pursuing her IDS major, McLinden is working on an anthropological research project looking at the impact of sorority culture on beauty standards and body modification choices. Her project, part of the honors undergraduate research program, will shed light on what beauty standards, if any, are propagated within the UCF sorority community and how those standards impact students' behavior and choices.

"As a member of a sorority, I've found community and friends and opportunities for personal growth," said McLinden. "At the same time, many individuals perceive an undercurrent of social emphasis placed on beauty. Stereotypically, appearance is an important part of being in a sorority. So, I wanted to understand that more."



The project will entail McLinden interviewing sorority sisters and then synthesizing the information and data she collects into an undergraduate thesis. She hopes her findings will help sorority members be more mindful of the role sorority culture plays in decisions they make about how they dress, perceive themselves and others, and interact with their peers. McLinden theorizes that participation in, and consumption of, social media may amplify the influence of those beauty standards.

"It's more of a subconscious understanding, but that unspoken construct may become apparent in behaviors like fat-shaming and fatphobia, changes in attitudes towards food and eating, and judgmental tendencies," added McLinden. "I want to understand if sorority culture plays influencing any of these behaviors and attitudes."

McLinden believes her research will tie into her future career plans by contributing to her understanding of young women in general, a population that will make up a sizable chunk of the people she'll



be serving. It will also give her important insights on subcultures, how people interact, and the beliefs people hold about themselves, and where those come from.

McLinden sees value not just in the lessons she'll learn from analyzing the data, but also in the process of collecting that information. She anticipates that the experience of interviewing 20 study participants will help her better relate to others and develop the rapport-building skills, empathy, and bedside manner that is so important when interacting with patients. In addition, to interviewing sorority members, McLinden will be observing the 2021 sorority recruitment process.

When she's not participating in her sorority, laying the groundwork for her research project, or exploring the many fields that hold her interest, McLinden loves reading fiction. She's also a craft coffee connoisseur and enjoys traveling around Orlando trying different coffee shops. She keeps track of it all, and more details about her life and experiences, in a journal she updates frequently.

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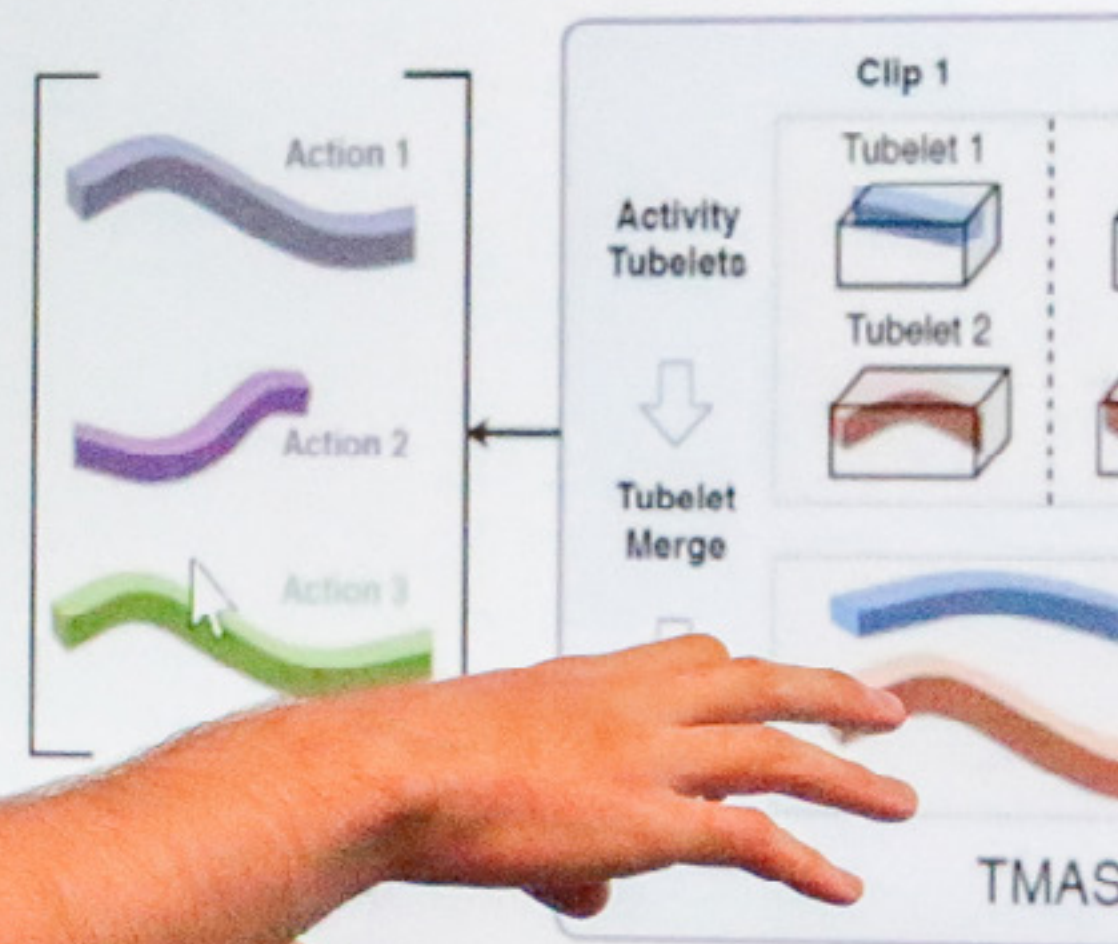
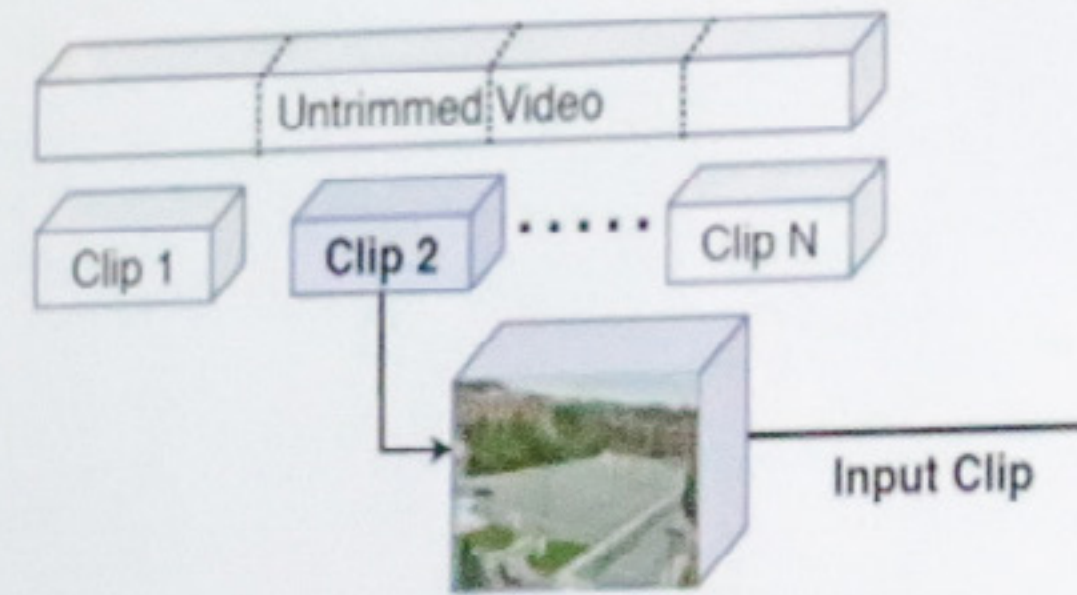
I've always been interested in a lot of different subjects, so I wanted to have space in my schedule to study anthropology, take extra courses in psychology and explore other areas.

”

RESEARCH CENTERS

Going Above and Beyond

Architecture



Top-Ranked UCF Computer Vision Program Continues to Excel in 2020

By: Robert Wells

UCF's Center for Research in Computer Vision (CRCV) is a top-ranked research group that will continue to attract more students with the College of Engineering and Computer Science's newly approved Master of Science in Computer Vision degree that began in Fall 2021.

The center, which includes four core faculty, 13 courtesy faculty, and postdoctoral associates, promotes research in computer vision for applications in national defense, intelligence, homeland security, the environment, biotechnology, and robotics.

From 2010 to 2020, UCF's computer vision ranked No. 10 in the nation by CSRankings.org, a metrics-based ranking system of top computer science institutions around the world.

The new master's degree will teach students to recognize and track objects and events using computer vision, which are critical skills and knowledge needed to succeed in the fast-growing computer vision industry.



The center received \$3.79 million in research funding in 2020, including two U.S. Department of Defense grants for \$1 million each.



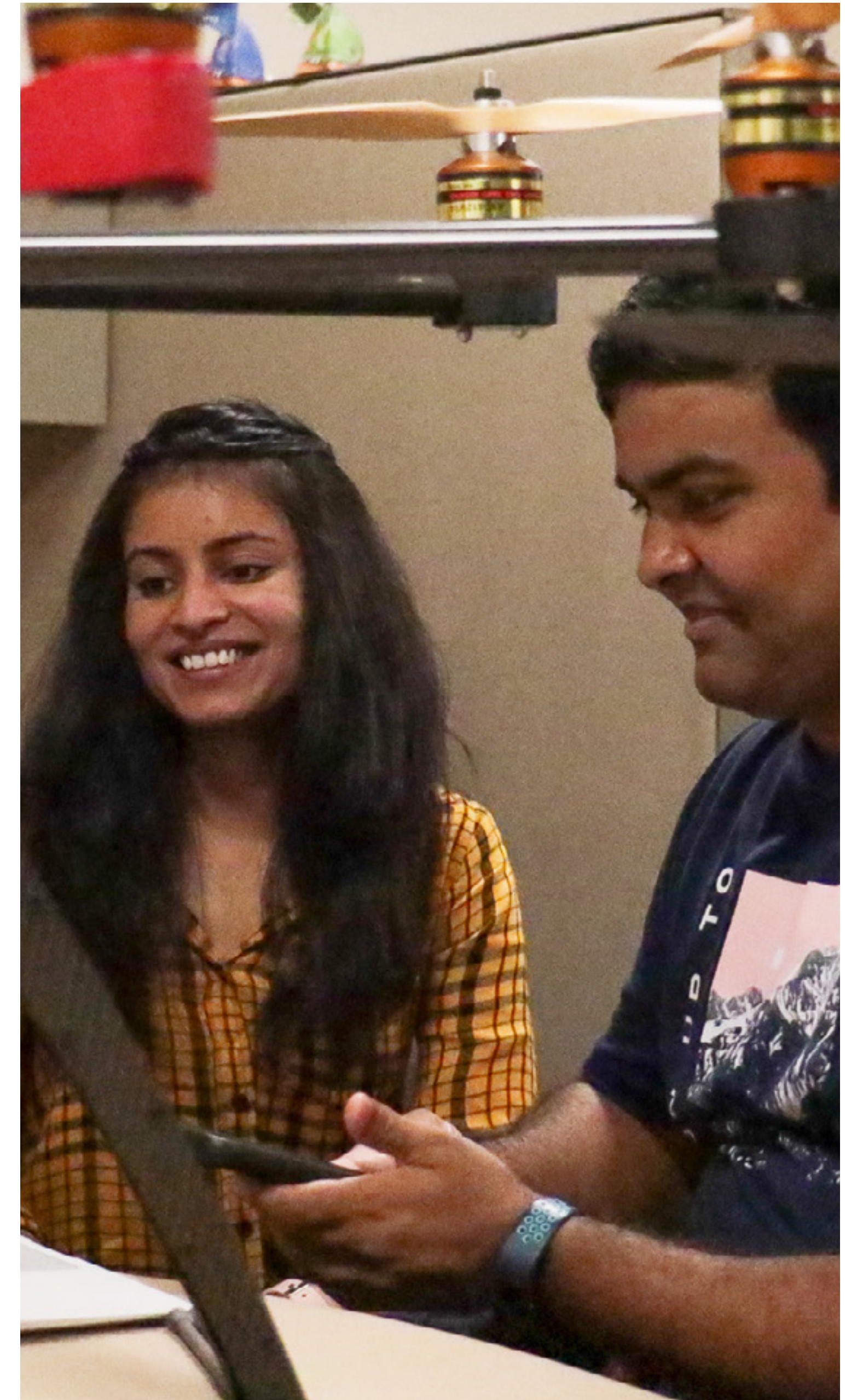
It was a good year for awards as well. The center received \$3.79 million in research funding in 2020, including two U.S. Department of Defense grants for \$1 million each.

These two grants were awarded to center director Mubarak Shah, a UCF Trustee Chair Professor in the Department of Computer Science. The grants fund research to teach computers to detect, understand and build a defense capability against adversarial attacks.

