DEPARTMENT OF BIOLOGICAL SCIENCES

2021-2022

SMU | DEDMAN COLLEGE OF HUMANITIES & SCIENCES

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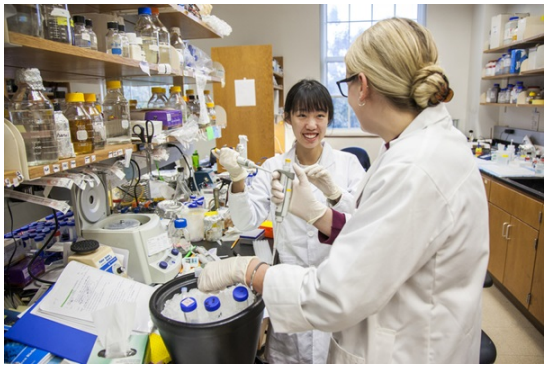
INTRODUCTION

The Department of Biological Sciences and its faculty provide insight into how life and physical sciences intersect and prepares students to pursue advanced degrees or a career in a variety of scientific fields. Students receive top notch, interdisciplinary academics and the opportunity to participate in hands-on research in a variety of subjects including cancer, immunity and aging, and neuroscience, among many others. The department is located in the 68,000 square foot Dedman Life Sciences Building, which contains state-of-the-art laboratories, research facilities, lecture halls, and conference rooms.



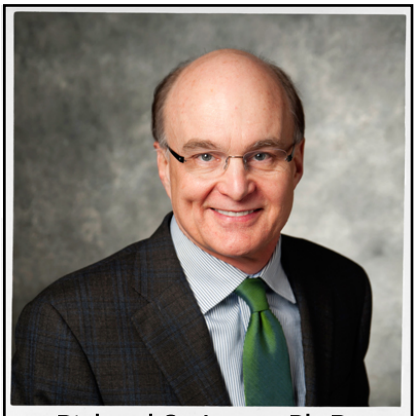
Website

https://www.smu.edu/Dedman/Academics/Departments/Biological-Sciences

Contact the Department of Biological Sciences

Dedman Life Sciences Building
P.O. Box 750376 | Dallas, Texas | 75275
214-768-2730

MESSAGE FROM THE CHAIR



Richard S. Jones, Ph.D.
Professor and Chair

Recent decades have witnessed breathtaking advances in the biological sciences. It has become clear that the expression and function of genes depends not only on the genomic blueprint, but also on transient and inherited chemical modifications of the genome. The complete sequencing of the human genome as part of the human genome project has made it possible to conduct a comprehensive analysis of these epigenetic modifications and understand their role in biological systems, a goal of the human epigenome project. Also ongoing is the human proteome project that seeks to identify and study the properties of all proteins produced by the human genome. Together, information from these projects will enhance understanding of human biology at the molecular level and provide information on the molecular underpinnings of diseases long considered intractable. Therapies and cures for these complex diseases will then be possible. Research on embryonic, adult, and induced pluripotent stem cells holds the potential for pioneering approaches to tissue regeneration and treatment of disease. The recently commenced "BRAIN" initiative will enable researchers to produce dynamic pictures of the brain that show real time interactions between individual brain cells and complex neural circuits. Much needed information on the complex links between brain function and behavior, and dysfunction in these links in psychological and psychiatric disorders such as autism, schizophrenia, and depression, will become available. The troubling development of antibiotic resistant strains of pathogens is driving the development of novel approaches to the treatment of bacterial infections. Powerful computational and bioinformatics approaches are permitting the analysis of data on a scale once thought impossible, and are playing an increasingly important role in all facets of biological research. Indeed, it is an exciting time to pursue a career in the biological and biomedical sciences.

A central mission of our department is to train students to develop the skills necessary to drive the current revolution in the biomedical sciences. We strive to fulfill this mission in a nurturing, supportive, and intellectually stimulating environment. The department is under expansion, with plans to recruit four new faculty in the next several years. Current faculty conduct research in the areas of genetics and developmental biology, biochemical structures and functions, epigenetics, gene regulation at the levels of transcription and RNA processing, infectious diseases, neurodegeneration, and epilepsy. Graduate students have the opportunity to take courses in a variety of specialty areas reflecting the research interests of our faculty. Graduate degrees (M.A., M.S. and Ph.D.) are awarded in Molecular and Cell Biology. An important priority for the department is undergraduate education. The undergraduate curriculum provides rigorous didactic and laboratory-based training for students seeking admission to professional or graduate schools as well as those who seek jobs upon obtaining their B.S. or B.A. degree. Exceptional opportunities are available for undergraduate students to participate in faculty research alongside graduate students and postdoctoral fellows. Like their graduate peers, undergraduates are encouraged to present their research results at national and regional conferences and publish their work in peer-reviewed scientific journals.

Check out our Twitter site (@SMUBiology) for updates on current activities and accomplishments by members of our department. Please feel free to contact us if you have any questions or to schedule a visit to our department.

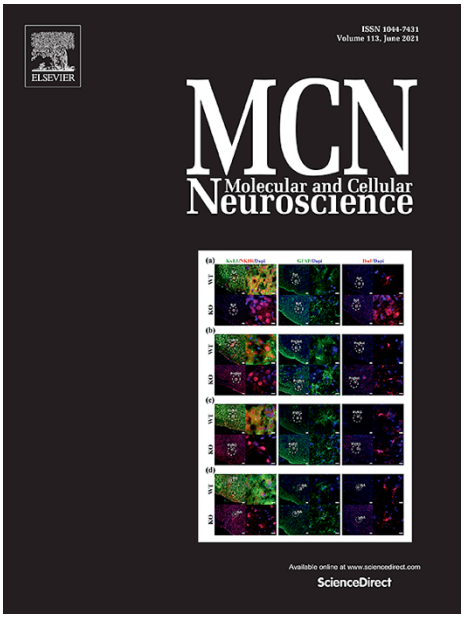
NEWS & NOTEWORTHY

- The department joined Twitter to provide updates on the latest headlines.

- The research of **Lauren Ammerman**, a recent graduate from the **Wise lab** (PhD, Spring 2021) and her fiancé **James McCormick**, a previous SMU Biology PhD graduate, was featured in the Dallas Morning News. The article highlighted their recent publication in the journal PLOS One which confirmed P-glycoprotein's ability to expel Alzheimer's-related amyloid-beta protein through computer simulations and cell studies.

- PhD graduate student, **Lacin Yapindi**, received a 2021-2022 Moody Dissertation Fellowship to support her studies on the molecular mechanisms of carcinogenesis by oncogenic viruses in the **Harrod lab**. She also received a Second Place Award for the SMU 3-Minute Thesis Competition 2020.

- Images by a recent PhD graduate from the **Glasscock lab** (Hemangini Dhaibar, PhD '20) were featured on the cover of the journal Molecular and Cellular Neuroscience.



- **Kelsey Paulhus**, a PhD graduate student in the **Glasscock lab**, was selected as one of three graduate students at SMU to participate in the newly established Dedman College Interdisciplinary Institute's Graduate Student in Residence (GSiR) program.

- **Amy Brewster** joined the faculty as an Associate Professor after spending the previous 8 years as faculty at Purdue University in the Department of Psychological Sciences. Dr. Brewster brings extensive research expertise in acquired epilepsy, neuron-glia interactions, and neuroinflammation.

- **Bill Orr** retired as Professor Emeritus of Biological Sciences after being at SMU for 35 years. Prior to SMU, he received a B.A. in French and a Ph.D. in Biology at Wayne State University. He later conducted his postdoctoral training at Harvard University. Over the last three decades, his research focused on antioxidant genes and their impact on aging and its related conditions such as Alzheimer's – work which was continuously funded by the National Institutes of Health. He was a member of three different National Institutes of Health study sections and lists some 85 publications to his credit. He also served as Chair of the Biological Sciences Department for eight years, leading multiple successful recruiting ventures.

