THE TEXAS STATE UNIVERSITY SYSTEM

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2020 TSUS Annual Research Report

THE TEXAS STATE UNIVERSITY SYSTEM

About TSUS

Research operations at Texas State University System's four-year universities are catalysts for discovery and innovation. As part of a fast-growing system, Lamar University, Sam Houston State University, Sul Ross State University and Texas State University are at the forefront of new ideas and discoveries that respond to today's scientific, environmental and societal challenges.

These institutions are building upon existing frameworks of academic excellence in learning, teaching and research. They are focused on fostering an environment of creativity and collaboration where student scholars, faculty researchers and industry partners generate solutions-based research relevant to a 21st century economy.

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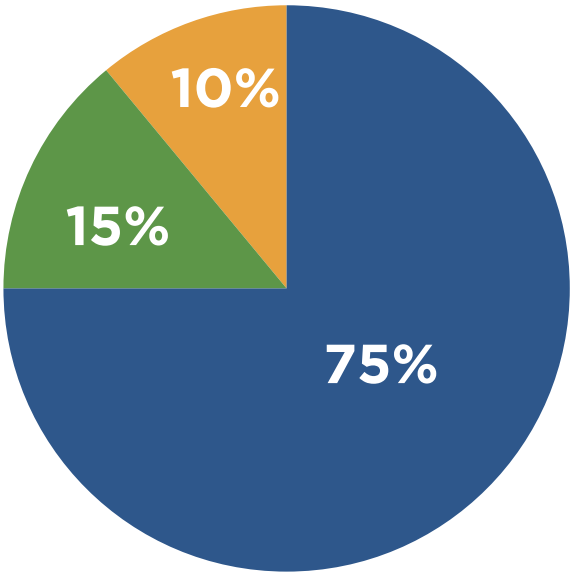
TSUS Facts & Figures

FY 2019 Funding Sources



- **Federal** ($59.3m)
- **State** ($12.0m)
- **Private/Non-Profit** ($8.3m)

Federal Funds - All federal monies used in support of the R&D activities of the institution.

State - Included in this category are state appropriated "non-formula items," state research contracts and grants, interagency contracts, contracts with Texas local governments, etc.

Private/Non-Profit - Include expenditures from both for-profit and non-profit corporations and individuals. Also, included in this category funds from other states.