Researchers at the center also received multiple awards and honors, including:

- The UCF-Carnegie Mellon University team won Topic 4 of HeroX Automated Streams Analysis for Public Safety Challenge.
- Shah and a doctoral graduate Yun Zhai won a Test of Time Honorable Mention Award at the Association for Computing Machinery's annual conference on multimedia, special interest group on multimedia.
- CRCV researchers won the International Conference of Pattern Recognition Best Scientific Paper Award. ICPR is the premiere conference in pattern recognition.
- CRCV had six journal papers accepted to the Conference on Computer Vision and Pattern Recognition, which is the 5th ranked top publication venue among all Sciences, according to the h-5 index.
- Shah was recognized received an honorable mention for the Most Influential Scholar Award for his outstanding and vibrant contributions to the field of Computer Vision between 2010 and 2020
- CRCV received the National Science Foundation Research Experiences for Undergraduates site grant for three more years, which means UCF has been serving as an REU site for computer vision for 37 years.

University leaders are working to make the master's in computer vision program available completely online next year, Shah says, and the center will continue world-class research in computer vision and attracting large research grants.





More External Funding led by Up-and-Coming Researchers, Publications Make 2020 a Hit for the Florida Space Institute

By: Zenaida Gonzalez Kotala



The Florida Space Institute (FSI) had some big wins this past year, especially in the area of post-doctoral success.

FSI generated more than \$11.8 million in grants, up from \$9.1 million in 2019. Several of those grants were awarded to researchers just getting started in their academic careers. Post-doctoral scholars are individuals who have earned a doctorate and are conducting independent research.

“One of our biggest success was having three of our post-docs successfully compete and get several research grants,” says Ray Lugo, the center’s director. “Grants to do work in space-related research are very competitive. We have bright post-docs and we work hard to create a collegial environment where junior and senior researchers collaborate to bring home the wins.”

The three post-doctoral scholars are part of UCF’s Preeminent Postdoctoral Program better known as P3. The matching program, sponsored by the College of Graduate Studies, helps help faculty researchers hire postdoctoral scholars.

The Scholars

Estela Fernández-Valenzuela is leading or co-leading four research projects funded by NASA and other groups. Mario de Prá secured five grants that he is leading or co-leading. Charles Schambeau rounds out the team with seven projects that he leading or co-leading.

Fernández-Valenzuela’s work focuses on trans-Neptunian Objects, among the oldest bodies in the solar system. She was also selected to help researchers seeking to use NASA’s James Webb Space Telescope (JWST) once it launches later this year. She received a grant to attend workshops on how to best prepare proposals for time on the telescope, which she then used to set up workshops for scientists in the South and Latin America. She has several degrees including a doctorate in Physics and Space Science from the University of Granada in Spain.

De Prá is working on research that looks at small bodies in the outer main belt with unknown origin, which could relate them to comets or asteroids. To do that, he uses observations from the

Hubble Space Telescope. De Prá is also co-investigator in one of the few projects worldwide awarded observation time at the JWST. With an international team of researchers led by FSI, de Prá submitted a proposal at the end of 2020 to study the composition of the TNOs, which resulted in the only large program for JWST to study the Solar System at this time.

De Prá has a master’s degree and a doctorate in Astronomy from the Observatorio Nacional, in Rio de Janeiro, Brazil.

Schambeau’s work focuses on the study of distantly active comets and Centaurs to better understand the origins of our Solar System. His funded work includes characterization of the comet populations in preparation for the NASA Near-Earth Object (NEO) Surveyor Mission led by Amy Mainzer at the University of Arizona. This planetary defense mission includes a space-based infrared telescope to be launched in early 2026 designed to discover, track and characterize the population of potentially hazardous NEOs. NASA has also funded Schambeau to help develop a software package called Coma Factory, which will provide tools to the astronomical community enabling more detailed analyses of comet observations.

He has multiple degrees including a master’s degree in Physics from the University of Alabama in Huntsville and a doctorate in Physics from UCF.

The post-doctoral scholars work most closely with Planetary Scientist Noemi Pinilla Alonso, Physics Professor Yan Fernandez, and Associate Scientist Julie Brisset.

Helping Researchers Nationwide

FSI expanded its collaboration with the Center for Lunar & Asteroid Surface Science (CLASS), a NASA center located at UCF. CLASS published research that led to the Exolith Lab. It produces regolith-simulated extraterrestrial dirt. The regolith mimics dirt found on asteroids, the moon, and even Mars and is based on the mineral composition of the sources. FSI personnel produce the regolith and ship it to researchers based on CLASS’ specifications.

Despite COVID-19, Lugo says production increased and schedules were kept. That means researchers around the nation – including at Kennedy Space Center – were able to continue using the regolith to conduct their investigations. For example, some groups are working on how to grow plants on Mars while others are looking at the best designs for tires that will be on vehicles traversing the moon. Working with something that closely resembles the real substance outside earth, improves the chances of success.

Arecibo Observatory

The biggest challenge for FSI was the collapse of the radar dish and platform at the Arecibo Observatory (AO) in December 2020, which UCF manages for the U.S. National Science Foundation. The principal investigators on the grant are from FSI.



Data from Arecibo and the Fermi Space Telescope led to the discovery of a “gamma-ray heartbeat” coming from a cosmic gas cloud.



Several times in 2020 Arecibo made headlines for its contributions to scientific discoveries published in top journals. The biggest success came four months before the collapse when an international team of researchers using data collected over a decade at AO published a discovery in Nature Astronomy. Data from Arecibo and the Fermi Space Telescope led to the discovery of a “gamma-ray heartbeat” coming from a cosmic gas cloud. The cloud is in the constellation Aquilla and “beats” in rhythm with a black hole 100 light-years away in a microquasar system known as SS 433.

[Read More Here](#)

“The was huge,” Lugo says. “It shows the value of the instruments at AO and the data collected over decades.”

Despite the loss of the instrument, other work continues at the observatory. Through a new partnership announced in May 2021, the 3,000 petabytes of telescope data collected at AO since the 1960s is being securely backed up at the Texas Advanced Computing Center Ranch, another NSF-funded facility. It is a site for long-term data mass storage. Securing the data is important so that the information collected at AO can continue to make an impact.

Thanks to the collection of data going back to the 1960s, the science group at AO continues making discoveries in science areas as diverse as the search for Fast Radio Burst, very energetic events in the universe, solar activity, and how it affects the Earth and the planetary environment, the shape and nature of the asteroids that orbit the Sun in the near-Earth region, and much more which affect future space exploration, human health and communications systems on earth.

UCF meanwhile continues to work with scientists from around the world and the NSF to continue AO’s legacy of discovery and innovation far into the future.





UCF Solar Energy Research Center Shines in Research and Community Outreach

By: Robert Wells



UCF's Florida Solar Energy Center, now rebranded as the FSEC Energy Research Center (FSEC-ERC), has shined the past year with its research and community outreach.

The center, established in 1975 to serve as the state's solar energy research institute, focuses on all aspects of renewable energy and energy efficiency research. FSEC-ERC's strong presence and partnerships with the RISES Cluster and Center for Advanced Turbines and Energy Research (CATER) is part of the reason UCF researchers were selected for four U.S. Department of Energy awards in 2020, the most of any university.

The awards amplify UCF's national leadership in solar energy research. The awards include Securing Our Nation's Power Grid, Extending the Operational Life of Solar Panels, Improving the Reliability of Bifacial Solar Panels, and Optimizing Compressors for Solar-Thermal Power.

Researchers at the center also recently completed a project for DOE that tested the use of residential isolation space control to minimize the transmission of infectious diseases, like COVID-19, between family members in single-family homes. They found low-cost methods could be used to create a safe, comfortable isolation zone for an infectious person in a typical home.

The center also developed an online residential energy modeler certification, which is the first step in preparing a workforce to perform energy ratings for homes. The certification can be earned by completing four, on-demand, short courses and passing the corresponding exam.

In the community, FSEC-ERC is working with Orlando Utilities Commission, Plug Power, and OneH2, Inc., to build a nearly \$10 million pilot-scale system that will integrate hydrogen as a renewable fuel source for both backing up a solar energy system and for use in fuel cell vehicles. FSEC-ERC is performing the systems optimization and control strategy of the pilot system.

The center also reaches out to local K-12 students and teachers through its annual EnergyWhiz event, held virtually in 2021 after the traditional in-person event was canceled in 2020 due to COVID-19. EnergyWhiz is a hands-on renewable energy-focused event for students to demonstrate their science, technology, engineering, art, and math capabilities through project-based learning activities.



The awards amplify UCF's national leadership in solar energy research.



"The year 2025 will mark the half-century mark for FSEC-ERC's service as the statewide energy research and education institute," says James Fenton, the center's director and a professor in UCF's Department of Materials Science and Engineering. "In preparation for the next 50 years of dynamic energy developments, the FSEC-ERC is implementing our recently adopted five-year strategic plan. This includes enhancing the center's core programs, supporting the clean-energy sector, maintaining and adding to our broad base of collaborators, increasing awareness of the center, and nurturing a diverse and inclusive workforce."



New Collaborations, Research Publications, Lab Expansion, and Clinical Trials Make 2020-2021 a Busy One for Limbitless Solutions

By: Zenaida Gonzalez Kotala

Photos By: Limbitless Solutions



While the global pandemic slowed down most of the world, the level of activity and contributions to the community only increased for Limbitless Solutions (LS).

Known for producing bionic arms for children, the UCF-based group pivoted and used its lab to support healthcare providers by 3D printing components of face shields healthcare workers and first-responders responding to the COVID-19 need in March 2020.

At the same time, LS continued working with some of the nation's most recognized video game companies on collaborations that included an LS-themed arm that is featured in the Cyberpunk game. The game's main character is voiced by actor Keanu Reeves.

The team also continued to innovate new designs of bionic arms, published a new research paper, and finalized new agreements with several companies and two Florida hospitals all while planning the expansion of its lab.

"It's been a busy, busy year," says Albert Manero, co-founder, and president of LS. "It was a tough one for our staff, our students, and our bionic families because of COVID 19. But we pulled together, kept each other safe, got even more creative, and found new opportunities to help our community."



We pulled together, kept each other safe, got even more creative, and found new opportunities to help our community.



Expanding Lab Space and Promoting STEM

One of the reasons for LS's success is its ability to adapt in real-time. The first bionic arm the team created in 2014, was envisioned, designed, manufactured, and delivered to a Central Florida boy within two months. Although not the prettiest arm, it was functional and launched LS. When the pandemic slowed down the group's clinical study with Oregon Health & Science

University (OHSU) to minimize risk to the children involved, the team was able to flex again. Team members used the lab's 3D printers to produce components for face shields.

Being able to flex has been an asset and demand for services has increased, which is one reason the team was starting to run out of space even before the pandemic. LS routinely has 30 students in the lab on research internships each semester. The participants - college students - learn everything from manufacturing and engineering to art design and marketing. The goal is to give them real experience working, which they can't easily get in a classroom. LS's ongoing work with college students led to Adobe providing \$100,000 toward the new lab. The team moved into its 5,000 plus square foot facility this past summer. The lab, in Research Park, triples the amount of space available to build bionic arms, train future engineers and artists and expand the group's research.

In early 2020, LS announced it was expanding its work to create bionics for adults and a new initiative that aims to help first-responders and veterans who have lost the use of their arms.

Aside from building bionics, the team is also focused on preparing the next generation of engineers, scientists, and problem solvers. That's why LS hosts K-12 field trips and works so hard to provide hands-on experiences in the lab that make a difference to college students. The Department of Education has taken notice and for a second time, LS was involved in the Sunshine State Scholars conference. The conference, which honors some of Florida's brightest 11th graders and is aimed at keeping these talented teens in Florida colleges, was almost scrapped because of COVID. The event is a collaborative effort among the Florida Education Foundation, the State University System of Florida, the Florida College System, and the Florida Department of Education. Local and national companies with STEM emphasis also participate. LS stepped in and helped the collaborators create a virtual experience with substance. More than 100 students participated, and LS led workshops and provided some of the keynote speakers.

Global Impact

Members of the team also presented at the United Nations in 2020. That marked the fourth time LS has advocated for accessibility through design and technology at the UN. Staff member Mrudula Peddinti presented at Adobe's annual international conference, with more than 10,000 virtual attendees present.