- **Teresa Strecker** retired from her role as a Senior Lecturer after being at SMU for 25 years. She earned her B.S. in Biology at the University of Washington and her Ph.D. in Biology at the University of California, Los Angeles. She carried out post-doctoral work as an American Cancer Society Fellow at the California Institute of Technology and taught at Pomona College where she earned the Wigg Distinguished Professorship for Teaching Excellence Award and was an Arnold and Mabel Beckman Young Investigator. Her research in the area of Developmental Genetics in *Drosophila melanogaster* was funded by the American Cancer Society, NSF, NIH and the Beckman Foundation and was published in Science, Development, and the Proceedings of the National Academy of Sciences. During her time teaching at SMU, she was nominated twice by students for the HOPE Professor of the Year award, served on the Health Professions Recommendation Committee and served as faculty advisor for the national pre-health honor society, Alpha Epsilon Delta. After developing one of the first online courses in the Sciences at SMU, she co-authored >75 research reports with her students and collaborator, Dr. Eva Oberdorster, in the field of plant and mammalian Genomics.

PUBLICATIONS BY BIOLOGICAL SCIENCES

Polycomb-group recruitment to a *Drosophila* target gene is the default state that is inhibited by a transcriptional activator.
Ghotbi E, Ye P, Ervin T, Kum A, Benes J, Jones RS.
Science Advances. 2021 Jul 16;7(29):eabg1556.

Microelectrode array recording of sinoatrial node firing rate to identify intrinsic cardiac pacemaking defects in mice.
Kumar, P., Si, M., Paulhus, K., Glasscock, E.
J Visualized Experiments 2021; 173: e62735.

Evaluation of Mitochondrial Function and Morphology in Drosophila.
Tang Y, Tahmasebinia F, Wu Z.
Methods Mol Biol. 2021;2322:195-206.

siRNA-Inhibition of TIGAR Hypersensitizes Human Papillomavirus-Transformed Cells to Apoptosis Induced by Chemotherapy Drugs that Cause Oxidative Stress.
Yapindi L, Hernandez BY, Harrod R.
J Antivirals Antiretrovirals 2021 May 31; 13(4), in press.

Hyperoxidation of Peroxiredoxins and Effects on Physiology of *Drosophila*.
McGinnis A, Klichko VI, Orr WC, Radyuk SN.
Antioxidants (Basel). 2021 Apr 15;10(4):606.

Kv1.1 subunits localize to cardiorespiratory brain networks in mice where their absence induces astrogliosis and microgliosis.
Dhaibar HA, Hamilton KA, Glasscock E.
Mol Cell Neurosci. 2021 Jun;113:103615.

Transport of Alzheimer's associated amyloid-β catalyzed by P-glycoprotein.
McCormick JW, Ammerman L, Chen G, Vogel PD, Wise JG.
PLoS One. 2021 Apr 26;16(4):e0250371.

Mitochondrial Redox Signaling Is Critical to the Normal Functioning of the Neuronal System.
Odnokoz O, Nakatsuka K, Wright C, Castellanos J, Klichko VI, Kretzschmar D, Orr WC, Radyuk SN.
Front Cell Dev Biol. 2021 Jan 28;9:613036.

Kv1.1 potassium channel subunit deficiency alters ventricular arrhythmia susceptibility, contractility, and repolarization.
Trosclair K, Si M, Watts M, Gautier NM, Voigt N, Traylor J, Bitay M, Baczko I, Dobrev D, Hamilton KA, Bhuiyan MS, Dominic P, Glasscock E.
Physiol Rep. 2021 Jan;9(1):e14702.

Decreased bioavailability of hydrogen sulfide links vascular endothelium and atrial remodeling in atrial fibrillation.
Watts M, Kolluru GK, Dherange P, Pardue S, Si M, Shen X, Trosclair K, Glawe J, Al-Yafeai Z, Iqbal M, Pearson BH, Hamilton KA, Orr AW, Glasscock E, Kevil CG, Dominic P.
Redox Biol. 2021 Jan;38:101817.

Mechanisms Underlying the Biological Effects of Molecular Hydrogen.
Radyuk SN.
Curr Pharm Des. 2021;27(5):626-735.

Antiviral Effects of Oleandrin.
Newman RA, Sastry KJ, Arav-Boger R, Cai H, Matos R, Harrod R.
J Exp Pharmacol. 2020 Nov 16;12:503-515.

Analysis of Human Mutations in the Supernumerary Subunits of Complex I.
Dang QL, Phan DH, Johnson AN, Pasapuleti M, Alkhaldi HA, Zhang F, Vik SB.
Life (Basel). 2020 Nov 20;10(11):296.

Directed Connectivity Analysis of the Neuro-Cardio- and Respiratory Systems Reveals Novel Biomarkers of Susceptibility to SUDEP.
Hutson TN, Rezaei F, Gautier NM, Indumathy J, Glasscock E, Iasemidis L.
IEEE Open J Eng Med Biol. 2020;1:301-311.

BIOLOGICAL SCIENCES FACULTY

Bianca Batista

Lecturer

EDUCATION & TRAINING:
BS in Biology, Texas A&M University
Ph.D. in Cell and Molecular Biology, University of Texas, Austin
Postdoctoral, New York University

CONTACT INFO:
Office: DLSB 335
Phone: 214-768-4069
Email: bbatista@smu.edu

ABOUT:
Dr. Batista teaches undergraduate Cell Biology (BIOL 3350), Microbiology Lecture (BIOL 3370), Microbiology Lab (BIOL 3170), Essentials of Biology (BIOL 1300), and Biochemistry Lab (BIOL 5110). She is the faculty advisor for the SMU chapter of Alpha Epsilon Delta, an honor society for students wishing to pursue careers in medicine, dentistry, osteopathic medicine, optometry, podiatry, veterinary medicine, and other allied health professions. Dr. Batista is also a member of the Health Professions Recommendation Committee (HPRC) which meets each spring to interview students applying to medical and dental schools.

Amy Brewster

Associate Professor

EDUCATION & TRAINING:

B.S. in General Biological Sciences, University of Puerto Rico
Ph.D. in Biol. Sci., Anatomy & Neurobiology, Univ. of California, Irvine
Postdoctoral Scholar, Baylor College of Medicine

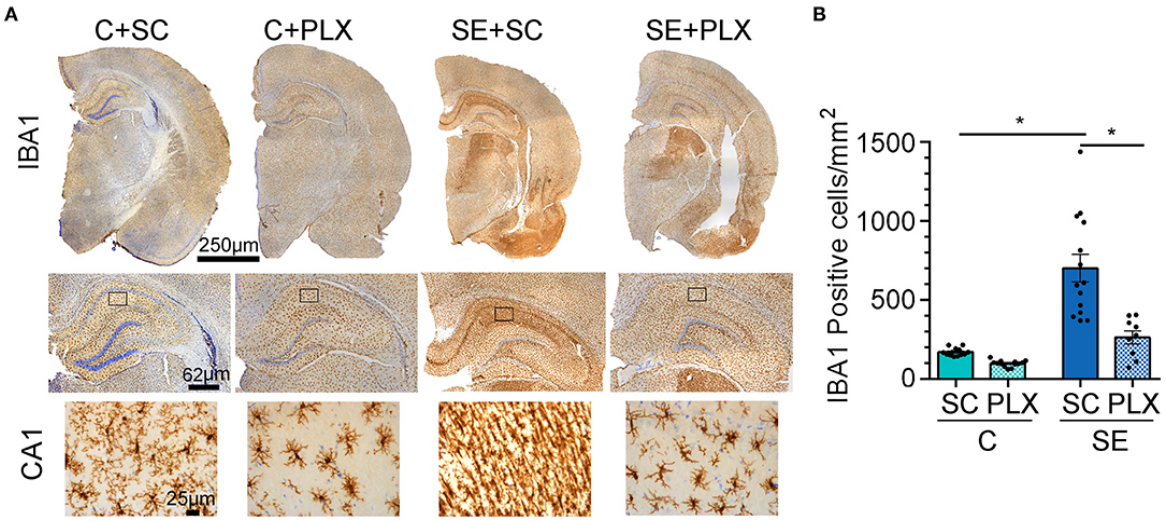
CONTACT:

Office: DLSB 240
Lab: DLSB 215
Phone: 214-768-1784
Email: albrewster@smu.edu

ABOUT:

Epilepsy is a neurological disorder characterized by the occurrence of spontaneous recurrent seizures. In addition, epilepsy is highly co-morbid with cognitive and behavioral deficits along with catastrophic consequences such as sudden unexpected death. Unfortunately, anti-epileptic medications do not suppress seizures in one-third of the epileptic population. Therefore, our research goal is to identify potential therapeutic targets for the prevention, treatment, and control of this neurological disorder. Through our scientific discoveries we seek to help stop seizures and improve cognitive outcomes in those affected by severe epilepsy.

