CORE FACULTY

Core Faculty in the CMB Ph.D. program are those in whose labs CMB students can pursue doctoral dissertation research.

DR. BERNARD P. ARULANANDAM, Professor of Immunology

My research program is focused on understanding host-microbe interactions and identifying approaches to induce optimal mucosal protection and immunity. My current research efforts in the laboratory include: intranasal based vaccine approach against genital *Chlamydia trachomatis* infection and respiratory defenses against pulmonary tularemia. We are characterizing novel antigens as potential vaccine candidates against *C. trachomatis* genital infection and characterizing the use of a defined *Francisella tularensis* mutant as a live attenuated vaccine candidate against pneumonic tularemia. Additionally, we are examining the feasibility of using locally administered combinatorial immunotherapy against aerosolized tularemia.

For more information: [http://stceid.utsa.edu/lab-Arul/](http://stceid.utsa.edu/lab-Arul/)

DR. ASTRID CARDONA, Associate Professor of Immunology

Neuron-microglia communication and the contribution of microglia-mediated inflammation to neuronal damage are major areas of interest in my lab. We utilize models of neuroinflammation, including experimental autoimmune encephalomyelitis, diabetic retinopathy and neurocysticercosis to determine the role of fractalkine signaling in microglial function. In humans, a polymorphic variant of CX3CR1 is adhesive defective and was associated with heart disease and age related macular degeneration. Therefore, our long term plan is to clarify the role of fractalkine/CX3CR1 in the brain and in the periphery using CX3CR1-deficient mice, and in Knock-in expressing the human receptors. Some of the questions we are addressing include: Does CX3CR1 play a role in the trafficking of microglial precursors? Does CX3CR1-deficiency on microglia or peripheral cells enhance neuronal/axonal pathology? Does CX3CR1-deficiency alter CNS T cell and/or monocytes functions? and most importantly we intend to define the role of human wild type and variant CX3CR1 during brain inflammation.

For more information: [http://stceid.utsa.edu/lab-Cardona/](http://stceid.utsa.edu/lab-Cardona/)

DR. JAMES P. CHAMBERS, Professor of Biochemistry

The focus of my research is on the characterization of calcium binding proteins in the cell and in particular the kinetic analysis of the [Ca$^{2+}$ + Mg$^{2+}$] - dependent adenosine-triphosphatase. My research focuses on the regulation of intracellular free calcium and its maintenance at extremely low concentrations (submicromolar), which is one of the main tasks of cells.

For more information: [http://stceid.utsa.edu/lab-Chambers/](http://stceid.utsa.edu/lab-Chambers/)

DR. JURGEN ENGELBERTH, Associate Professor

The major focus of my research program is on the metabolic analysis of signaling compounds and their molecular regulation within plants under insect herbivore attack. My studies of the metabolic analysis of signaling compounds include: insect-derived elicitors; production of proteins that block digestion or disrupt intestinal tissue; the production of defense-related secondary metabolites, which directly or indirectly affect the herbivore performance; lipid-derived compounds (oxylipins); and the regulation of the pathway leading to the production of jasmonic acid (JA).

For more information: [http://www.utsa.edu/biology/faculty/JurgenEngelberth.html](http://www.utsa.edu/biology/faculty/JurgenEngelberth.html)
FACULTY RESEARCH INTERESTS 2018-2019

DR. MARK EPPINGER, Associate Professor
The focus of Dr. Eppinger’s research is on the application of microbial genomics to address fundamental questions in emerging infectious diseases research. His current interests are directed towards large-scale sequencing and phylogenomic studies investigating major public health threats, such as the dominant cause of food-borne disease in North America, Escherichia coli O157:H7. Data from this research provides crucial insights into the make-up of bacterial pathogens and how genomic variants relate to differences in evolutionary and ecological niches that underlie human transmissibility, infectivity and disease outcome. Most importantly, this research can help to initiate therapeutic and diagnostic countermeasures in an attempt to decrease human morbidity rates.

For more information: [http://stceid.utsa.edu/lab-Eppinger/](http://stceid.utsa.edu/lab-Eppinger/)

DR. THOMAS FORSTHUBER, Professor of Immunology
Immune mechanisms driving autoimmune encephalomyelitis. Erroneous activation of the immune system can lead to autoimmune diseases such as multiple sclerosis (MS). Dr. Forsthuber’s lab pursues several lines of investigation to understand how the immune system, in particular T cells, contribute to autoimmune diseases and how to modulate T cell immunity for therapeutic purposes in humans. Specifically, he studies immune mechanisms in the central nervous system in experimental autoimmune encephalomyelitis (EAE), the animal model for MS. The lab has generated transgenic and knockout mouse models to investigate the role of important autoimmune disease-related genes such as HLA-DR. His research is aimed towards direct applicability to human diseases, for example by developing novel drugs for autoimmune diseases and biomarkers to monitor the efficacy of treatments for autoimmune diseases.