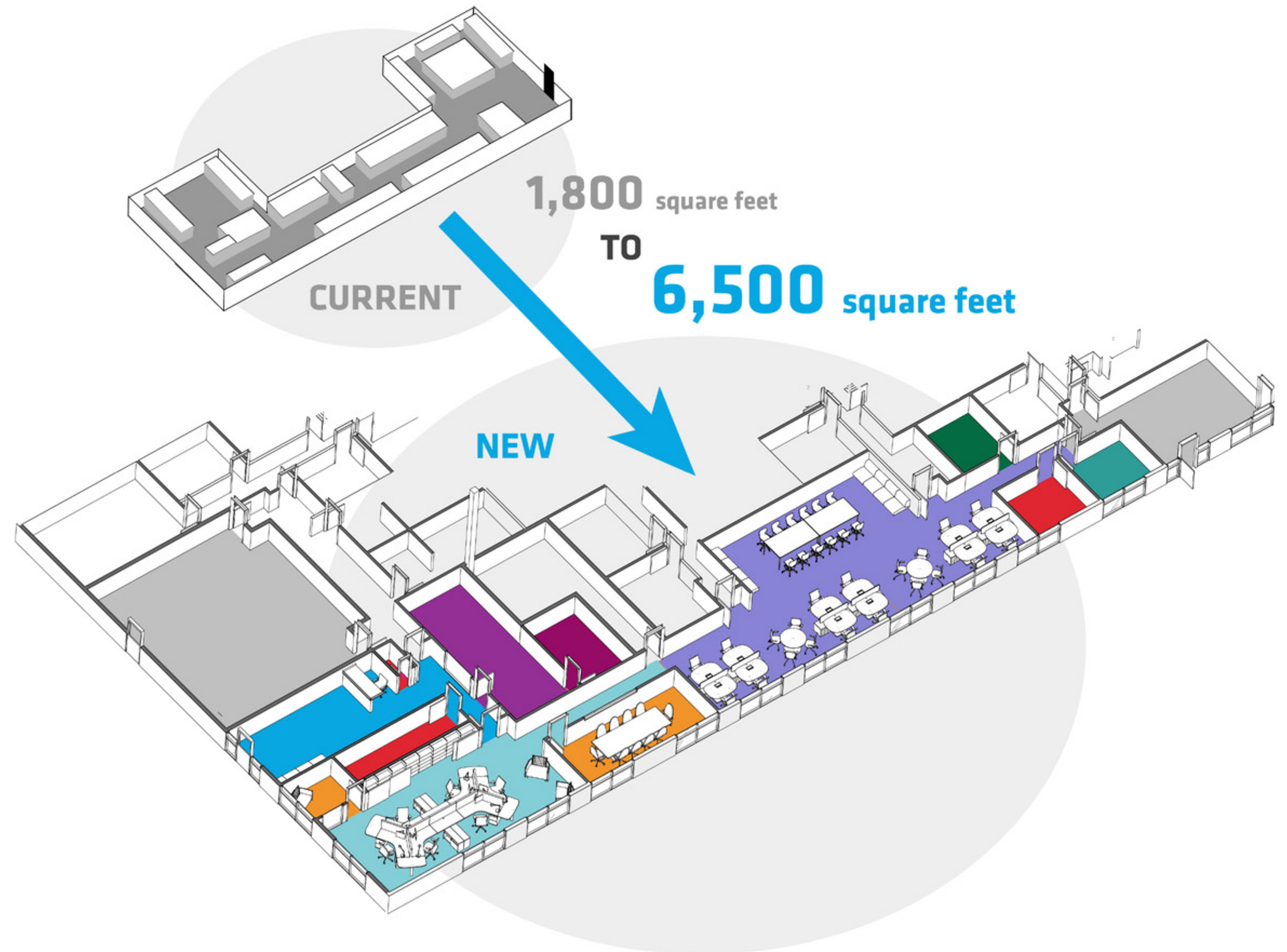
New Clinical Trials

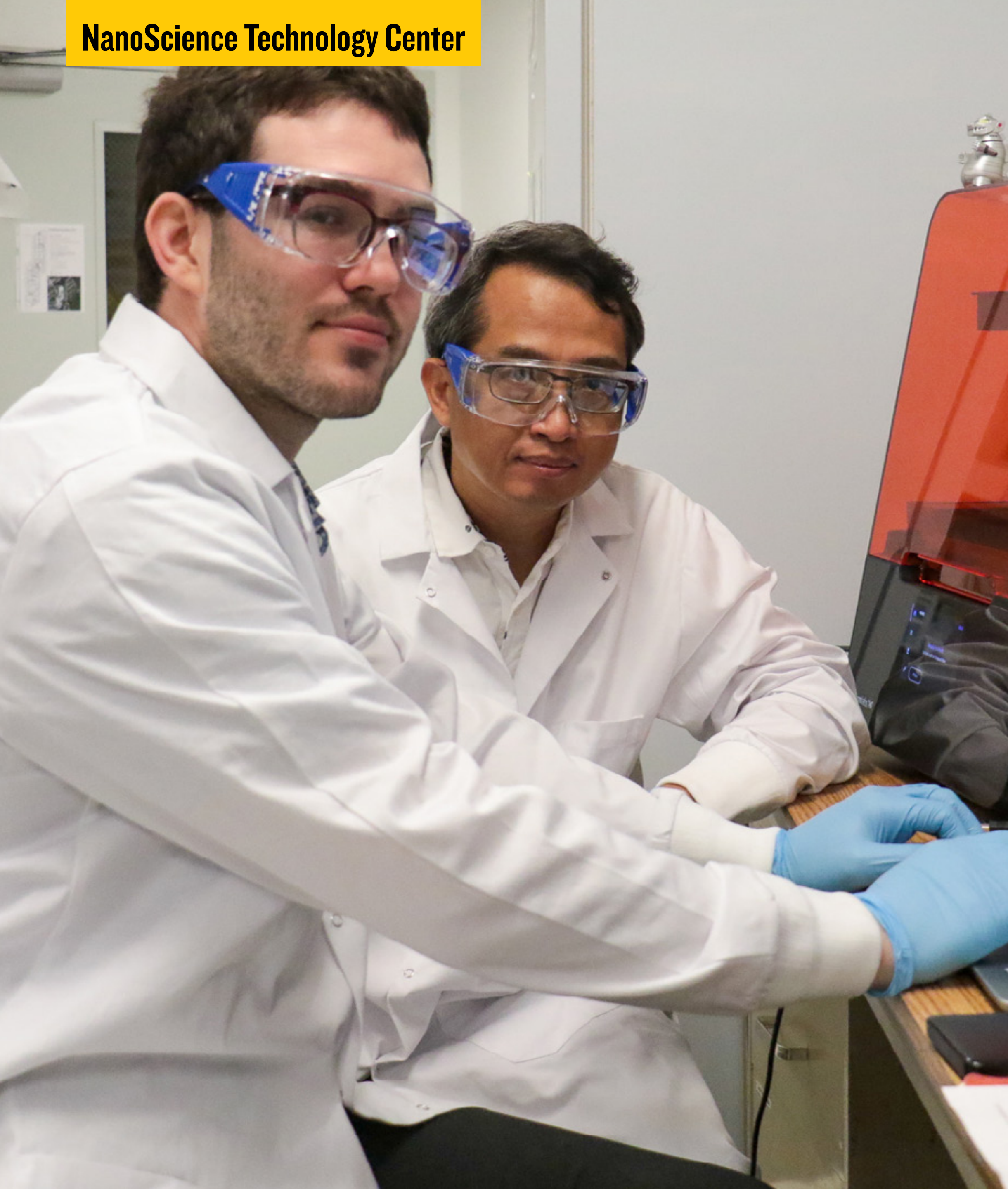
In the meantime, LS reached agreements with Orlando Health and Wolfson Children's Hospital in Jacksonville to launch new clinical trials in late 2021 and early 2022. One of the trials will evaluate how the video games developed in collaboration with UCF SVAD faculty are working to prepare children for bionic arms. The games help the children build strength in the muscles required to work the bionic arm.

"Our training video games at Limbitless are impactful for empowering and improving our limb recipient's quality of life," said School of Visual Arts and Design (SVAD) Associate Professor of Emerging Media and Limbitless, affiliated faculty member Matt Dombrowski '05 '08. "The project also serves as a platform for our UCF visual arts and design undergraduate students to utilize their artistic skills through research and partnerships visible on a national stage."

The second clinical trial will focus on how children's brains adapt while using prosthetics and the video game training system, using advanced fMRI imaging.

The team expects to close out its first clinical trial with OHSU and begin preparing results for publication by the end of 2021.





UCF NanoScience Technology Center Researchers Recognized for Cutting-Edge Work

By: Robert Wells

UCF's NanoScience Technology Center professors and students cleaned up in awards this year thanks to their expertise and high-impact research.

The center has six faculty members who were recognized last year as part of the top 2 percent of World Scientists, as ranked by Stanford University. These researchers are Sudipta Seal, Lei Zhai, Qun Huo, Swadeshmukul Santra, Michael Leuenberger and Saiful Khondaker.

Seal is a Pegasus Professor and Chair of UCF's Department of Materials Science and Engineering. Zhai is a professor in UCF's Department of Chemistry and the center's director. Huo is a professor and graduate program coordinator and Santra is a professor, both in UCF's Department of Chemistry. Leuenberger and Khondaker are professors in UCF's Department of Physics.

Some of the other major recognitions center researchers received include:

James Hickman, a professor in UCF's Department of Chemistry, was inducted into the National Academy of Inventors.

Sudipta Seal was elevated into Fellow status in the American Ceramic Society and was inducted into the Academy of Science, Engineering and Medicine of Florida.

Ellen Kang, an assistant professor in UCF's Department of Physics, received the NSF CAREER award.

The National Science Foundation selected the center as a Research Experiences for Undergraduates site for Engineering and Nanoscience of Materials and Device Applications in Biotechnology and Medicine. This was awarded to Andre Gesquiere, a professor in UCF's Department of Chemistry, and Sudipta Seal. The start date is May 2021.

Also of note is that the Master of Science in Nanotechnology program has graduated 65 students and currently has 30 students in the program. More than 50 percent of current students are minority students.

"We will expand the nanotechnology master's program through active recruiting and offer online master's degrees," Zhai says.

"A new mentoring program will be developed to assign a faculty member to each master's student to provide research, academic and career guidance."



A new mentoring program will be developed to assign a faculty member to each master's student to provide research, academic and career guidance.



The students working at the center also received many prestigious awards, including:

A UCF nanotechnology team led by David Fox, a doctoral candidate in chemistry, was selected by NASA as one of seven university groups from around the country tasked with developing ways to stop the negative effects of moon dust during lunar missions.

Yuen Yee Li Sip, a doctoral candidate in materials science and engineering, was awarded a three-year fellowship from NASA to support her research project on improving the durability of metals in space.

Elizabeth Barrios, a graduate of UCF's materials science and engineering doctoral program, was presented with the Luigi G. Napolitano Award by the Space Education and Outreach Committee of the International Astronautical Federation for her work studying materials that can use heat to produce electricity to keep deep-space exploration vehicles, like rovers and probes, working for long periods of time.

Bryan Demosthene, a nanoscience master's student, recently won a McKnight Doctoral Fellowship and will continue his doctoral study in biomedical sciences at UCF.

Elizabeth Coln, a graduate student in the Department of Electrical Engineering, received the Daniel D. Hammond Engineering Endowed Scholarship and CECS Alumni Scholarship Endowment.





Alireza Safaei, a graduate of the Department of Physics, received the Best Dissertation Award from the College of Sciences and UCF.

Discoveries by the center's researchers have also been documented in top publications over the past year including Science Advances and Nature Communications.

"NSTC is a multidisciplinary research center that performs cutting-edge research in materials and nanotechnology, provides high-quality training for students, and facilitates the advance of innovations to solve real-world technology challenges," Zhai says. "Our faculty members and students have excelled in nanotechnology research."

FACULTY CLUSTERS

Collaboration Meets Innovation



UCF's Biionix Cluster Shows Its Strength with Top Research and Awards

By: Robert Wells

UCF's Biionix research cluster had a banner year for research and awards in 2020 with more than 50 research papers published in top journals and multiple awards to faculty.

Research articles varied in topics ranging from developing new computational models to tissue repair, nanotherapeutics, advanced biomaterials, and research into brain-inspired, neuromorphing computing.

Studies by Biionix researchers appeared in top journals including *Advanced Functional Materials*, *Nano Letters*, *Medical Image Analysis*, *Advanced Electronic Materials* and *Materials Science and Engineering: C*.

"The range of topics reflects the interdisciplinary nature of the cluster, which researches ways to make technology that interfaces with the body smarter and safer," says Biionix cluster lead Melanie Coathup, a professor in UCF's College of Medicine.