Proposals Submitted

FY 15 776 → FY 19 1,008

30% Increase

Proposals Funded

FY 15 320 → FY 19 379

18% Increase

Funding Awarded

FY 15 $66.2m → FY 19 $79.6m

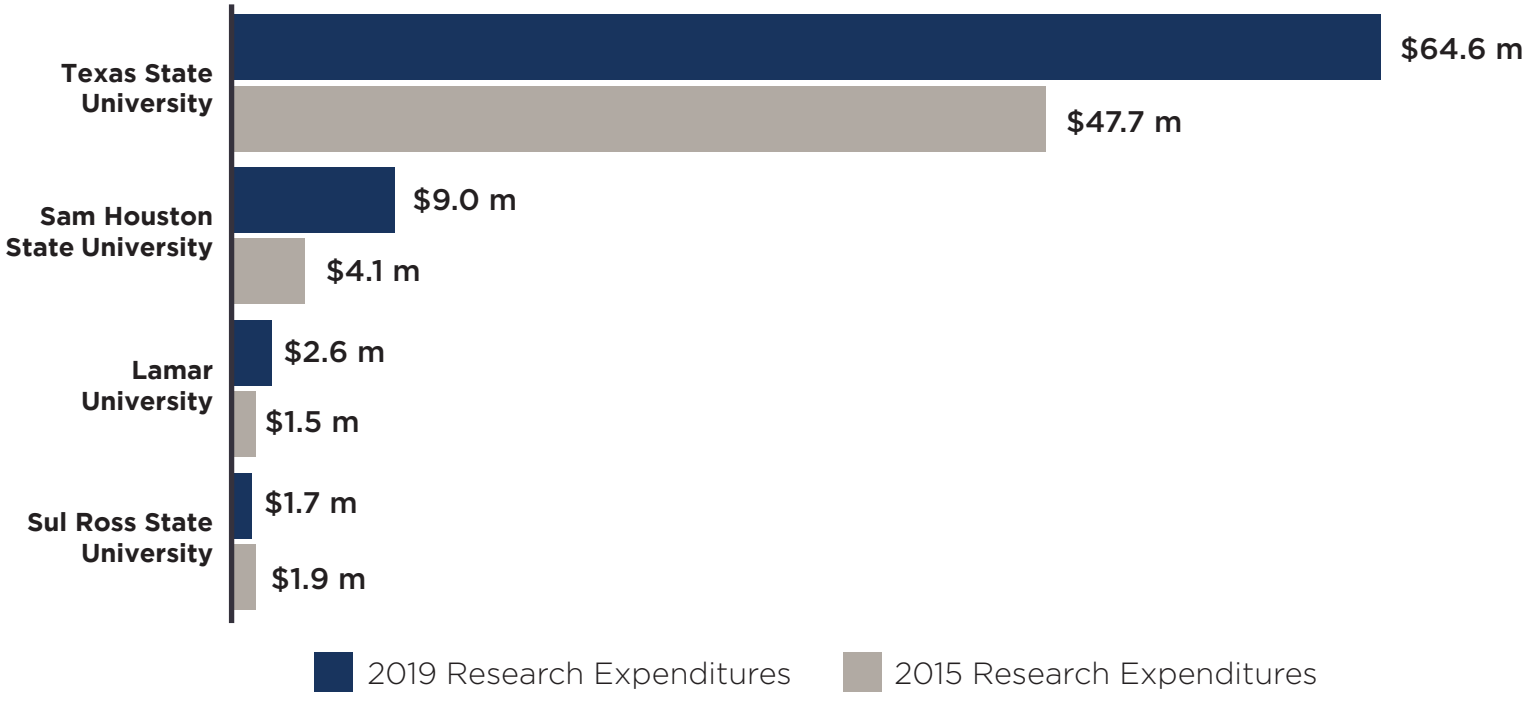
20% Increase

Research Expenditures

FY 15 $55.2m → FY 19 $77.9m

41% Increase

Research Expenditures by University

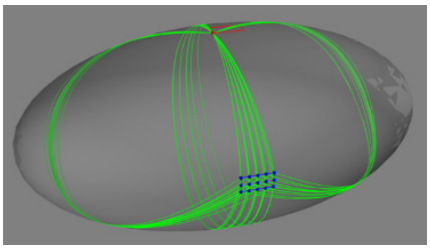


Lamar University

Scalable Synthesis of Environmentally Friendly Nanomaterials

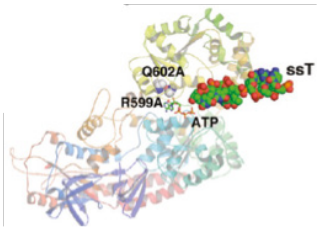
Lamar Chemical Engineering Assistant Professor Clayton Jeffryes develops sustainable, energy-efficient microwave-based reaction systems to produce environmentally friendly nanomaterials. In his design, the nanomaterials are produced using only common salts and biologically sourced, "green" substrates. The synthesis processes derived from Professor Jeffryes's research are readily scalable for commercial applications and have been shown to minimize environmental impacts to water and air. The manufacturing process substantially reduces the generation of hazardous wastes and the toxicity of nano-sized materials, as well as the cost of nano-synthesis.

No Interference in Multi-Antenna Systems



Lamar Electrical Engineering Assistant Professor Cagatay Tokgoz, supported by Air Force Research Laboratory, develops advanced mathematical algorithms and simulation tools capable of predicting surface waves that cause communication problems and performance degradations for antennas located on the same large-scale convex platform. His research enables accurate prediction of antenna-platform interactions to reduce undesired electromagnetic interference, improve electromagnetic compatibility and eliminate wireless communication barriers associated with these antennas. The results address challenging wireless communication interference issues encountered in both commercial and military applications.

