



TEXAS A&M UNIVERSITY  
CORPUS CHRISTI

# RESEARCH & INNOVATION ANNUAL REPORT

TEXAS A&M UNIVERSITY-CORPUS CHRISTI  
2021



# STRATEGIC AND INTENTIONAL GROWTH

*A message from the VP for Research and Innovation*

As we approach the third anniversary of the Island University's "R2 Doctoral University-High Research Activity" designation by the Carnegie Commission of Higher Education, I would like to take a moment to reflect on how far we have come in such little time.

There is no one who could have predicted how different the world in 2021 would be compared to our world in 2018, but by many accounts, we have not merely navigated through these challenging times, but we have galvanized our position as the Intellectual Capital of South Texas.

We have leveraged our expertise in research, scholarship, and creative activity, along with our unique coastal location, to define who we are and distinguish areas of significant growth.

From the countless hours our researchers have spent analyzing COVID-19 data for use by the local government to make critical decisions, to strategic growth in biomedical sciences, to our exclusive designation as trailblazers in coastal artificial intelligence, to being a hub for building capacity in minority-serving institutions, Islanders are making an impact beyond a singular research agenda. Our experts are driven by a cause larger than themselves, a cause that will make this world a more informed, and more importantly, a better place to exist.



None of our accolades are by accident. In fact, it is quite the opposite. Our growth has been strategic and intentional. It has been exciting to see our research portfolio expand, while attaining record levels of funding and disseminating scholarly and creative works.

These uncertain times have made one thing certain for me — that we can, and will, rise to the occasion. When people in our community need our help, we will answer the call. By investing in the next generation of researchers, we will answer the call for decades to come.

Please take a moment to review this annual report and see the many examples of the Islander Impact. I look forward to increasing our research momentum and raising our national reputation for student success, interdisciplinary research, and impactful innovation.

Sincerely,



Dr. Ahmed Mahdy

*Vice President for Research and Innovation*



## DR. PAUL MONTAGNA INTERNATIONALLY RANKED AMONG TOP SCIENTISTS

Dr. Paul Montagna, Chair for HydroEcology at the Harte Research Institute for Gulf of Mexico Studies at Texas A&M University-Corpus Christi, was recently recognized among the top 2% of scientists worldwide for research citations, according to a study conducted by Stanford University. The database includes more than 156,000 scientists whose work has been most cited by peers. Citation in the scientific world can be an indicator of a researcher's relevance, and many published works are only cited once or twice, if ever.

Recognized most notably for his research regarding the 2010 Deepwater Horizon oil spill (which he completed while Endowed Chair of Ecosystems and Modeling at HRI), Montagna says his passion now lies within the study of water resources and environmental flows. Procuring more than 35 years of environmental data from the Texas coast, Montagna says his recent work will provide state environmental agencies the leverage they need to set effective regulations for water management.

Since joining the university in 2006 as one of the six founding chairs to lead HRI, Montagna says he has witnessed the transition of TAMU-CC from a growing university into a leading research institution.

"I bought into the vision of what could be," said Montagna, who is also a Texas A&M University Regents Professor. "After being here 15 years, I can say that without a doubt those visions have come to fruition. Together, we've reached a level of national prominence in a very short time."



**DR. PAUL MONTAGNA**

HRI Chair for HydroEcology

## NEW NETTING STRUCTURE ALLOWS FOR SAFER, MORE EFFICIENT DRONE TESTING

An expansive new netting structure is giving drone-operating experts at the Texas A&M University-Corpus Christi Lone Star Unmanned Aircraft System Center of Excellence & Innovation a much greater ability to test drones safely and quickly at the center's Flour Bluff headquarters.

The structure — as big as a five-story warehouse — covers more than 6,700 square feet and encloses more than 322,000 cubic feet of airspace. Unique in Texas, the net provides a safe place away from pedestrians, roadway traffic, and military aircraft for TAMU-CC researchers to check drone flight airworthiness.

"This is an impressive addition to our scientific facilities at Texas A&M-Corpus Christi," Dr. Kelly M. Miller, TAMU-CC President and CEO, said. "The benefits are important to the Lone Star UAS Center as it works to advance technology and research with the FAA, with NASA, and with our many other partners."