The range of topics reflects the interdisciplinary nature of the cluster, which researches ways to make technology that interfaces with the body smarter and safer.



Research performed by cluster members also led to securing patents last year, including:

Energy-Efficient, Real-Time Variable Stiffness Ankle-Foot Prosthesis. This improved version of an ankle-foot prosthesis is the result of research by Hwan Choi, an assistant professor in UCF's Department of Mechanical and Aerospace Engineering.

Convenient, Self-Sterilizing Rollable Face Mask for Everyday Use. This patent, also from Choi's research, is for a rollable face mask that is easy to store and sterilizes itself.

Low-Cost Test for Distinguishing Between Real and Synthetic Urine. This patent is for a test for identifying fake urine when screening workers for illicit drugs. It's the result of research by Sudipta Seal, a Pegasus Professor, trustee chair and who is

affiliated with UCF's Advanced Materials Processing Analysis Center and Nanoscience Technology Center, in addition to his role as chair and professor in the College of Engineering and Computer Science's Department of Materials Science and Engineering.

Low-Cost Device Catches, Kills and Identifies Vectors with Infectious Diseases. This patent, also from Seal's research, is for an insect trap that can identify bugs that carry infectious diseases.

New projects by Biionix researchers that secured funding last year were:

A collaborative project with NASA, UCF's Department of Mechanical and Aerospace Engineering, and global company, imec, to carry out experiments in sub-orbital flight.

Projects with a local company, Kismet Technologies, Ltd., to develop self-cleaning personal protective equipment and a disinfection spray against COVID-19. This research is funded by the National Science Foundation and the Florida High Tech Corridor Council.

Funding from the National Institutes of Health to Qiushi Fu to study the effect of force-based motor repetition on the control and learning of dexterous manipulation. Fu is an assistant professor in UCF's Department of Mechanical and Aerospace Engineering.

Funding for an NSF Research Experiences for Undergraduates site at UCF for Nanotechnology and Medicine for three years.

Awards Biionix researchers received included:

Sudipta Seal was elected as a fellow of the American Ceramic Society.

Helen Huang received UCF's prestigious Reach for the Stars Award, which honors and rewards highly successful research and creative activity accomplished by early-career university professionals. Huang is an assistant professor in UCF's Department of Mechanical and Aerospace Engineering.

Total award funding for 2020 for Biionix was about \$1.5 million.





For academics and outreach, Biionix will introduce a new teaching program, Orthopedic Science and Research, to UCF's College of Medicine's curriculum.

"The Biionix Cluster consists of highly ambitious professors that have come together from diverse multidisciplinary backgrounds to conduct cutting edge research, with the ultimate goal of supporting our health and well-being," Coathup says. "We aim to develop innovative materials, processes and interfaces for advanced medical implants, tissue regeneration, prostheses, and other future high-tech products, such as sensors, drug, and gene nano-delivery systems and drug discovery."



UCF Cyber Security and Privacy Cluster Works to Expand Academic Options for Students

By: Robert Wells



UCF's Cyber Security and Privacy cluster researchers had a big year, which led to a \$2.9 million National Science Foundation award and the approval of the College of Engineering and Computer Science's new Master's in Cyber Security and Privacy program.

The five-year grant will provide cybersecurity scholarships to 22 undergraduate and graduate students. The first scholarships will be awarded in fall 2021, which coincides with the launch of UCF's master's in Cyber Security and Privacy degree program. The master's program will provide students with an in-depth education geared toward meeting the needs of business and industry in Florida and throughout the United States.

The cluster's work has never been more important. The past year has seen an escalation of cyber threats. Consumers have had their personal information stolen, government agencies have been hacked and even a U.S. pipeline was breached.



The new MS degree and the NSF SFS award help propel our education effort to be in line with our world-class reputation in research.



The cluster's reputation is growing thanks in part to the cluster's members. For example, Paul Gazzillo, an assistant professor in UCF's Department of Computer Science, received the prestigious and highly competitive NSF CAREER award. It recognizes early-career faculty with promising research. The award will fund his project, Inferring and Securing Software Configurations through Automated Reasoning, from 2020-2025.

Goals for the new year are to continue to expand the partnership and collaboration across UCF, secure new funding opportunities, work to hire new faculty members and recruit top students.

"The new MS degree and the NSF Scholarship for Service award help propel our education effort to be in line with our world-

class reputation in research," says Yan Solihin, Director of the cluster and Interim Chair of the Department of Computer Science. "Publications from research by our nine faculty members have collectively received an h-index of 180+ and 30,000 citations. Many of the publications appeared in venues considered to be among the best in the fields."

The group's education focus also includes an MS in Digital Forensics program, and the undergraduate, Secure Computing and Networks (SCAN) minor degree, in addition to the Scholarship for Service project, and the College of Engineering and Computer Science's MS in Cybersecurity program.

Total award funding for 2020 for the Cyber Security and Privacy cluster was more than \$1.4 million.



UCF Disability, Aging and Technology Cluster Revamps for Post-Pandemic Year

By: Robert Wells



The past year was an organizing year for UCF’s Disability, Aging and Technology (DAT) Cluster as the faculty members built a strategic plan and worked with their new cluster lead, Reid Oetjen, an associate professor in the School of Global Health Management and Informatics. The school is part of UCF’s College of Community Innovation and Education.

“We spent much of the year in the forming and storming stages of team development,” Oetjen says. “And as the new lead for the cluster, I have spent time getting to know and mentoring the junior faculty.”

The Disability, Aging and Technology Cluster is dedicated to helping people live longer and more productive lives by researching ways technology can help health professionals respond to illness and disability. The cluster brings together faculty from a wide range of disciplines, from nursing and social work to mechanical engineering and hospitality.

A major success for the cluster over the last year was an award from the U.S. National Institutes of Health to researchers Ladda Thiamwong, Jeff Stout, and Joon-Hyuk Park to study technology-based fall risk assessments for older adults in low-income settings.

This is important research because falls in older adults are the leading cause of fatal injury and the most common cause of nonfatal trauma-related hospital admission, according to the U.S. Centers for Disease Control and Prevention.

Thiamwong is an associate professor in UCF’s College of Nursing; Stout is a professor and founding director for the School of Kinesiology and Physical Therapy in the College of Health Professions and Sciences; Park is an assistant professor in the Department of Mechanical and Aerospace Engineering.

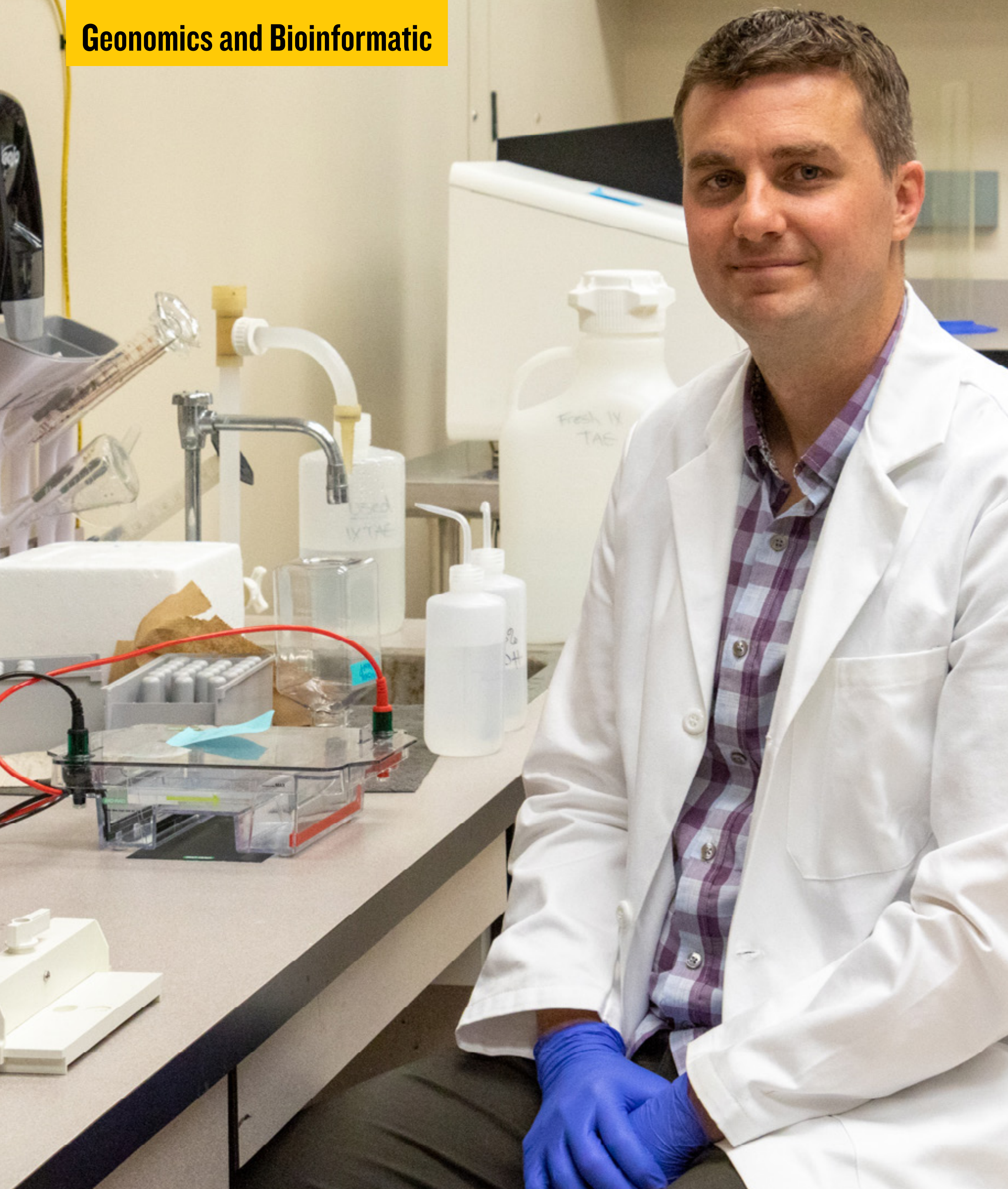
“The DAT Cluster is UCF’s largest cluster and is passionate about helping disabled people and the elderly move better and smarter, as well as lead healthier and stronger lives,” Oetjen says. “This will be another exciting year as a cluster and where we will continue to grow and build toward the future.”

Total award funding for 2020 for the Disability, Aging and Technology Cluster was more than \$42,000.

“

The DAT Cluster is UCF’s largest cluster and is passionate about helping disabled people and the elderly move better and smarter, as well as lead healthier and stronger lives.

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Genomics and Bioinformatics Cluster Members Land Prestigious Awards in 2020

By: Robert Wells

UCF Genomics and Bioinformatics cluster members landed major awards in 2020 while also publishing in top journals and supporting a large number of students.

“We use genomics, computation, and data science to address challenges in life sciences, and we want to train the next generation of students so they have the necessary skills to conduct interdisciplinary research,” says Shibu Yooseph, the Genomics and Bioinformatics cluster lead and a professor in UCF’s Department of Computer Science.

The cluster’s faculty use genomic and computational tools to help monitor biodiversity and infectious diseases and to understand the genetic workings of different cancers, drug responses, and microbial ecosystems.

Last year, a minor in Genomics and Bioinformatics in the College of Undergraduate Studies was developed and it will begin in Fall 2021. There are more than 73 students who are currently part of the cluster and are being trained by cluster faculty. This includes some 30 undergraduates, more than 40 graduate students, and three postdoctoral associates.



Goals for the cluster for the coming year are to target collaborative funding opportunities and continue mentoring junior faculty to target NSF CAREER awards.



“The interdisciplinarity aspect and the utility of genomics in addressing important scientific problems help draw students to the cluster’s faculty,” Yooseph says.

Graduates have obtained placement in top schools around the country, including Georgia Tech; the University of California, San Francisco Medical School; California State University, Dominguez Hills; and the University of Michigan.

