

2022

RESEARCH AND INNOVATION
ANNUAL REPORT

TEXAS A&M UNIVERSITY-CORPUS CHRISTI

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THE FUTURE IS BRIGHT

*A message from the EVP for
Research and Innovation*

When you hear the word innovation, what comes to mind? Is it using drones to study dolphins in the middle of the ocean? Perhaps creating an original screenplay honoring a local civil rights hero? Or maybe even implementing an out-of-the-box business idea to increase efficiency? Each one of these represents a different form of innovation. The good news is that they are not just ideas — they are real-world examples of the research, scholarship, and creative activities taking place on the Island University every day. While it is imperative that we continue to build upon the unique programs and activities that brought us to where we are today, it is even more important that we explore new ways of building multidisciplinary and interdisciplinary collaborations that will take us into the future.

So, what does the future look like and how do we get there? The future of TAMU-CC looks bright and exciting! Some of the ways we push forward are by continuing to build a culture that supports the Island University's R2 status and emerging research institution aspirations, increasing our research, scholarship, and creative activities, and continuing to foster an environment that inspires innovation.



As you will learn in this annual report, this has been a strong and fruitful year as we are stepping more into a place of normalcy. We are grateful for the ability and opportunity to have hosted our annual Research and Innovation Week this past spring, as well as our inaugural Student Research Symposium. We witnessed record numbers of attendance at both. It reaffirmed that research and innovation are integral to the fabric of the Island University.

As we look to the future in research and innovation, I want to emphasize the importance of embracing the accomplishments of our faculty, staff, and students. This annual report is a glimpse into their amazing work.

Sincerely,

Dr. Ahmed Mahdy
Executive VP for Research and Innovation
Texas A&M University-Corpus Christi



LONE STAR UAS CENTER ANSWERS CRITICAL NEEDS IN GROWING DRONE INDUSTRY

The Lone Star Unmanned Aircraft Systems (UAS) Center for Excellence and Innovation (LSUASC) at Texas A&M-Corpus Christi has recently partnered with the Texas Division of Emergency Management to build out a disaster response and recovery capability that can support all levels of government during emergencies.

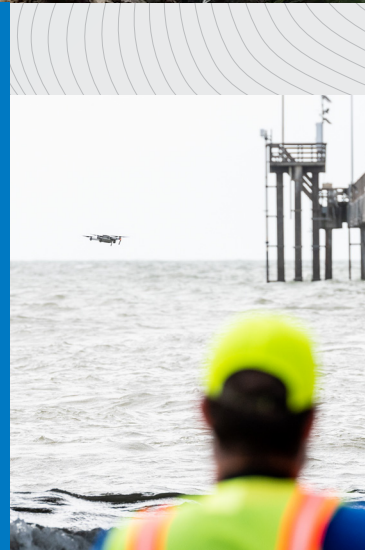
Helping to build that framework is \$3 million from the Texas Legislature for FY 22-23 to enhance the center's ability to supply UAS services in the case of critical emergencies throughout the state such as wildfires, floods, drought, winter weather, and other natural disasters.

"This additional funding allowed LSUASC to expand its public aircraft operations for the State of Texas beyond aeronautics research to encompass support for public safety, search and rescue, and firefighting operations, including biological and geological resource management," said Mike Sanders, LSUASC Executive Director.

In addition, LSUASC recently collaborated with the Federal Aviation Administration (FAA) and Embry-Riddle Aeronautical University on a two-year, \$3.4 million project involving the integration of large autonomous unmanned aircraft into the National Airspace System. The study involved researching the impact of aircraft leaving sight range and how UAS interact with air traffic control, including that of the Corpus Christi International Airport.

LSUASC is partnering with the Virginia Tech Mid-Atlantic Aviation Partnership (MAAP) on the joint National Aeronautics and Space Administration (NASA) and FAA's Unmanned Aircraft System Traffic Management (UTM) Field Test, a research project designed to safely coordinate drone activity by multiple operators in a low-altitude airspace. The UTM Field Test project, which has partnered with eight other technology organizations, will conduct test flights in complex environments such as operations over people and at night, as well as test updates to UTM technology, with a focus on cybersecurity.

"These test flights are critically important as they shift operational concepts into a complex, real-world environment," Sanders said. "We're pleased to be part of the MAAP team and leverage our ongoing work in UTM to contribute to the depth and breadth of the testing environment."



\$3M

TAMU-CC spearheads state and national UAS efforts



TAMU-CC RECEIVES NEH GRANT TO EXPAND RESOURCES OF TEXAS STATE MUSEUM OF ASIAN CULTURES

Thanks to a \$70,000 grant from the National Endowment for the Humanities (NEH), Texas A&M-Corpus Christi will help expand the resources of the Texas State Museum of Asian Cultures for the betterment of underserved school children in the Coastal Bend.

