welcome to UTSA Biology Department

The Department of Biology at The University of Texas at San Antonio is a comprehensive academic unit that offers Bachelor of Science, Master of Science and Doctor of Philosophy degrees.

Our faculty members conduct research in a variety of areas including: Cell and Molecular Biology, Microbiology and Immunology, Neurobiology, and Plant Biology. We are dedicated to the university mission and discovery, teaching and learning, community engagement, and public service.

Our goals are to advance scientific literacy and provide modern training in the biosciences to undergraduate and graduate students, enabling them to pursue careers in scientific research, biology, and biomedical careers. Outreach to local public schools and establishing partnerships in the community serve to promote UTSA activities and increase community awareness of the role of science in our society.
Message FROM THE CHAIR

Welcome to the Department of Biology at The University of Texas at San Antonio! Our department combines a tradition of excellence in research with modern and multi-disciplinary teaching in the major areas of biology including: cell and molecular, biotechnology, microbiology and immunology, plant biology and neurosciences.

Our programs offer students an intellectually stimulating environment with many opportunities to conduct research in state-of-the-art facilities. Students at both the undergraduate and graduate levels are encouraged to enhance their skill set by becoming familiar with advanced research techniques.

The Biology program at UTSA emphasizes a hands-on approach to education. An outstanding faculty lies at the heart of our great educational programs. In our labs and classes you will find 48 tenured or tenure-track faculty members, and 26 non-tenured faculty. They are professional scientists, and bring our students the latest discoveries, techniques and topics from their fields of specialization. This provides outstanding opportunities for students to engage in an active learning environment.

Our faculty is actively engaged in carrying out cutting-edge research in fundamental areas that include cancer, infectious diseases, stem cells, and brain health. Research performed by the faculty is regularly published in the top biological science journals. Aided by advanced core facilities, and an outstanding infrastructure, our faculty is able to obtain in excess $9,000,000 in research awards every year. We are therefore able to offer incredible options for students wanting to participate in an environment where world-class research is being conducted.

We continue to attract students from diverse backgrounds and our graduating students find that their education in Biology provides numerous opportunities for careers that are both exciting and gratifying.

If you are a prospective student, I urge you to contact us to arrange a campus tour of our facilities and to meet with our faculty and students.

Sincerely,

Garry Sunter, Ph.D.
Professor and Chair
faculty AND SPECIALIZATIONS

**Cell & Molecular Biology**

J. Aaron Cassill, Ph.D.
Professor and Roland K. and Jane W. Blumberg Professorship in Biosciences

Luis S. Haro Ph.D.
Professor

Brian P. Hermann, Ph.D.
Associate Professor

Richard LeBaron, Ph.D.
Professor

Chin-Hsing Annie Lin, Ph.D.
Associate Professor

Martha J. Lundell, Ph.D.
Professor

Lindsey Macpherson, Ph.D.
Assistant Professor

John R. McCarrey, Ph.D.
Professor and Kleberg Distinguished University Chair in Cellular & Molecular Biology

**Cell & Molecular Biology and Microbiology & Immunology**

Bernard Arulanandam, Ph.D.
Professor and Jane & Roland Blumberg Professorship in Biology and Interim Vice President for Research

Astrid E. Cardona, Ph.D.
Associate Professor

James P. Chambers, Ph.D.
Professor

Mark Eppinger, Ph.D.
Assistant Professor

Thomas G. Forsthuber, Ph.D.
Professor and Jesse H. and Mary Gibbs Jones Endowed Chair in Biotechnology

Gary Gauf, Ph.D.
Associate Professor

David Jaffe, Ph.D.
Professor

Hyoung-gon Lee, Ph.D.
Associate Professor and John H. Doran, M.D., F.A.C.P., Distinguished Professorship in Peripheral Neuropathy

Asif Mirza Maroof, Ph.D.
Assistant Professor

Isabel Muzzio, Ph.D.
Associate Professor

Carlos A. Paladini, Ph.D.
Professor

George Perry, Ph.D.
Professor and Dean of College of Sciences; Semmes Foundation Distinguished University Chair in Neurobiology

Clyde F. Phelix, Ph.D.
Professor

Fidel Santamaria, Ph.D.
Associate Professor

David M. Senseman, Ph.D.
Associate Professor

Kelly Suter, Ph.D.
Associate Professor

Todd W. Troyer, Ph.D.
Associate Professor

Matthew Wanat, Ph.D.
Assistant Professor

Nicole Y. Wicha, Ph.D.
Associate Professor

Charles J. Wilson, Ph.D.
Professor and Ewing Halsell Distinguished Chair in Biology