Some of the funding awards cluster members received included:

- Salvador Almagro-Moreno and Charissa de Bekker received National Science Foundation CAREER awards. The award recognizes early-career professionals with promising research. Almagro-Moreno is an assistant professor in UCF’s Burnett School of Biomedical Sciences, and de Bekker is an assistant professor in UCF’s Department of Biology.
- Taj Azarian received funding from UCF’s Higher Education Emergency Relief Fund II to work on rapid, onsite COVID-19 detection and viral sequencing. Azarian is an assistant professor in UCF’s Burnett School of Biomedical Sciences.
- Robert Fitak received UCF SEED funding for a project that will use genomic techniques to better understand the visual system of lone star ticks and how vision contributes to their mating and host-seeking behaviors. Fitak is an assistant professor in UCF’s Department of Biology. UCF provides SEED funding to conduct preliminary research it hopes will lead to more funding from other agencies and breakthroughs in a variety of fields.
- Anna Forsman received funding from The Nature Conservancy to support her Florida Scrub Jay work looking at genomic variation and disease prevalence across populations. Forsman is an assistant research scientist in UCF’s Department of Biology.
- Michelle Gaither received funding from the U.S. National Oceanic and Atmospheric Administration Saltonstall-Kennedy Grant Program for a multi-species population genomics study to define management units in marine fishes in the remote Mariana Islands.
- Wei Zhang received funding from the National Institutes of Health’s National Institute of Diabetes and Digestive and Kidney Disease Information Network to develop an AI-based framework to improve diabetes prognosis from large-scale genomic data. Zhang is an assistant professor in UCF’s Department of Computer Science.
- Shibu Yooseph received funding from the National Science Foundation to develop machine learning algorithms to decipher





microbial associations from microbiome data generated using high-throughput DNA sequencing technologies. The project will also provide interdisciplinary training for graduate students, with an emphasis on training under-represented groups, including women and minorities.

Journals the researchers published included Nucleic Acids Research, Nature Scientific Reports, BMC Genomics, BMC Microbiology, Ecology and Evolution, and Philosophical Transactions of the Royal Society.

“Goals for the cluster for the coming year are to target collaborative funding opportunities and continue mentoring junior faculty to target NSF CAREER awards,” Yooseph says.

Total award funding for 2020 for the Genomics and Bioinformatics cluster was nearly \$1 million.



UCF Learning Sciences Cluster Earns Important Distinctions, Welcomes New Member

By: Robert Wells



UCF's Learning Sciences research cluster members earned important distinctions and welcomed a new member over the past year, as well as worked to obtain new funding for projects and to secure new patents.

The cluster, which researches how people use machines to learn and develops new technology to improve learning outcomes, uses the expertise of faculty from a range of disciplines including education, cognitive psychology, learning sciences, computer science, cognitive science, human-computer interaction, philosophy, and design.

Some highlights from the year include:

Cluster co-lead Roger Azevedo was recognized in the top 2 percent of the researchers in his field and No. 12 overall out of more than 100 at UCF in a study published in PLOS Biology. Azevedo is a professor in UCF's School of Modeling, Simulation, and Training.

Cluster co-lead Charlie Hughes was inducted into the National Center for Simulation's Hall of Fame in fall 2020.

The cluster welcomed the newest member Johnathan Mell, an assistant professor in UCF's Department of Computer Science. His research is centered on human-computer interaction, including in the fields of computer games, automated negotiation, behavioral game theory, and artificial intelligence. Mell is set to teach the AI for Games course in the Department of Computer Science in the fall. He is also hosting the 5th annual Human-Agent League of the Automated Negotiating Agents Competition this summer. The competition features an array of participant-submitted agents competing against humans in a multi-issue negotiation.

Cluster member Yanjie Fu, an assistant professor in UCF's Department of Computer Science, received a more than \$500,000 NSF CAREER award to develop machine-learning techniques that teach artificial intelligence to make better decisions in dynamic systems such as electrical grids and traffic networks.

The first semester of the Learning Science track in the Education doctoral program began in the fall of 2020 with four students and

three new students are expected to start in the program in the coming year. Cluster member Michelle Taub, an assistant professor in UCF's Department of Learning Sciences, is the program coordinator for the track.

Learning is ubiquitous, it occurs everywhere, not just in the classroom. Understanding how to improve learning outcomes is vital to our society and to advancing research.

New projects Learning Sciences cluster member worked to secure funding for were:

PROJECT RAISE: Robots and Artificial Intelligence to Improve Social Skills for Elementary Students. Cluster members Lisa Dieker and Charles Hughes are part of a team of principal investigators on this nearly \$2.5 million project funded by the U. S. Department of Education via United Cerebral Palsy of Central Florida. UCF will receive about \$998,000. Dieker is a Pegasus Professor and Lockheed Martin Eminent Scholar Chair in the College of Community Innovation and Education. Hughes is the Learning Sciences Cluster's co-lead and a professor in UCF's Department of Computer Science. Cluster member Taub is an advisory board member for the project.

EAGER: SaTC-EDU: Improving Cybersecurity Education for Adolescents with Autism Through Automated Augmented Self-Monitoring Applications. Cluster members Hughes and Dieker are principal investigators on this nearly \$300,000 project funded by the National Science Foundation.

Patents secured by Learning Sciences cluster members over the past year were:

Sensor-based Complexity Modulation for Therapeutic Computer-Simulation. This is an apparatus for developing a routine and specific task competencies of an individual having an environmental anxiety disorder. It was developed by a team that

included cluster members Dieker, Hughes, and Eleazar Vasquez. Vasquez is a professor in the College of Community Innovation and Education.

S: 3-Dimensional Character. This is part of a toolkit that uses artificial intelligence to improve the social skills of students with disabilities. It was developed by a team that includes cluster members Dieker and Hughes.

Cluster members were also active in publishing in journals and conferences, including the 25th International Conference on Pattern Recognition, Computers & Education, International Journal of Artificial Intelligence in Education, Journal on Multimodal User Interfaces and Proceedings of the 13th International Conference on Educational Data Mining, Proceedings of the 42nd Conference of the Cognitive Science Society, Proceedings of the 12th ACM Symposium on Eye Tracking Research and Applications, and the 35th AAAI Conference on Artificial Intelligence.

Azevedo says goals for the coming year will be to integrate the cluster with UCF IST, SMST and to continue to mentor graduate students, submit proposals and contracts, publish in top journals and conferences and develop collaborations with industry partners across different sectors.

“Learning is ubiquitous,” Azevedo says. “It occurs everywhere, not just in the classroom. Understanding how to improve learning outcomes is vital to our society and to advancing research.”

The total funding amount for the cluster in 2020 was more than \$1.1 million.





REACT Cluster Members Recognized for Contributions to Cleaner, More Efficient Energy

By: Robert Wells

UCF's Renewable Energy and Chemical Transformation cluster members earned important distinctions last year that recognized their contributions to the renewable energy and chemical transformation field.

The cluster, which includes researchers from physics, engineering, and chemistry, carries out research that provides a mechanistic understanding of chemical processes and characteristics of low dimensional catalysts, thereby facilitating the discovery of novel materials for catalyzing energy production, especially energy from renewable sources such as solar.



This past year, REACT cluster co-lead Talat Rahman, a Pegasus Professor in UCF's Department of Physics, was elected as an American Association for the Advancement of Science fellow, a prestigious, lifetime distinction.



This past year, REACT cluster co-lead Talat Rahman, a Pegasus Professor in UCF's Department of Physics, was elected as an American Association for the Advancement of Science fellow, a prestigious, lifetime distinction.

The award, which is given to scientists who've made important contributions to their field, recognized Rahman's distinguished contributions to computational and theoretical nanoscience, in predictions of chemical, vibrational, and structural properties of low-dimensional systems, together with diversity in STEM.

Also last year, Rahman and cluster member Fudong Liu were part of a team that received a \$750,000 grant from the National Science Foundation to research ways to reduce the amount of expensive, noble metals needed to catalyze chemical reactions.

Liu is an assistant professor in UCF's Department of Civil, Environmental, and Construction Engineering.

In addition, Liu and Shaohua Xie, a postdoctoral associate in the Department of Civil, Environmental, and Construction Engineering, won the national TechConnect Conference's 2020 TechConnect

Defense Innovation Award that recognizes technology that can positively impact national security. Their winning technology removes more than 90 percent of pollutants from engine exhaust at low temperatures by using novel environmental catalysts with universal, scalable fabrication techniques.

Meanwhile, William Kaden, an assistant professor in the Department of Physics, was able to secure another NSF \$500,000 grant which is being used to purchase a Near-Ambient Pressure Xray Photoelectron Spectroscopy. The instrument, once fully installed, will be one-of-a-kind in the southeast allowing the cluster to conduct even more sophisticated research.

Cluster members also continued to publish research in various journals, including:

Xiaofeng Feng, an assistant professor in UCF's Department of Physics, published two articles on the effect of microenvironment on electrochemical catalysis in the journals Nature Communications and ACS Energy Letters.

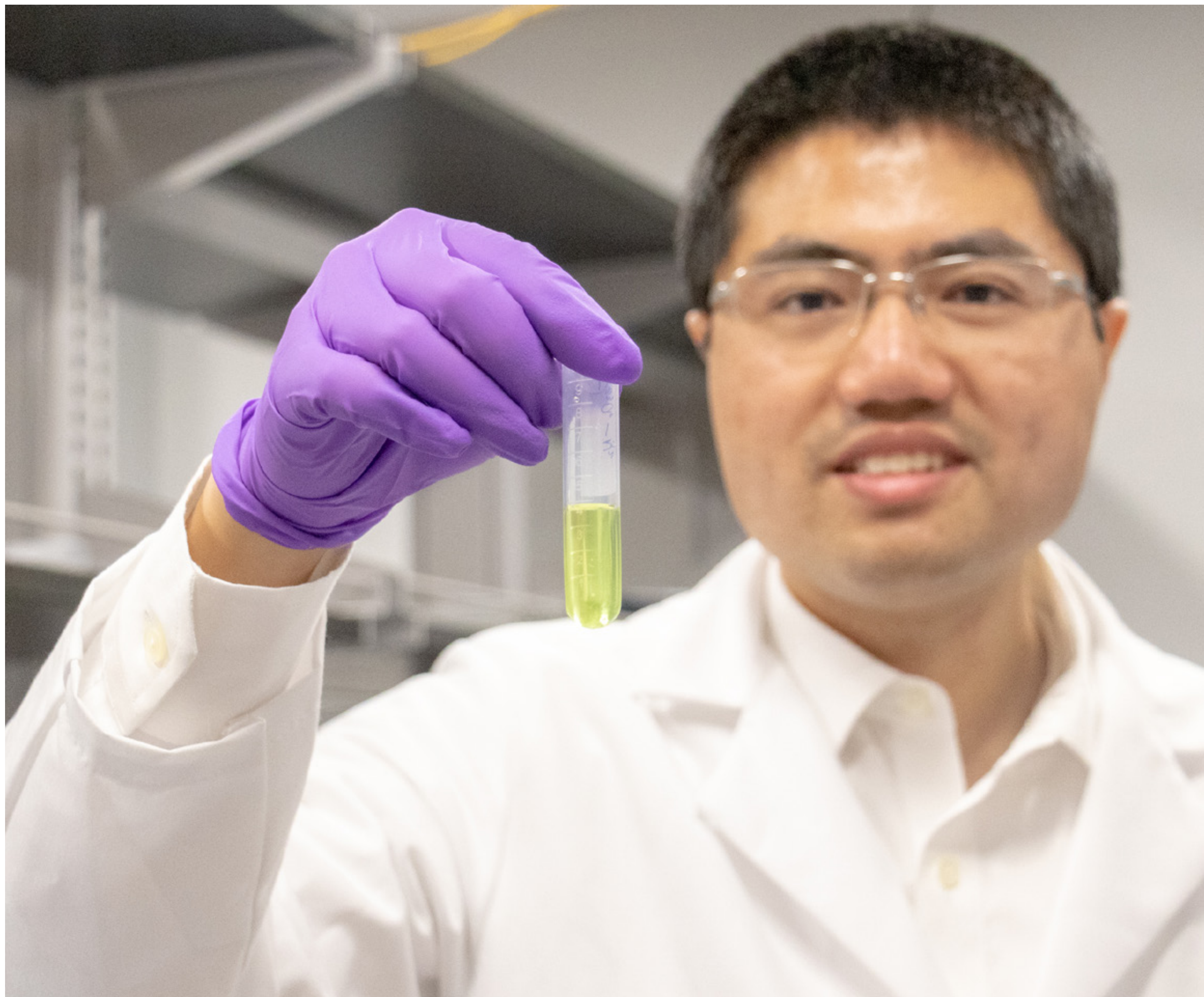
Yang Yang, an assistant professor in UCF's Department of Materials Science and Engineering, published articles about his research to improve battery life and safety in the journals Advanced Materials and Advanced Energy Materials and about his saltwater battery research in Nature Communications.

Students working with cluster members found much success in 2020 including:

Kaden saw two of his doctoral students, Asim Khaniya and Bijoya Dhar, graduate and hired in postdoctoral positions. Khaniya works at Brookhaven National Laboratory researching ambient pressure x-ray photoelectron spectroscopy/ infrared absorption spectroscopy, and Dhar studies electrocatalysis at Pacific Northwest National Laboratory.