Our research goal is to identify whether neuro-immune interactions contribute to the construction of hyperexcitable neuronal networks that may promote seizures and cognitive deficits in epilepsy. We seek to determine the role that microglial inflammatory and phagocytic signaling mediated by the classical complement cascade (C1q-C3), Triggering receptors expressed on myeloid cells (Trem2), Colony stimulating factor 1 receptor (CSFR1), and the mechanistic target of Rapamycin (mTOR), play in pathological synaptodendritic remodeling, seizures, and cognitive deficits in experimental models of epilepsy.



Alejandro D'Brot

Lecturer

EDUCATION & TRAINING:

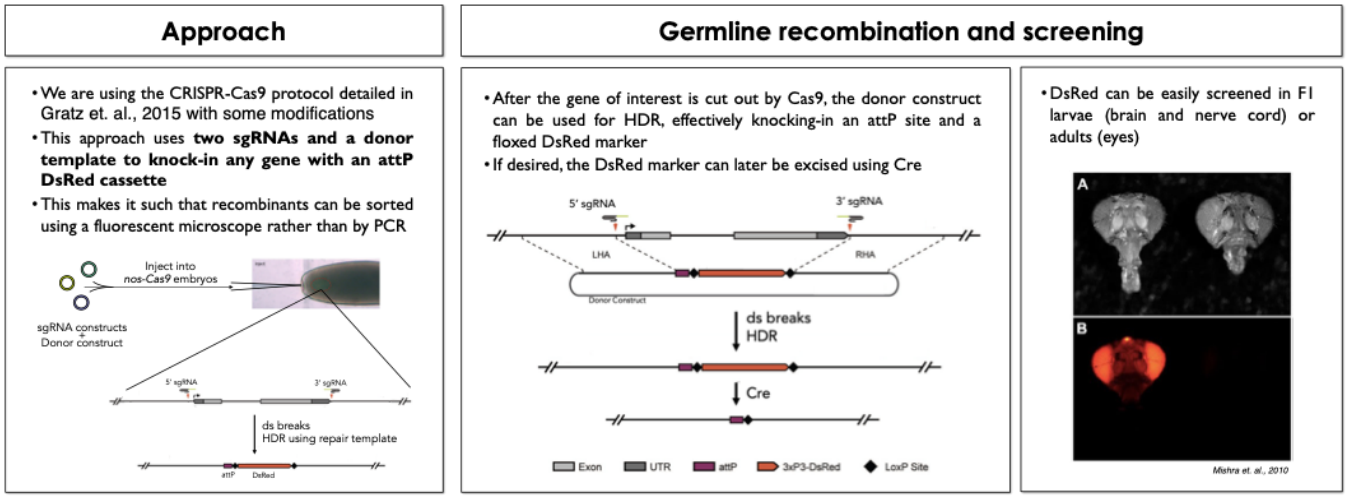
B.S. in Biology, Texas Christian University
Ph.D. in Genetics, Development & Disease, UT Southwestern
Postdoctoral, UT Southwestern

CONTACT:

Office: DLSB 239
Phone: 214-768-2848
Email: adbrot@smu.edu

ABOUT:

Dr. D'Brot teaches the following undergraduate courses: Essentials of Biology (BIOL 1300); Introduction to Biology II (BIOL 1302); Gene Editing Lab (BIOL 4380); and Biochemistry Lab (BIOL 5110). He is interested in developing project-based lab courses that provide avenues for undergrads to engage in publishable scientific research (CUREs). He is also continuing to develop the Gene Editing lab course, in which students use CRISPR-Cas9 gene editing technology to generate new alleles in model organisms that can be used by the research community. The Gene Editing lab course aims to crowd-source the generation of attP-DsRed knock-in alleles for the Drosophila research community. In the lab, students learn to design and clone the CRISPR components required to replace specific genes in the sgRNA and attP-DsRed donor constructs, set up fly crosses and screen F1 progeny for RFP expression.



Edward Glasscock

Associate Professor
Director of Graduate Studies

EDUCATION & TRAINING:

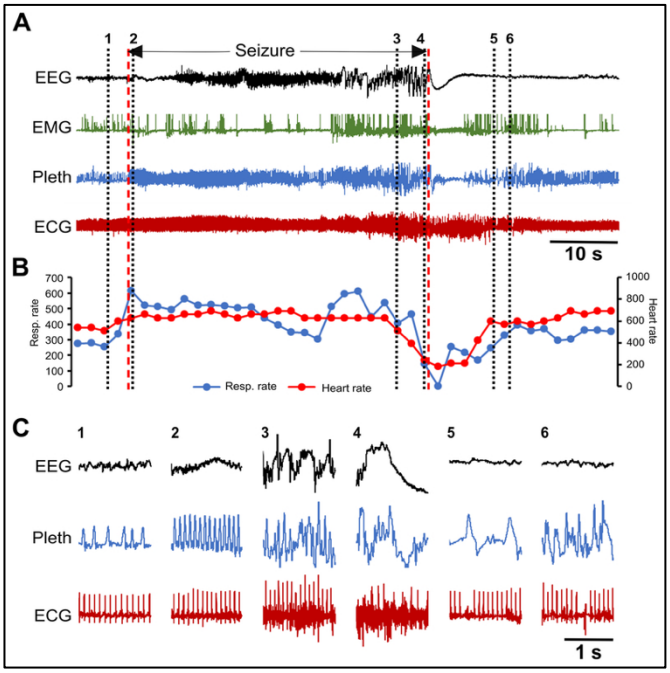
B.S. in Chemical Engineering, University of Texas, Austin
Ph.D. in Molecular & Cell Biology, University of California, Berkeley
Postdoctoral, Baylor College of Medicine

CONTACT:

Office: DLSB 338
Lab: DLSB 317
Phone: 214-768-4050
Email: eglasscock@smu.edu
Website: http://glasscock-lab.mozello.com

ABOUT:

Dr. Glasscock leads the Cardiorespiratory Neurogenetics Laboratory, which is focused on understanding the genes and mechanisms underlying epilepsy and sudden unexpected death in epilepsy (SUDEP). Epilepsy is the 4th most common neurological disorder affecting about 1 in 26 Americans during their lifetime. Epilepsy is characterized by the presence of recurrent unprovoked seizures due to abnormal electrical activity in the brain. Genetics and heredity play an important role in the development of epilepsy. One of the goals of the lab is to identify the genes and combinations of genes that determine whether an individual will develop epilepsy.



People with epilepsy have an increased risk of dying suddenly for unknown reasons. These deaths are classified as sudden unexpected death in epilepsy (SUDEP) and represent the leading cause of epilepsy-related mortality. The exact causes of SUDEP are poorly understood, but the leading explanation is that seizures evoke respiratory failure or cardiac arrhythmias that culminate in death. One of the focuses of the lab is to better understand how epilepsy can alter the brain's control of cardiorespiratory function increasing the risk of SUDEP. In addition, we are striving to develop new therapeutics to prevent SUDEP and better biomarkers to predict those with high risk. To explore these research questions, we study genetic mouse models of epilepsy, utilizing a wide array of in vivo, ex vivo, and in vitro electrophysiological techniques, as well as pharmacological, histological, and molecular approaches.