Decoding Bacterial RNAs Pathways for Human Health



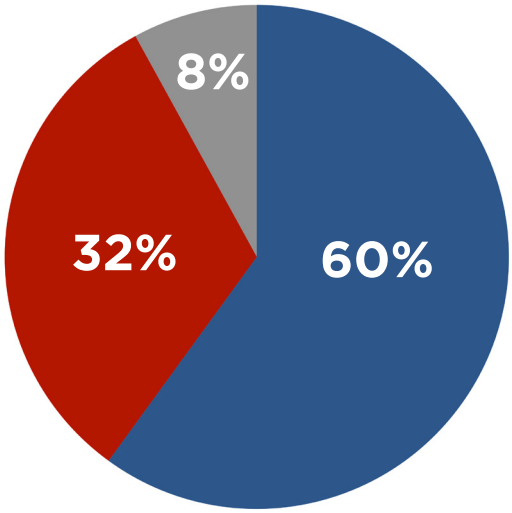
Lamar Chemistry Associate Professor Maxim Sukhodolets has received multiple research grants from the National Institutes of Health (NIH) for investigating bacterial transcription factors linked to important human diseases. His work advances the state-of-the-art methodology in mechanistic analysis of proteins involved in nucleic acids metabolism, elucidates the mechanistic aspects of RNA management in bacteria, and predicts protein functions through a blend of advanced biochemical, biophysical and genetic techniques. Understanding of such molecular mechanisms has assisted in finding effective cures against HIV, tuberculosis, and Hepatitis C in the past.

Web-Based CBT for Tinnitus Sufferers

Lamar Speech & Hearing Professor Vinaya Manchaiah has received continuous support from the National Institutes of Health (NIH) to improve accessibility, affordability and outcomes of hearing healthcare services by promoting self-management and use of digital technologies. His research develops an accessible and affordable self-help program that improves health outcomes in individuals with tinnitus via cognitive behavior therapy (CBT). As one of Jerger Future Leaders of Audiology named by American Academy of Audiology, Professor Manchaiah's work offers CBT via the Internet as a guided self-help program (i.e., ICBT) customized to meet specific individual needs.

Facts & Figures

FY 2019 Funding Sources



Federal ($4.6m) State ($2.5m) Private/Non-Profit ($0.62m)

Proposals Submitted

FY 15 134 → FY 19 188

40% Increase

Proposals Funded

FY 15 72 → FY 19 93

29% Increase

Funding Awarded

FY 15 $3.7m → FY 19 $7.7m

108% Increase

Research Expenditures

FY 15 $1.5m → FY 19 $2.6m

74% Increase

University Research Centers

- ★ Center for Midstream Management and Science
- ★ Center for Advances in Water and Air quality
- ★ Center for Advances in Port Management
- ★ Center for Educational Innovation & Digital Learning
- ★ Center for History and Culture
- ★ Texas Air Research Center & Hazardous Waste Research Center

Federal Funding Sources

- ★ Department of State
- ★ Department of Interior
- ★ National Institutes of Health
- ★ National Institutes of Justice
- ★ National Science Foundation
- ★ Office of National Drug Control Policy
- ★ US Department of Agriculture
- ★ US Department of Agriculture, APHIS Farm Bill 10007
- ★ USDA, National Institute of Food and Agriculture
- ★ US Department of Education
- ★ National Endowment for the Humanities

Five-Year Publications by Discipline

103 Materials Science Multidisciplinary	67 Chemistry Multidisciplinary	55 Chemistry Physical	41 Audiology Language Pathology	41 Othorhinolaryngology
99 Engineering Electrical Electronic	66 Physics Applied	35 Telecommunications	30 Energy Fuels	28 Engineering Civil
74 Environmental Sciences	57 Engineering Chemical	32 Nanoscience Nanotechnology	30 Engineering Environmental	28 Meteorology Atmospheric Sciences

Sam Houston State University

In collaboration with the state of Texas, SHSU established the Center for Assessment, Research, and Education Safety (C.A.R.E.S.) in early 2020 to focus on school safety. Originally tasked with creating a statewide needs assessment on school safety, mental health and violence in schools, C.A.R.E.S is now going nationwide. This new project, launching July 6, uses a crowdsourcing data collection method (IdeaScale) to examine decision-making processes and ideas for future responses to the COVID-19 pandemic. This site will be shared with more than 45,000 people in higher education across the U.S. The Center is led by Dr. Matthew Fuller.