**Plant Molecular Biology & Biochemistry**

Karl E. Klose, Ph.D.
Professor and Robert J. Kleberg Jr. & Helen C. Kleberg Colleg of Sciences Endowed Professorship

Soo Chan Lee, Ph.D.
Assistant Professor

Jose L. Lopez-Ribot, Pharm.D., Ph.D.
Professor and Margaret Batts Tobin Distinguished Chair in Biotechnology

Robert D. Renthal, Ph.D.
Professor

Stephen P. Saville, Ph.D.
Associate Professor

Janakiram Seshu, Ph.D.
Associate Professor and Associate Dean of Graduate School

Garry Sunter, Ph.D.
Professor and Department Chair

Yufeng Wang, Ph.D.
Professor

Floyd L. Wormley Jr., Ph.D.
Professor and Microsoft President’s Professorship and Associate Dean for Research & Graduate Studies

**Neurobiology**

Jürgen Engelberth, Ph.D.
Associate Professor

Valerie Sponsel, Ph.D., D.Sc.
Professor

Alfonso Apicella, Ph.D.
Assistant Professor

Deborah L. Armstrong, Ph.D.
Professor

Edwin J. Barea-Rodriguez, Ph.D.
Professor and Roland K. & Jane W. Blumberg Professorship in Biosciences and Associate Dean for Student Success and Instructional Innovation

Brian E. Derrick, Ph.D.
Professor
2016-2017 Degrees Awarded

- 310 Undergraduate Degrees
- 17 Masters Degrees
- 3 Doctoral Degrees
- 240 Degrees by Minorities

2016-2017 Publications

- 142 Publications by Core Faculty
- 103 Publications by PhD Students

Faculty

- 48 Tenure & Tenure Track Faculty
- 26 Non-Tenure Faculty
By the Numbers

Enrollment

2017 - 2,134 Undergraduates, 161 Graduates
2016 - 2,132 Undergraduates, 121 Graduates
2015 - 2,274 Undergraduates, 112 Graduates
2014 - 2,425 Undergraduates, 135 Graduates

2016-2017 Graduates by Gender

55% Female Graduates
45% Male Graduates

Note: The Information contained in these chart is retrieved from UTSA Office of Institutional Research. The numbers reflected have fluctuated from the previous report due to the removal of Environmental studies from the department program.

Source: Office of Institutional Research dashboard, and 18 Characteristics of Texas Doctoral Programs
The UTSA Neurosciences Institute is a multidisciplinary research organization for Neurosciences. The Institute offers resources for the studying of human experiences and behaviors, and the origin and treatment of nervous system diseases.

Areas of Special emphasis include:

- Nervous system development;
- Neuronal and network computation;
- Sensory, motor and cognitive function;
- Learning and memory, and the disease processes that impact them;
- Implementing mathematical and computational tools in experimental neurobiology;
- Mathematical theory of neurons and nervous systems.

The Neurosciences Institute conducts weekly seminars that invite researchers and scientists from around the globe to present their work. In addition, weekly podcast are recorded and made available on their website: http://snrp.utsa.edu/podcast/podcast.html

The San Antonio Cellular Therapeutics Institute (SACTI) conducts research in the areas of cell and molecular biology in nonhuman primates, focusing on primate embryology, stem cell biology, biogenesis research, regenerative medicine and basic developmental biology.
The South Texas Center for Emerging Infectious Diseases (STCEID) specializes in research in the fields of molecular microbiology, immunology, medical mycology, virology, microbial genomics, vaccine development, and biodefense.

STCEID brings special attention to research in pathogenic mechanisms of emerging and infectious diseases and the immune response to infectious diseases.

STCEID is a one-of-a-kind center with a group of highly specialized faculty and researchers from UTSA that investigate various diseases that impact humans including bacterial, fungal, viral and auto-immune diseases. The center also provides hands-on experience to both undergraduate and graduate students who intend to pursue careers in microbiology and immunology.

STCEID holds weekly Seminars by national and international speakers. STCEID hosts a weekly podcast series: MicroTalk. The podcasts are made available on the STCEID website. Visit: http://stceid.org/

http://www.stceid.org/
Dr. Janakiram Seshu, Associate Professor of Biology, received a $404,250 grant from the National Institute of Allergy and Infectious Diseases to sponsor research that will help in preventing the spread of Lyme disease.

Lyme disease is the most rampant arthrodo-born infectious disease and is transmitted to humans through the bite of an infected tick (Ixodes scapularis).