Carolyn Harrod

Laboratory Coordinator and Senior Lecturer

EDUCATION & TRAINING:
B.S. in Biology, University of Texas, Dallas
M.A. in Teaching Science Education, University of Texas, Dallas

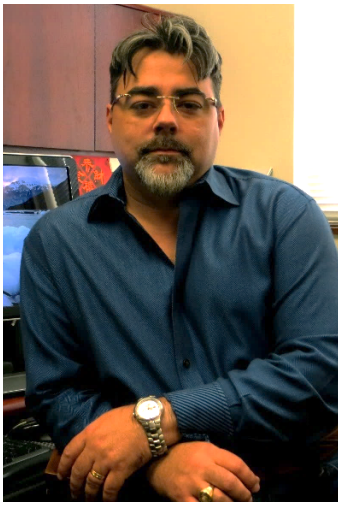
CONTACT:
Office: FOSC 063
Phone: 214-768-1658
Email: charrod@smu.edu

ABOUT:
Carolyn Harrod teaches and coordinates introductory level biology labs for the department. She also teaches the following lecture courses: Essentials of Biology (BIOL 1300) and Introductory Biology (BIOL 1101-2). She performs several activities and services at SMU including:

- HOPE (Honoring our Professors' Excellence) Award
- Health Professions Recommendation Committee (HPRC) Member
- Hilltop Scholars Faculty Member
- Dallas Regional Science & Engineering Fair Grand Prize Judge
- Student Teaching supervisor, former
- Week of Welcome Planning Committee member

Robert Harrod

Associate Professor

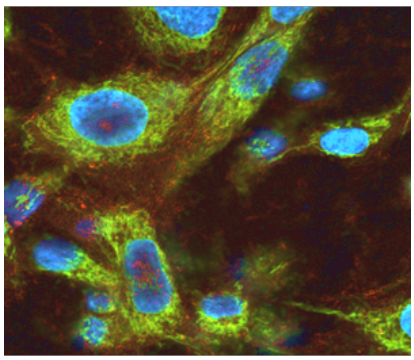


EDUCATION & TRAINING:
B.S. in Microbiology, Louisiana Tech University
Ph.D. in Molecular & Cellular Biology, University of Maryland
Postdoctoral, National Institutes of Health and USUHS/NMC

CONTACT:
Office: DLSB 334
Lab: DLSB 322
Phone: 214-768-3864
Email: rharrod@smu.edu

ABOUT:
The Harrod lab is studying how certain transforming viruses cause cancers in humans. It is estimated approximately 15-20% of human cancers are caused by oncogenic viruses, yet the molecular etiology by which infectious agents deregulate host cellular growth/proliferative pathways to promote the establishment and progression of neoplastic disease is not completely understood. Our research is primarily focused toward advancing our understanding of the molecular biological and biochemical events underlying carcinogenesis by the human T-cell leukemia virus type-1 (HTLV-1) and high-risk subtype human papillomaviruses (HPVs).

The HTLV-1 is a complex oncoretrovirus that infects and transforms CD4+ T-lymphocytes and causes adult T-cell leukemia/lymphoma (ATLL) – an aggressive and often-fatal hematological malignancy that is highly resistant to most anticancer treatments. At present, there are 10-20 million HTLV-1-infected individuals worldwide, with most clustered in the tropical endemic regions of Southeast Asia (i.e., Japan, Taiwan, Malaysia, and the Philippines), the Middle East, Northern and Central Africa, Central and South America, Australo-Melanesia, and certain islands of the Caribbean. In the United States, Florida and Hawaii have the highest incidences of HTLV-1-related diseases. Recent evidence also suggests HTLV-1 may be a re-emerging health threat in some global regions, such as Australia. The high-risk subtype HPVs are causally linked with cervical cancers and head-and-neck carcinomas which often have poor clinical outcomes and high mortality rates. Our research has demonstrated that the HTLV-1 and high-risk subtype HPVs encode proteins that cooperate with cellular oncogenes, including c-Myc, through molecular interactions with transcriptional coactivators and the differential modulation of p53-regulated pro-survival signals to promote cellular immortalization/transformation in vitro and tumorigenesis in in vivo xenograft models of HTLV-1-induced T-cell lymphoma and HPV-induced carcinomas. Importantly, these studies have revealed several key players which are essential for the survival of virus-infected tumor cells, as determined through siRNA-knockdown experiments, and may be candidates for the translational design of targeted therapeutics. My laboratory's research is supported by grant funding from the National Cancer Institute/National Institutes of Health.



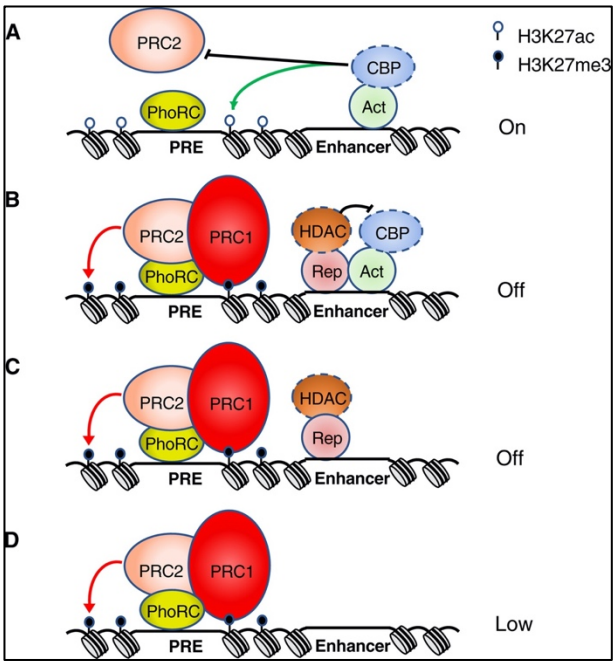
Richard S. Jones

Professor and Chair

EDUCATION & TRAINING:
B.S. in Biology, University of Missouri
Ph.D. in Biology, Wesleyan University
Postdoctoral, Harvard University

CONTACT:
Office: DLSB 333
Lab: DLSB 321
Phone: 214-768-3810
Email: rjones@smu.edu

ABOUT:
The Jones lab studies the mechanisms by which a group of evolutionarily conserved epigenetic regulators, called the Polycomb-group (PcG), maintain the transcriptional silence of genes. PcG proteins play critical roles in regulating normal development in essentially all metazoans, functioning in largely similar ways in organisms ranging from mammals, insects, and even plants. The primary targets of PcG-mediated transcriptional repression are regulators of development and/or cell cycle progression. Among PcG targets are lineage-specific genes in embryonic and adult stem cells, and pluripotency genes when embryonic stem cells are induced to differentiate. Misexpression of human PcG proteins contributes to a wide range of cancers. Repression of pluripotency genes and the oncogenic effects of misregulated PcG proteins both involve de novo repression of target genes.



Our current focus is to define the molecular and biochemical mechanisms by which PcG-mediated gene silencing is initially established and to shed light on this important, but poorly understood, epigenetic phenomenon. In pursuit of this goal, the Jones lab uses a combination of genetic, immunological, biochemical and transgenic experimental approaches. Due to the high degree of conservation of PcG proteins, we are able to take advantage of the experimental tools available with the *Drosophila melanogaster* (fruit fly) model system with confidence that our findings will also provide insight into the mechanisms by which PcG proteins contribute to mammalian development and oncogenesis.

Ongoing projects include identifying proteins that are associated with a PcG target gene and dissecting their respective contributions to the establishment of transcriptional silencing.

Adam D. Norris

Assistant Professor

EDUCATION & TRAINING:
B.S. in Biology, California State University Fullerton
Ph.D. in Molecular Biology, University of Kansas
Postdoctoral, Harvard University

CONTACT:
Office: DLSB 235
Lab: DLSB 222
Phone: 214-768-4094
Email: adnorris@smu.edu
Website: www.thenorrislab.org

ABOUT:
The Norris Lab studies RNA regulation in the nervous system. Using the nematode *C. elegans* we can visualize RNA regulation in single neurons of living animals, and use the awesome power of genetics to investigate mechanisms and function. Here are some of the projects we're working on:

1) RNA Binding Proteins with Cell-Specific Pathologies. Many RNA binding proteins are expressed broadly, but when they are mutated, specific neuron types are affected (*e.g.* motor neurons in ALS). Why? Is there something special about the cell type? The RNA binding protein? Something else?

2) Alternative Splicing in Single Neurons. Many RNAs are alternatively spliced in different neuron types. How is this regulated? Do the different splice isoforms have different functions?

3) Coordinated Transcriptome Regulation. Transcriptomes are simultaneously regulated by transcription factors (turning genes on/off) and RNA binding proteins (selecting specific gene isoforms). How are these processes coordinated?