Sibyl Bucheli and Aaron Lynne, associate professors in the Department of Biological Sciences, were awarded nearly $1.2 million in FY20 from the National Institute of Justice to support their continued collaboration with their partners at Colorado State University to study the effects of decomposition in the microbiome in order to more accurately assess the time-of-death of victims in criminal investigations.

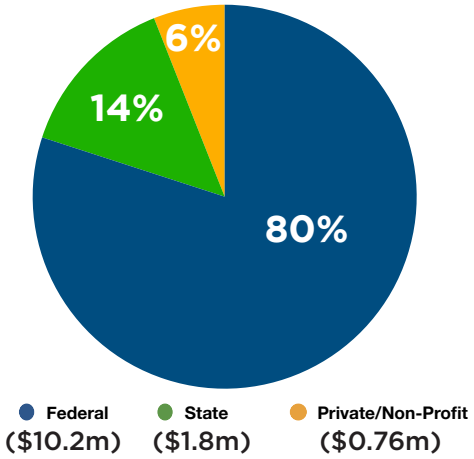
The Garrett Center at Sam Houston State University received nearly $1.5 million in FY19 from the Texas Education Agency to support their work to improve the transition services available to students, educators, families, agencies, and community partners to facilitate the success of students with disabilities. Vickie Mitchell, Executive Director of the center and associate professor in the College of Education, serves at the state lead on the grant.

Ling Ren, a professor in the Department of Criminal Justice and Criminology, earned over $70,000 in FY19 from the Montgomery County, Texas, District Attorney's Office for work in fighting the opioid epidemic. She collaborates with Montgomery County, Texas, ADA Tamara Holland and Investigator Joe Nichols.

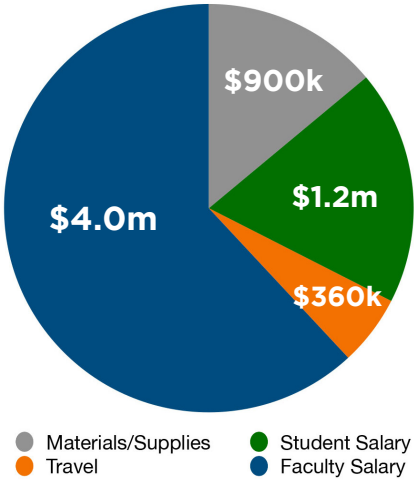
Craig Henderson, professor in the Department of Psychology and Philosophy, leads a team that was awarded over $75,000 in FY19 from the National Institute of Alcohol Abuse and Alcoholism for their project titled, "Informing Prevention by Modeling Associations Between Physical Activity and Alcohol Consumption."

Facts & Figures

FY 2019 Funding Sources



University Level Research Expenditures



Proposals Submitted

FY 15 134 → FY 19 170

27% Increase

Proposals Funded

FY 15 46 → FY 19 57

24% Increase

Funding Awarded

FY 15 $7.0m → FY 19 $12.7m

81% Increase

Research Expenditures

FY 15 $4.1m → FY 19 $9.0m

121% Increase

University Research Centers

- ★ Cyber Forensics Intelligence Center
- ★ Geospatial Research and Service Center
- ★ Global Center for Journalism and Democracy (2009 - 2017)
- ★ Sam Houston State Natural History Collections
- ★ Science Annex (Vivarium)
- ★ Southeast Texas Applied Forensic Sciences Facility (STAFS)
- ★ Texas Research Institute for Environmental Studies (TRIES)
- ★ Virtual Laboratories