The net also opens the skies to academic endeavors from grade school to post-doctoral work, along with partnerships with the aeronautics and technology industry.



**322,000**

cubic feet of airspace in the Lone Star UAS Center netting structure

# UNIVERSITY LEADS NATIONAL EFFORTS FOR COASTAL ARTIFICIAL INTELLIGENCE

Strong interdisciplinary research, a strategic coastal location, and an innovation ecosystem are top reasons why Texas A&M University-Corpus Christi was selected to host one of seven national centers to explore how to best develop Artificial Intelligence (AI) to benefit our society, with a focus on environmental science.

Hailed as a “historic milestone in environmental science,” this partnership is funded by the National Science Foundation and seven other federal agencies, which have invested more than \$100 million in the project.

The Coastal Bend team, which is supported by \$3.2 million over five years, is led by researchers at the TAMU-CC Conrad Blucher Institute (CBI).

One of the goals of the team is to develop Coastal AI models using big data and satellite imagery to better predict and understand beach inundation, which impacts beach goers and nesting of sea turtles. Local researchers will also focus on ways AI models can help better manage the environment and the economy. For example, they plan to explore how combining satellite imagery and numerical models to predict coastal fog will help manage ship traffic and how the development of new models and methods will improve weather, climate, and coastal forecasts.

“We must be smart, efficient, and creative if we hope to evolve towards a new balance between humankind and our earth,” Dr. Philippe Tissot, CBI Interim Director, said. “AI has the potential to take advantage of the large data sets and growing computational capabilities to help us do a better job in the face of challenges such as climate change, increase of extreme events, and relative sea level rise.”

At TAMU-CC, a dozen graduate and undergraduate students, as well as faculty and research staff, have been funded. The first publication focused on predicting fog with a deep learning method was accepted in fall 2021, and two students won awards at the 2021 meeting of the American Meteorological Society. Additionally, in collaboration with Del Mar College, Island University researchers have launched the first-of-its-kind Artificial Intelligence in Geographic Information Science Occupational Skills Award to develop a pipeline of GIS students, specifically Hispanic and first-generation students, for the growing AI field.



**\$3.2M**

allotted over five years to investigate AI integration with a focus on environmental impacts





## INTERNAL FUNDING KEY TO BROAD SHOWCASE OF PANDEMIC-INSPIRED ART

Funding from the Texas A&M University-Corpus Christi Division of Research and Innovation (R&I) was instrumental to a broad showcase of art by Leticia Bajuyo, TAMU-CC Associate Professor of Art.

“Tethered: Bell South, Singer, Royal, and Sony,” is a set of four graphite on wood panels that was inspired by the impacts of COVID-19 and was one of seven faculty projects awarded \$2,500 in summer 2020 as part of R&I’s Just-in-Time internal funding program.

Separated from her regular tools during the stay-at-home order, Bajuyo, who specializes in sculpture, returned to drawing. The series of artworks features analog objects, including a phone, sewing machine, typewriter, and headphones.

“While this initially began as a conceptual response to social distancing, I recognize it is also about the stretch and juggle of sheltering-in-place, homeschooling, and listening to too many news reports about the economic ripple effect of COVID-19,” she said. “These eight-foot drawings embody the desire to touch, share, and listen, but also serve as slow public service announcements that demonstrate a need for social distancing that conflicts with the need for social contact.”

The R&I funding allowed Bajuyo to professionally frame the drawings so they could be exhibited in person instead of remaining a digital display. The series was displayed in fall 2020 in Mobile, Alabama; and in Dallas, Texas, from November 2020 through January 2021. The exhibit was also displayed at the Art Museum of South Texas from April through September 2021.



**LETICIA  
BAJUYO**  
Associate Professor  
of Art

## STRATEGIC INVESTMENT BOOSTS FUNDING FROM NATIONAL SCIENCE FOUNDATION

Through an intentional and strategic allocation of resources, Texas A&M University-Corpus Christi has reached new levels of National Science Foundation (NSF) funding. Thanks to the expertise of university researchers, along with the commitment and dedication of staff in the Division of Research and Innovation (R&I), the success of research proposals has surged across three of the university's colleges: Science and Engineering, Liberal Arts, and Nursing and Health Sciences.