Dr. Seshu’s research will explore how the bacterium Borrelia burgdorferi which causes Lyme disease is able to adapt inside its host. The tick’s body is known to be low in nutrients but despite this the tick is able to acclimatize.

Dr. Seshu is focusing his study to understand how the Lyme disease pathogen is able to sustain itself inside the tick vector and in a mammalian host.
Dr. Brian Hermann, Associate Professor of Biology, is investigating ways to prevent infertility in pediatric cancer patients who receive high doses of life-saving chemotherapy.

Dr. Hermann and his team of researchers have been working on a number of strategies that may help give childhood cancer survivors the ability to reproduce after their cancer treatments. One approach is using a drug called granulocyte colony-stimulating factor or G-CSF which is used to intensify infection-fighting white blood cells in bone marrow that commonly die during cancer treatment. This drug also protects male fertility by regenerating stem cells responsible for sperm production.

Dr. Hermann’s group is also using cutting-edge single-cell genomics to better understand the stem cells that are responsible for sperm production in males. He hopes that these stem cells may be harnessed and used to make sperm after transplantation to a patient’s testicles or even in the petri dish.
In April 2015, UTSA’s Department of Biology established the Cell Analysis core facility for the purpose of providing centralized services, teaching and training for cell analysis using flow cytometry to students, researchers and faculty at UTSA and other public and private institutions in Texas.

Flow Cytometry is a powerful technology for investigating many aspects of cell biology and for isolating cells of interest. Flow Cytometry utilizes highly focused, extremely bright beams of light from lasers to directly reveal aspects of cells and allows for a quantitative analysis of individual cells and thus permitting the identification of subpopulations within a sample.

The Facility is housed in the Biology Department and is administered by Dr. Floyd Wormley, Professor and Director of the facility, together with Dr. Astrid Cardona, Dr. Chiung-Yu Hung.
Associate Professor and Dr. Chiung-Yu Hung Assistant Professor.

The core retains a 4-laser LSR II cell analyzer, a 4-laser FACSaria sorter, a 5-laser Amnies ImageStream X Mark II (ISX-MKII) imaging flow cytometer and several cell analysis software including FACSDiva, FlowJo and IDEAS. The LSR II cell analyzer can process >20,000 cells per second to determine their phenotypes and functionality. The FACSaria sorter is able to isolate nearly 100% pure cells of a targeted population for tissue culture, genomic and proteomic studies.

The ISX-MKII imaging cytometer combines the function of a flow cytometer and a high resolution microscope with the capacity of simultaneous cytometry analyses and visualization of individual cells. The ISX-MKII was purchased in 2014 with support from a State grant for improving Library, Equipment, Renovations and Rehabilitation (LERR) and it is the only imaging cytometer that is available to the research community in San Antonio.

“We have utilized all three types of flow cytometers in the Cell Analysis Core Facility to study neural stem/progenitor cells and cancers,” said Dr. Annie Lin, Associate Professor. “The instruments housed in the core facility provide advanced technologies to accurately measure cell numbers along with correlated states of lineage commitment. We have employed the LSR II cell analyzer to improve our quantitative analysis of cell cycle re-entry during hippocampal neurogenesis. We have also applied the sorter to purify subpopulations of neural stem and progenitor cells for chromatin configuration and gene expression profile using genomic approaches. Furthermore, the ISX-MKII imaging flow cytometer is used to characterize co-localization of cell markers during quantification in parallel with phenotype analysis”

The flow cytometers in the UTSA Cell Analysis Core can be applied in all aspects of life science research including immunology diseases, stem cells, infectious diseases, vaccine development, neuroscience, biomarker identification, cancers, nanoparticles and many more. The core provides hands-on training for instrument operation, data analysis and assistance in experimental design. The facility is also available for academic support and currently assists with several activities of the immunology laboratory course curriculum. During these past 2 years, the core has provided training for over 100 researchers and students and hosted four lunch-and-learn workshops to provide additional education and training to investigators.
MULTI PHOTON SUITE OF THE NEUROSCIENCES INSTITUTE

It can be challenging to get a clear microscope image through more than one single layer of cells, and is even more so when imaging live cells. One solution to this problem is two-photon microscopy. Researchers in the fields of neurobiology, immunology, physiology and tissue engineering are finding this technology solves many of their imaging needs. The technology allows for high speed imaging and is typically utilized in noninvasive optical biopsy.

The UTSA Department of Biology houses such a technology within its Neuroscience Institute. The core was established in 2006 through a Research Centers and Minority Institutions (RCMI) grant from the National Institutes of Health (NIH). The equipment comprises of two-photon microscopes which have a higher sensitivity than a normal confocal microscope. While typical fluorescent microscopes use one photon to generate one fluorescent photon, a two-photon microscope uses two photons to produce a single fluorescent photon.

