

# Cell and Molecular Biology

*Master of Arts  
Doctor of Philosophy*

## For More Information

**Campus address:** Norman Hackerman Building (NHB) 2.606, phone (512) 232-9660, campus mail code: A6500

**Mailing address:** The University of Texas at Austin, Graduate Program in Cell and Molecular Biology, 1 University Station A4810, Austin TX 78712

**E-mail:** [ilsgrad@austin.utexas.edu](mailto:ilsgrad@austin.utexas.edu)

**URL:** <https://ils.utexas.edu/cmb/>

## Facilities for Graduate Work at the Center for Biomedical Research Support (CBRS)

CBRS is a group of shared resource core facilities operated under the Vice President for Research and open to all faculty, staff, and students at The University of Texas at Austin. The cutting-edge technology, services, and expert advice offered by CBRS core facilities are valuable to many students in Cell and Molecular Biology research programs. The facilities offer a wide range of services in nucleic acid and protein sequencing, microscopy, mass spectrometry, protein purifications and analysis, next-generation sequencing, high performance computing, bioinformatics, cryo-electron microscopy, biomedical imaging, and transgenic knock-out mice. Additionally, a large variety of supplies are available from the STEM Stockroom and freezer supply core. Keeping the core facilities as comprehensive and accessible as possible increases faculty, staff, and student research productivity.

**Microscopy and Imaging Facility.** The Microscopy and Imaging Facility provides extensive equipment and services for microscopy and structural analysis. The facility's expert staff offer assisted use and training on instrumentation and consult on microscopy and flow cytometry research. Equipment in the facility includes scanning and transmission electron microscopes; fluorescence-based cell analyzers and cell sorters; super-resolution, TIRF, confocal, spinning disk confocal, multiphoton, and widefield fluorescence microscopes; a cryostat; vibratome and paraffin microtomes; an ultramicrotome; and a laser microdissection system. More information about the facility's services is available on the [Microscopy and Imaging Facility website](#).

**Genomic Sequencing and Analysis Facility.** The Genomic Sequencing and Analysis Facility provides advanced analytical resources for analysis of DNA and RNA at scales ranging from single cells to whole-genomes. The facility operates two full-service laboratories for nucleic acid sequencing: the Next Generation Sequencing (NGS) Lab and the Sanger DNA Sequencing Lab.

The NGS Sequencing Lab has staff available for consultations to assist with project planning needs. Once research samples are ready, the NGS lab can take DNA or RNA, transform it into sequence ready libraries, and deliver data ready for analysis.

The NGS Sequencing Lab supports one Illumina NovaSeq, which is excellent for large whole genome, RNA-Seq, or single cell sequencing projects. The facility also has two Illumina MiSeq next-generation DNA sequencers that are best for smaller projects or for projects requiring longer read lengths. Additionally, the facility has two Illumina NextSeq sequencers that are ideal for intermediate scale projects, requiring

more read depth than is feasible on the MiSeq. One of the NextSeq instruments has scanning capabilities allowing the core to offer the Illumina Infinium EPIC microarray.

The NGS Sequencing Lab includes a fully equipped molecular laboratory, which is outfitted with Agilent Bioanalyzers, NanoDrops, the Tecan Freedom Evo robotic liquid handling station, Hamilton Nimbus liquid handler, two Covaris shearing instruments, a 10X Chromium controller, and two automated Pippin gel electrophoresis systems.

The GSAF also houses the Sanger DNA Sequencing Lab and provides automated DNA sequencing and fragment analysis using capillary-based Applied Biosystems 3730 and 3130 DNA analyzers. These instruments offer high throughput and sensitivity with a capability of handling more than 800 samples per day, with reads greater than 700 base pairs and a success rate of over 90 percent. The AB 3730 and 3730XL are also used for the analysis of microsatellites, AFLP, SNPs, and other fragment applications. Walk-up equipment available for quantitative real-time PCR include three Life Technologies ViiA systems. More information about the facility's services is available on the [Genome Sequencing and Analysis Facility website](#).

**Biological Mass Spectrometry Facility.** The Biological Mass Spectrometry Facility provides proteomics and metabolomics services, develops methods for collaborative research projects, and trains users on self-service mass spectrometry instrumentation. Two high-resolution, high-sensitivity Thermo Orbitrap Fusion mass spectrometers with Ultimate 3000 RSLCnano UPLC chromatography systems provide qualitative and quantitative proteomics analyses. Proteome Discoverer database searches using Sequest HT and Scaffold, MaxQuant, Perseus, and Skyline software are provided for data processing, validation and visualization, capable of identifying thousands of proteins in a single run. Techniques for quantitation include stable isotope labeling and tandem mass tags, as well as label free methods. Fractionation enables in-depth proteomics analysis. Protein post-translational modifications including phosphorylation, acetylation, methylation, oxidation, and ubiquitination are identified from the high-resolution data. De novo sequencing of antibodies and glycopeptide searches are conducted with Byonic, and Supernovo software, respectively. The Intavis DigestPro robot automatically digests and desalts samples for analysis. Protein molecular weight determination service provides good quality control for expressed and modified proteins. A self-service Bruker Autoflex maX MALDI-TOF/TOF instrument is available for analyzing proteins, nucleic acids, peptides, polymers and chemicals, with training provided by core staff. A Vanquish Duo UPLC in line with Thermo Q-Exactive is utilized for metabolomics experiments with Compound Discoverer for metabolite identification and quantitation. More information about the facility services and protocols can be found on the Biological Mass Spectrometry website and Wiki pages.