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### DR. BARNABAS DARU

Assistant Professor of Biology

The grant proposal process takes months of preparation and teamwork, from weekly meetings to budget planning, assigning team roles, and drafting proposals for early feedback and revisions. To meet the challenge of writing a successful grant head-on, R&I recently organized two grant writing bootcamps, where researchers not only learned what R&I can do to help them be successful, but what role they have in their own success.

Dr. Barnabas Daru, TAMU-CC Assistant Professor of Biology and Curator of the Ruth O'Brien Herbarium, received an NSF award of \$143,676 in 2020, and a \$585,050 NSF award in 2021. The latter is for a project to create a software identification program and develop methods for mapping organisms, including plant and animal species across the globe.

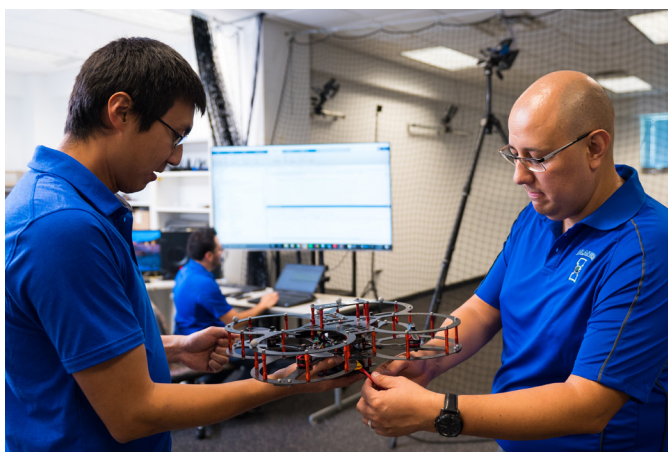
Another recent NSF success is Dr. Wei Xu, TAMU-CC Assistant Professor of Marine Biomedical Science, who earned a 2021 NSF CAREER grant totaling \$809,202 over the next 5 years. His

project, which will utilize the skill sets of Islander students, community college students, and local STEM teachers, aims to discover how certain environmental stressors affect oyster shell formation. His results will be applied to oyster aquaculture in the Gulf of Mexico and will help with restoration of shellfish habitats along the coast.

An NSF CAREER award is one of the most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and lead advances in the mission of their organization.

Dr. Carlos Rubio-Medrano, TAMU-CC Assistant Professor of Computer Science, along with a team of faculty from the College of Science and Engineering, secured a grant totaling \$486,455 in fall 2021. The three-year project, funded by NSF's Computer and Information Science and Engineering Minority-Serving Institutions Research Expansion Program, will focus on an open-source framework called No-Fly-Zone that will help regulate the flight paths of unmanned aerial vehicles with an emphasis on safety, cybersecurity, and privacy.

In addition, the researchers will use this project as a launchpad for underrepresented groups, including women and Latinx students, with the end goal of building a stronger and more diverse workforce pipeline.



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### DR. CARLOS RUBIO-MEDRANO

Assistant Professor of Computer Science (right) with Dr. Tiaxing Chu, (left) Assistant Professor of Geographic Information Science



# TAMU-CC TO MODERNIZE SPATIAL REFERENCE SYSTEM FOR TEXAS

Texas A&M University-Corpus Christi is leading the way in the Lone Star State as part of a national technological update that will transform the fields of surveying, cartography, and land-use planning.

To improve the National Spatial Reference System (NSRS), a system that defines latitude, longitude, height, scale, gravity, and orientation throughout the United States, the U.S. National Geodetic System will introduce its replacement, which includes four new terrestrial reference planes and a geopotential datum, in 2023.

As part of the update, each state is required to update its State Coordinate System Project zones. In Texas, the Texas Spatial Reference Center (TSRC), led by Dr. Davey Edwards and housed within the Conrad Blucher Institute for Surveying and Science at TAMU-CC, will serve as the official resource to the new National Spatial Reference System and Texas State Coordinate System definitions starting fall 2021.

TAMU-CC, on behalf of the TSRC, helped author a bill during the 87th Legislative Session to appoint TSRC as the official resource to the new Spatial Reference System and Texas State Coordinate System definitions. Once introduced, Coastal Bend elected officials, including Sen. Juan “Chuy” Hinojosa and Rep. Todd Hunter, moved quickly to secure the bill’s passage. Gov. Greg Abbott signed Senate Bill 1072 into law as written on June 7. The bill also defined the international foot as the standard unit of measure.