The project, which runs from spring 2022 through summer 2023, has paired TAMU-CC's Coastal Bend Writing Project (CBWP) with museum staff to create open access and adaptable resources like lesson plans and activities pertaining to Asian cultures and history that align with the Texas Essential Knowledge and Skills (TEKS). CBWP teacher consultants, in collaboration with museum experts, will use their expertise to create lesson plans that are both pedagogically sound and targeted toward children from local public, private, and charter schools, as well as home-school groups who, due to time, distance, or budget constraints, have limited access to this information.

The project will also improve in-person and virtual museum displays for the betterment of teachers, students, and museum patrons alike.

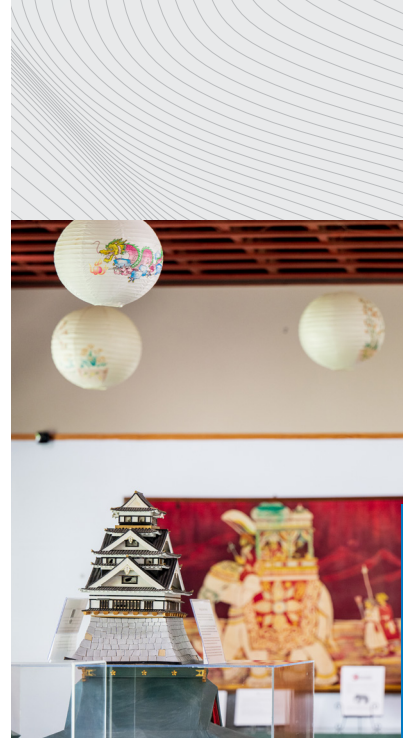
Expanding the museum's reach will enhance appreciation and understanding of the many cultures, religions, histories, and nationalities of Asia, and therefore improve intercultural understanding within our region and country.

Dr. Susan Wolff-Murphy, TAMU-CC Interim Associate Provost and Professor of English, leads the CBWP.

"The more partnerships we can have in the community, the better education we're going to provide to our students and the more we can improve the community as a whole," Wolff-Murphy said. "As the community is improved, everybody benefits."

The Texas State Museum of Asian Cultures, located in downtown Corpus Christi, is the sole museum dedicated to Asian cultures in Texas.

The NEH grant is part of its "A More Perfect Union" initiative, which is designed to demonstrate and enhance the critical role the humanities play in our nation.



**\$70,000
GRANT**

NEH Grant furthers
TAMU-CC's positive impact
on the Coastal Bend

PRESTIGIOUS AFFILIATIONS ELEVATE UNIVERSITY PROFILE

Texas A&M-Corpus Christi is achieving new heights through recent advancements in both national and international research organizations.

TAMU-CC's Office of Research and Engagement earned a coveted spot as a member of the Advancing Research Impact in Society's (ARIS) Program to Enhance Organizational Research Impact Capacity (ORIC). The ORIC Program aids top research institutions in building and expanding their capacity to support research impact efforts through training, resources, and mentorship. TAMU-CC is part of only the second cohort to participate in the program, and was selected through a competitive application process involving organizations from around the world.

The Island University was also recently elected to the University Corporation for Atmospheric Research (UCAR). UCAR is a prestigious nonprofit consortium of North American colleges and universities that provides research and education programs related to Earth system sciences including meteorology, hydrology, oceanography, and climate sciences.

The Department of Physical and Environmental Sciences is TAMU-CC's primary program in UCAR, with the Conrad Blucher Institute for Surveying and Science as the secondary program. Application of TAMU-CC's UCAR membership was led by Dr. Chuntao Liu, TAMU-CC Associate Professor of Atmospheric Sciences. The Island University is the only regional institution in the Texas A&M University System to join the consortium and is one of 122 members nationwide.



TAMU-CC

joins the prestigious
UCAR consortium

DATA SCIENCE MASTER'S DEGREE COMING TO ISLAND UNIVERSITY

Both private industry and the public sector require high-level data scientists to lead applied innovation and make informed business, healthcare, and policy decisions. To meet this growing need, Texas A&M-Corpus Christi will launch a Master of Science in Data Science to begin in fall 2023. This fully online multi-disciplinary program will focus on developing and applying modern mathematical and statistical modeling in conjunction with computational methods to work on "big data" driven problems in science, medicine, engineering, the environment, and other fields.

The program will address a growing demand for a workforce — including researchers and faculty — fluent in data science, and will produce graduates with exceptional skill and expertise to provide Texas and the nation with innovative data-driven solutions.

This data science degree will fuel university research in many areas, particularly in artificial intelligence and machine learning. The Island University plans to introduce a Ph.D. in data science in the next two to three years.