**Computational Biology and Bioinformatics.** The Computational Biology and Bioinformatics core (<https://research.utexas.edu/cbrs/cores/cbb/>) provides support for students, postdoctoral fellows, and faculty interested in the use of computational approaches to solving biological problems. This group helps lower the threshold to enter the -omics area of the life sciences. To achieve this goal this core offers an on-demand **Bioinformatics Consulting Group** that works with researchers on big data analysis projects. Through **Training Initiatives**, numerous short courses on diverse topics for learning computational approaches to biological problems; an Annual Summer School for Big Data in Biology; peer-led working groups, and community events that complement semester-long for-credit courses are available for the community. Finally, the **Biomedical Research Support Facility** provides researchers with local computation and managed storage capabilities suitable for research computing workflows not addressed by the Texas Advanced Computing

Center. For more information, visit the [Center for Computational Biology and Bioinformatics website](#).

**Mouse Genetic Engineering Facility.** The Mouse Genetic Engineering Facility is in the Animal Resource Center and provides services to generate and archive custom-made transgenic mouse models. Services include CRISPR microinjection, DNA pronuclear injection, embryonic stem (ES) cell microinjection, gene targeting in ES cells, expansion of ES cell clones from the International Knockout Mouse Consortium, embryo cryopreservation, and re-derivation of mouse strains to pathogen-free status. The lab also performs sperm cryopreservation and *in vitro* fertilization. More information about the facility's services is available on the [Mouse Genetic Engineering Facility website](#).

**STEM Stockroom.** The STEM Stockroom is located in the Norman Hackerman Building and provides many lab and office supplies. The STEM Stockroom carries different items ranging from lab consumables, chemicals, office and cleaning supplies, as well as kits from companies such as Qiagen, Sigma, LifeTech and Fisher. Enzymes are also available from New England BioLab and ThermoFisher (Fermentas). The STEM Stockroom also does special orders. For a full inventory list, please check the [Center for Biomedical Research Support website](#).

**Biomedical Research Supply Core (BioReSCo).** This Core maintains automated refrigerators and freezers from multiple vendors of molecular biology reagents. These units are available 24/7 to registered users. Primers can also be purchased from Sigma or IDT via a customized website for free delivery to the Core. More information about the reagents available at this facility is available at the [BioResCo website](#).

**Electronics Repair.** This core provides electronics services including maintenance, service, and repair of biomedical/scientific equipment and instrumentation. This is one of the only SMD (surface-mount device) re-work and fabrication services on campus. Additionally, this core offers electrical and mechanical safety consultations related to classrooms and laboratories. More information about the facility's services is available on the [Electronics Repair website](#).

**Sauer Structural Biology Laboratory (SSBL).** The Sauer Structural Biology Laboratory is a state-of-the-art cryo-electron microscopy facility. The SSBL houses an FEI Titan Krios equipped with a Gatan K2 Summit direct electron detector and an FEI Glacios also equipped with a Gatan K2 Summit direct electron detector. Both instruments are capable of imaging macromolecular machines at atomic or near atomic resolution. The facility also contains all the accessory equipment required for high-resolution structure determination. More information about the facility's services is available on the [SSBL website](#).

**Biomedical Imaging Center (BIC).** The Biomedical Imaging Center is an interdisciplinary, multi-methods facility specializing in non-invasive neuroimaging. The center supports a Siemens VIDA 3T MRI scanner and a Siemens Skyra 3T MRI scanner. These instruments are used by many researchers for studies of human perception, memory, decision-making, and behavior. Unique emphases at the BIC include a strong connection to supercomputing resources at the Texas Advanced Computing Center (TACC), real-time fMRI, high-resolution / 3D visual presentation, and support for developmental studies. The facility also contains several resources for imaging in model systems, as well as imaging-informed fabrication and machining. More information about the facility's services is available on the [BIC website](#).

## Areas of Study

The Interdisciplinary Life Sciences Graduate Programs, a research unit housed in the College of Natural Sciences, provides the support and infrastructure for the Cell and Molecular Biology (CMB) graduate program at The University of Texas at Austin. The CMB graduate

program is supported by more than 130 faculty members from four colleges and over 10 academic departments.