Two of Rahman's doctoral students, Naseem Uddin and Mahboob Ur-Rehman, graduated and have secured the next steps. Uddin accepted a postdoctoral position at Wayne State University, and Ur-Rehman accepted a residency in medical physics at the University of Arizona. Rahman jointly supervised Ur-Rehman





with Omar Zeidan at Orlando Health and Kevin Erhart at .decimal. Rahman's postdoctoral associate and graduate student Tao Jiang also secured a position and will work as a postdoctoral researcher at Ames Laboratory.

Feng's first graduate student, Lin Hu, graduated in December. Hu received the College of Engineering and Computer Science Graduate Excellence Award and the Outstanding Dissertation Award as part of Founder's Day.

Additional cluster member achievements include:

Rahman co-edited the new Springer Handbook of Surface Science.

Rahman was selected to be a Senior Mercator Fellow (Guest Professorship) of the German Research Foundation DFG and gave (virtually) invited lectures to doctoral students at Ruhr-University Bochum, Germany. She will be visiting the university in the near future.

"The goal for the cluster for the coming year is to continue to raise its profile and to continue to do world-class research and secure new funding," Rahman says. "Cluster members will also continue to pursue collaborative research with colleagues at UCF and elsewhere — a process already put in place through the REACT biweekly distinguished seminar series," she says.

The series is available to the research community through the American Vacuum Society.

Total award funding for 2020 credited to REACT was more than \$1.7 million.



UCF Resilient, Intelligent and Sustainable Energy Systems Center Sees Major Successes

By: Robert Wells



Over the past year, UCF’s Resilient, Intelligent and Sustainable Energy Systems, or RISES, cluster has evolved into a university research center and has achieved major accomplishments in funding, academics, and lab space.

“There is a critical need to design a more robust and agile electric power network,” says center director Zhihua Qu, a Pegasus Professor in UCF’s Department of Electrical and Computer Engineering and RISES’ director. “Natural disasters, malicious attacks, or human errors disrupt our nation’s energy and infrastructure systems. The vulnerability of the electric energy systems and the power grid represents a critical national challenge due to the dependence of nearly all infrastructure systems on electric energy.”



There is a critical need to design a more robust and agile electric power network.



The main objective of the RISES Center is to build a strong research portfolio in resilient and secure electric power systems by collaborating with utilities, industry, national labs, municipalities, and government agencies.

Some of the most recent large awards RISES received came from the U.S. Department of Energy and totaled more than \$14 million.

These awards were:

- Secure and Resilient Operations Using Open-Source Distributed Systems Platform. This is a \$4.75 million award from the U.S. DOE, Solar Energy Technologies Office. Researchers Wei Sun, Zhihua Qu, and Aleksandar Dimitrovski from the Department of Electrical and Computer Engineering are working on the project.
- Understanding Critical Failure Modes and Degradation Mechanisms in Fielded Photovoltaic Modules. This is a \$2.5

million award from DOE SETO. Kris Davis, an assistant professor in UCF’s Department of Materials Science and Engineering, is leading the project.

- Autonomous Inverter Controls for Resilient and Secure Grid Operation: Vector Control Design for Grid Forming. This is a \$3.75 million award from DOE SETO. Qu and Sun are leading the research.
- Building Intelligence with Layered Defense using Security-Constrained Optimization and Security Risk Detection. This is a \$3.75 million award from the DOE Buildings Energy Efficiency Frontiers & Innovation Technologies. Researchers Qun Zhou Sun, George Atia, Qu, and Sun are working together on the grant. Qun Zhou Sun is an assistant professor, and Atia is an associate professor, both in UCF’s Department of Electrical and Computer Engineering.

This year also saw the launch of the College of Engineering and Computer Science’s graduate certificate program in resilient energy systems, which will help people boost their skill set in this increasingly important field, Qu says.

RISES also established its newest externally funded laboratory, known as the Microgrid Control Lab, that will focus on resilient microgrids and long-duration battery research.

Since 2017, the center has received substantial support from industry to create:

- The Siemens Digital Grid Lab, which is supported by Siemens Digital Grid and is packed with the latest utility-grade software and hardware for researching the optimal operation and protection of power systems.
- The Smart Infrastructure Data Analytics Lab, supported by Siemens Smart Infrastructure, uses cutting-edge technology to research consumer interactions with power grids, including timing, smart buildings, solar energy, and batteries. Orlando Utilities Commission provided support to develop data-driven forecast and optimization of photovoltaic power or energy from the sun.

- An Internet-of-Things security testbed supplied by Siemens Ruggedcom was installed at the Cyber-Physical Systems & Control Laboratory, which is a lab focused on developing tools and algorithms for optimizing and controlling cyber and physical systems.
- The Microgrid Control Lab, supported by both General Electric and Florida Power and Light, investigates safe, reliable, efficient, and secure ways to operate microgrids and large-scale power distribution networks composed of mainly renewable energy sources. Duke Energy also provided funds to install a long-duration battery testbed in the lab.
- The Autonomous Unmanned Systems Lab, equipped by L3Harris, focuses upon research in modeling, distributed sensing, control, and real-time decision making.

Total award funding for 2020 for RISES was more than \$2.8 million.





UCF Coastal Researchers Expand Reach with New Facilities and Projects

By: Robert Wells



UCF Coastal, which integrates science and societal needs to address coastal issues, has seen its reach expand over the past year with new facilities, new research projects, and focusing on critical societal challenges.

This year UCF Coastal received possession of the Econfina River House, which was donated to UCF as part of the Econfina River Field Research Station. Now that COVID restrictions are slowly being lifted, UCF Coastal aims to utilize the River House to extend its reach into these understudied areas of coastal Florida.

Graham Worthy, Chair of UCF's Department of Biology, Director of UCF Coastal, and Cluster Lead of the Sustainable Coastal Systems cluster, says the Econfina River Field Research Station is designed to provide a flexible workspace for research teams or participants in field courses.

"The station will allow them to prepare for their fieldwork, process and store collected samples, and potentially serve as an outreach facility to convey research results to park visitors," Worthy says.

"Additionally, the facilities include lodging and a space for storing shallow draft boats as well as an adjacent boat launch," Worthy says.



As individuals, we continue creating new knowledge and driving science-based action for coastal areas.



This year also saw UCF Coastal sign an agreement with the environmental organization The Nature Conservancy allowing researchers to study the conservancy's pristine preserves in Florida, such as the Apalachicola Bluffs and Ravines Preserve, Blowing Rocks Preserve, and Tiger Creek Preserve.

"Researchers, students, and the greater community will be able to conduct biological research on coastal and terrestrial ecosystems, controlled burn research on The Nature Conservancy preserves,

undergraduate education through internships, graduate education, public outreach using local residents as speakers, and joint fund-raising opportunities," Worthy says.

Coastal members were also highly active in research over the last year. Some top research activity included:

Sergio Alvarez was the principal investigator of an awarded \$274,000 National Oceanic and Atmospheric Administration (NOAA) research grant focused on red tide. Alvarez is an assistant professor at UCF's Rosen College of Hospitality Management.

Alvarez, Jacopo Baggio, Chris Emrich, and Thomas Wahl received a \$67,000 internal seed funding award supporting proposal development focused on adaptation pathways. Baggio is an assistant professor in UCF's School of Politics, Security, and International Affairs. Wahl is an assistant professor in UCF's Department of Civil, Environmental, and Construction Engineering.

Alvarez and Lewis were co-principal investigators on an awarded \$2.4 million NOAA research grant focused on red tide mitigation.

Emrich was the principal investigator of a \$100,000 research grant from the Florida Department of Health to continue the development of the Florida Public Health Risk Assessment Tool. The tool uses multiple factors to create risk assessments for area managers and planners.

Lewis was awarded a \$124,926 planning grant from NOAA's Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf States science program. The project is focused on planning and adaptive management in response to changing river flow in the Northern Gulf of Mexico.

Wahl was the principal investigator of a \$336,000 U.S. Army Corps of Engineers research grant focused on compound flooding.

Top publications that UCF Coastal researchers' work appeared in last year included Nature Climate Change; Nature Sustainability; Journal of Geophysical Research Oceans; Journal of Destination Marketing and Management; EOS, Science News by AGU; and Estuaries and Coasts.

Emrich says the aim of UCF Coastal's research is to approach issues from diverse and innovative perspectives with the goal to create solutions to coastal challenges.

"As individuals, we continue creating new knowledge and driving science-based action for coastal areas," Emrich says. "As a team, we are searching for ways to leverage our unique contributions in new transdisciplinary ways for the benefit of society. Coupling our knowledge with local knowledge from all stakeholder groups can foster sustained approaches to tackling tricky coastal problems."

Worthy says the goals for the coming year are to submit an application for a new doctoral program in Integrated Coastal Research, implement a communication campaign for UCF Coastal research, and continue community outreach efforts.

Total award funding for 2020 for Coastal was about \$1.67 million.





Making a Difference for Women and Children, Faculty Cluster has Stellar Year

By: Zenaida Gonzalez Kotala

The Violence Against Women research cluster spent most of 2020 sharing its expertise with UCF and world community.

From collaborations with Victim Services on campus to presenting at the United Nations, members of the cluster worked hard to showcase their expertise and show groups how UCF can help address violence against women that ranges from domestic violence and sexual assault to how the criminal justice system responds to domestic violence.

The cluster, which launched in 2017 is comprised of 11 interdisciplinary researchers from education, social work, criminal justice, sociology, and medicine. The team strives to improve the lives of women and children in the community by creating knowledge to guide policymaking designed to reduce the experience and impact of violence toward women.

According to the cluster, about 33 million women will experience violence in their lifetimes. In addition to physical, sexual, emotional injury, and even death, the economic costs of violence against women in lost work productivity and healthcare services are as high as \$12.6 billion in the United States.

The cluster partners with nonprofit agencies that provide services and support to community members in need. Faculty share their research on relevant topics and issues, conduct evaluations, and partner with agencies when applying for external funding.

In 2020, the cluster generated \$204,282 in fiscal year '20 in sponsored research funding and were quoted multiple times in the media for their research and expertise. Much attention, including articles in the New York Times and on CNN, covered research about the status and experience of transitional housing for survivors of domestic violence, and the increase of domestic violence during the COVID pandemic.

Professor Catherine Kaukinen, one of the cluster leads, presented at the United Nations Office - Drugs and Crime 5th International Conference on Governance, Crime and Justice Statistics. She also completed a commissioned report to the Council on Criminal Justice - National Commission on COVID-19 and Criminal Justice, which received worldwide attention.

Assistant Professors Bethany Backes and Erica Fissel and Associate Professor Amy Reckdenwald presented at the United Nations 65th Commission on the Status of Women Conference. They covered an ongoing national study examining criminal justice responses to domestic violence during the pandemic.

“

I'm so proud of our team, which works tirelessly because we know our work matters.

”

Cluster members also published more than 50 articles in academic journals in 2019-2020. And the cluster is only getting started. Assistant Professor Karina Villalba from the College of Medicine joined the cluster this past year. Her expertise is in Population Health.

“We are a motivated group,” Kaukinen says. “I’m so proud of our team, which works tirelessly because we know our work matters. We want to make it better for women and children. At the end of the day, the work we do is about saving lives.”



FACTS AND STATISTICS

Success By the Numbers

A blurred background image of a business meeting. In the center, a man in a dark suit and red tie is looking towards the camera. To his left, a woman is partially visible, holding a tablet. To his right, another man is seen from the back, wearing a blue shirt. The setting appears to be a modern office with glass partitions and overhead lights.