Federal Funding Sources

- ★ National Endowment for the Humanities
- ★ National Institutes of Health
- ★ National Institute of Justice
- ★ National Science Foundation
- ★ US Department of Agriculture
- ★ US Department of Agriculture, Animal and Plant Health Inspection Service, PPA 7721
- ★ US Department of Agriculture, National Institute of Food and Agriculture
- ★ US Department of the Interior
- ★ US Department of State

Sul Ross State University

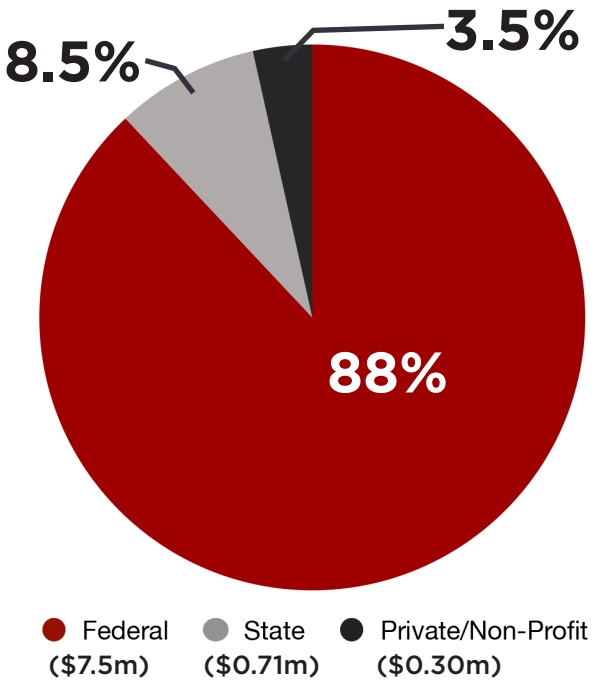
The team at the Center for Big Bend Studies at Sul Ross State University uses new laboratory and field methods to advance research at heavily looted archaeological sites. The Spirit Eye Cave in the Sierra Vieja Mountains of far west Texas, had been heavily impacted by decades of digging by relic hunters. Dr. Bryon Schroeder, the lead researcher and director of the Center for Big Bend Studies, spearheaded the research which involved contacting collectors rumored to have excavated inside the cave, collaborating with SRSU Professor of Earth & Physical Sciences Dr. Kevin Urbanczyk to create a LiDAR map of the cave, and begin controlled excavation work. The results were overwhelming. Fieldwork determined the earliest evidence of horticulture in the region and extracted ancient DNA that shows a related group of humans occupied the cave for several hundred years almost 900 years ago. This fieldwork also found deposits associated with the Pleistocene ground sloths who occupied the cave prior to humans.

Professor Kevin Urbanczyk, Director of the Sul Ross Rio Grande Research Center, has been working on multiple projects associated with mapping riparian vegetation and geomorphology of rivers, and assisting with associated restoration/conservation activities. This work relies on the use of modern technologies such as LiDAR, UAVs and Object Oriented Image Analysis (OBIA) to create high resolution multispectral imagery and elevation maps of specific areas and using these data and the OBIA technique to map the land cover types. This helps track the success of restoration activities in areas such as the White River in Utah, the Rio Grande in the Big Bend region and upland tributaries. The research also includes monitoring spring flow and general aquatic habitat in the Lower Canyons of the Rio Grande, which is considered a “groundwater dependent ecosystem.” Project funding has come from the Bureau of Land Management, Utah State University, the World Wildlife Fund, and the National Park Service.

DWF Songbird Program - Thanks to the Dixon Water Foundation, Borderlands Research Institute will enhance a songbird conservation program that will connect landowners, birders and the public through community engagement activities. The $25,000 grant will allow BRI to implement a number of new initiatives to engage citizens in songbird conservation, including bird watching excursions on private ranches, bird photography workshops and educational seminars. In addition, a citizen science project will be developed that will document bird populations on ranches through long-term monitoring efforts.