While this might sound as a waste of photons, the contrary happens; a two-photon microscope uses less energy to illuminate cells, thus less damage due to heat; and can obtain better images deeper into the tissue.

Dr. Fidel Santamaria, Associate Professor explained that, presently, the technology in the core is used to study how the shape, electrical, and chemical properties of neurons combine to encode information and store memories. As an exciting new development he hopes that this core facility will be used by the new faculty recruits from the "Brain-health Initiative", led by Drs. Hyoung-gon Lee and Asif Maroof.
FACILITIES

Dr. Fidel Santamaria, Associate Professor

SYNDAVERS

INNOVATIVE SYNTHETIC CADAVERS TO STUDY HUMAN ANATOMY
Neuroscience research often depends on animal models, mostly rodent, in order to objectively quantify variations in the behavior phenotype of those models. The Behavior core at UTSA was established in 2016. The facility offers state-of-the-art equipment to serve as a time-efficient and cost-effective service for researchers in need of Rodent behavior analyses.

The Behavior Core is located in the Biosciences building and operates under the auspices of the Department of Biology’s Neurosciences Institute. The facility is managed by Dr. Carlos Paladini, Professor in the Department of Biology.

“The facility does not only serve neurosciences but other disciplines in the scientific field that seek to investigate the effects of physiological manipulations on behavior”. Says Dr. Paladini, “We plan to expand this facility to better serve scientific research in a broad range of disciplines. The facility has two divisions; one for mice and the other for rats, and offers a battery of behavior tests. The instrumentation used are as follows:

**Drug self-administration and reinstatement tests**

The drug self-administration test has perhaps the highest predictive validity, defined as the ability of a rodent behavioral test to predict the effect of a drug in humans. Sessions are performed in operant boxes with grid floors, houselights, two nose-poke ports with lights, and a tone generator. A pre-determined number of nose pokes into the active port will deliver reward, elicit the tone and active nose poke light to turn on, and initiate a time out. In experiments where specific brain regions will be manipulated, the control manipulation involves tethering the animal to a fiber optic commutator.
Conditioned place preference/ aversion
This test is used to measure the rewarding or aversive effects of objects or experiences (e.g., abused drugs). It provides measurement of a trait in the same general domain as self-administration. This protocol involves three phases: 1) habituation (pretest), 2) conditioning of an association between the drug and a contextual stimulus and 3) a test that offers a choice between the drug-associated cue and a neutral cue. If the conditioning has motivational significance, animals spend significantly more time (preference) or less time (aversion) in proximity to the cue.

Real-time place preference / avoidance
In this test the animal is placed in a rectangular open field with distinct regions. One of these regions is usually paired with optogenetic stimulation (e.g. astrocyte depolarization). Depending on whether this stimulation is activating or deactivating, this can be a rewarding or aversive stimulus for the animal. If the rodent spends more time on the half of the open field where stimulation is activated, then the activation is considered rewarding. If the animal avoids this side, the stimulus is considered aversive.

Elevated zero-maze.
This test is used to assess anxiety. The basic measure is the animal’s preference for enclosed over exposed places. The animal is placed on the apparatus and observed for a set time. The innate conflict is between the tendency of mice and rats to explore a novel environment versus their preference to avoid the brightly lit open raised sections by staying in the dark enclosed sections. The elevated maze test also has high predictive validity as benzodiazepines, which are widely used to treat anxiety in patients, reduce the extent to which rodents display anxiety-like behavior.

Open Field Exploratory Locomotion
Several tests rely on spontaneous rodent behavior, such as the exploration of a novel environment in the open field. The open field is a simple apparatus that can be used to measure locomotor activity (horizontal and vertical), hyperactivity, exploratory activity, rearing, and stereotyped rotation. Automated and video equipment provides measures of total distance, horizontal and vertical activity, and center time.

Rotarod
The rotarod test is a motor function test. The mouse is placed on a slowly rotating, grooved rubber rod. The rod accelerates from 4 revolutions per minute to 40 revolutions per minute during a test session. Latency to fall is a measure of motor coordination and balance.
The Brain Health Initiative
It is estimated that the direct and indirect annual costs of cognitive diseases such as Alzheimer’s, Parkinson’s and related diseases are around $150- $200 billion; a cost which is fundamentally equivalent to, if not more, than the cost of cancer. Rising concerns over the health of the human brain had driven the Obama Administration, in its second term, to announce its intention to focus national resources in the advancement of scientific efforts in the brain health capacity.