\$204.14

million dollars of sponsored
research generated in 2020

TECHNOLOGY TRANSFER 2020

\$204.1M

Research Funding



33

Start-ups Still Operational as of FY20



32

Products on the Market



117

Invention Disclosures



147

Total U.S. Patent Applications Filed



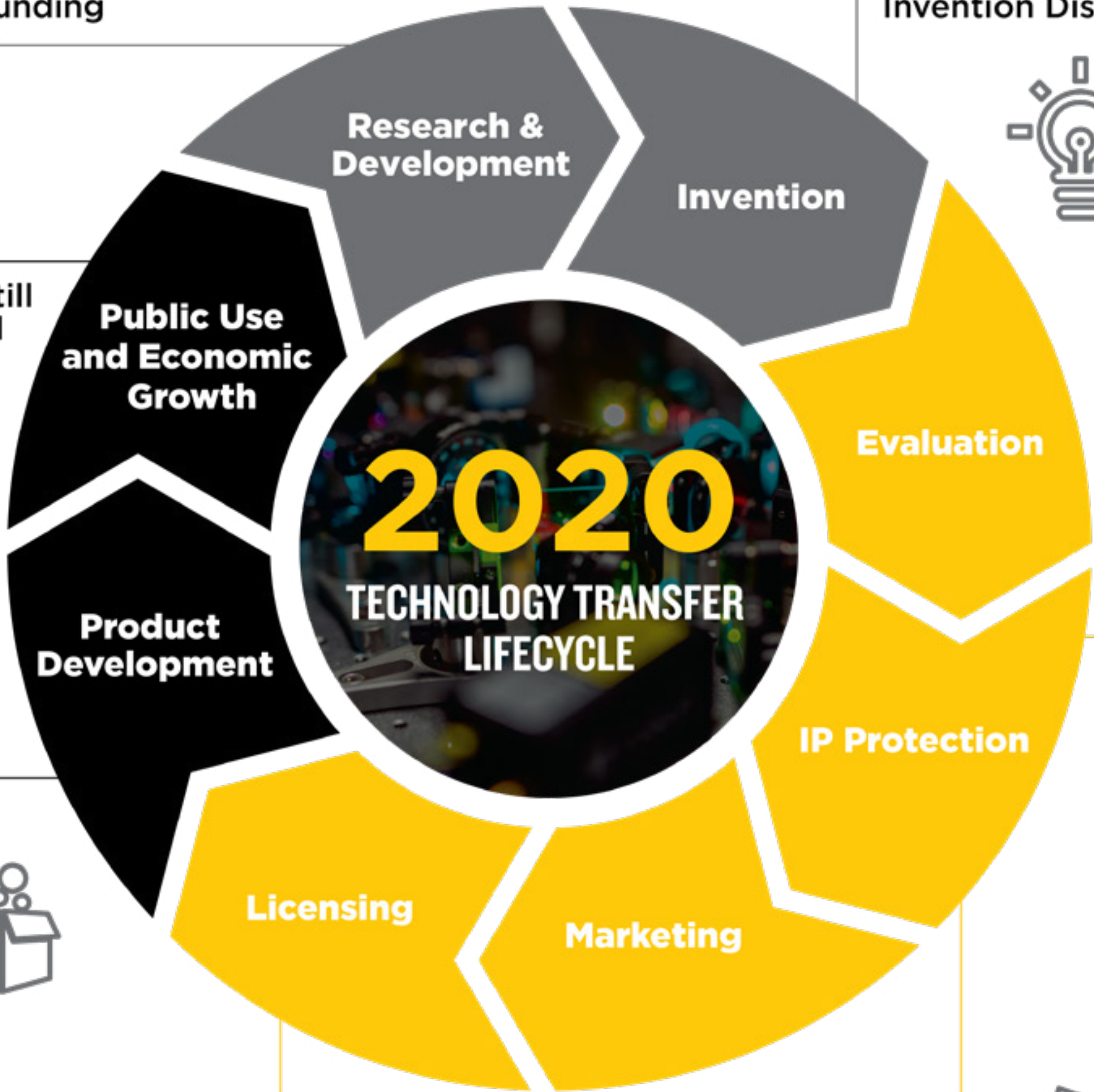
37

U.S. Patents Issued



28

Licenses & Options Executed



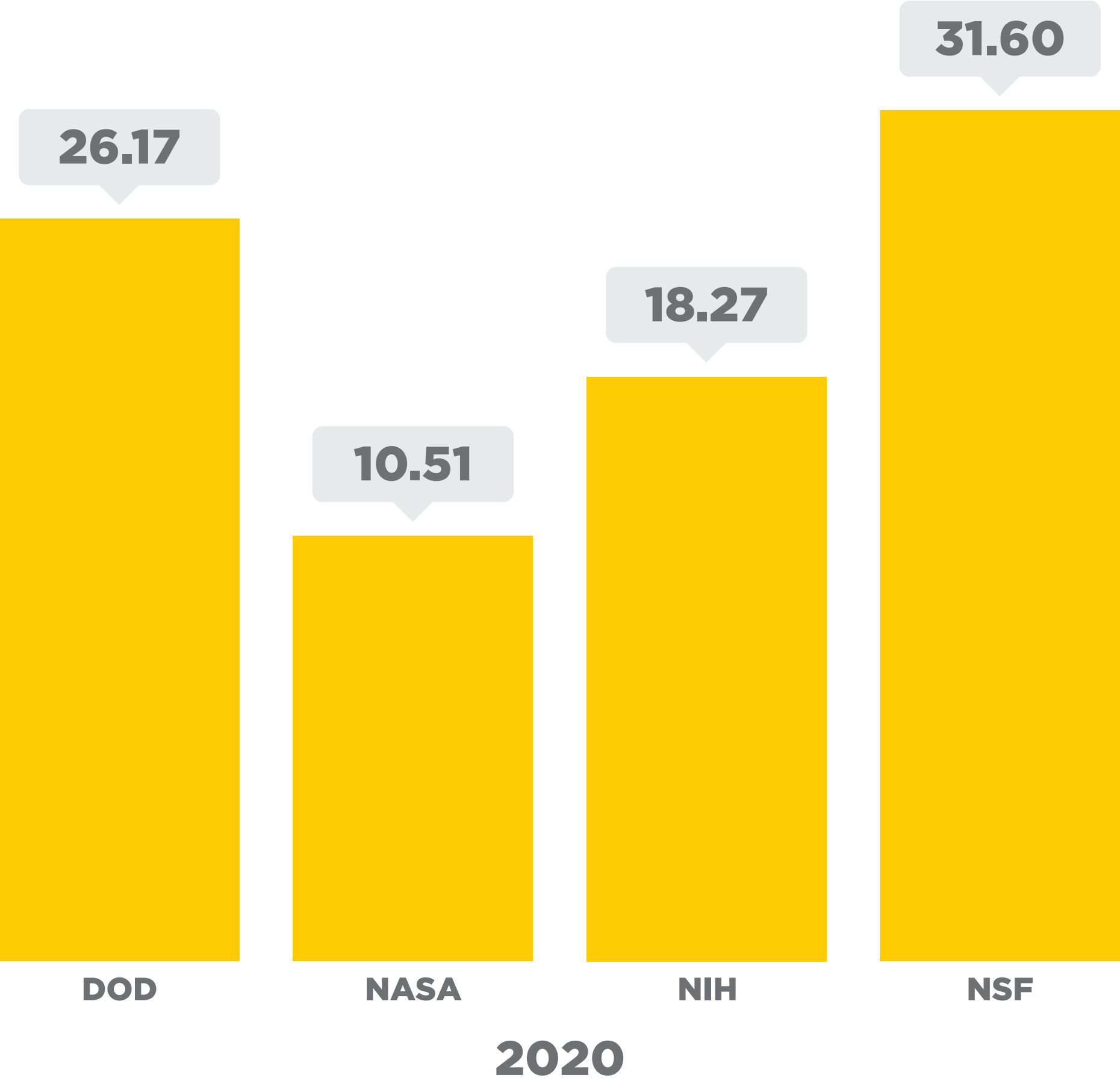
992

Total U.S. patents secured through FY 2020

Our dedicated team of professionals works to bring UCF discoveries to the marketplace through intellectual property protection, marketing and licensing and connects researchers with companies and entrepreneurs to transform innovative ideas into successful products.



KEY FUNDING SOURCES



	2020
Department of Defense	26.11M
National Aeronautics and Space Administration	10.51M
National Institutes of Health	18.27M
National Science Foundation	31.60M

Totals are in United States Dollars (USD)



TYPES OF FUNDING



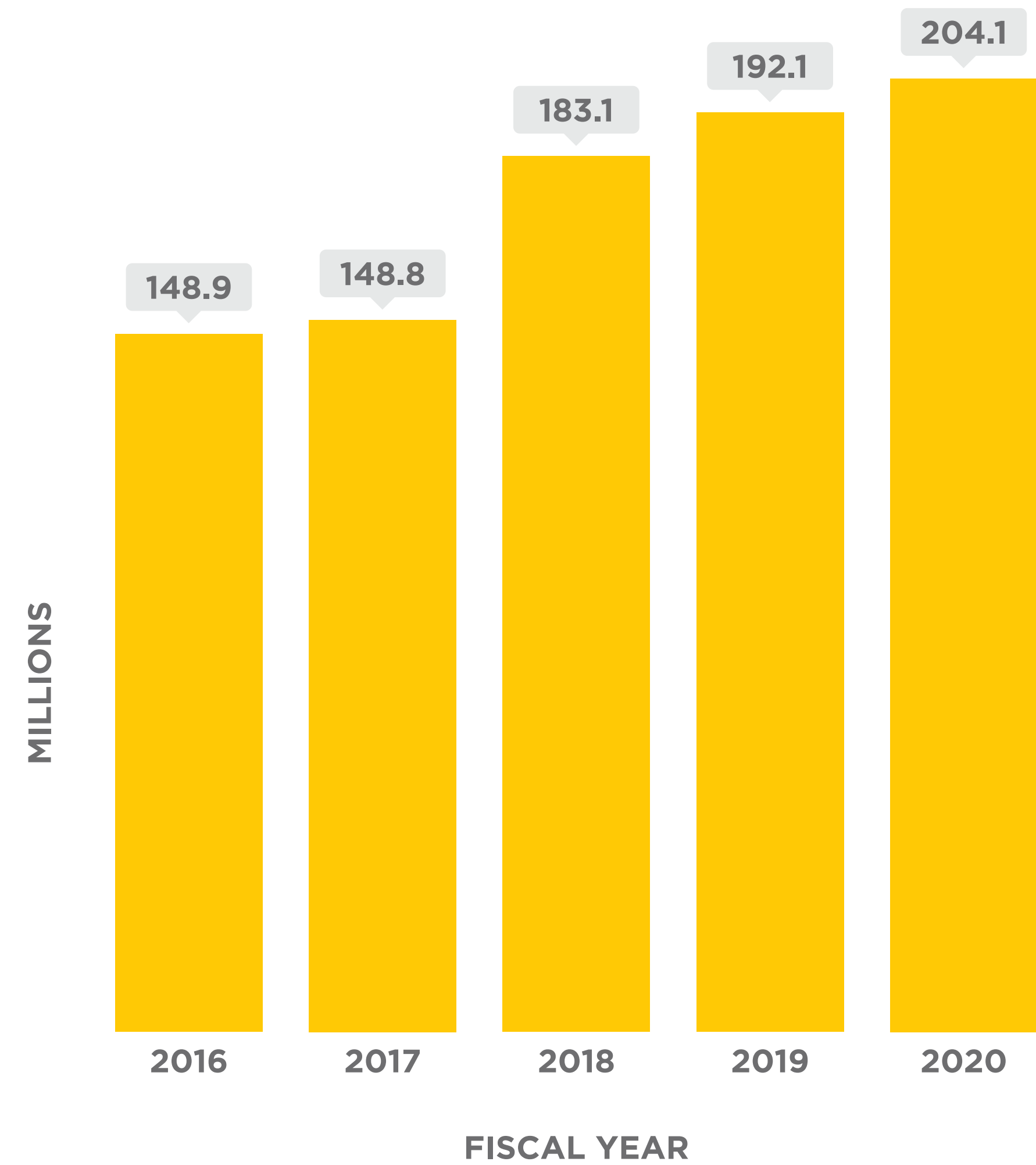
- Key
- Federal
 - Industry and Other
 - State and Local



	2020
Federal	110.82M
Industry and Other	46.63M
State and Local	46.69M

Totals are in United States Dollars (USD)

FISCAL YEAR 2020 RESEARCH ACTIVITY



FIVE YEAR TREND					
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
UCF	148.92M	148.79M	183.12M	192.14M	204.14M
Federal	84.12M	74.11M	97.16M	105.23M	110.82M
Industry & Other	30.64M	25.88M	44.37M	47.83M	46.63M
State & Local	21.45M	36.64M	30.97M	35.20M	46.69M

KEY FEDERAL					
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
DOD	29.84M	23.41M	34.89M	35.84M	26.11M
NASA	17.71M	12.79M	9.49M	8.00M	10.51M
NIH	7.51M	9.19M	7.35M	12.29M	18.27M
NSF	10.09M	13.07M	23.09M	25.69M	31.60M

* Totals are in United States Dollars (USD)

