



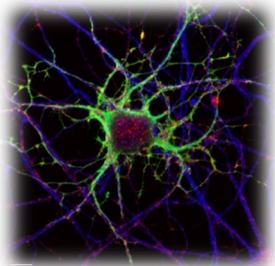
**DIVISION OF RESEARCH**  
TEXAS A & M UNIVERSITY

## Texas A&M Core Research Facilities

Texas A&M Division of Research  
Jack K. Williams Administration Building, Suite 312  
College Station, Texas 77843-1112  
Tel. 979-845-8585  
<http://vpr.tamu.edu>

## Texas A&M Core Facilities Thematic Areas

### 1. Microscopy and Imaging



All cores having microscopy and imaging as the primary activity. Examples include electron microscopy, radiological imaging, ultrasound, etc.

### 2. Integrated Biological and Medical Translational



All cores whose focus is various aspects of human, animal and plant health, including precision medicine, precision agriculture, and microbiome.

### 3. Materials and Fabrication



All cores whose focus is various aspects of materials and manufacturing, including materials characterization, mechanical testing, nanofabrication, and therapeutics.

### 4. Data Informatics and Computation



All cores whose focus is various aspects of bioinformatics and computation, including genomics, high throughput screening, molecular simulations and biological informatics.

### 5. Chemical Science Technologies



All cores whose focus is various aspects of chemical and molecular analysis, including NMR, mass spectrometry, protein analysis, and isotopes.

## Core Facilities by Thematic Area

Name of Core Facility	Director	Thematic Area
Cell Metabolism Core	Fen Wang	Microscopy and Imaging
Center for Advanced Imaging	Michael Mancini	Microscopy and Imaging
College of Dentistry Research Core	Shannon Kramer	Microscopy and Imaging
Image Analysis Laboratory	Robert C. Burghardt	Microscopy and Imaging
Integrated Microscopy and Imaging Laboratory	Andreea Trache	Microscopy and Imaging
Microscopy and Imaging Center	Kristen Maitland	Microscopy and Imaging
Pre-Clinical Imaging Core	Jiang Chang	Microscopy and Imaging
AgriGenomics Laboratory	David Stelly	Integrated Biological and Medical Translational
Animal Genetics Laboratory	Rytis Juras	Integrated Biological and Medical Translational
Antibody & Biopharmaceutics Core	Praveen Rajendran	Integrated Biological and Medical Translational
Center for Precision Ag Technology	Libo Shan	Integrated Biological and Medical Translational
COM Cell Analysis Facility	Robert Alaniz	Integrated Biological and Medical Translational
Comparative Medicine Program	Robert Rose	Integrated Biological and Medical Translational
Epigenetics Core	Yun (Nancy) Huang	Integrated Biological and Medical Translational
Flow Cytometry and Cell Sorting Core	Margie Moczygemba	Integrated Biological and Medical Translational
Flow Cytometry Facility	Gus Wright	Integrated Biological and Medical Translational
High Throughput Research and Screening Center	Peter Davies	Integrated Biological and Medical Translational
Human Clinical Research Building	Richard Kreider	Integrated Biological and Medical Translational
Integrated Metabolics Analysis Core (IMAC)	Larry Dangott, Arul Jayaraman	Integrated Biological and Medical Translational
Laboratory for Synthetic-Biologic Interactions	Karen Wooley	Integrated Biological and Medical Translational
Molecular Cytogenetics Laboratory	Terje Raudsepp	Integrated Biological and Medical Translational
Molecular Genomics Core	Andrew Hillhouse	Integrated Biological and Medical Translational
Multi-Crop Transformation Facility	Marco Molina	Integrated Biological and Medical Translational
Protein Production Core	Magnus Hook, Wen Liu	Integrated Biological and Medical Translational
Rodent Preclinical Phenotyping Core	Alexandra Trott	Integrated Biological and Medical Translational
Systems and Synthetic Biology Innovations Hub	Joshua S. Yuan	Integrated Biological and Medical Translational
Texas A&M Institute for Genomic Medicine	Ben Morpurgo	Integrated Biological and Medical Translational
AggieFab Nanofabrication Facility	Arum Han	Materials and Fabrication
Biomedical Engineering Shared Laboratories	Amanda Myatt	Materials and Fabrication
IODP Core Scanning Laboratory	Brian LeVay	Materials and Fabrication
Materials Characterization Facility	Miladin Radovic	Materials and Fabrication
Materials Development and Characterization Center	Ibrahim Karaman	Materials and Fabrication
National Center for Therapeutics Manufacturing	Zivko Nikolov	Materials and Fabrication
National Corrosion and Materials Reliability Laboratory	Raymundo Case	Materials and Fabrication

## Core Facilities by Thematic Area

Name of Core Facility	Director	Thematic Area
Soft Matter Facility	Svetlana Sukhishvili	Materials and Fabrication
SQUID Magnetometer	Nattamai Bhuvanesh	Materials and Fabrication
X-Ray Diffraction Laboratory	Francois Gabbai	Materials and Fabrication
Crop Genome Editing Laboratory	Michael Thomson	Data Informatics and Computation
Genomics and Bioinformatics Service	Charlie Johnson	Data Informatics and Computation
Laboratory for Molecular Simulation	Michael B. Hall	Data Informatics and Computation
Rigor & Reproducibility Core	Kurt Zhang	Data Informatics and Computation
Smart Grid Control Room Lab	Tom Overbye	Data Informatics and Computation
TIGSS Bioinformatics Core	Kranti Konganti	Data Informatics and Computation
Center for Atmospheric Chemistry and the Environment	Sarah Brooks	Chemical Science Technologies
Center for Mass Spectrometry	Klaudia Kocurek	Chemical Science Technologies
Chemistry Mass Spectrometry Facility	Bo Wang	Chemical Science Technologies
Collaborative Resource in Biomolecular NMR	Joshua Wand	Chemical Science Technologies
Elemental Analysis Laboratory	Bryan E. Tomlin	Chemical Science Technologies
Geochemical and Environmental Research Group	Anthony Knap	Chemical Science Technologies
ILSB Mass Spectrometry Lab (ILSB-MSL)	David H. Russell	Chemical Science Technologies
NMR/ESR Facility of the Chemistry Department	Janet Bluemel	Chemical Science Technologies
Nuclear Science Center	Sean McDevitt	Chemical Science Technologies
Protein Chemistry Laboratory	Lawrence Dangott	Chemical Science Technologies
Radiation Effects Facility	Henry Clark	Chemical Science Technologies
Stable Isotope Geosciences Facility	Brendan Roark	Chemical Science Technologies
Stable Isotopes for Biosphere Science Laboratory	Tom Boutton/Jason West	Chemical Science Technologies

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# Texas A&M Core Facilities

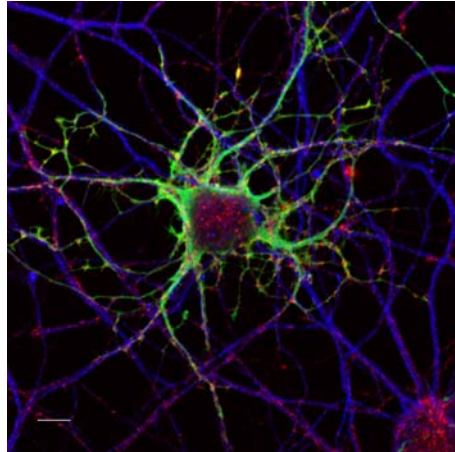


## Thematic Areas

- Microscopy and Imaging
  - Integrated Biological and Medical Translational
    - Materials and Fabrication
      - Data Informatics and Computation
        - Chemical Science Technologies



# Microscopy and Imaging



## CELL METABOLISM CORE



LOCATION  
Institute of Biosciences and  
Technology  
Houston

DIRECTOR  
Fen Wang, PhD  
[wangfen@tamu.edu](mailto:wangfen@tamu.edu)  
713-677-7520  
<https://ibt.tamhsc.edu/faculty/wang-bio.html>

*The mission of the Core is to provide researchers with the access and expertise on real-time measuring glycolysis, oxidative phosphorylation, ATP production profiles, and mitochondria function. The Core will also share expertise on how cell signaling regulates cell metabolism and how abnormal cell signaling hijacks cell metabolism machinery and creates a disease-favoring tissue microenvironment.*

*Major Equipment*  
• Seahorse XFe96 Analyzer.





# Center for Advanced Imaging

The joint IBT:BCM Center for Advanced Imaging provides advanced imaging technologies to support PI's from IBT, Baylor, and other GCC institutions, supported in part by a joint IBT:BCM CPRIT CFSA resource grant.

Imaging and analysis support, including training, is available for leading-edge basic science R&D, assay development to accelerate drug discovery, and HT screening in live or fixed cells via fully-automated multiplex confocal microscopy, spectral genomics, single cell analytics, machine learning, etc.