**COMING
FALL 2023**

Master of Science in
Data Science

ISLAND UNIVERSITY RECEIVES FUNDING TO TRAIN UNDERREPRESENTED STUDENTS AND NEXT GENERATION OF SCIENTISTS

The National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA) are supporting three projects at Texas A&M-Corpus Christi, each of which prioritizes the recruitment and training of underrepresented students who will use artificial intelligence (AI) techniques as they become the next generation of experts in coastal data.

Dr. Lea-Der Chen, Associate Dean of the College of Engineering, is the Principal Investigator on a \$5 million grant from NSF to fund the CREST Center for Geospatial and Environmental Informatics, Modeling, and Simulation. The CREST Center, located in the Dr. Robert R. Furgason Engineering Building at TAMU-CC, will recruit and support underrepresented minority students to pursue degrees in STEM fields with a focus on coastal research, resilience, and innovation. Over the course of five years, funding will support three key subprojects: 1) using AI, remote, and autonomous sensing to improve coastal zone monitoring and resiliency decision making, 2) developing a better understanding of the urban water cycle and the resilience of water infrastructure, and 3) investigating how emerging data sources and advanced geospatial computing can be applied to evaluate, assist, and improve a coastal community's physical, behavioral, and social health after disasters.

Dr. Dorina Murgulet, Director of the Center for Water Supply Studies, is the Principal Investigator on a \$2 million grant from the NSF Research Traineeship program. Her project will create a new generation of diverse environmental scientists in coastal and marine system science who are able to conduct big data analyses in interdisciplinary research settings. Focusing on the Gulf Coast, the project will guide the scholarly and professional development of 45 trainees over the course of the four-year grant. The trainees, who will be led by an interdisciplinary cadre of expert faculty researchers, will experience coastal research curriculum, field trips, and data collection, and will make research presentations for internal and external stakeholders.

Dr. Paul Montagna, Regents Professor and Chair for HydroEcology at the Harte Research Institute, is the Principal Investigator for a continuation of funding in the amount of \$1.49 million, for a total of \$6.86 million, from the NOAA Center for Coastal and Marine Ecosystems (CCME). This funding subcontract, led by Florida A&M University, is in its second of five years and will continue the recruitment and training of TAMU-CC undergraduate, graduate, and postdoctoral fellows from underrepresented minority groups in three main areas: conservation, coastal resilience, and coastal intelligence. The project includes exposure to broad research and experiential learning opportunities including NOAA internships.



\$5M GRANT

to fund the CREST Center for Geospatial and Environmental Informatics, Modeling, and Simulation





NSF GRANT SUPPORTS ISLAND UNIVERSITY RESEARCHER IN DOLPHIN REPRODUCTIVE ANATOMY STUDY

Artificial insemination, or assisted reproduction, is not an uncommon conservation method for species whose natural population and biodiversity are dwindling; however, scientists have not yet developed a method that ensures consistent results.

Texas A&M-Corpus Christi's Dr. Dara Orbach, Assistant Professor of Marine Biology, is charting a path to refine this process by understanding the reproductive morphology of female dolphins. Reproductive morphology refers to how reproductive organs are composed and interact with other organs.

Orbach recently secured a \$497,922 National Science Foundation grant to specifically examine how the reproductive anatomy of female bottlenose dolphins enhances or decreases sperm quality samples collected from male dolphins under managed care.

Using female reproductive organ molds made by state-of-the-art 3D printers in Orbach's lab, her team will film the interaction between male dolphins and the molds to determine how tactile cues alter semen quality.

The research is set to span from 2022 to 2025, and the team is hopeful the data collected will lead to groundbreaking discoveries that could change the scope of artificial insemination.

"While the current grant is for three years, I suspect that the data we uncover will be some really exciting findings for basic and applied sciences, which will perpetuate and lead to new discoveries and new research directions," Orbach said. "There's a lot of potential directions we can move. We're laying the foundation for a whole new field that has yet to be explored."

ISLAND UNIVERSITY LAUNCHES NEW RESEARCH CENTER

Texas A&M-Corpus Christi launched the Center for Collaborative Community Research (CCCR), a re-imagined research and educational resource center to serve the Coastal Bend. The center, formerly the Social Science Research Center, will include interdisciplinary collaboration especially among the university's College of Liberal Arts (CLA), College of Nursing and Health Sciences (CONHS), and College of Education and Human Development (COEHD).

CCCR's emerging vision is to be a regionally and nationally recognized home to innovative,

community-based participatory research that engages faculty, staff, and students with public and private sector leaders in ways that develop and sustain human and social capital across South Texas. Through interdisciplinary and holistic approaches, the center will study the impact of health, education, social factors, and cultural influences and their impact on the region.