Facts & Figures

FY 2019 Funding Sources



Proposals Submitted

FY 15: 10 → FY 19: 14

40% Increase

Proposals Funded

FY 15: 7 → FY 19: 9

29% Increase

Research Centers

- ★ Borderlands Research Institute
- ★ Center for Big Bend Studies
- ★ Rio Grande Research Center

Federal & State Funded Sources (2019)

- ★ U.S. Department of Agriculture
- ★ U.S. Department of the Interior
- ★ U.S. Small Business Administration
- ★ U.S. Department of Education
- ★ U.S. Department of State
- ★ Texas Parks & Wildlife Department

Funding Awarded

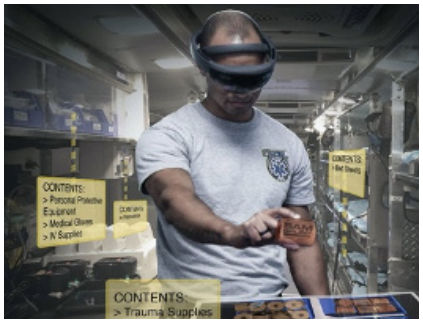
FY 15: $6.5m → FY 19: $8.5m

31% Increase

Texas State University

Learning With Augmented Reality/Virtual Reality

Since 2013, the advanced Law Enforcement Rapid Response Training (ALERRT) Center has been the FBI's national standard for active-attack response training. Now a Big Ideas group is testing whether virtual reality (VR) is as effective in learning in other real-life scenarios. The results may shape the future of our world for law enforcement but also in fields such as health care, engineering, aerospace, education, and sports medicine - and the futures of Texas State students who will be leaders in implementing these new technologies in the workforce.



A Community of Innovators

During their academic study and research, students and professors at Texas State collaborate on ideas for new technologies, devices, and solutions to social problems. The university has invested in a robust innovation and entrepreneurship ecosystem that includes six makerspaces and prototyping labs, degree programs with a focus on technology commercialization, the startup incubator Science, Technology, and Advanced Research (STAR) Park, boot camp experiences in design-thinking idea development, and new-venture business plan competitions.

Big Data in Healthcare

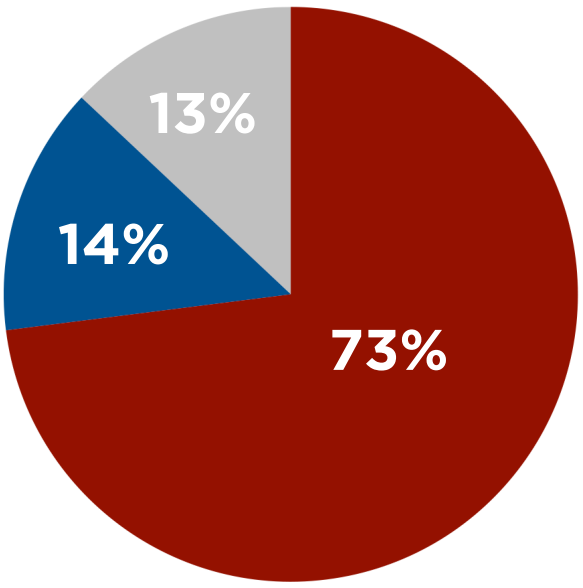
Data science uses computer science and math to make sense of the massive amount of data being generated in a field such as healthcare. One Texas State researcher uses data science to work on issues related to depression, chronic pain, HIV research, and multiple sclerosis. Others use algorithms to interpret brain scans of mental health patients and identify the treatment that's most likely to help them. They're developing ways to reduce the number of patients needed for clinical trials, which saves money and makes new treatments available sooner.

Advancing Materials

More than 70 Texas State researchers are developing the sensor platforms of the future, which will bring "smart" technology to both houses and cities. Sensors are increasingly embedded in everyday technology such as lights, thermostats, security systems, smoke alarms, refrigerators, and automobiles. The smart homes of the future will have fully integrated sensor technology that can be managed from a single device. What's more, they'll use artificial intelligence and machine learning to adapt to your patterns and recognize changes that could predict a safety hazard.