## Location

Institute of Biosciences and Technology  
Houston

<https://ibt.tamhsc.edu/research/ctcr/mancini/index.html>

## Director

Michael A. Mancini, PhD  
[michaelamancini@tamu.edu](mailto:michaelamancini@tamu.edu)  
713-408-0179

## Co-Director

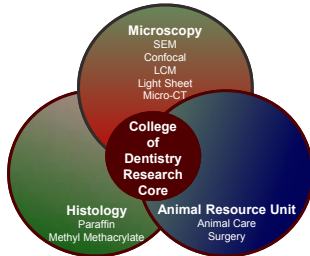
Leoncio Vergara, MD  
[leovergara@tamu.edu](mailto:leovergara@tamu.edu)  
409-750-2153

## Major Equipment

- Leica SP8 spectral confocal with white light laser, Falcon deconvolution, STED super-resolution\*\*, FCS, FLIM, live or fixed;
- Nikon CSU-W1 dual spinning disk, multi-laser/multichannel confocal with optogenetics, photobleaching, live or fixed;
- Nikon A1si spectral confocal, with TIRF and Ca++ upgrades, live cell incubator;
- GE-Healthcare DeltaVision deconvolution microscope with hi-res, hi-speed CCDs for routine live/fixed cell;
- IN Cell Analyzer 6000 on-chip HT confocal imaging platform for assay development and automated fixed cell imaging;
- Molecular Devices spinning disk HT confocal microscope and robotics for assay development and live/fixed cell imaging;
- Pipeline Pilot and Open Source software platforms (R, Python): 2D/3D segmentation, data analysis and interpretation, machine learning, neural net, etc;
- StellarVision Synthetic Aperture Optics low-mag, high-res, multi-channel, HT microscope designed for multiplexing and spectral genomics;
- \*\* additional super-res resources are available for SIM and STORM



# College of Dentistry Research Core



## LOCATION

College of Dentistry  
Dallas, Texas

## DIRECTOR

Shannon Kramer, MS, PhD  
[skramer@tamu.edu](mailto:skramer@tamu.edu)  
214-828-8344  
<https://dentistry.tamhsc.edu/research/index.html>

The goal of the COD Research Core is to facilitate the investigation of craniofacial and tooth development, pain, signal transduction, proteins involved in the formation, development, and function of dentin, enamel and bone, and encourage development of multi-institutional collaboration utilizing animal models, histology, and microscopy.

## Major Equipment

- Leica SP5 confocal system with four lasers and five detectors used with an upright scope. Laser lines 405, 458, 488, 514, 543, 561, 633.
- JEOL-6010LA SEM which uses a field emission gun with cold cathode. The resolution is 1.5 nm in SEI and 3.0 nm in BEI. Sample diameter: 32-150 nm.
- ScanCo Mirco-CT 35 Scanner
- Leica CTR 6500 Laser Capture Microdissection Microscope
- Other available microscopes: Slide Scanning Olympus VS 120-S5, Nikon epifluorescent microscope, Zeiss Axioplan microscope, and Leica DMRXE microscope
- Animal resource unit.
- Full service histology lab.



## Image Analysis Laboratory



The Image Analysis Laboratory (IAL) supports microscopy needs of basic and clinical scientists and their trainees to perform research that improves the health of animals, humans and the environment as part of the One Health Initiative of the Texas A&M University System. The IAL engages in interdisciplinary collaboration with multiple colleges and interdisciplinary programs, and serves as an Advanced Imaging Facility Core for Texas A&M Center for Environmental Health Research, an interdisciplinary NIEHS-supported Center.

### LOCATION

B12 Veterinary Medical Administration  
Building, College Station  
<https://vetmed.tamu.edu/ial>

### CONTACTS

Robert C. Burghardt, PhD, Director  
[rburghardt@cvm.tamu.edu](mailto:rburghardt@cvm.tamu.edu)  
979-847-8555

Rola Mouneimne, PhD, Assoc. Director  
[rmouneimne@cvm.tamu.edu](mailto:rmouneimne@cvm.tamu.edu)  
979-458-1149

### Major Equipment

- Zeiss LSM 780 Airy Scan – 4 channel spectral confocal/multiphoton microscope with definite focus and live cell incubator
- Zeiss Elyra super-resolution microscope with 3-Ch, definite focus and live cell incubator
- Cell Discoverer 7 (CD7) – high throughput deconvolution microscope with robotic arm, high-res/speed CCDs and live cell incubator.
- Arivis Vision 4D, Arivis InView R - data visualization, analysis, segmentation and interpretation of 3D & 4D datasets
- Zeiss Imager M.2 motorized upright microscope – fluorescence, DIC, phase optics, Apotome optical sectioning and deconvolution
- FEI Morgagni transmission electron microscope



## Integrated Microscopy and Imaging Laboratory



**IMIL**

### Integrated Microscopy & Imaging Laboratory

#### LOCATION

Texas A&M University  
Health Science Center  
<https://medicine.tamhsc.edu/imil/>

#### DIRECTOR:

Andreea Trache, PhD  
[trache@tamu.edu](mailto:trache@tamu.edu)

#### MANAGER:

Malea Murphy PhD  
[maleamurphy@tamu.edu](mailto:maleamurphy@tamu.edu)  
979-436-9037

The primary purpose of the IMIL is to support research innovation and grant development by encouraging researchers to explore advanced imaging modalities and to incorporate them into their existing research programs.

The IMIL includes six microscopy rooms, supporting facilities, and an image processing station.

#### Core Equipment

- **Olympus Fluoview FV3000** Confocal Laser Scanning Microscope - Resonant and galvo scanner, four high-sensitivity GaAsP detectors, automated stage for time-lapse and mosaic imaging, stage-top incubator
- **Olympus VS120** Virtual Slide Scanning System -100 slide capacity, automated sample identification and focus, Brightfield and Epi-fluorescence
- **NanoFluorII** - Ultra-fast spinning disk confocal with piezo Z-control (up to 100 fps), Spinning Disk Confocal microscope, TIRF microscope
- **Atomic Force Microscope** for live cells
- **Leica SP2** Confocal Laser Scanning Microscope - AOBs spectral confocal scanning head, three PMT detectors
- **Coming soon! Olympus FVMPE-RS** Multiphoton Laser Scanning Microscope - Gantry frame optimized for intravital imaging, dual wavelength MP Spectra Physics lasers, two high-sensitivity GaAsP detectors, resonant and galvo scanner



## Microscopy and Imaging Center



The mission of the MIC is to provide current and emerging technologies for teaching and research involving microscopy and imaging in Life and Physical Sciences. The Center offers expertise in sample preparation, in situ elemental/molecular analyses, high-resolution imaging using light- and electron-enabled microscopy, as well as digital image analysis and processing.

### Major Equipment

#### Light Microscopy

- Leica SP8 Confocal, STED, FLIM system for live cell imaging with high-speed, multi-spectral, super-sensitivity, super-resolution and fluorescence lifetime capability located in a BSL2 room with cell culture equipment.
- Olympus FV1000 Confocal for optical sectioning and 3D imaging of fluorescently labelled BSL1 or fixed samples.
- Zeiss Z.1 Light Sheet for illuminating samples with a focused sheet of laser light to image an entire plane, minimize photobleaching, and maximize acquisition speed.

#### Electron Microscopy

- Quanta 600 SEM field emission SEM for high-resolution and low-vacuum images.
- Tescan Vega3 SEM with variable pressure mode and Oxford EDS detector
- FEI Tecnai G2 F20 ST TEM Materials for morphological, crystallographic, and elemental analysis of bulk and nanoscale materials
- FEI Tecnai G2 F20 T FE-TEM Cryo with Z contrast dark-field STEM imaging using HAADF detector, Oxford EDS detector, and EELS for elemental mapping
- JEOL 1200 TEM for biological samples with double condenser projection lens and bright/dark field imaging
- JEOL 2010 TEM with high resolution for materials research and INCA Semi-STEM mode for elemental mapping
- Other Supporting Equipment including sputter coaters, plasma cleaners, high pressure freezer, plunge freezer, etc.

### LOCATION

Interdisciplinary Life Sciences Building  
College Station

### DIRECTOR

Kristen Maitland, PhD  
[kmaitland@tamu.edu](mailto:kmaitland@tamu.edu)  
979-845-1864

### ASSISTANT DIRECTOR

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979-845-3639

<https://microscopy.tamu.edu/>



## Pre-Clinical Imaging Core



The purpose of the Pre-Clinical Imaging Core is to provide a platform to support investigators using state-of-the-art dynamic molecular and anatomical imaging technology to accelerate a broad spectrum of basic and pre-clinical studies via non-invasive, live and in vivo fluorescence, bioluminescence and micro-ultrasound imaging system.

### Major Equipment:

- PerkinElmer IVIS Spectrum In Vivo Imaging System – integrated with 2D optical and 3D optical tomography in one platform, ideal for longitudinal monitoring of disease progression, tumor tracking, cell trafficking and gene expression patterns in living animals.

- Fujifilm-Visual Sonics Vevo 3100 – powerful combination of high frame rates and advanced image processing system, ideal for pre-clinical imaging including disease development, tumorigenesis progression, angiogenesis, hemodynamic changes, animal model phenotype characterization.

### LOCATION

Institute of Biosciences and  
Technology  
Houston

### DIRECTOR

Jiang Chang, MD, PhD  
[jiangchang@tamu.edu](mailto:jiangchang@tamu.edu)  
713-677-7603



## Integrated Biological and Medical Translational



## AgriGenomics Laboratory (AGL)



**GOALS:** To help graduate students, staff and lab-less faculty launch, economize and expedite their research, especially when it involves DNA extraction and quality checks, targeted genotyping and DNA content analysis.

**ANNUAL MEMBERSHIPS** by PIs provides fiscal year access to AGL training, expertise and equipment for each member's research team.

**SERVICE:** While most activities are completed by users, services can be purchased when needed. Non-institutional users can only purchase services.

**WEBPAGE:** <http://agl.tamu.edu/>

**LOCATION**  
Building 0954 (rear), i.e., Agronomy Field Laboratory (AGFL), Agronomy Rd., TAMU campus

**DIRECTOR**  
David Stelly, PhD  
[stelly@tamu.edu](mailto:stelly@tamu.edu)  
979.845.2745

**MANAGER**  
Robert Vaughn, PhD  
[agl@tamu.edu](mailto:agl@tamu.edu)  
979.458.6594

### Major Equipment

- Tissue homogenizers (tube and plate)
- Cooled centrifuge (plate compatible)
- Low-volume 1-channel fluorometer (DNA and RNA extract analysis)
- Plate sealers
- Plate replicator (i-Pipette – 96/384-well formats)
- Thermocyclers (96- and 384-well)
- Hydrocycler – giant multi-plate PCR machine
- Pherastar Plus – end-point plate reader and KlusterKaller software
- Accuri C6 tabletop flow cytometer



## Animal Genetics Laboratory



The Animal Genetics Laboratory offers DNA genotyping used for identification, parentage verification and determination of specific homozygous/heterozygous gene mutations in animals. The analysis provides useful information for diseases, coat colors, as well as physical traits. Currently, the lab provides routine services for testing horses, donkeys and cattle. We also offer ancestry testing for horses.