The program offers students training in seven different research tracks: bioinformatics and computational biology, biomolecular structure and function, cell and developmental biology, chemical biology and drug discovery, molecular genetics, neurobiology, and plant molecular biology. Each of the tracks provides specialized courses and training for the graduate student beyond the basic core curriculum of genetics, biochemistry, molecular biology, and cell biology.

## Graduate Studies Committee

The following faculty members served on the Graduate Studies Committee (GSC) in the spring 2024 semester.

Seema Agarwala  
 Hal S Alper  
 Eric V Anslyn  
 Nigel S Atkinson  
 Chandrajit L Bajaj  
 Aaron Blair Baker  
 Brett J Baker  
 Jeffrey E Barrick  
 Brian Belardi  
 Adela Ben-Yakar  
 George D Bittner  
 Amy Brock  
 Karen S Browning  
 Xiaolu Cambronne  
 Can Cenik  
 Frances Anne Champagne  
 Z Jeffrey Chen  
 Lydia Maria Contreras  
 Maria A Croyle  
 Kevin N Dalby  
 Bryan William Davies  
 Arturo De Lozanne  
 Daniel James Dickinson  
 John Digiovanni  
 Jennifer Jane Donegan  
 Michael Drew  
 Jaquelin P Dudley  
 Johann K Eberhart  
 Lauren Ilyse richie Ehrlich  
 Stephen Carl Ekker  
 Ron Elber  
 Andrew Ellington  
 Ilya J Finkelstein  
 Janice A Fischer  
 Ernst-Ludwig Florin  
 Laura K Fonken  
 George Georgiou  
 Nace L Golding  
 Vernita Gordon  
 Andrea C Gore  
 Ryan S Gray  
 Jeffrey Martin Gross  
 Marvin L Hackert  
 Arbel Harpak  
 Rasika M Harshey  
 Justin C Havird  
 David M Hillis  
 David W Hoffman  
 Johann Hofmann  
 Jon M Huibregtse  
 Enamul Huq  
 Brent L Iverson  
 Vishwanath R Iyer  
 Robert K Jansen  
 Andres Jara-Oseguera  
 Arlen W Johnson  
 Kenneth Johnson  
 Christopher A Jolly  
 Thomas E Juenger  
 Adrian T Keatinge-Clay  
 Benjamin Keith Keitz  
 Jonghwan Kim  
 John S Kuo  
 Alan Lambowitz  
 Daniel J Leahy

Hung-Wen Liu  
 Alan M Lloyd  
 Jaime Lopez  
 Yi Lu  
 Dmitrii E Makarov  
 Edward M Marcotte  
 Mia K Markey  
 Stephen F Martin  
 Andreas Matouschek  
 Mikhail V Matz  
 Despoina Mavridou  
 Jennifer A Maynard  
 Jason McLellan  
 Mona Mehdy  
 Robert Messing  
 Lauren A Meyers  
 S J Mihic  
 Kyle M Miller  
 Daniel P Miranker  
 Ian J Molineux  
 Nancy A Moran  
 Hitoshi Morikawa  
 Somshuvra Mukhopadhyay  
 Vagheesh M Narasimhan  
 Robert W Newberry  
 Hiroshi Nishiyama  
 Howard Ochman  
 Tanya T Paull  
 Shelley M Payne  
 Steven M Phelps  
 Jonathan T Pierce  
 Martin Poenie  
 William H Press  
 Nicholas J Priebe  
 Hong Qiao  
 Pengyu Ren  
 John H Richburg  
 Rick Russell  
 Elif Sarinay Cenik  
 Eric Senning  
 Jason B Shear  
 Jeanne Casstevens Stachowiak  
 David S Stein  
 Scott W Stevens  
 Laura J Suggs  
 Christopher S Sullivan  
 Sibum Sung  
 Thibaud Olivier Taillefumier  
 David William Taylor Jr  
 Stefano Tiziani  
 Keiko Torii  
 Benjamin J Umlauf  
 Carla L Vandenberg  
 Karen Marie Vasquez  
 Steven A Vokes  
 John B Wallingford  
 Huiliang Wang  
 Lauren J Webb  
 Christian P Whitman  
 Claus O Wilke  
 Arielle Woznica  
 Blerta Xhemalce  
 Kun Yang  
 Stephen Yi  
 Harold H Zakon

Amy Lee  
 Seongmin Lee

Boris Zemelman  
 Yan Zhang

## Admission Requirements

Applicants must provide evidence of strong accomplishment in the natural sciences, documented by undergraduate grades and a bachelor's degree or the equivalent in an area such as one of the biological sciences, chemistry, or physics. Preparation should include at least one semester each of cell biology and molecular biology, and one year each of calculus, organic chemistry, and general physics. Coursework in genetics and biochemistry is also required. Deficiencies in undergraduate work should be corrected before application to the program.

Because the graduate program is focused on the doctoral degree, students seeking only the master's degree are not admitted.