“The Island University is so thankful for the continued support we have received from our legislators, especially Senator Hinojosa, Representative Hunter, and Representative Herrero,” said Dr. Kelly M. Miller, TAMU-CC President and CEO. “It is thanks to their tireless work that we have achieved this unique and innovative opportunity, bringing further national recognition to our campus.”

The new update will rely on Global Navigation Satellite System (GNSS), which includes the Global Positioning System (GPS) and others, and gravity to calculate the new datum, instead of a point of reference, like a static monument or landmark.

Looking ahead, the TSRC will continue to work with stakeholders to provide mapping information, especially for emergency and floodplain management.



## THE TEXAS SPATIAL REFERENCE CENTER

works with geospatial scientists, engineers, and land surveyors



# NEW NIH AWARD ADVANCES RESEARCH IN MARINE BIOMEDICAL SCIENCES

By studying the effects of cross-generational inheritance of disease susceptibilities of an East Asian fish, Dr. Frauke Seemann, Assistant Professor of Marine Biomedical Sciences at Texas A&M University-Corpus Christi, is focused on preventive and therapeutic tool development to better assess, avert, and mitigate osteoporotic fracture risks.

Through a newly earned \$405,202 R15 Academic Research Enhancement Award grant from the National Institute of Environmental Health Sciences, a division of the Department of Health and Human Services, Seemann is taking a deeper dive into the impacts of environmental stressors and their potential to cause osteoporosis.

According to Seemann, medaka, which are commonly found living in Japanese rice paddies, make an excellent test subject, as their spine and bone cell structure bear strong resemblance to that of humans. In addition, using fish models allows real-time live imaging of biological traits like skeletal development and repair.

Seemann is working alongside a well-trained cohort of Islander students.

“This study, conducted at our Minority-Serving Institution, will expose students to cutting edge research and research methodologies,” Seemann said. “It will increase STEM participation and retention of underrepresented students, some of whom will no doubt pursue a career in biomedical science.”

The project, carried out in Seemann’s labs on the first and third floor of the Island University’s Tidal Hall, will provide yearly updates to NIEHS and wrap up in March 2024.



## DR. FRAUKE SEEMANN

Assistant Professor  
of Marine Biomedical  
Sciences

Source: Kotaro Negawa



# TAMU-CC DISTINCTIONS BY RESEARCH

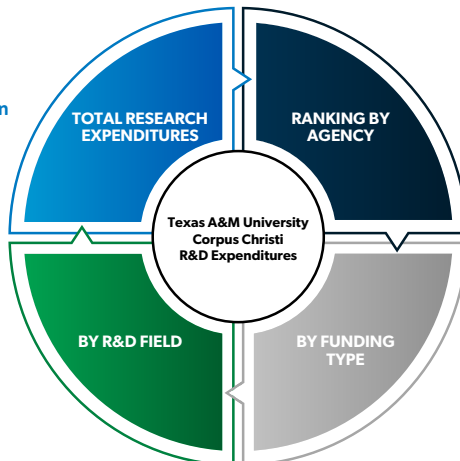
Per the latest NSF HERD

#1 Texas A&M Regional University  
Total R&D Expenditures \$32.944 million

#1 Texas A&M Regional University  
#187 of 430 Total in Engineering  
R&D Expenditures \$7.193 million

#1 Texas A&M Regional University  
Federally funded R&D Expenditures  
\$14.451 million

#1 Texas A&M Regional University  
State & Local govt. funded  
R&D Expenditures \$8.481 million



NASA: #1 Texas A&M Regional University  
Ranking increase to 114 from 132  
R&D Expenditures \$1.724 million

NSF: #1 Texas A&M Regional University  
Ranking increase to 230 from 256  
R&D Expenditures \$2.337 million

#10 of 26 R&D Expenditures  
Texas Public Universities (Non-Medical)

#1 Texas A&M Regional University  
#56 of 430 Geosciences, Atmospheric  
Sciences, and Ocean Sciences  
R&D Expenditures \$14.719 million