Eva Oberdorster

Senior Lecturer

EDUCATION & TRAINING:
B.S. in Biology, Binghampton University (SUNY)
Ph.D. in Integrated Toxicology and Zoology, Duke University
Postdoctoral, Tulane University Center for Bioenvironmental Research

CONTACT:
Office: DLSB 241
Phone: 214-768-1241
Email: eoberdor@smu.edu

ABOUT:
Dr. Oberdorster is interested in co-curricular development and integrating technology into the classroom. This has led to over 70 DNA barcodes of native Texas species published on GenBank with undergraduate students as co-authors. Dr. O also uses her family's nearly 200-acre ranch to study native flora and fauna with students from SMU in the Biology Department as well as Environmental and Civil Engineering. Some of this research is in collaboration with the Botanical Research Institute of Texas, where two populations of an endangered plant are being studied to ensure survival of this species.

Dr. O has taught numerous lecture and laboratory courses to undergraduates, and currently teaches the Anatomy & Physiology lecture/lab sequence, as well as a Senior Seminar on Bioethics.

- Biol 3106: Physiology Lab
- Biol 4164: Anatomy & Histology Lab
- Biol 4306: Anatomy with Human Physiology
- Biol 4364: Integrated Human Physiology with Endocrinology
- Biol 4132: Senior Seminar

In addition, to her teaching interest, she is also an active member of the Society of Toxicology and American Association of Zoos and Aquaria. She has previous experience as an Assistant Professor of Biochemical Ecotoxicology and Molecular Toxicology at Clemson University in the Department of Environmental Toxicology, and has held Adjunct appointments at Duke University and Baylor University.

Svetlana N. Radyuk

Research Associate Professor

EDUCATION & TRAINING:

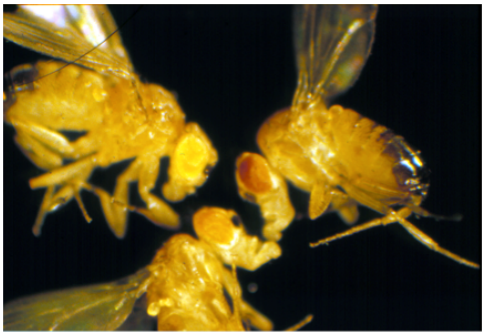
B.S. in Chemistry, M.V. Lomonosov Moscow State University, Russia
M.S. in Chemistry, M.V. Lomonosov Moscow State University, Russia
Ph.D. in Biology, Research Institute for Applied Microbiology, Russia

CONTACT:

Office: DLSB 340
Lab: DLSB 317
Phone: 214-768-2892
Email: snradyuk@smu.edu

ABOUT:

The focus of research in Dr. Radyuk's lab is to understand the role of cellular redox in the immune response, aging and related diseases. Aging is characterized by impaired redox balance and malfunctioning of the immune system. Deregulation of the immune response during aging and redox imbalance can result in cancer and other age-related diseases. The study in our group is aimed at elucidating the mechanisms that underlie such deregulation in order to develop proper interventions.



Our model: Drosophila
Immune pathways are similar to those in humans
Life span is 60-70 days
Genetically tractable
Variety of genetically modified strains available at stock centers

In addition to research, Dr. Radyuk teaches in several courses including the following:

Immunobiology (BIOL 4319)
Concepts in Immunology (BIOL 6319)
Immunobiology laboratory (BIOL 4119)
Molecular Biol Eukaryotes (BIOL 6322)

Steven Vik

Professor

Advisor for Undergraduate Biochemistry Majors

EDUCATION & TRAINING:

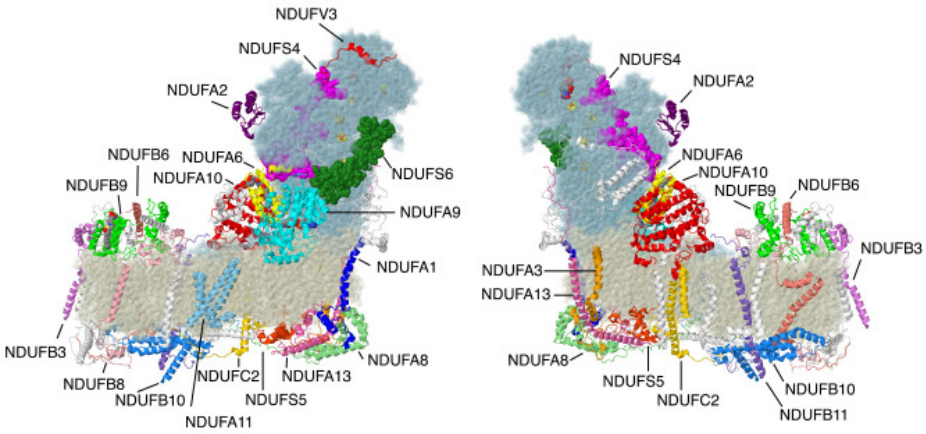
B.S. in Chemistry, California Institute of Technology
Ph.D. in Biochemistry, University of Oregon
Postdoctoral, Scripps Institute; Academy of Sciences (Beijing); Stanford

CONTACT:

Office: DLSB 236
Lab: DLSB 218
Phone: 214-768-4228
Email: svik@smu.edu

ABOUT:

The Vik lab is interested in the structure, function, and assembly of the membrane-bound enzymes that are involved in oxidative phosphorylation. His research group is currently investigating Complex I from *E. coli*. Complex I, the NADH-ubiquinone oxidoreductase in *Escherichia coli* is encoded by the thirteen genes of the nuo operon. It is homologous to the larger enzyme found in mammalian mitochondrial membranes. This enzyme oxidizes NADH, reduces ubiquinone, and translocates protons across the inner membrane. Six of the thirteen subunits (B, CD, E, F, G and I) constitute a membrane peripheral domain that includes the NADH binding site, one noncovalently bound flavin mononucleotide, and nine Fe-S centers. Subunits E, F, and G form the N module, which binds NADH. B, CD, and I make up the Q module, which helps to bind the quinone near the membrane, where it is reduced. The other seven subunits (A, H, J, K, L, M, and N) are hydrophobic membrane proteins that are homologous to the seven proteins typically encoded by mammalian mitochondrial DNA. These proteins form the P module, and contain 4 sites for proton translocation. The three largest of the mitochondrial homologues, called L, M and N in *E. coli*, are related to one another, and to proteins in a bacterial cation/proton antiporter system. Current work in the lab concerns the assembly pathway of these subunits, and consequences of clinically identified mutations on the assembly and function of Complex I.



Pia Vogel

Professor

EDUCATION & TRAINING:

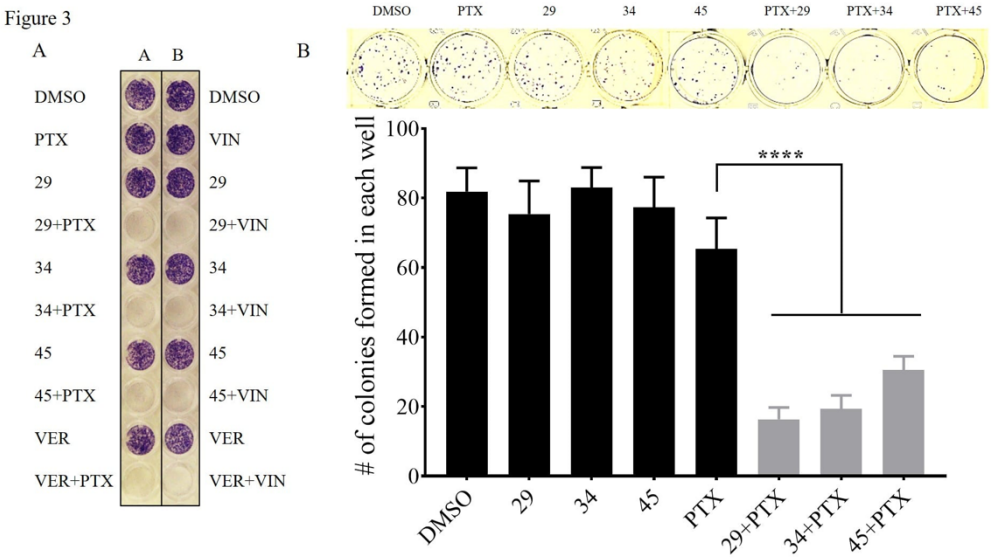
M.S. in Chemistry, Technical University in Kaiserslautern, Germany
Ph.D. in Biochemistry, Technical University in Kaiserslautern, Germany
Dr. habil. in Biochemistry, Technical University in Kaiserslautern, Germany
Postdoctoral, State University of New York Medical School (Syracuse)

CONTACT:

Office: DLSB 233
Lab: DLSB 221
Phone: 214-768-1790
Email: pvogel@smu.edu

ABOUT:

The main goal of the Vogel lab is to find ways to combat chemotherapy resistance in cancer that is caused by high expression levels of membrane proteins that actively pump chemotherapeutics out of cancer cells, making therapy ineffective. Using a combination of human cell culture as well as biochemical and biophysical evaluation, our lab is assessing the efficacy of experimental compounds, previously discovered in computational high throughput searches, in re-sensitizing therapy resistant cancer cells to therapy. To pave the way for potential future clinical applications of these experimental compounds, physiologically relevant cancer cell lines are developed for evaluation of efficacy and potential toxicity. The mechanism of inhibiting the pump proteins is evaluated by biochemical and biophysical methods using physiologically relevant human membrane protein preparations.