**LOCATION**  
Texas A&M University, CVM, VIBS  
Veterinary Medical Research Bldg (1197)

**DIRECTOR**  
Rytis Juras, DVM, PhD  
[rjuras@cvm.tamu.edu](mailto:rjuras@cvm.tamu.edu)  
979-845-6524  
<https://vetmed.tamu.edu/animalgenetics/>



3730xi DNA Analyzer



## Antibody and Biopharmaceutics Core



The Antibody and Biopharmaceutics Core (ABC) can generate customized polyclonal and monoclonal antibodies tailored to meet the specific needs of individual research programs. The core also provides tailored engineering of monoclonal antibodies with specialization in affinity maturation and humanization. As part of the Texas A&M Center for Epigenetics and Disease Prevention, ABC has unique expertise generating antibodies against epigenetic targets.

**LOCATION**  
Institute of Biosciences and  
Technology  
Houston

**DIRECTOR**  
Praveen Rajendran, PhD  
[prajendran@tamuhsc.edu](mailto:prajendran@tamuhsc.edu)  
713-677-7803  
<https://ibt.tamuhsc.edu/cores/abc/core/index.html>

**Major Equipment:**

- Biomek FX automated liquid handling workstation
- Molecular Devices ClonePix 2 system
- ForteBio Octet system

**Services:**

- Rapid selection & optimization of hybridoma cell lines
- Affinity determination, maturation and humanization
- Optimized antibody engineering
- Screening for stability, activity and in vivo efficacy



## Center for Precision Ag Technology



The goal of the joint IPGB service facilities centered on Precision Ag Technology is to develop a framework to support multi-investigator, multi-institutional grants using advanced agricultural biotechnology to accelerate novel ag trait discovery and design through leading edge R&D and screening via high throughput sensitized monitoring plant physiology traits, genetic lesion detections, and in vitro plant regeneration and transformation pipelines.

### LOCATION

Institute For Plant Genomics and Biotechnology (IPGB),  
Norman E. Borlaug Center,  
498 Olsen Blvd., College Station, TX

### DIRECTOR

Libo Shan  
Managing Directors  
Eun-Gyu No  
979-458-1410  
<https://ipgb.tamu.edu/services/>

### Major Equipment and service

- Green house, chambers and plant sample preparation facility.
- High quality plant and pathogen genomic DNA preparation, Sanger sequencing and genotyping services.
- Plant tissue culture, regeneration and transformation facility.
- High throughput plant physiology trait monitoring and screening; monitoring leaf surface temperature, photosynthesis rate, water vapor rate and stress hormone production.



## COM Cell Analysis Facility



The Cell Analysis Facility at the TAMHSC provides cell analysis and cell sorting services for research in the TAMHSC and TAMU community. Equipped for full user experimental workflow from animal/tissue to cells to immunophenotyping and high purity cell sorting to downstream functional analysis.

### MAJOR EQUIPMENT

- **Becton-Dickinson FACSaria III – Sorter/Cytometer.** Lasers: Violet (405nm), Blue (488nm), Yellow-Green (561nm), Red (640nm); 13-parameter single cell analysis; 4-way bulk high speed sorting; Single-cell sorting into 96- or 384-well plates or onto slides; Risk-Group 2 compliant (end of Nov 2019).
- **Becton-Dickinson Fortessa X-20 – Cytometer.** Lasers: Violet (405nm), Blue (488nm), Yellow-Green (561nm), Red (640nm); 16-parameter single cell analysis; Risk Group 2 compliant (end of Nov 2019).
- **Agilent Seahorse XFe96 - Cellular Metabolism Analyzer.** Measure cellular metabolism and metabolic pathways in real-time (OxPhos, glycolysis, FAO, ATP production, etc.) in a 96-well format; Screen compounds for effects on metabolism; used in cancer biology, immunology and cell biology.
- **Miltenyi gentleMACS Octo-Dissociator.** Semi-automated dissociation of multi-species tissues into single-cell suspensions or homogenates for downstream culture or cellular & molecular analysis; high viability and recovery; process 16 tissues in 30-45 minutes; Optimized tissue-specific kits and preset programs.

### LOCATION

Medical Education & Research  
Building #2, Room 3226  
TAMHSC  
Bryan-Hwy 47 Campus

### DIRECTOR

Robert C. Alaniz, PhD  
[robert\\_alaniz@tamu.edu](mailto:robert_alaniz@tamu.edu)  
979-436-0844  
<https://research.tamhsc.edu/caf/>



## Comparative Medicine Program



### LOCATION

CMP administrative offices are at LARR Main, building 972, Agronomy Road, College Station

### DIRECTOR

Robert Rose, DVM, MS, DACLAM  
[rose@tamu.edu](mailto:rose@tamu.edu)  
979-845-7433  
<https://vpr.tamu.edu/directory/comparative-medicine-program>

-The Comparative Medicine Program (CMP) is the centrally administered support service for animal research and teaching programs at Texas A&M University, College Station.  
-The program's facilities and services are available for all Texas A&M campus affiliated faculty, staff, and students who have been approved to conduct animal research by the [Institutional Animal Care and Use Committee](#) (IACUC). CMP is accredited by the Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) through its affiliation with other AAALAC-accredited Texas A&M programs.  
-CMP facilities offer housing and care for most standard laboratory animals. Specialized housing can be provided for biohazard projects and hazardous chemical projects. Varying degrees of animal isolation are available.  
- Other services include technical training of research staff, technical support, rental of anesthesia equipment and use of the CMP surgical facility.



## Epigenetics Core



### LOCATION

Institute of Biosciences and Technology  
Houston

### DIRECTOR

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[yun.huang@tamu.edu](mailto:yun.huang@tamu.edu)  
713-677-7484  
Deqiang Sun, PhD  
[dsun@tamu.edu](mailto:dsun@tamu.edu)  
713-677-7439

The Epigenetics Core provides support for a range of epigenetics/epigenomics investigations, including high-throughput sequencing and bioinformatics expertise for RNA-seq, ChIP-seq, DNA methylation and hydroxymethylation profiling, and high-order chromatin organization studies. The Epigenetics core also is equipped with 10X Genomics single cell analyzer capabilities for single-cell transcriptomics, ATAC-seq analysis, and immune profiling.

### Major Equipment:

- **Nextseq 550** – Illumina next-generation sequencer
- **10X Chromium Controller** – Single cell analyzer
- **Covaris M220** – Focused-ultrasonicator
- **Bioruptor** – Chromatin and DNA sonicator
- **Bioanalyzer** – Automated electrophoresis
- **Qubit Fluorometer** – Quickly quantitate DNA/RNA
- **Computers** – 300 CPUs up to 3.7Ghz and 1000GB RAM 4GPU
- **Data storage** – 328 TB Failure tolerant disk array
- **Websserver** – 108 TB, daily remotely backup



## Flow Cytometry and Cell Sorting Core



LOCATION  
Institute of Biosciences and  
Technology  
Houston

DIRECTOR  
Margie Moczygemba, PhD  
[mmoczygemba@tamu.edu](mailto:mmoczygemba@tamu.edu)  
713-677-8114  
<https://ibt.tamhsc.edu/cores/flow/index.html>

The goal of our core is to provide state-of-the-art instrumentation, exceptional specialized expertise and training in flow cytometry. Services include fluorescence-activated cell sorting (FACS), flow cytometry analysis, consultation, data analysis and training. We are also expanding our services to include a CPRIT-funded high-throughput flow cytometry core that supports immuno-oncology drug screening applications.

**Major Equipment:**

- **BD FACSAria Fusion** - A fully integrated advanced cell sorter and analyzer with a biosafety solution. 4 solid state lasers: 488-nm blue laser (50mW), 640-nm red laser (100mW), 405-nm violet laser (85mW), and a 561-nm yellow-green laser (50mW). Detects 15 simultaneous fluorescent colors.
- **BD LSR II** - Special Order Laser Upgrade includes the installation of a 561-150mw laser system, 637-150nm laser w/mount, Octagon with 3 premounted detectors and 3 high performance filters/mirrors set (3 Bandpass & 3 Dichroic Mirrors) for 561nm laser system on BD LSR II.
- **iQue Screener Plus** – COMING SOON! An automated 3-laser flow cytometer that supports the analysis of 96- or 384-well plate-based multiplexing assays with fast sampling times (<20 min sampling time per 384-well plate) and miniaturized sampling volumes (1 – 5 ul). Uses Forecyte 6 analysis software for analyzing large content data.



## Flow Cytometry Facility



*The mission of the Flow Cytometry Shared Resource Facility at Texas A&M is to provide the highest quality flow cytometry data, data analysis, and cell sorting services to support the research goals of the faculty, students and staff of the Texas A&M University system and surrounding biotech companies.*

LOCATION  
Texas A&M University College of  
Veterinary Medicine and Biomedical  
Sciences. VMR Addition Room 257

DIRECTOR  
Gus A. Wright, PhD  
[gwright@cvm.tamu.edu](mailto:gwright@cvm.tamu.edu)  
979-458-9859  
<https://vtpb.tamu.edu/flow-cytometry/>

**Major Equipment**

- Beckman Coulter MoFlo Astrios high-speed cell sorter- 3-laser, 11 detector cell sorter that can sort up to 6 different populations simultaneously. Housed in a Class 2 B BSC for BSL2 sorting
- Becton Dickinson Accuri C6 flow cytometer- 2-laser, 4 detector flow cytometer.
- Becton Dickinson FACSCalibur flow cytometer- 1-laser, 3 detector flow cytometer.
- FlowJo Workstation- flow cytometry data analysis and visualization software package.