Facts & Figures

FY 2019 Funding Sources



- Federal ($37m)
- State ($7.1m)
- Private ($6.6m)

Proposals Submitted

FY 15 498 → FY 19 636

28% Increase

Proposals Funded

FY 15 195 → FY 19 220

13% Increase

Funding Awarded

FY 15 $49.0m → FY 19 $50.7m

3.5% Increase

Research Expenditures

FY 15 $47.7m → FY 19 $64.6m

35% Increase

Federal Funding Sources

- ★ National Science Foundation
- ★ National Institute of Justice
- ★ National Institutes of Health
- ★ Department of Education
- ★ United States Department of Agriculture
- ★ Department of Defense
- ★ Environmental Protection Agency
- ★ National Aeronautics and Space Administration
- ★ National Endowment for the Humanities
- ★ Department of Commerce
- ★ Department of Homeland Security
- ★ Department of Interior
- ★ Department of Labor
- ★ Department of Transportation
- ★ National Institute of Standards and Technology
- ★ Administrative Conference of the United States

University Research Centers

- ★ Texas School Safety Center
- ★ The Meadows Center for Water and the Environment
- ★ Freeman Center
- ★ Xiphophorus Genetic Stock Center
- ★ Materials Applications Research Center
- ★ The Translational Health Research Center
- ★ Center for Innovation and Entrepreneurship

TSUS Research

Christmas Mountains

The Christmas Mountains are a small range of mountains next to Big Bend National Park in Brewster County, Texas, United States. The highest peak is 5,728 feet (1,746 m) above sea level. The 9,270 acre tract is owned by the Texas State University System and is open to the public and to academic researchers.

CHRISTMAS MOUNTAINS
THE TEXAS STATE UNIVERSITY SYSTEM

The Texas Invasive Species Institute

The Texas Invasive Species Institute is the first comprehensive effort in Texas focused on the early detection of and rapid response to invasive species that impact ecosystems and the Texas economy. The Institute draws from the expertise of more than 40 researchers across the Texas State University System. This expertise enables TISI to apply effective measures currently lacking in Texas when dealing with detection and rapid response to invasive species.

Normandy Group

Securing such funding for research institutions requires a rigorous and dynamic partnership between universities and the Normandy Group. Each year, researchers and faculty from each TSUS institution come to Washington to build relationships, explore funding opportunities, and eventually successfully pursue federal grants of interest. Similarly, the Normandy team visits TSUS campuses regularly to meet with university leadership, as well as program directors and faculty to better understand the institutions' requisite needs. As part of this process, the Normandy Group also seeks out non-federal sources of funding that may be applicable to a particular research project. Once a funding source has been identified for a particular project, Normandy works to formulate local support as well as Congressional support.

THE NORMANDY GROUP

TSUS Leadership

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David Montagne
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Charlie Amato
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Duke Austin
Regent