John Wise

Associate Professor

EDUCATION & TRAINING:
B.S. in Biology, Syracuse University
Ph.D. in Biochemistry, University of Rochester Medical Center

CONTACT:
Office: DLSB 332
Lab: DLSB 332
Phone: 214-768-3426
Email: jwise@smu.edu

ABOUT:
The Wise lab has concentrated on understanding the dynamics of membrane protein function using classical biochemical and molecular biological tools as well as the use of high-performance computational studies. Our research vision is to simulate natural membrane protein systems computationally and to test any computationally generated hypotheses in our "wet-lab" using classical methods. Once sufficient information has been gained in these mechanistic studies, drug discovery programs to identify inhibitors of related proteins that cause human pathologies is begun.

These **Mechanistic Studies** have been applied to two major causes of "Multi-Drug Resistance" in both cancer chemotherapies (where both P-glycoprotein – ABCB1 and the Breast Cancer Resistance Protein – ABCG2 have been studied) and in the treatment of multi-antibiotic-resistant, Gram-negative, bacterial pathogen infections (where the RND efflux pumps from *Escherichia* and *Neisseria* species have been examined), see graphic. Both the human P-glycoprotein and the bacterial RND transporters cause these therapeutic resistances by different, but similar mechanisms: they "pump" the therapeutic drugs out of the cell, whether it be a human cancer cell or an invading bacterial pathogen.

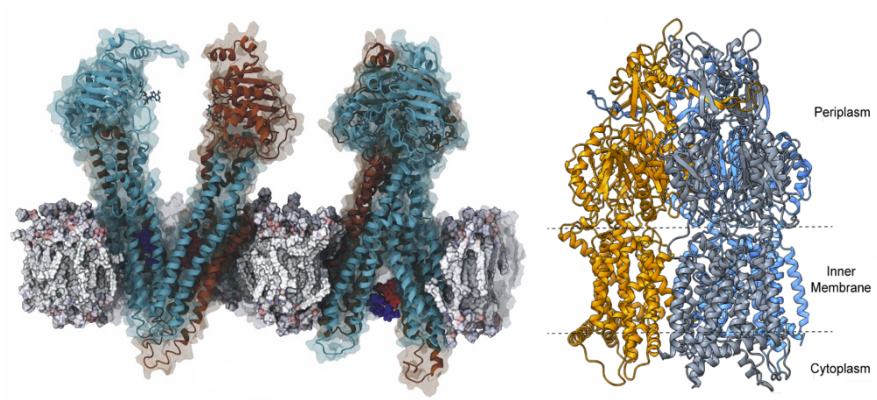


Figure 1 - **Left**: Two depictions of P-glycoprotein in a biological membrane system; **Right**: An RND drug transporter from *Neisseria*, mtrD. Graphics by J. McCormick and L. Ammerman, former Ph.D. students from the lab.

In our **Drug Discovery** studies, we have leveraged our high-performance computational methods into searches for inhibitors of these drug pumps in massively parallel, ligand-interaction studies with literally tens of millions of potential molecules. To date we have identified and patented about two dozen specific, small molecule, drug-like inhibitors of P-glycoprotein and BCRP and are presently searching for inhibitors of the Gram-negative bacterial pathogen drug pumps.

Zhihao Wu

Assistant Professor

EDUCATION & TRAINING:

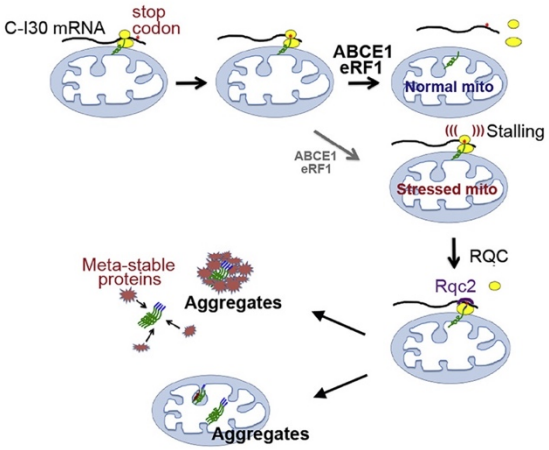
B.S. in Biology, Tsinghua University, China
Ph.D. in Molecular Genetics, Tsinghua University, China
Postdoctoral, Stanford School of Medicine

CONTACT:

Office: DLSB 238
Phone: 214 768-4854
Lab: DLSB 217
Email: zhihaowu@smu.edu

ABOUT:

The long-term goal of research in the Wu lab is to uncover the fundamental mechanism of age-related neurological diseases. Our current focus is to investigate the role of cellular quality control systems in the pathogenesis of these disorders. We try to link ribosome-associated translation quality control, macromolecule quality control, and organelle (mitochondrial) quality control into a continuum of the cellular quality control system. It will enhance our understanding of proteostasis failure induced by aberrant translation products in mitochondrial dysfunction in neurodegenerative diseases. Our mission also includes identifying the potential novel biomarkers and therapeutic strategies in the process of investigating the perturbation of QC factors in the disease conditions. Our lab primarily uses fruit fly (*Drosophila melanogaster*) as the experimental system, because of the availability of sophisticated genetic tools, and also various mammalian systems such as cultured neurons and mice models to test the conservation of the players and principles we uncover from the *Drosophila* studies. Our lab also actively collaborates with the industrial partners (e.g., ModeGene and Merck) on the projects of dissecting the molecular mechanisms of human ageing. The ultimate goal of our research is to elongate the healthy lifespan of humans in a clinically feasible way.



ADMINISTRATIVE STAFF

Mary Varela

Administrative assistant II

CONTACT:
Office: DLSB 113B
Phone: 214-768-2217
Email: mvarela@smu.edu

ABOUT:
Mary is a Dallas native, and has been with the biology department for 32 years, and counting. She is the go-to person for the department, and provides assistance for all areas ranging from assisting students with add/drop to overseeing department financials. During her career at SMU, she has been nominated twice for the Presidential Continuing Excellence Award, was the recipient of the Faculty Senate Outstanding Staff Award (2012), the Dedman College Staff Lasting Impact Award (2017), and inducted to the 25-year club in 2014.

GRADUATE STUDENTS

INCOMING STUDENTS

Mary Margaret de la Torre
BS, Southern Methodist University
MA student

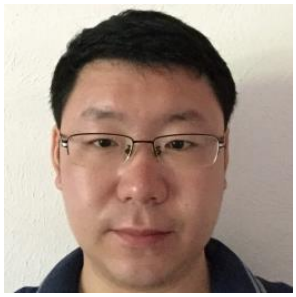
Anusha Iyengar
BS, Univ. of Wisconsin, Madison
PhD student (Norris Lab)

Anni Kum
BS, Southern Methodist University
MS student (Jones lab)

Nicole Petchey
BS, Southern Methodist University
MA student

Rebecca Peterson
BS, University of South Florida
PhD student

MASTER OF ARTS STUDENTS



Fang Qi
BS, Southern Methodist University
Vogel lab

MASTER OF SCIENCE STUDENTS

Nick Kurtaneck
BS, Grace College
Harrod lab

PhD STUDENTS

Hind Alkhaldi

BS, Princess Nourah bint Abdulrahman Univ., Saudia Arabia
MS, Southern Methodist University
Vik lab