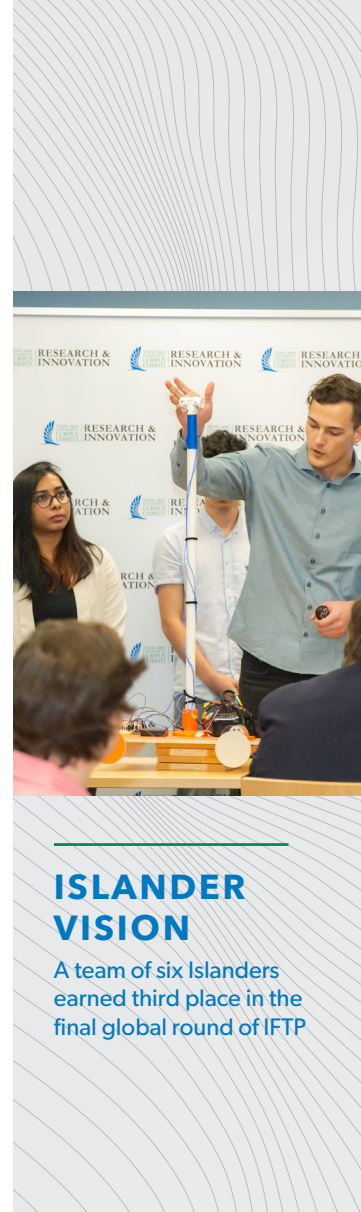
Dr. David Scott, COEHD Dean, is the center's interim director.

FOSTERING STUDENTS' RESEARCH AND INNOVATION THROUGH EXPERIENTIAL LEARNING

In support of the Island University's mission of preparing life-long learners, opportunities to foster students' creativity and enhance their research skills are plentiful and come in many forms. The following are intentional and strategic examples of Texas A&M-Corpus Christi's commitment to this goal.

In spring 2022, TAMU-CC held its inaugural Student Research Symposium, the largest presentation of student research to date on campus. This symposium provided students with the opportunity to communicate their research with the campus and local community. The symposium featured the work of over 100 Islander students from different disciplines including the sciences, engineering, health care, and education. The event drew more than 300 attendees who had the opportunity to learn about state-of-the-art research and to provide students with constructive feedback. This interdisciplinary symposium awarded more than \$2,000 in research awards to students in both undergraduate and graduate degree programs. Students will be able to use this experience as a tool to better prepare themselves for national and international research conferences.

Also, this past spring, Islander students competed in Invent for the Planet (IFTP), a 48-hour global competition that focused on the creation of bold and innovative technologies to address some of the world's major issues. This year, 29 universities from 16 different countries participated in the unique competition. IFTP is hosted by Texas A&M University in College Station and is yet another platform where students can apply their knowledge to make a positive impact on the world. Among the TAMU-CC teams was Islander Vision, a group of six Islander students set out to make their contribution to the world with the invention, Hero 1.0, an automated robot programmed to help guide visually impaired children. Nolan Bell, Gregory Hartsfield, Amine Khodja, Aurelia O'Neil, Aseema Pati, and Nabil Abdelaziz Ferhat Taleb, undergraduate and doctoral candidates, were awarded third place in the final IFTP round for this innovative technology. In addition to achieving this accomplishment, Islander Vision has gained experience solving real-world problems.



TAMU-CC DISTINCTIONS BY RESEARCH

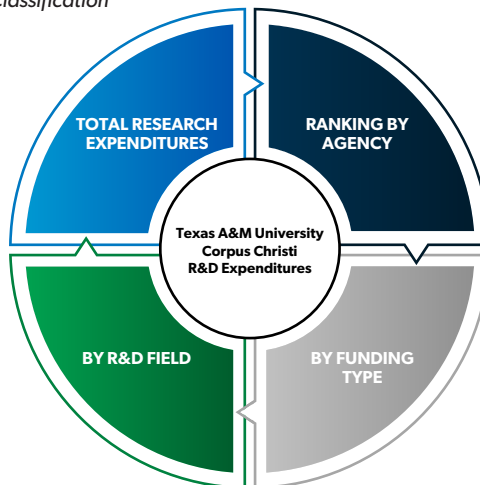
Per latest NSF HERD and Carnegie Classification

#1 Texas A&M Regional University
Federally funded

#1 Texas A&M Regional University
State & Local govt. funded

NASA: # 1 Texas A&M Regional University

#1 Texas A&M Regional University
#187 of 403 in Engineering
(of reporting U.S. Institutions)



#1 Texas A&M Regional University

#9 of 27 among all Texas Public, Non-Medical Universities

#24 of 71 R2 Universities in the U.S.; Public, Non-medical

#1 Texas A&M Regional University
#61 of 425 in Geo-, Atmospheric, and Ocean Sciences (of reporting U.S. Institutions)