UTSA has long been a leader in brain research through its Neurosciences Institute. After receiving millions in grants and endowments, UTSA has collaborated with UT Health San Antonio and other UTSA research institutes and departments who specialize in biology, physics, chemistry, electrical engineering, regenerative medicine, stem cell technology and various other disciplines to further its brain health initiative.

“While there is a lot of competition for Brain health funds nationally, UTSA is one of the few institutions in Texas that is taking this approach to brain health through harnessing the power of collaboration” said Dr. George Perry, Professor and Dean of the College of Sciences. “Our departments and institutes in various scientific disciplines are engaged in research on brain mechanisms and therapeutics in health and disease to better understand, diagnose and treat neurological disorders.”

So far, specialized faculty have been hired such as Associate Professor, Dr. Hyoung-gon Lee and Assistant Professor, Dr. Asif Maroof, and plans are in place to hire additional faculty and researchers in the near future. UTSA is also building a new Science and Engineering building which will house state-of-the-art laboratories that will be assigned to brain health research.
The Biology Diplomats is a student organization that offers Biology majors and minors the opportunity to connect with other Biology students, receive tutoring assistance, as well as prospects for volunteer work and networking with professionals in various fields in Biology.

The Diplomats are a very active group that participates in various events around campus and within the community. The organization is led by a student executive committee and meets every second and fourth Wednesday of the month.

For more information about this organization, contact: biodiplomatsutsa@yahoo.com
Laurel Porter ‘05

Laurel Porter is one of UTSA Biology’s many Alumni who have found themselves in a very gratifying career. She currently works as a Forensic Toxicology Chemist at the Bexar County Medical Examiner’s Office. Laurel graduated in 2007 with a BSc in Biology. After volunteering at UT Health San Antonio for several months, she landed a research position with the Surgery Department where she acquired valuable laboratory experience that helped her gain her Master’s degree in Clinical Lab Sciences—Toxicology.

“Having a background in research and hands-on laboratory experience was extremely helpful,” said Laurel, when asked about what skills she thought were essential in her career. Laurel believes that exposure to all forms of biology, from marine life to plant ecosystems, to human pathology were critical in her career path. These experiences opened the door to forensic pathology and gave her the passion for it. “I think it’s really important to try out a little bit of everything before embarking on your path to a permanent career.” Laurel said.

Her advice to prospective students who consider following the same career path is: “Great choice! It’s definitely a fulfilling career.”

She also recommends establishing a solid foundation in laboratory bench work and gaining knowledge of laboratory safety and management.

Laurel advises volunteer work as much as possible, as it is a great way to gain experience. She also advises making connections and networking by going to conferences and looking into societies such as the Society of Forensic Toxicology that have wonderful resources for students.

Ashley Book ‘99

Ashley Karen Book graduated from UTSA with a BSc in Biology in the fall of 1999. After shadowing a close friend of hers who was a Physician’s Assistant, Ashley discovered that she had a passion for this type of work and so pursued a BS degree in Physician Assistant Studies. Later Ashley specialized in orthopedics.

“From the time I was very young, being a daddy’s girl, I was always working on projects with my father in his spare time, he loved building things and wood working. He taught me how to use saws and power tools and how to construct and design different types of structures. This made my decision to specialize in Orthopedics seamless because in this field I get to use power tools and structure things together.”

Ashley admits that she is who she is today due to some great professors at UTSA Biology, who helped her think more critically and outside the box.

“This helped me not only in PA school, but still today in medical practice.” Ashley said. “Not everything we see in medicine is in the textbooks, so in order to be a great practitioner, thinking outside what’s in the textbook is critical to formulate a diagnosis.”

Ashley advises today’s Biology students to endeavor to volunteer, and do research whenever possible. She also advises those who seek a career in the medical field to keep in mind that most of the time the BSc in Biology is just their first degree and that most likely they will seek a post graduate degree of some sort; therefore, they should work hard to get the highest grades possible to be successful in their pursuits.
ART MEETS SCIENCE

FACULTY ORGANIZERS:
DR. LUCERO MARTINEZ DELGADO, LECTURER II, UTSA Biology Dept
JAYNE LAWRENCE, SENIOR LECTURER, UTSA Art & Art History Dept.
CATHERINE PELL, LECTURER II, UTSA Art & Art History Dept.
FINANCIALS

Endowment Revenue

- FY 2015: $378K
- FY 2016: $403K
- FY 2017: $482K

Total Grant Expenditures

- FY 2015: $6.3M
- FY 2016: $6.5M
- FY 2017: $8.3M