Canyon Calovich-Benne

BS, Southern Methodist University
Norris lab

Tiffany Collie

BS, Univ. of the Incarnate Word
MS, Tulane University
Glasscock lab

Xiaoyu Liang

BS, Northeastern Univ., China
MS, Northeastern Univ., China
Norris lab

Jesiska Lowe

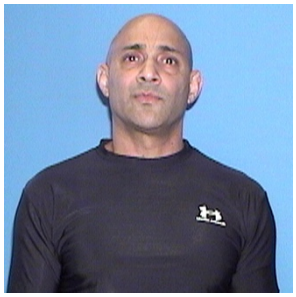
BS, Bangalore University, India
MS, Univ. of Colombo, Sri Lanka
Vogel lab

Rebekah Napier-Jameson

BS, Delta State University
MS, Stephen F. Austin University
Norris lab

Kelsey Paulhus

BS, Texas Christian University
MS, Texas Christian University
Glasscock lab



Hashim Raja

BS, Troy University
MA, Southern Methodist University
Radyuk lab

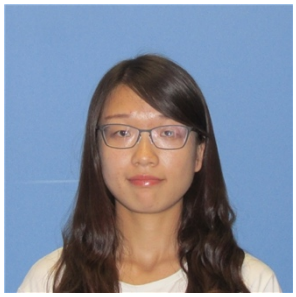
Morgan Thompson

BS, Baylor University
MS, Texas Christian University
Norris lab

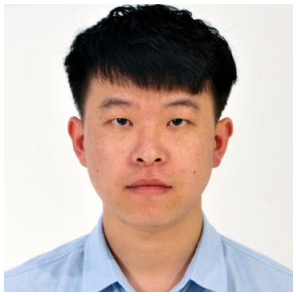
Foozhan Tahmasebinia
BS, Shahid Beheshti Univ., Iran
MS, Shahid Beheshti Univ., Iran
Wu lab

Yinglu Tang
BS, Tongji University, China
Wu lab

Lacin Yapindi
BS, Middle East Tech. Univ., Turkey
Harrod lab



Fang Zhang
BS, Luoyang Normal Univ., China
Vik lab



Hang Zhao
BS, Southern Medical Univ., China
MS, Northeastern Univ., China
Wise lab

POSTDOCTORAL RESEARCHERS & RESEARCH STAFF

Bikash Choudhary
BS, Orissa U. of Ag. & Tech., India
MS, Indian Inst. of Tech. Bombay
PhD, Natl. Ctr. for Biol. Sci., India
Postdoc, Norris lab

Indu Jagadeeswaran
MS, Annamalai University
PhD, Jawaharlal Inst. of Postgrad. Med. Education & Research, India
Postdoc, Glasscock lab

Praveen Kumar
MS, Lucknow University, India
PhD, Sanjay Gandhi Post Graduate Institute of Medical Sciences, India
Postdoc, Glasscock lab

Man Si
MS, Hebei Medical Univ., China
PhD, Hebei Medical Univ., China
Postdoc, Glasscock lab

Fallon Wenck
BS, Texas A&M University
Research Assistant, Glasscock lab

WHERE ARE FORMER TRAINEES NOW?

Lauren Ammerman (PhD 2021, Wise Lab) is a postdoctoral fellow in the Department of Biophysics (Dr. L. Rice Lab) at the University of Texas Southwestern Medical Center in Dallas.

Tetiana Bowley (PhD 2020, Harrod Lab) received a postdoctoral fellowship in the Department of Pathology (Dr. D. Marchetti Lab) at The University of New Mexico-Health Sciences Center/UNM-Comprehensive Cancer Center.

Elnaz Ghotbi (PhD 2019, Jones Lab) is a postdoctoral fellow in the Department of Dermatology (Dr. L. Le Lab) at the University of Texas Southwestern Medical Center in Dallas.

Aditi Malu (PhD 2019, Harrod Lab) received a Senior Research Associate position at Bay Genomics LLC in Berkeley, CA.

James McCormick (PhD 2017, Wise Lab) is a postdoctoral fellow in the Department of Biophysics (Dr. K. Reynolds Lab) at the University of Texas Southwestern Medical Center in Dallas.

Jumana AlHaj Abed (PhD 2014, Jones Lab) is a postdoctoral fellow in the Department of Genetics (Dr. T. Wu Lab) at Harvard Medical School.

Megan Romeo (PhD 2014, Harrod Lab) received a tenure-track Instructor position at Richland College, Dallas County Community College District.

Shaotong Zhu (PhD 2014, Vik Lab) will be a Principal Scientist at the Institute for Protein Innovation (IPI) in Boston, MA starting September 2021.

Soumya Awasthi (PhD 2007, Harrod Lab) received a postdoctoral fellowship in the Division of Neurosciences (Dr. A. Geller Lab) at Harvard Medical School.

GRADUATE PROGRAMS SUMMARY

SMU's Department of Biological Sciences offers three graduate degree programs: M.A., M.S., and Ph.D.

Advantages of graduate research at SMU:

- **Our faculty are nationally recognized for their research.** Faculty members serve on National Institutes of Health Study Section review panels and are funded by the NIH. In addition, our faculty serve as reviewers for several national and private granting agencies and have published their research in leading journals including: Nature, Science, Molecular Cell, Oncogene, Journal of Biological Chemistry, Molecular and Cellular Biology, Vaccine, Genetics, PNAS, Molecular Biology of the Cell, Methods in Enzymology and Biochemistry.

- **Modern Research Facilities.** The Biological Sciences Department is located in the Dedman Life Sciences Building, adjacent to Fondren Science Library, and the closely affiliated departments of Chemistry and Computer Science. The department has state-of-the-art equipment, including two confocal microscopes, a flow cytometer, shared cell tissue culture facilities, and qRT-PCR instrumentation.

- **Didactic lectures, scientific discourse and active research.** The MCB program places great emphasis on training independent scientists. Students are taught to cover the breadth of modern molecular biology, yet maintain adequate time to follow up on areas of more specific interest in their own research. We are a supportive, collegial environment. Frequent interactions and open lines of communication are central to the success of a research department. From the first day onward, students meet with each faculty member the first week to 'break the ice' and foster long-term, scientific relationships. Lab rotations during the first semester introduce students to the research topics and techniques employed in various labs ensuring that students make well-informed decisions as to the lab in which they will pursue their thesis project. Supportive, collegial environment. Frequent interactions and open lines of communication are central to the success of a research department. From the first day onward, students meet with each faculty member the first week to 'break the ice' and foster long-term, scientific relationships. Lab rotations during the first semester introduce students to the research topics and techniques employed in various labs ensuring that students make well-informed decisions as to the lab in which they will pursue their thesis project.

- **Financial Support.** The Department of Biological Sciences offers numerous tuition scholarships, teaching assistantships, and faculty research assistantships.

GRADUATE PROGRAM GUIDELINES & TIMELINES

A. Overview

The charge of the Graduate program is to provide a vibrant research environment in which the graduate student may participate in a meaningful research training experience leading to job opportunities in Academia and Industry. The core curriculum consists of three advanced courses in Cell Biology (BIOL 6310), Molecular Biology (BIOL 6322), and Biochemistry (BIOL 6318) and are typically taken in year one by all PhD, MS, and MA students. Beyond that more specialized courses are offered that are tailored to the individual student and may be more directly related to the student's ongoing research. Other important elements of the Graduate Curriculum include the Departmental Seminar (BIOL 6114) and the Graduate Seminar (BIOL 6120) course programs. Departmental seminars will be held regularly each semester. Speakers (graduate students, faculty and visiting scientists) will present a variety of topics of current interest in the Biological Sciences. All graduate students will be expected to participate as speakers. In addition, all MS, and PhD students will be expected to participate in the Graduate Seminar program in the first four semesters (MA students participate every semester they are enrolled in the program). Each student will take turns leading a discussion on a current research paper, while the others will be responsible for discussing the data presented in the individual Figures. In this way students will acquire the ability to critically analyze the primary literature.

Ph.D. program in Molecular and Cellular Biology

Students enrolled in doctoral graduate studies conduct dissertation research under the mentorship of expert faculty in the areas of aging, neuronal development and neuropathogenesis, epigenetics and gene regulation, structural biology, inflammation and immunity, drug resistance, cancer biology, and infectious diseases. During the first semester, students rotate through 2-3 different laboratories before choosing a faculty mentor to supervise their PhD research. All new students are advised by the Biological Sciences-Graduate Education Committee (GEC) and are required to have at least one annual meeting with their Graduate Advisory Committee to review their academic and research progress.