Garry Crain
Regent

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Regent

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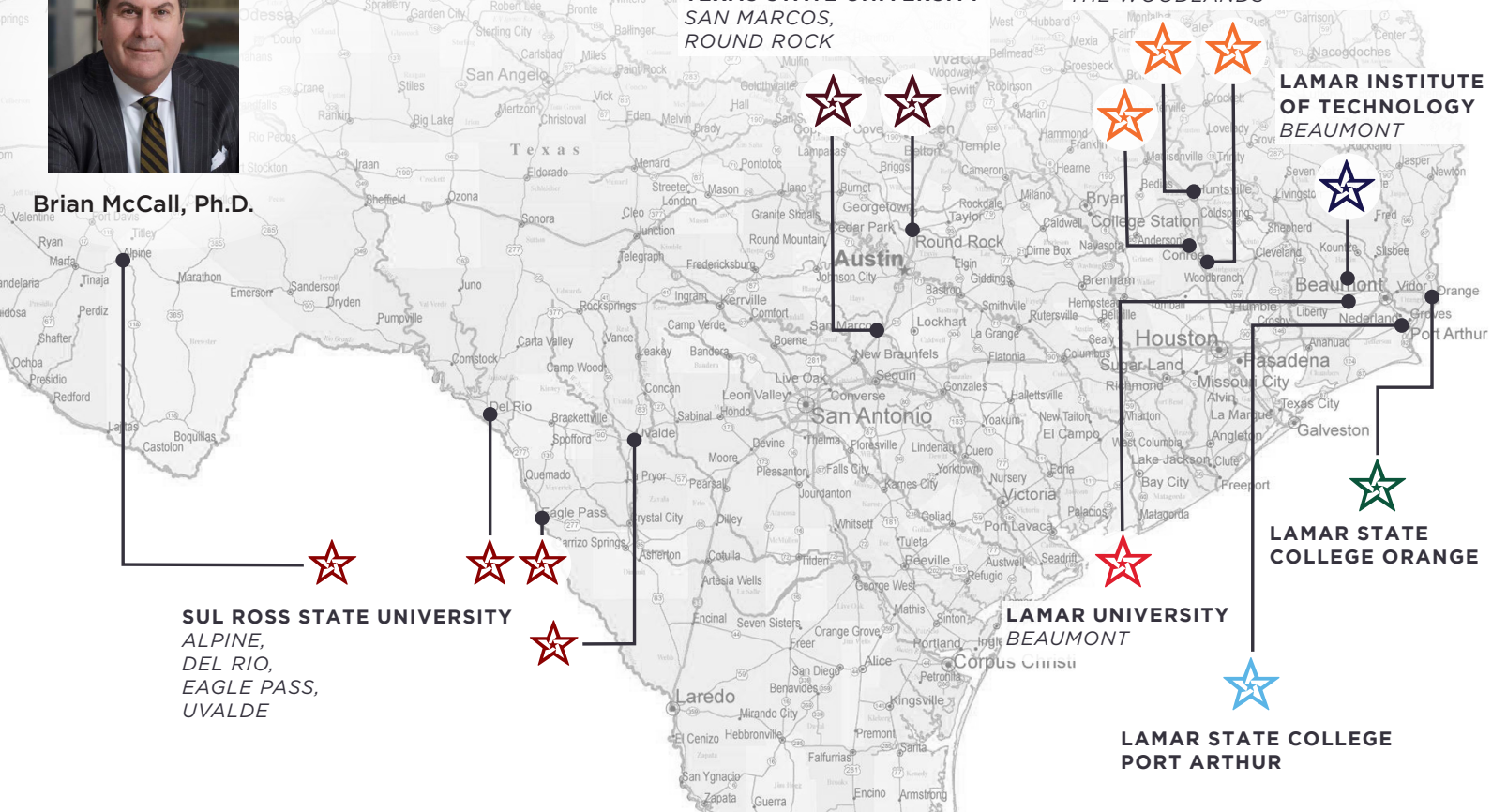
Student Regent

Chancellor

Brian McCall, Ph.D.



TSUS Quick facts

- The Texas State University System (TSUS) is the third-largest university system in Texas and 21st nationally based on enrollment.
- The System is based in Austin, Texas and is governed by a nine-member Board of Regents appointed by the Governor and led by a board-appointed Chancellor.
- More than 86,000 students (30% Hispanic, 17% African-American, and 40% Pell undergraduate students) are enrolled at TSUS's seven member institutions, a 19% increase since 2010.
- The System awards more than 21,100 degrees and credentials per year, a 40% increase since 2010.
- Approximately 15,500 are employed across the system, including 4,500 faculty, 5,000 staff and administrators, and another 6,000 student workers.
- The System has a combined operating budget of approximately $1.5 billion.
- TSUS receives 29% of its operating revenue from the state, down from 32% in 2010.
- Total research expenditures across TSUS have increased 88% since 2010, to $78 million.
- The System's endowment across all institutions has more than doubled since 2010, to $489 million.
- TSUS's administrative office has the fewest employees and the smallest budget — by far — of any university system in Texas.
- The System's administrative cost as a percentage of total operating revenue is 8.1%, down from 9.6% in 2010.

The Texas State University System
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