## High Throughput Research and Screening Center



**LOCATION**  
Institute of Biosciences and  
Technology  
Houston

**DIRECTORS**  
Peter Davies, M.D., PhD  
[pdavies@tamu.edu](mailto:pdavies@tamu.edu)  
Cliff Stephan, PhD  
[cstephan@tamu.edu](mailto:cstephan@tamu.edu)  
713-677-7456  
<https://ibt.tamhsc.edu/cores/high-throughput/index.html>

A unique resource providing researchers from Texas A&M and the Texas Medical Center institutions with access to state-of-the-art tools to support academic drug discovery research. The Core provides industry-standard high throughput screening and imaging capabilities and access to collections of nearly 60,000 FDA-approved drugs, investigational agents and chemical compounds. The Core also has assembled libraries of mechanistically annotated compounds to support mechanistic pathway and target-identification studies. The Core is managed by a fulltime professional staff of experienced cell biologists, biochemists, pharmacologists and bio-informaticians with pharmaceutical industry and academic experience.

**Major Equipment:**  
**Labcyte Echo 550** liquid-handling workstation - acoustic dispenser integrated with a Cytomat incubator  
**Tecan Evo 200** liquid-handling workstation - integrated with Tecan multimode readers and Liconic incubators  
**Beckman-Coulter Biomek FXP** and **Beckman NX P** liquid-handling workstations - 96-channel and variable spanning 8-channel pipettor integrated with cell culture incubators and consumables storage system  
**Tecan Hydrospeed** microplate washer and Multidrop Combi system with stackers.  
**BioTek Synergy Neo2** Multimode microplate reader with plates loader  
**GE Healthcare IN Cell Analyzer 6000** high-throughput 4-channel confocal imaging system with an integrated plate handler,  
**Molecular Devices ImageXpress** Micro-confocal microscope with integrated Cytomat incubator for continuous live cell imaging 24hrs a day.



## Human Clinical Research Building



**LOCATION**  
675 John Kimbrough Blvd.  
Bldg. #1542  
College Station, TX 77843-4253

**EXECUTIVE DIRECTOR**  
Richard B. Kreider, PhD  
[rbkreider@tamu.edu](mailto:rbkreider@tamu.edu)  
979-458-1498

**CLINICAL RESEARCH DIRECTOR**  
Nicolaas Deutz, MD, PhD  
[nep.deutz@tamu.edu](mailto:nep.deutz@tamu.edu)  
979-220-2910

<http://hcrf.tamu.edu/>

*The HCRB is a biomedical research facility that was developed to provide a centralized research facility for clinical researchers to conduct human clinical research trials at Texas A&M University.*

*The HCRB contains the following equipment and facilities:*

- exercise training and rehabilitation facilities;
- a large conference / lecture area;
- Faculty & staff offices and research assistant desks;
- 12 beds for overnight stay research studies;
- a metabolic kitchen for feeding studies;
- 4 procedure and research examination rooms;
- DEXA body composition/bone density analyzer
- Resting energy expenditure rooms;
- Large physiological testing area (ECG/cardiopulmonary exercise testing, isokinetic testing, isotonic testing, etc.);
- a secured data archive system;
- nursing station;
- blood/tissue processing and testing laboratory;
- biobank with monitored and controlled -80°C;
- a comprehensive wet lab facility with 4 LC-MS/MS, 2 GC-MS/MS systems, cell culture, routine clinical chemistry applications, etc.; and
- a pharmacy compounding room for preparing sterile IV solutions.

Faculty members can reserve access for examination space or have HCRB staff collect data for their independent research on a fee for service basis through iLab or collaborate directly with PI's housed in the HCRF on grants.



## Integrated Metabolomics Analysis Core



### LOCATION

Biochemistry / Biophysics  
College Station

### CO-DIRECTORS

Arul Jayaraman, PhD  
arulj@tamu.edu  
979-845-3306  
<https://imac.tamu.edu/>

Larry Dangott, PhD  
dangott@tamu.edu  
979-845-2965  
[https://tamu.corefacilities.org/service\\_center/show\\_external/4628](https://tamu.corefacilities.org/service_center/show_external/4628)

The IMAC core facility supports metabolomics research by providing state-of-the-art instrumentation, systems, software, technical expertise and training for the application of modern molecular biological and chemical technologies. With users across 7 colleges the IMAC enables a broad range of liquid and gas chromatography mass spectrometry based research on campus with a significant impact on the scientific community at large with select external clients.

### Major Equipment

- *Thermo Ultimate 3000 / Q Exactive Plus* – Liquid chromatography high resolution accurate mass spectrometry system for untargeted analysis
- *Thermo Vanquish / Altis* – UHPLC-QQQ MS system for targeted analysis
- *Thermo Ultimate 3000 / Quantiva* - LC-QQQ MS system for targeted analysis
- *Thermo Trace 1310 / TSQ Evo* – Gas chromatography – QQQ MS system for targeted analysis



## Laboratory for Synthetic-Biologic Interactions



### LOCATION

Department of Chemistry  
College Station

### DIRECTOR

Karen L. Wooley, PhD  
wooley@chem.tamu.edu  
979-845-4077  
<https://lsbi.chem.tamu.edu/>

The Laboratory for Synthetic-Biologic Interactions (LSBI) is dedicated to supporting research in the study of interactions between synthetic materials and biological systems to facilitate the application of advanced materials within biological environments. The facility provides expertise, BL-2 workspace, and advanced instrumentation for biological testing and development of medical devices and nano-pharmaceuticals.

### Major Equipment

- Olympus FV1000 & Picoquant TCSPC- Full-spectral confocal with lifetime fluorescence and lifetime-fluorescence anisotropy capabilities.
- Malvern Zetasizer Nano ZS – dynamic light scattering (DLS) with zeta potential and static-light scattering capabilities.
- Mettler Toledo DMA 1 – dynamic mechanical analysis with temperature range from -190 to 600 °C.
- Bruker In Vivo Xtreme – animal imaging cabinet with modalities for x-ray, fluorescence, and bioluminescence.
- Shimadzu IR Prestige – Fourier transform infrared (FTIR) with camera
- B&W Tek i-Raman – Raman spectrometer microscope and probe.



## Molecular Cytogenetics Laboratory



The Molecular Cytogenetics lab offers traditional karyotyping and molecular cytogenetic analysis for a broad range of vertebrate species to: i) identify chromosome rearrangements underlying congenital disorders, subfertility, and disorders of sexual development; ii) evaluate chromosomal stability of cell lines; iii) identify species, or iv) contribute to collaborative projects.

### LOCATION

Texas A&M University, CVM, VIBS  
Veterinary Medical Research Bldg  
(1197), Room #314, College Station

### DIRECTOR

Terje Raudsepp, PhD  
[traudsepp@cvm.tamu.edu](mailto:traudsepp@cvm.tamu.edu)  
979 862 2879  
<https://vetmed.tamu.edu/molecular-cytogenetics/>



## Molecular Genomics Core



### LOCATION

266 Vet Med Research Annex  
446 Reynolds Medical Building  
College Station, TX

### ASSOCIATE DIRECTOR

Andrew Hillhouse, PhD  
[hillhouse@tamu.edu](mailto:hillhouse@tamu.edu)  
979-458-5678

[www.genomics.tamu.edu](http://www.genomics.tamu.edu)

The Texas A&M Institute for Genome Sciences and Society (TIGSS) seeks to improve the lives of humans and animals and advance genomic research throughout the Texas A&M System. The goal of the TIGSS Molecular Genomics Core :

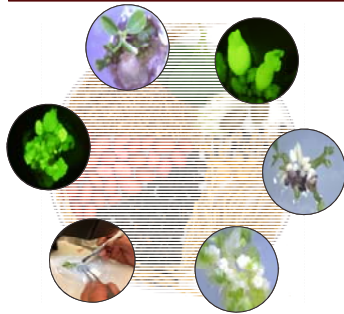
*Enhance educational excellence through training of faculty, students and staff in genomic and analytical techniques  
Expand infrastructure and facilitate access to instrumentation for genomic research and analysis increase collaboration with investigators throughout Texas A&M, the state of Texas and beyond.*

### *Major Equipment*

- Illumina NextSeq 500 and MiSeq Next generation sequencers
- Oxford Nanopore GridION Nanopore sequencer
- BioNano Saphyr Optical DNA mapper
- 10x Genomics Chromium single cell genomics system
- EpMotion 5075 Fluid Handling robotic system
- Fluidigm C1 and BioMark HD microfluidics system for single cell sequencing and high throughput molecular analysis.
- BioRad droplet Digital PCR system for high resolution qPCR
- Biotek Cytation 5 plate reader and Imager
- BioRad CFX96 and CFX384 real time PCR systems
- Agilent TapeStation 2200 and 4200 Nucleic Acid Analyzer



## Multi-Crop Transformation Facility (MTF)



*Plant transformation is a major bottleneck in genetic research among crops and especially in commercial varieties of agricultural importance. In order to leverage Texas A&M research and development capabilities, MTF provides high quality plant transformation services to the scientific community across Texas A&M AgriLife, TAMU, the Texas A&M University System, and external collaborators. Partnership with AgriLife Research Facilities including the Genomics and Bioinformatics Service Lab and the Crop Genome Editing Laboratory provides a solid plant transformation pipeline.*

### Location

Norman E. Borlaug Center, IPGB #159  
498 Olsen Blvd., College Station, TX  
979.458.1410

### Director

Marco Molina  
[marco.molina@tamu.edu](mailto:marco.molina@tamu.edu)

### Managing Director

Mayra Faion-Molina  
[mavrafmolina@tamu.edu](mailto:mavrafmolina@tamu.edu)

### Major Skills and Equipment

- 20+ years of industry experience in plant tissue culture/transformation and Project Management
- Agrobacterium-mediated and Biolistic transformation capabilities for Plant Transgenesis and Genome Editing.
- Protocol validated in model crops and multiple commercial varieties
- Laminar flow hoods, growth chambers, light rooms, barcode tracking and greenhouse capacities

<https://croptransformation.tamu.edu/>



## Protein Production Core



The goal of the Protein Production core is to provide cloning, expression and purification services of functional proteins at a scale that meets the quantity and purity benchmarks for structural, biophysical, biochemical, and therapeutics studies; employs bacteria and yeast host systems with a view to expanding into insect and mammalian host systems; and specializes in systematic method development for expressing and purifying challenging proteins.