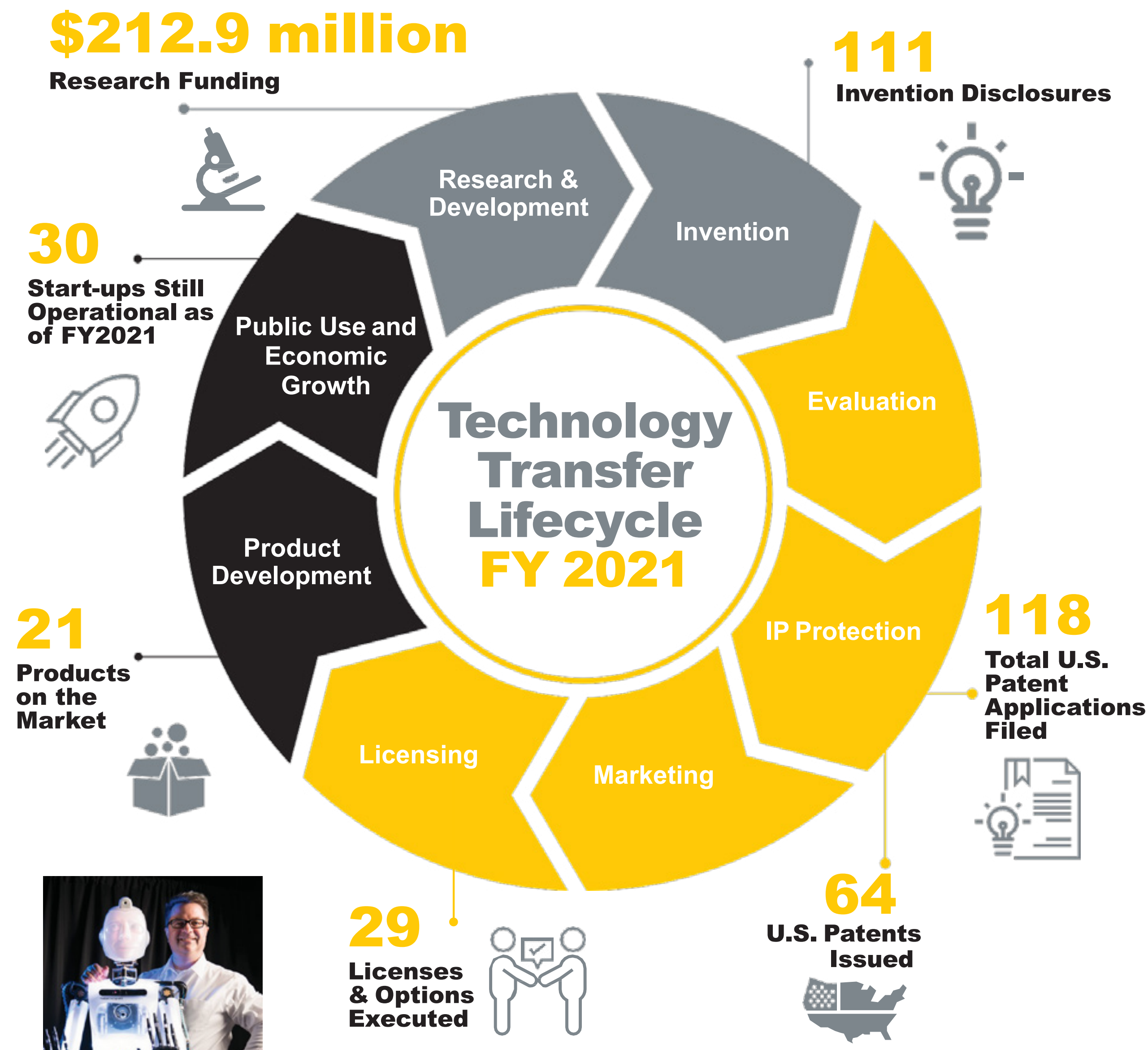
The background of the slide is a photograph of three scientists in a laboratory. In the foreground, a woman with curly hair is looking down at a petri dish. Behind her, a man is looking on. To the right, another woman with glasses is looking at a petri dish. The lab equipment and petri dishes with blue and red samples are visible.

BREAKING NEWS

\$212.93M

million dollars of sponsored
research generated in 2021

TECHNOLOGY TRANSFER 2021



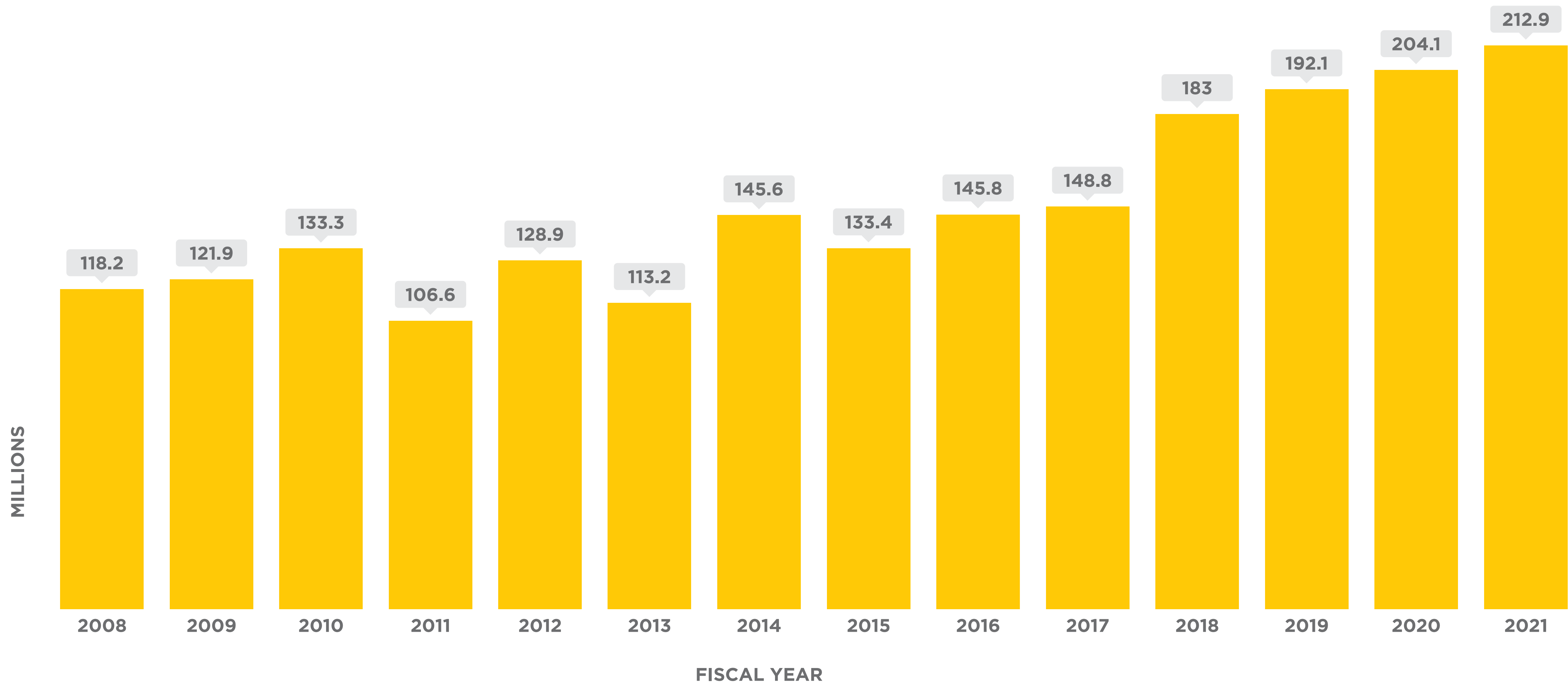
AWARDS BY UNIT

COLLEGE AWARDS	2019	2020	2021
Activity and Service Fees	\$17,582	\$17,582	\$18,435
College of Business	\$490,335	\$215,739	\$343,118
Administration and Finance	\$209,783	\$304,704	\$463,318
Office of Research	\$6,762,632	\$138,662	\$1,162,726
Academic Affairs Administration	\$374,502	\$646,647	\$310,292
College of Graduate Studies	\$899,570	\$813,864	\$230,075
College of Hospitality Management	\$273,210	\$984,542	\$227,256
College of Arts and Humanities	\$1,644,739	\$1,218,732	\$1,567,027
College of Nursing	\$1,271,942	\$1,445,192	\$3,390,097
Communications and Marketing	\$1,680,008	\$1,821,794	\$2,322,706
Advanced Materials Processing and Analysis Center	\$2,903,578	\$2,298,609	\$1,543,921
FSEC Energy Research Center	\$6,008,713	\$3,004,884	\$2,452,599
Center Research Computer Vision	\$1,937,213	\$3,798,909	\$4,440,261
College of Health Professions and Sciences	\$3,610,350	\$4,986,631	\$3,493,778
Student Development and Enrollment Services	\$12,364,619	\$6,754,386	\$2,596,651
Nanoscience Technology Center	\$6,979,607	\$7,786,732	\$4,073,543
Presidential Division	\$3,925,680	\$8,009,335	\$7,171,719
Florida Space Institute	\$9,133,628	\$11,813,375	\$44,095,941
Institute for Simulation and Training	\$17,511,149	\$13,519,998	\$8,763,992
Center for Research and Education in Optics and Lasers	\$15,962,912	\$15,169,478	\$21,480,252
College of Medicine	\$15,564,427	\$20,061,254	\$14,970,361
College of Sciences	\$27,379,968	\$25,350,483	\$25,977,279
College of Community Innovation and Education	\$14,277,791	\$30,890,773	\$26,197,890
College of Engineering and Computer Science	\$40,953,424	\$43,091,982	\$35,645,497
TOTALS	\$192,137,360	\$204,144,286	\$212,938,736

Totals are in United States Dollars (USD)



RESEARCH FUNDING OVER TIME



* Totals are in United States Dollars (USD)

TOP PERFORMERS IN 2021

► Top Performers

- Florida Space Institute: \$44.09M
- Engineering and Computer Science: \$35.64M
- Community Innovation and Education: \$26.19M
- Sciences: \$25.97M
- CREOL: \$21.48M

► Top Researchers

- Ramon Lugo: \$29.76M
- Paula Kohler: \$6.95M
- Amy Ellis: \$6.82M
- Yan Fernandez: \$4.61M
- Felix Tan: \$4.35M

MEDIA HIGHLIGHTS 2020

168

PRESS RELEASES

3,674

RESEARCH STORIES TRACKED

398

FACEBOOK POSTS

324,983

FACEBOOK REACH

42

NATIONAL MEDIA OUTLETS

7,530,410

AUDIENCE REACH

Examples of Media Placements

National	CNN, USA Today, Forbes, Wired, Washington Post, New. York Times, Los Angeles Times, Huffington Post, U.S. News & World Report, Weather Channel, Cosmopolitan Magazine, Good Morning America
Local / Regional	Orlando Sentinel, Orlando Business Journal, Florida Trend, Tampa Bay Times, Miami Herald, WMFE
National Science and Business	Popular Mechanics, Discovery, SciTech Daily, Gizmodo, Space.com, Live Science, IFL Science, CNET, Scientific American, Astronomy Magazine, Marketplace, Fast Company, Forbes, Harvard Business Review
International	Telegraph, BBC, El Nuevo Dia, EFE, TV Peru, Daily Mail, WAPA (Puerto Rico)

* Does not include media pitches or stories written with a UCF internal audience in mind.



ACKNOWLEDGMENTS

The Office of Research and the College of Graduate Studies Communication Team compiled the 2020-2021 Annual Research Report.

The team works directly with researchers across campus and college communicators to share stories with our campus community and to the outside world through the press.

Your 2019-2020 ORGS Team

Zenaida Gonzalez Kotala

Carreen Krapf

Kissimme Crum

Gerri Levitson

Karen Norum

Micaela Reyes

Andres Torres

Thalia Torres

Robert Wells

We want to thank all the faculty, student researchers, and support staff who reached out to us with great story tips this year. If you have a story tip, please send it to Research@ucf.edu.

A special thanks to our colleagues across campus for helping us share our collective research success throughout the year.

Burnett Honors College

Padmini Coopamah Waldron

College of Arts and Humanities

Heather Gibson

Nicole Wills

College of Business

Erika Hodges

Joshua Miranda

College of Community Innovation and Education

D’Ann Rawlinson

College of Engineering and Computer Science

Kimberly Lewis

College of Graduate Studies

Carreen Krapf

College of Health Professionals and Sciences

Megan Pabian

Camille Dolan

Drexler B. James

College of Medicine

Wendy Sarubbi

Suhtling Wong-Vienneau

Christian Senior

College of Nursing

Carolyn Petagno

Julie Harper

College of Sciences

Judy Froehlich

Kyle Martin

College of Undergraduate Studies

Barbara Smith

Rosen College of Hospitality

Susan Vernon-Devlin

UCF Marketing and Communications

Heather Smith

UCF Today

Thomas Bell

Laura Cole

Nichole Dudenhoefer

Jenna Lee

Gene Kruckmeyer