The Molecular and Cellular Biology PhD degree program requires approximately 4 to 5 years to complete, including:

- 60 credit hours
- Two-year full-time residency
- Passing a qualifying examination at the end of the second year
- Complete a research program
- Writing and defending a monograph (dissertation) detailing proposed research

M.S. program in Molecular and Cellular Biology

The MS in Molecular and Cellular Biology degree program is designed primarily for students who are research oriented and wish to prepare for advanced work at the doctoral level. The MS degree program requires approximately 2 years to complete, including:

- 30 credit hours, including 18 term hours at the 6000-level and BIOL 6398, 6399 (thesis)
- One-year full-time residency
- Complete a research program
- Writing and defending a monograph (thesis) detailing proposed research

M.A. program in Molecular and Cellular Biology

The MA program in Molecular and Cellular Biology program is designed for students who seek additional training in the biological sciences as a prerequisite to further study in professional schools or for individuals seeking additional training for secondary education. This program is particularly well-suited for pre-health professional undergraduates who want to use a gap year to increase their overall competitiveness by obtaining an advanced MA degree.

The MA degree program is typically completed in 12-24 months, including:

- 30 credit hours, including 12 at the 6000-level
- One-year full-time residency
- Complete a three-term-hour research project

B. Role of Ph.D. and M.S. students in faculty research programs and expectations for their work

The PhD and MS student will receive rigorous training in the molecular, biochemical and genetic methods that are the currency of the selected laboratory and that serve as the prerequisite to participate in faculty research in a meaningful way. The graduate student will not only develop the technical skills required to carry out a research project, but they will be expected to make an intellectual contribution as well, ranging from data analysis to the development of experimental strategies. The work will be carried out responsibly and in a timely manner and the end product for the PhD student, who will typically be conducting research over a 4-5 year span, will be 1-2 first author papers or manuscripts in preparation. The successful MS student, whose research spans ~2 years, should be an author on at least one paper or manuscript in preparation.

The timetable for the graduate student is as follows. In their first semester, MS and PhD students will perform research rotations lasting 6-8 weeks in at least two different labs. At the end of the first semester the student may then select a home lab or elect to participate in additional rotations during the second semester. **Once a lab has been selected, the Graduate student advisor(s) will appoint an Advisory Committee in consultation with the student.** In the case of an MS student, the committee will consist of

at least two faculty members; in the case of a PhD student, the committee will consist of at least three persons besides the advisor, including one from outside the Department. Before the end of the second semester in residence, and at least once during each additional year, a meeting of the committee and the student will take place. At the first meeting, the committee and the student will review the student's record and future professional goals, and jointly determine a full program of studies leading to the degree. At subsequent meetings, the student will report on progress towards the goal.

For the PhD student, a **qualifying examination** will occur at the end of the second year to determine admission to candidacy. The student will author at least a 10-page proposal comprising the PhD research, which will include specific aims, background and significance, and preliminary results, and a research plan. Proposals will be distributed to committee members at least two weeks prior to the examination. The exam should preferably be completed before the beginning of the third year. The oral examination will include a 30-minute oral presentation by the student and a subsequent discussion of the proposed research. The student will be expected to demonstrate sufficient knowledge to conduct the research. Should the student not demonstrate a satisfactory level of proficiency, the committee will recommend either that the exam be retaken at the beginning of the fifth semester or that the student be dismissed from the PhD program and receive a terminal MA degree, provided that the requirements for the MA degree are fulfilled.

At the end of every academic year, all MS and PhD students will be subjected to an **overall performance review** by a "General Graduate Review Committee." This committee will assess each student in terms of research, class performance, teaching, as well as professional and ethical behavior. This Committee will include the advisory committee, instructors, and teaching supervisors who have been involved with the student, and will provide the framework to detect any early patterns that may be problematic moving forward such as lack of progress in research, unsatisfactory academic performance, poor teaching assessments, behavioral patterns that contribute to interpersonal conflict, and violation of University policies on plagiarism and data manipulation. Unsatisfactory performance in any category will be communicated to the student, and a plan for remediation and a timeline will be developed with the student. Some infractions, such as purposeful data manipulation and cheating constitute grounds for removal from the program.

Ph.D. Degree Program Timeline (5-year plan; tentative): 60 credit hours required

		Required Courses	Electives	Other Requirements and Milestones
Year 1	Fall	• BIOL 6322 • BIOL 6310 • BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res)		• Teaching assistantship • Two research rotations (6-8 weeks each)
	Spring	• BIOL 6318 • BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res)	• 3 credits of elective coursework at the 5000 or 6000-level	• Teaching assistantship • Faculty mentor assigned • General academic performance and progress review
	Summer	• BIOL 6170 (Grad Res) • BIOL 8049 (Grad Full-time)		• First Graduate Advisory Committee meeting
Year 2	Fall	• BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res) • BIOL 6370 (Grad Res)	• 3 credits of elective coursework at the 5000 or 6000-level	• Teaching assistantship
	Spring	• BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res) • BIOL 6370 (Grad Res) • BIOL 6371 (Grad Res)		• Teaching assistantship • General academic performance and progress review
	Summer	• BIOL 6170 (Grad Res) • BIOL 8049 (Grad Full-time)		• Second Graduate Advisory Committee meeting • PhD Qualifying examination passed
Year 3	Fall	• BIOL 6270 (Grad Res) • BIOL 8049 (Grad Full-time)		• Teaching assistantship

Ph.D. Degree Program Timeline continued

	Spring	• BIOL 6370 (Grad Res) • BIOL 8049 (Grad Full-time)		• Teaching assistantship • General academic performance and progress review
	Summer	• BIOL 6170 (Grad Res) • BIOL 8049 (Grad Full-time)		• Third Graduate Advisory Committee meeting
Year 4	Fall	• BIOL 6371 (Grad Res) • BIOL 8049 (Grad Full-time)		• Teaching assistantship
	Spring	• BIOL 6372 (Grad Res) • BIOL 8049 (Grad Full-time)		• Teaching assistantship • General academic performance and progress review
	Summer	• BIOL 6170 (Grad Res) • BIOL 8049 (Grad Full-time)		• Fourth Graduate Advisory Committee meeting
Year 5	Fall	• BIOL 8398 (Dissertation) • BIOL 6170 (Grad Res) • BIOL 8049 (Grad Full-time)		• Register for graduation • Teaching assistantship
	Spring	• BIOL 8399 (Dissertation) • BIOL 6270 (Grad Res) • BIOL 8049 (Grad Full-time)		• Submit PhD Dissertation and oral presentation/defense of research • Teaching assistantship • Degree requirements completed

M.S. Degree Program Timeline (2-year plan; tentative): 30 credit hours required

				Required Courses	Electives	Other Requirements and Milestones
Year 1	Fall			• BIOL 6322 • BIOL 6310 • BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res)		• Two research rotations (6-8 weeks each)
	Spring			• BIOL 6318 • BIOL 6114 • BIOL 6120 • BIOL 6170 (Grad Res)		• General academic performance and progress review
	Summer			• BIOL 6170 (Grad Res) • BIOL 6049 (Graduate Full-time)		• First Graduate Advisory Committee meeting
Year 2	Fall			• BIOL 6114 • BIOL 6120 • BIOL 6398 (Thesis) • BIOL 6270 (Grad Res)		• Register for graduation
	Spring			• BIOL 6114 • BIOL 6120 • BIOL 6399 (Thesis) • BIOL 6270 (Grad Res)		• Submit MS Thesis and oral presentation/defense of research • Degree requirements completed

M.A. Degree Program Timeline (1-year plan; tentative): 30 credit hours required

				Required Courses		Electives	Other Requirements and Milestones
Year 1		Fall		• BIOL 6322 • BIOL 6310 • BIOL 6114 • BIOL 6120		• 7 credits of elective coursework at the 5000 or 6000-level	• Register for graduation
		Spring		• BIOL 6318 • BIOL 6114 • BIOL 6120		• 7 credits of elective coursework at the 5000 or 6000-level	• 3 credit hours of graduate research (e.g., BIOL 6370, or BIOL 6170 and 6270) • Degree requirements completed


BIOLOGICAL
SCIENCES