### Major Equipment:

- **AKTA Pure 25L chromatography system** – A flexible and intuitive purification system for proteins, peptides, and nucleic acids from microgram levels to tens of grams of target product in research applications.
- **Jasco-720 Spectrophotometer** - High sensitivity measurements in the near- and far-UV regions. High optical throughput, double prism monochromator, highly efficient nitrogen purge system, and simultaneous multi-probes.
- **Avanti J-E centrifuge and Optima XPN-80 ultracentrifuge** – capable of large scale and high efficiency cell lysate separation and membrane preparation.
- **MicroCal PEAQ-ITC** - Allows direct, label-free in solution measurement of binding affinity and thermodynamics to provide a complete thermodynamic profile of the molecular interaction.
- **Microfluidics' Microfluidizer M 110P** – capable of large scale and high efficiency cell lysis.

### LOCATION

Institute of Biosciences and  
Technology  
Houston

### DIRECTOR

Wen Liu, PhD  
[wen\\_liu@tamu.edu](mailto:wen_liu@tamu.edu)  
713-677-7583  
<https://www.ibt.tamhsc.edu/cores/protein/index.html>



## Rodent Preclinical Phenotyping Core



The Rodent Preclinical Phenotyping Core houses various instruments to measure and quantitate mouse physiology and behavior. We offer a wide variety of state of the art equipment to help expedite comprehensive research in many fields, including Behavior, Cardiovascular, Cancer, Chemical, Metabolic, and Skeletomuscular.

### LOCATION

TAMU Reynolds Medical Building

### ASSOCIATE DIRECTOR

Alex Trott, PhD  
[atrott@tamu.edu](mailto:atrott@tamu.edu)  
940.368.2374  
<https://genomics.tamu.edu/preclinical-phenotyping/>

### Major Equipment

- TSE Phenomaster- measures food/water intake, activity monitoring, and calorimetry/O<sub>2</sub>/CO<sub>2</sub> measurements.
- Noldus Ethovision XT- video tracking software that tracks and analyzes behavior, movement, and activity.
- Vevo 3100 LT Ultrasound- real time, in vivo physiological information: B-Mode, M-Mode, Color Doppler, and PW Doppler.
- Storz Rodent Endoscope- small animal endoscopy for various diagnostic, surgical, and orthopedic indications.
- EchoMRI-130- body composition analyzer for live subjects, whole body fat, lean, free water, and total water masses.



## Texas A&M Institute for Genomic Medicine



### LOCATION

College Station

### EXECUTIVE DIRECTOR

Dr. Ben Morpurgo, PhD  
[bmorpurgo@tigm.org](mailto:bmorpurgo@tigm.org)  
979.458.5494  
[http://www.tigm.org/tamus\\_services/](http://www.tigm.org/tamus_services/)

The Texas A&M Institute for Genomic Medicine (TIGM) is an essential resource for researchers looking to obtain transgenic services. Since 2006, TIGM has delivered more than 800 mouse and cells orders to more than 340 academic and commercial institutions in over 26 countries. These are featured in more than 230 peer-reviewed publications. TIGM provides transgenic core services to researchers within and outside the Texas A&M system including blastocyst or pronuclear injections (including CRISPR/Cas9), rederivation, embryo transfer, design and production of vectors for custom knockout (stable and Cre-ready conditional) and knock in projects, various aspects of ES cell manipulations and embryo and sperm cryopreservation.

Texas A&M Institute for Genomic Medicine (TIGM) facilitates breakthroughs in science and medicine and accelerate the pace of medical discoveries through internal research and by providing our resources, training and services to the scientific community at Texas A&M, The State of Texas, and the world.



# Materials & Fabrication



## AggieFab Nanofabrication Facility



The AggieFab Nanofabrication Facility is a class 100/1000 nano/microfabrication cleanroom facility, equipped with full ranges of micro/nano-scale fabrication on diverse materials. Over 35 instruments are placed in four cleanroom bays, categorized into: lithography/patterning, deposition/diffusion, plasma etching, bonding/dicing, rapid prototyping, and characterization.

#### Major Equipment (few examples)

- FEI Helios NanoLab 460F1 DualBeam Focused Ion Beam (FIB): direct nanopatterning with ion beam and imaging with electron beam; TEM sample preparation using EZ lift
- Tescan Mira 3 electron beam lithography tool with DrawBeam patterning software
- Zeiss Orion Plus Helium Ion Microscope/NanoFab: 10nm patterning resolution; biological material imaging
- EVG 610 double-sided mask aligner
- Nanoscribe Photonic Professional GT2: maskless sub-micron-resolution 3D printer (being acquired)
- Tystar LPCVD: deposit low temperature  $\text{SiO}_2$  and low stress  $\text{Si}_3\text{N}_4$
- Lesker Sputter and Evaporator: deposit metals and insulators
- Clustex multi-sputter tool: 20 magnetron arms (DC/RF)
- Oxford PECVD: deposition of  $\text{SiO}_x$ ,  $\text{SiNx}$  and  $\text{SiOxNy}$
- Oxford ICP RIE: selective etch of Si,  $\text{SiO}$  and  $\text{SiN}$  with ICP
- EVG510 Wafer Bonder
- Veeco Nt91000 and Bruker DektakXT Profilometers
- EnvisionTech high-resolution 3D printers, PLS Laser engraver

#### LOCATION

GERB, 1617 Research Parkway  
TAMU, College Station

#### DIRECTOR

Arum Han, PhD  
[arum.han@tamu.edu](mailto:arum.han@tamu.edu)  
979-458-8854  
<https://aggiefab.tamu.edu>



## Biomedical Engineering Shared Laboratories



The Biomedical Engineering Shared Laboratories are a collection of controlled access labs that house various equipment shared amongst the Biomedical Engineering faculty. The main purposes of these facilities are to provide more, cost-effective resources for the research groups and to minimize duplication of equipment within the department. Equipment is available to other TAMU departments and external users.

### LOCATION

Emerging Technologies Building  
Texas A&M University  
101 Bizzell St.  
College Station, TX 77843

### COORDINATOR

Amanda Myatt  
[amyatt@tamu.edu](mailto:amyatt@tamu.edu)  
979-458-2317

### Major Equipment

- EnvisionTEC 3D Bioplotter in biological safety cabinet
- Molecular Devices ImageXpress Micro Confocal – High-throughput imaging system
- Biotek Cytation 5 Imaging reader
- Resonetics RapidX250 Excimer Laser
- Gravograph LS100-40W CO<sub>2</sub> Laser
- NanoSight LM10 Nanoparticle Tracking Analysis
- Malvern Nano ZS Zetasizer – DLS and Zeta Potential
- Beckman Coulter Optima MAX-XP Ultracentrifuge
- JEOL JCM-5000 Neoscope Scanning Electron Microscope
- Anton Paar MCR 301 Rheometer
- TA Instruments Q800 DMA, Q20 DSC and Q50 TGA
- HAAS Super Mini CNC Mill



## IODP Core Scanning Laboratory



The core scanning laboratory at IODP allows rapid non-destructive lithological characterization of sediment and hard rock cores. The laboratory mostly supports the research activities of the JOIDES Resolution, but it is also open to the public. Scientists from around TAMU and around the world can come to study the cores stored in the Gulf Coast Repository, or they can bring their own.

### LOCATION

International Ocean Discovery  
Program (IODP)  
1000 Discovery Dr

### DIRECTOR

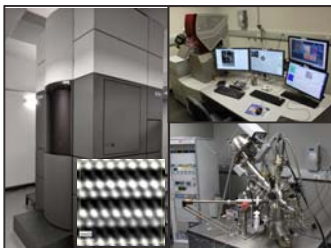
Brian LeVay, PhD  
[levay\\_b@iodp.tamu.edu](mailto:levay_b@iodp.tamu.edu)  
979-458-1155  
<http://iodp.tamu.edu/labs/xrf/>

### Major Equipment

- Avaatech XRF Core Scanners (2) – capable of performing automated EDS-XRF analyses at user-defined locations on the surface of a core or other flat sample; 100W Rh tube, maximum 50kVp, 2.0mA, capable of measuring from Mg to Ce (semi-quantitative)
- Section-Half Image Logger – capable of producing high-resolution line scan images of core sections
- Whole-Round Multi-Sensor Logger – capable of measuring the magnetic susceptibility and density (gamma-ray) of core sections
- Chemistry Lab – 1.5 rooms dedicated as chemistry labs with fume hoods rated for HF and perchloric acid
- Other – Additional equipment soon to be added include an SEM, UV/Vis spectrometer, SRA, GC, and IC



## Materials Characterization Facility



The Materials Characterization Facility (MCF) is a core user facility that provides researchers with access to high-end instrumentation essential for characterization of structure and properties of various materials, surfaces and interfaces. MCF is staffed by research scientists with expertise in different areas providing fundamental research training to internal and external users, consolation of measurements needs and data interpretation.

### LOCATION

Frederick E. Giesecke Engineering  
Research Building  
1617 Research Parkway  
College Station

### DIRECTOR

Miladin Radovic, PhD  
[mradovic@tamu.edu](mailto:mradovic@tamu.edu)  
979-845-5114  
<https://mcf.tamu.edu/>

### Major Equipment

- Titan Themis<sup>3</sup> Scanning Transmission Electron Microscope (S/TEM) with EFTEM, EDXS and EELS.
- Lyra-3 and Fera-3 Focused Ion Beam - Scanning Electron Microscope with (FIB-SEM) with EDS, EBIC, EBSD, TOF-SIMS and in-situ loading/heating stages.
- Omicron X-ray and UV Electron Spectroscopy (XPS/UPS) system with Argus detector.
- Bruker Dimension Icon Atomic Force Microscope (AFM) and Anasys nanoIR2-s Atomic Force Microscope Infrared Spectroscopy (AFM-IR)
- Horiba Jobin-Yvon LabRam HR Raman Confocal Microscope.
- Cameca SXFive electron microprobe with EDS.
- Hysitron TI 950 Triboindenter/Nanoindeter.



## NCTM

NATIONAL CENTER FOR  
THERAPEUTICS MANUFACTURING



The National Center for Therapeutics Manufacturing is an interdisciplinary workforce education and research center serving the global vaccine and biopharmaceutical manufacturing industries. NCTM's technical staff can support your bioprocess research, development, and scale-up needs with its wide selection of bench- and pilot-scale microbial and mammalian bioreactors, chromatography systems, and analytical equipment.

**Equipment use agreements are customizable and can also include trained operator time and documentation.**

### Major Equipment / Capabilities

- Bacterial/mammalian cell (CHO, VERO, etc.) expression systems
- 5-10L Eppendorf BioFlo bioreactors; 125L stainless steel stirred tank bioreactor with CIP capability; 10L Sartorius B Plus stirred tank reactor; 50L Sartorius BIOSTAT RM single-use system
- Microfluidics homogenizer, tubular and disc-stack centrifuges, and Millipore Millistak+® Pod depth filter holder
- Spectrum Krosflo and Millipore Pellicon® TFF membrane filtration systems;
- ÄKTA Avant 25, Avant 150, ÄKTA Pilot systems and GE AxiChrom™ columns
- Tecan Freedom EVO liquid handling system, Dionex UltiMate 3000 HPLC system, Biotek Synergy H1 multi-mode plate reader, Biotek ELx50 ELISA plate washer, Bio-Rad ChemiDoc gel, TOC water analyzer, thermal cycler, and UV-VIS specs
- Class IIA biosafety cabinets, CO<sub>2</sub> incubators, LN<sub>2</sub> cryo storage, cell counters, microscopes

### LOCATION

100 Discovery Drive, 4482 TAMU  
College Station, Texas 77843-4482  
[nctm.tamu.edu](http://nctm.tamu.edu)  
[programs@NCTMmail.tamu.edu](mailto:programs@NCTMmail.tamu.edu)

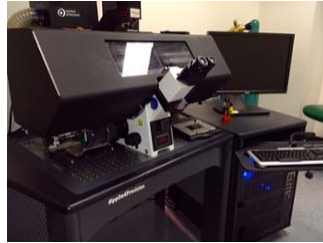
### DIRECTOR

Zivko Nikolov, PhD  
[znikolov@tamu.edu](mailto:znikolov@tamu.edu)  
(979) 458-0763





## National Corrosion and Materials Reliability Laboratory (NCMRL)



### LOCATION

Centre of Infrastructure Renewal Building  
in the new Texas A&M University RELIS  
campus  
(<https://cir.tamu.edu/facilities/national-corrosion-materials-reliability-lab/>).

### DIRECTOR

Homero Castaneda, PhD  
[hcastaneda@tamu.edu](mailto:hcastaneda@tamu.edu)

Raymundo Case, PhD  
[Raymundo.Case@tamu.edu](mailto:Raymundo.Case@tamu.edu)

The National Corrosion and Materials Reliability Laboratory (NCMRL) goal is to preserve and extend the integrity of the structures, such as buildings, bridges, pipelines, roads, ports and off-shore platforms that can be continuously occupied and operational during the entire design life of current or new civil infrastructures. The NCMRL conducts state-of-the-art research in close collaboration with industry, for the development, testing and assessment of corrosion-resistant materials, corrosion mitigation strategies, corrosion sensors and asset life prediction tools. To achieve the goals and vision of the laboratory the NCMRL facilities and equipment are organized across the following research lines:

- Atmospheric Corrosion: 2 Fog chamber LF 8151 QS Model
- Advanced surface electrochemistry characterization:
  - Scanning Kelvin Probe
  - Scanning Vibrating Electrode Technique
  - Localized Electrochemical Impedance Spectroscopy
  - Scanning Electrochemical Microscopy
- Coating system evaluation and testing laboratory
  - Gamry Reference 600 potentiostats
  - Gamry 600+ potentiostats
  - Faraday cages (custom made)
- Extreme service conditions materials selection laboratory:
  - Cortest Autoclave with 5 lt capacity, made with Hastelloy C-2000, rated at 6000 psia and 350°F, equipped for electrochemical testing
  - CERT frames capable up to 10,000-pound force. This are instrumented to perform slow strain rate, constant load and ripple testing following applicable standards at both room conditions and high pressure and temperature
  - Laboratory capable of handling experiments with H<sub>2</sub>S



## Soft Matter Facility



### LOCATION

Testing & Characterization Facility  
(TCF) Building  
1313 Research Parkway  
College Station, TX 77845  
Website: [somf.engr.tamu.edu](http://somf.engr.tamu.edu)

### DIRECTOR

Svetlana Sukhishvili, PhD

### COORDINATOR

David Truong, PhD  
[pvtruong@tamu.edu](mailto:pvtruong@tamu.edu)

*The new Soft Matter Facility (SoMF) is the user facility funded by an RDF grant. The facility is focused on characterization of multifunctional soft materials. The facility includes four instrumentation suites:*

1. Processing & Mechanics
  - Microcompounder & Injection Molder
  - Spin Coater
  - Dynamic Mechanical Analysis (DMA)
  - Rotational Rheometer
  - Differential Scanning Calorimetry (DSC)
  - Thermogravimetric Analysis (TGA) with Mass Spectrometry Attachment
2. Molecular Characterization
  - Four Gel Permeation Chromatography (GPC) Instruments for Ambient & High-Temp Analysis in Different Solvents
  - Membrane Osmometer
3. Thin Film & Interfacial Analysis
  - Nanosizer Zetasizer
4. Nanostructure Characterization
  - Small Angle X-ray Scattering (SAXS)



# X-ray Diffraction Laboratory



The X-ray Diffraction Laboratory is a full service facility that provides TAMU researchers with access to high-end instruments routinely used for determining the three dimensional structure of molecules and solids. The facility has two full-time PhD crystallographers who assist students, postdocs and faculty members with data collection and analysis tasks. Full service is also available including to occasional outside users and collaborators.

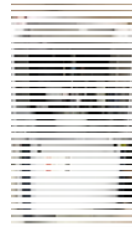
Major instrumentation.

#### Bruker single crystal instruments

Venture (Cu)  
Quest (Mo)  
D8 Duo (Mo,Cu)  
APEX2 (Mo)

#### Bruker powder diffractometers

Davinci  
ECO  
D8 Advanced  
D8 Advanced (OVEN RT-1000C).



#### LOCATION

Department of Chemistry  
Texas A & M University  
College Station, Texas

#### DIRECTOR

François Gabbai

#### Associate Director

Joseph H. Reibenspies

#### Manager

Nattamai Bhuvanesh

xray.tamu.edu



Available services include: single crystal diffractometry, wide angle diffractometry high resolution diffractometry, 2D powder diffractometry, structure solution of single crystal and powder materials, qualitative and quantitative phase analysis, micro powder diffraction, crystallinity measurement, residual stress analysis, line broadening analysis, thin film analysis, and pole figure analysis.

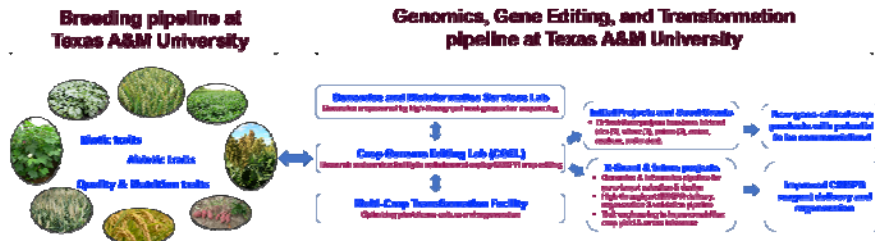
The users may opt to submit their samples to the facility for structural analysis or to have students and postdocs trained to use the equipment if frequent use is expected. The hands-on aspect of the laboratory is one of the hallmarks of our PhD and postdoc education, as many research groups depend on X-ray crystallography for the main method of characterization.



# Data Informatics and Computation



# Crop Genome Editing Laboratory (CGEL)



**LOCATION**  
Centeq Building, Suite 220  
College Station

**DIRECTOR**  
Michael Thomson, PhD  
[m.thomson@tamu.edu](mailto:m.thomson@tamu.edu)  
979-845-7526  
<https://agrilife.org/cgel/>

The goal of the Texas A&M AgriLife Research Crop Genome Editing Lab (CGEL) is to test novel approaches for high-throughput CRISPR/Cas-based crop gene editing and to offer a gene editing service to crop research and breeding groups. A pilot X-Grant project is underway to bring Texas A&M to the forefront of the field of genome editing for crop improvement. Seed grant projects for gene editing across multiple crops have also been initiated by CGEL and the Multi-Crop Transformation Facility in collaboration with research and breeding groups at Texas A&M to develop new gene-edited products with potential to be commercialized.



# Genomics and Bioinformatics Service



**Mission:** Empowering genomics research across AgriLife and the Texas A&M System by applying the Aggie core values of *Excellence, Integrity, Leadership, Loyalty, Respect, and Selfless Service*.

In our 10th year, we have completed over 2500 projects and worked with over 1000 scientists from 36 countries, grown to be one of the leading agrigenomic sequencing facilities in the world. Our team work with faculty across the Texas A&M System, providing support for grants totaling over \$135 million.

**LOCATION**  
Centeq Building A, Suite 250  
College Station

**DIRECTOR**  
Charlie Johnson, PhD  
[charlie@ag.tamu.edu](mailto:charlie@ag.tamu.edu)  
979-862-3262  
<https://www.txgen.tamu.edu>

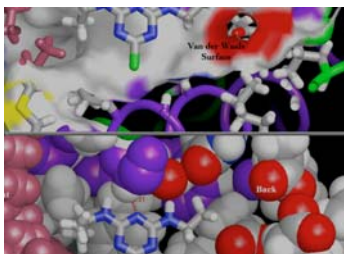
**Major Equipment (\$7.8M/10 years)**

- Illumina NovaSeq 6000 Sequencing System (x2)
- Illumina Dragen HPC system
- PacBio Sequel SMRT Sequencing System
- Illumina HiSeq 4000 Sequencing System
- Illumina MiSeq Sequencing System
- Illumina iSeq 100 Sequencing System
- PerkinElmer JANUS G3 NGS Express Workstation
- PerkinElmer Sciclone G3 Liquid Handling Workstations (x2)

**GENOMICS  
& BIOINFORMATICS  
SERVICE**



## Laboratory for Molecular Simulation



The mission of the LMS is to bring atomistic modeling closer to the experimental scientist by offering training and cutting-edge molecular modeling software for applications ranging from quantum calculations on "small" molecular or solid systems to molecular mechanics/dynamics modeling for proteins, DNA, nanoparticles, polymers, solids, and liquids. The LMS is also committed to expanding the incorporation of molecular modeling into TAMU university courses.

### LOCATION

Room 2109  
Department of Chemistry  
College Station

### DIRECTOR

Michael B. Hall, PhD  
[MBHall@tamu.edu](mailto:MBHall@tamu.edu)  
979-845-1843  
<https://lms.chem.tamu.edu/>

### Major SOFTWARE and HARDWARE:

- Materials Studio: Visualizer, Conformers, Forcite Plus Parallel, Qsar+, Reflex, VAMP, CASTEP, DFTB+, etc.
- Discovery Studio: Visualizer, Analysis, Biopolymer, Catalyst Conformation, CHARMM, De Novo Ligand Builder, etc.
- Schrödinger: Maestro, CombiGlide, Glide, Jaguar, etc.
- MOE: a fully integrated drug discovery software package.
- Gaussian, AMBER, MOLPRO, ADF, LAMMPS, Desmond, ORCA.
- Linux Teaching Lab - 17 Dell Precision workstations, NVIDIA GPU.
- Two HPC clusters: 1088-core cluster and 312-core cluster.



## Rigor and Reproducibility Core

### Scope of Work



### LOCATION

Institute of Biosciences and  
Technology  
Houston

### DIRECTOR

Kurt Zhang, PhD  
[kzhang@tamu.edu](mailto:kzhang@tamu.edu)  
713-677-7476  
<https://ibt.tamhsc.edu/cores/rigor-reproducibility/index.html>

### Mission

- To assist investigators to incorporate Rigor and Reproducibility into their research proposals.
- To collaborate with researchers to perform rigorous statistical and bioinformatics analysis for their research projects.
- To train the next generation scientists for the good practice of Rigor and Reproducibility.

### Staffing

- Director: Kurt Zhang, PhD
- A postdoctoral fellow for bioinformatics/biostatistics
- 2 graduate students

### Operations

Functions as IBT Core /  
TAMU – qualified Service Center  
iLabs scheduling and project management  
Administrative Core to manage workflow



## Smart Grid Control Room Lab



*The Control Room Lab (CRL), a facility of the TEES Smart Grid Center, is an innovative vision of a large-scale seamlessly integrated Power System Control Center of the future, featuring facilities that emulate end-to-end control systems and a training room. The CRL functions as a living laboratory, one that continuously monitors certain sites in various grids through virtual substation equipment, as well as some actual sensors.*

### LOCATION

Center for Infrastructure Renewal  
RELLIS Campus, Bryan

### DIRECTOR

Thomas Overbye, Ph.D.  
[overbye@tamu.edu](mailto:overbye@tamu.edu)  
979-458-5001  
<https://smartgridcenter.tamu.edu>

### *Major Equipment*

- Simulation system for continuously monitoring certain sites in various grids through actual or virtual substation equipment.
- Advanced visualization tools for electric grid control center emulation.
- A wide variety of electric grid analysis software
- Training room integrated with the simulation system with 24 dual monitor computers.



## TIGSS Bioinformatics Core



*The Texas A&M Institute for Genome Sciences and Society (TIGSS) started offering Bioinformatics services and support since January of 2012.*

*Accelerate data analysis through standardized gold-standard pipelines  
Provided computational resources tailored for Bioinformatics data analysis and computational biology research  
Assist in software development streamlined data analysis pipelines.*

### LOCATION

266 Vet Med Research Annex  
446 Reynolds Medical Building  
College Station, TX

### ASSOCIATE DIRECTOR

Kranti Konganti  
[konganti@tamu.edu](mailto:konganti@tamu.edu)  
979-900-9392

[genomics.tamu.edu](http://genomics.tamu.edu)

- Next-generation sequencing generates huge amounts of data and the size of data sets is further compounded by number of samples and conditions being investigated. Such data generation tasks often require at least some form of storage and ease of access to foster multi collaborative research and to construct, model and engineer new approaches to solve the complexity and challenges of big data analysis through high performance computing.
- With programming expertise in various computer languages (Perl, Python, MATLAB, R, JavaScript, MySQL, CSS, HTML) TIGSS Bioinformatics Core can efficiently design custom computational analysis pipelines to better perform secondary and tertiary data analysis.
- Few examples of software developed by the core and open-sourced for biological data analysis:
  - SBEToolbox is a GUI based Matlab toolbox for biological network analysis
  - IncRNApipe is an open-source command-line automated software to predict novel long non-coding RNA from mRNA-Seq data.



## Chemical Science Technologies



## Center for Atmospheric Chemistry and the Environment (CACE)



*An interdisciplinary center, CACE, provides a platform for collaborative research projects with members across campus addressing the roles of atmospheric chemistry in fundamental chemical processes, environmental threats resulting from climate change, the exploration of new technologies and mitigation strategies to reduce the impacts of climate change, as well as chemical aspects of air quality and human health.*

LOCATION  
1105 Eller O&M Bldg.  
College Station, TX

DIRECTOR  
Dr. Sarah Brooks  
sbrooks@tamu.edu  
979-845-5632  
<https://atmo.tamu.edu/people/faculty/brookssarah>

*Major equipment:  
Sigmaspace micro-pulse LIDAR, used to generate vertical maps of aerosol and cloud properties.  
Available for ground, mobile, and shipboard projects lead by on and off-campus users.*



## Collaborative Resource in Biomolecular NMR



The Department of Biochemistry & Biophysics maintains a state-of-the-art solution NMR spectroscopy collaborative resource for studies of the structure and dynamics of biological macromolecules.

### Major Equipment

- Bruker NEO 800 MHz NMR 4-channel spectrometer equipped with a triple resonance  $^1\text{H}$  detection He-cooled cryoprobe and SampleJet sample changer
- Bruker Avance III HD 800 MHz NMR 4-channel spectrometer equipped with a triple resonance  $^1\text{H}$  detection He-cooled cryoprobe.
- Bruker Avance III HD 600 MHz NMR 4-channel spectrometer equipped with a triple resonance  $^1\text{H}$  detection He-cooled cryoprobe.
- Bruker NEO 600 MHz NMR 4-channel spectrometer equipped with a triple resonance  $^1\text{H}$  detection N<sub>2</sub>-cooled cryoprobe also tunable to  $^{19}\text{F}$ .
- Bruker Avance III HD 500 MHz NMR 4-channel spectrometer equipped with a triple resonance  $^1\text{H}$  detection He-cooled cryoprobe.

### LOCATION

NMR Wing (Bldg 1507)  
Biochemistry & Biophysics  
300 Olsen Blvd  
College Station

### DIRECTORS

A. Joshua Wand, PhD  
[wand@tamu.edu](mailto:wand@tamu.edu)  
Tatyana Igumenova, PhD  
[tiigumenova@tamu.edu](mailto:tiigumenova@tamu.edu)



## Elemental Analysis Laboratory



The EAL at Texas A&M University is a component of the Department of Chemistry's Center for Chemical Characterization and Analysis. The laboratory provides research support in the area of elemental and trace analysis. Our lab is distinguished in that we feature fast neutron activation analysis (FNAA) capabilities in addition to thermal instrumental neutron activation (INAA) using the NESC 1 MW TRIGA research reactor. In addition, the laboratory provides training and access to a state-of-the-art ICP-MS.

### LOCATION

Olin E. Teague Research Center

### MANAGER

Bryan E. Tomlin, Ph.D.  
[bryan.tomlin@chem.tamu.edu](mailto:bryan.tomlin@chem.tamu.edu)  
979-845-2341  
<http://eal.tamu.edu>

### Major Equipment

- Two Kaman A-711 14-MeV Neutron Generators.
- Suite of HPGe Gamma-ray Spectrometers, including low-background counting.
- PerkinElmer NexION 300D ICP-MS.
- Cetac ASX-520 Liquid Autosampler.
- New Wave Research UP-213 Laser Ablation Instrument.



## Geochemical and Environmental Research Group



### LOCATION

833 Graham Road  
College Station, Texas 77845

### DIRECTOR

Anthony Hayden Knap, PhD  
[tknap@tamu.edu](mailto:tknap@tamu.edu)  
979-862-2323  
[Gerg.tamu.edu](http://Gerg.tamu.edu)

*The Geochemical and Environmental Research Group (GERG) is a research center providing a wide range of capabilities including field acquisition, analyses, and interpretation of data across several different interlocking themes in environmental sciences, ocean sciences, and resource geosciences. It operates a variety of Autonomous Ocean Vehicles, Gliders, Surface ASVS, Buoys and HF Radars. GERG is also part of the Applied Mass Spectrometry Core of the University. It has (11) Mass Spectrometers and various other analytical equipment for both targeted and untargeted analysis of contaminants and natural products in a number of matrices from soils, tissues, water, seawater and tissues. It has a large BSL2 facility for other matrices*



## ILSB Mass Spectrometry Laboratory



### LOCATION

Interdisciplinary Life Science Bldg  
Room 1172/1195

### DIRECTOR

David H. Russell, Ph. D.  
[russell@chem.tamu.edu](mailto:russell@chem.tamu.edu)  
979/845-3345  
<https://ilsbms.chem.tamu.edu>

*The goal of the ILSB-MSL is to provide advanced native mass spectrometry capabilities for analysis and characterization of proteins/protein complexes as well as how ligands (small molecules, metals, lipids, nucleic acids) influence their structure/function. The lab supports fundamental and applied multi-investigator, multi-institutional research using state-of-the-art native ion mobility-mass spectrometry instruments. The research capabilities of ILSB-MSL are leveraged by an NIH P41 grant "Resource in Native MS-Guide Structural Biology", thereby providing researchers access to unrivaled native ion mobility/mass spectrometry resources.*

### Major Equipment

- Agilent 6560 HPLC-Ion Mobility-Q-ToF MS.
- Agilent 6545XT HPLC-Q-ToF MS modified for 25 kDa. mass range
- ThermoFisher HPLC Fusion Orbitrap MS (cutting edge proteomics)
- P41 Resource Instruments: Waters Synapt G2 TWIMS, 2 ea. ThermoFisher Exactive EMR IMS, and Q-Exactive UHMR (80,000 mass range) modified for high resolution IMS.





## NMR/ESR Facility of the Chemistry Department



### LOCATION

Chemistry Department of  
Texas A&M University  
Chemistry, Reed McDonald, and ILSB  
College Station

### DIRECTOR

Dr. Janet Bluemel  
[bluemel@tamu.edu](mailto:bluemel@tamu.edu)  
979-845-7749  
<https://www.chem.tamu.edu/rgroup/bluemel/index.html>

Our NMR/ESR facility includes 8 solution NMR spectrometers, a solid-state NMR, and an EPR instrument. Although all instruments are physically housed within buildings of the Chemistry Department, access and services are provided to the entire TAMU community and beyond.

The goal is to enable faculty to pursue cutting-edge research on all aspects of molecular species and materials.

Major Equipment (details: <https://nmr.chem.tamu.edu/index.php>)

- Avance 400 (Solids NMR): new instrument will replace old one soon!
- Avance III 400 (ILSB)
- Avance Neo 400 (2 instruments)
- Avance 500
- Varian NMR 500
- Varian NMR 300 (dedicated to teaching)
- Varian NMR 500 (Reed McDonald)
- Inova 500
- EPR (paramagnetic species)



## Protein Chemistry Laboratory



### LOCATION

Biochemistry / Biophysics  
College Station

### DIRECTOR

Larry Dangott, PhD  
[dangott@tamu.edu](mailto:dangott@tamu.edu)  
979-845-2965  
<https://pcl.tamu.edu/>

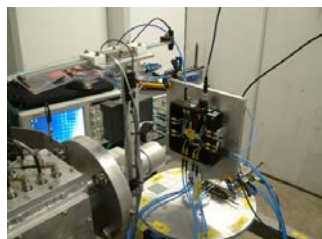
The PCL core facility supports metabolomics research by providing state-of-the-art instrumentation, systems, software, technical expertise and training for the application of modern protein chemistry and proteomic technologies. With services including *imaging mass spectrometry*, amino acid analysis, chromatographic separations and both MALDI-TOF and LC-ESI MS based analysis, the PCL provides researchers on campus with a significant resource to increase their impact on the scientific community at large.

Major Equipment

- *Ultraflexxtreme MALDI-TOF-TOF* – Top Down and Bottom Up protein sequencing. In addition the Ultraflexxtreme is capable of *Imaging Mass Spectrometry*.
- *Exactive Orbitrap* – Liquid chromatography high resolution accurate mass spectrometry system
- *Ettan Robotic Systems* - Robotic systems for High-throughput Proteomics analysis; Spot Picker, Digester, (MALDI plate) Spotter
- *AAA Analyzer* - Agilent 1260, G1365, DG1321B combined with a programmable autosampler.



## Radiation Effects Facility



The Cyclotron Institute's Radiation Effects Facility provides a convenient and affordable solution to commercial, governmental and educational customers in need of studying, testing, and simulating the effects of ionizing radiation on electronic and biological systems. The facility features two dedicated beam lines with diagnostic equipment for complete dosimetry analysis and beam quality assurance. A beam energy degrader system allows for a change of linear energy transfer (LET) without cyclotron re-tuning or target rotations.

### LOCATION

Cyclotron Institute  
120 Spence Street  
College Station, TX 77843

### REF PROJECT MANAGER

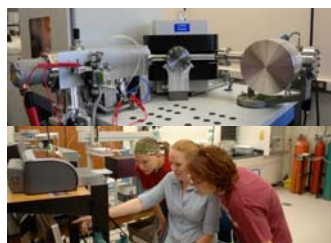
Henry Clark, PhD  
[clark@comp.tamu.edu](mailto:clark@comp.tamu.edu)  
979-845-1411  
<https://cyclotron.tamu.edu/ref/>

### Major Equipment / Information:

- K500 Superconducting Cyclotron – ion beams of He, N, Ne, Ar, Cu, Kr, Ag, Xe, Pr, Ho, Ta, Au at 15, 25, 40 MeV/u.
- K150 (88") Cyclotron – proton beams at 3 – 45 MeV (tunable) and ion beams of He, N, Ne, Ar, Cu, Kr at 15 MeV/u.
- Dedicated beam line on each cyclotron complete with SEUSS dosimetry system and remote controlled staging system.
- Two data rooms with setup / staging areas.
- Machine and electronics shop time available on request.
- Beam time available 24 hours per day / 7 days per week.
- Over 4,000 hours available annually.



## Stable Isotope Geosciences Facility



Established in 2009, the Stable Isotope Geosciences Facility brings together under one roof the College of Geoscience's mass spectrometers for light stable isotope measurement, ensuring reliable and timely analyses to TAMU's faculty, staff, and students. We use isotopic measurements of hydrogen, carbon, and nitrogen - elements necessary for life - to reveal clues about the history and workings of our oceans, atmosphere, lithosphere, and biosphere.

### Major Equipment -- Thermo Fisher Scientific IRMS

- **Delta<sup>plus</sup>XP isotope** with Carlo Erba NA 1500 Elemental Analyzer (EA) -- analyze a broad range of organic sample types for  $\delta^{13}\text{C}$ , and  $\delta^{15}\text{N}$  compositions.
- **Delta V Advantage** with Flash EA to analyze  $\delta^{34}\text{S}$ ,  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  of organic matter and with **GasBench II**  $\delta^{13}\text{C}$  analyses of natural water dissolved inorganic carbon (DIC), soil gas, breath gas, etc.
- **Delta V Advantage** with GC-Isolink, -- analyze H, C, and N isotope analyses on specific organic compounds.
- **MAT 253** dual inlet IRMS **Kiel IV Automated Carbonate Device** -- high-precision carbonate  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  analyses.
- **MAT 253 Plus** and modified **Kiel IV Automated Carbonate Device** -- clumped isotope analyses of carbonate samples.
- **Picarro Li2120 Cavity Ring-Down Spectrometer (CRDS)** Water  $\delta^{18}\text{O}$  and  $\delta\text{D}$  analyses.

### LOCATION

College of Geosciences  
Eller O&M Building Room 406/309

### Co-DIRECTORS

Dr. Brendan Roark  
[broark@geos.tamu.edu](mailto:broark@geos.tamu.edu)  
979-862-1775  
Dr. Ethan Grossman  
979-845-0637  
[e-grossman@geos.tamu.edu](mailto:e-grossman@geos.tamu.edu)  
<https://stableisotope.tamu.edu/>



# Stable Isotopes for Biosphere Sciences Lab (SIBS)



**LOCATION:**  
Kleberg Building, Texas A&M  
College Station, TX

**DIRECTORS:**

Tom Boutton, PhD  
[boutton@tamu.edu](mailto:boutton@tamu.edu)  
979-845-8027

Jason West, Ph.D.  
[jwest@tamu.edu](mailto:jwest@tamu.edu)  
(979) 845-3772

Web site: <https://sibs.tamu.edu/>

*The purpose of the SIBS Lab is to provide Isotope Ratio Mass Spectrometry (IRMS) methods that enable unique and quantitative studies in the biogeosciences to address questions related to energy flow, element cycling, organismal physiology, hydrology, and land-atmosphere interactions. The lab is capable of analyzing organic materials (plants, animals, microbes, specific organic compounds), atmospheric gases ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ ), water, and other environmental materials for H, C, N, O, and S isotope ratios.*

**Major Equipment:**

- *ThermoFisher Delta V Advantage Isotope Ratio Mass Spectrometer* interfaced with a Carlo Erba Flash elemental analyzer to enable  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $\delta^{34}\text{S}$ , %C, %N, and %S on plant and animal tissues, soils, sediments, and other organic and inorganic materials.
- *ThermoFisher Delta V Advantage Isotope Ratio Mass Spectrometer* interfaced with a TC/EA high temperature conversion elemental analyzer to obtain  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  on water and organic materials, and with a Gas Bench/Precon system to enable isotopic measurements on atmospheric trace gases.
- *ThermoFisher MAT253 Plus Isotope Ratio Mass Spectrometer* Interfaced with a Trace GC system to obtain  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  on specific biochemical compounds (e.g., alkanes, lipids, amino acids, etc.). Linkage with a quadrupole mass spectrometer also provides compound identification and quantification.