For more information: [http://stceid.utsa.edu/lab-Forsthuber/](http://stceid.utsa.edu/lab-Forsthuber/)

DR. GARY O. GAUFO, Associate Professor of Biology
My research interest focuses on elucidating the mechanisms necessary for wiring the central and peripheral nervous systems, which include neural stem cell differentiation, migration, and axon pathfinding. These processes are also critical for neurogenesis and nerve regeneration in the adult nervous system. We are specifically investigating the transcriptional regulation of various sensory-motor circuits in the vertebrate head. My laboratory utilizes a host of genetic and cellular techniques, such as in vitro organ culture, genome-based microarray, RNA in-situ hybridization, immunohistochemistry, and fluorescent labeling, to study mice harboring genetic mutations for genes that code for transcription factors critical for neural development and disease.

For more information: [http://www.utsa.edu/biology/faculty/GaryGaufo.html](http://www.utsa.edu/biology/faculty/GaryGaufo.html)

DR. KIRSTEN HANSON, Assistant Professor of Parasitology
My research is focused on the liver stages of the malaria parasite *Plasmodium* and host-parasite interactions. Before causing any disease in a mammalian host, malaria parasites must first undergo an expansion phase in the liver. Motile parasite forms called sporozoites invade hepatocytes, and over the course of several days each single sporozoite will dedifferentiate and begin replicating, producing thousands of progeny inside a protected vacuolar compartment. Once fully mature, these progeny will initiate the blood stage of infection, along with the symptoms and syndromes of malaria. We aim to better understand the cellular organisation and developmental progression of *Plasmodium* liver stages and use this knowledge to develop novel interventions that would eliminate *Plasmodium* infection before any disease occurs. We rely heavily on image-based phenotypic approaches and quantitative bioimaging, as well as chemical biology and small molecule screening approaches. Much of the research uses *in vitro* infections systems, but we also work *in vivo* to translate antimalarial prophylaxis into significant immune protection directed against liver stage parasites.

For more information: [http://stceid.utsa.edu/lab-Hanson/](http://stceid.utsa.edu/lab-Hanson/)
Our laboratory studies the basic biology of spermatogonial stem cells (SSCs), which are adult-tissue stem cells responsible for sperm production in the mammalian testis and which are essential for male fertility. Ongoing studies in the lab are focused on 1) determining how these cells are regulated and behave like stem cells, 2) how we can prevent SSC loss due to chemotherapy, 3) how SSCs can be used to treat male infertility, and 4) how the pool of SSCs forms during development. We employ rodent and primate animal models and work with human testicular tissues. The approaches we use in the lab are multidisciplinary, including in vitro SSC culture, in vivo SSC transplantation to measure stem cell numbers, various wide-field microscopy techniques, as well as conventional and high-throughput molecular biology and genomic approaches. We also examine gene expression and the level of individual cells which allows us to investigate heterogeneity among cells within a population. Thus, our work has potential implications for basic stem cell biology, reproduction, as well as translational significance for treatment and prevention of male infertility.

For more information: [http://www.utsa.edu/biology/faculty/HermannLab/](http://www.utsa.edu/biology/faculty/HermannLab/)

Neural stem cells play a critical role in learning, memory formation, and mood regulation. These stem cells are present in both human and other mammals and continually self-renew throughout life facilitating these key functions. Here in the Hsieh lab we study the genetic mechanisms that control and regulate these stem cells. By making use of various models of brain injury and disease such as epilepsy, stroke, and traumatic brain injury we are working on dissecting the role of these stem cells in disease propagation and therapeutic interventions. One of the major focuses of our lab is to use patient derived pluripotent stem cells and animal models of epilepsy. Epilepsy is a devastating disease of the central nervous system characterized by spontaneous recurring seizures and affects 3 million Americans each year. Unfortunately, 1/3 of patients with epilepsy do not respond to any currently available therapeutic medications. We are particularly interested in the causes of genetic epilepsy, where a single causative gene mutation is discovered. Some of the newest technology in the field has allowed us to culture induced pluripotent stem cells derived from human clinical patients and perform gene editing with CRISPR/Cas9 to generate isogenic controls in order to study epilepsy-in-a-dish. The goal of our work is to better understand the underlying causes of epilepsy and pave the way for improving therapies through personalized medicine and treatment.

For more information: [https://www.utsa.edu/hsiehlab/](https://www.utsa.edu/hsiehlab/)

Worldwide human fungal diseases are on the rise. Patients with severe fungal infections usually require life-long chemotherapy with current clinical drugs. Development of better chemotherapies and preventive vaccination has become an urgent task to combat fungal infections. Research in Dr. Hung’s laboratory focuses on host-fungus interactions and antimicrobial immunity. My laboratory has the expertise, instruments, and infrastructure to provide multidisciplinary training opportunities to students who are interested in immune mechanisms against microbial infection, vaccine development and discovery of novel fungal chemotherapies.

For more information: [http://stceid.utsa.edu/lab-Hung/](http://stceid.utsa.edu/lab-Hung/)
**DR. KARL E. KLOSE, Professor of Microbiology**

My lab is interested in bacterial pathogenesis -- how bacteria cause disease. He has worked most extensively with *Vibrio cholerae*, the bacterium that causes cholera; and is also researching *Francisella tularensis*, the bacterium that causes tularemia, or rabbit fever. The lab is working to identify genetic factors responsible for *F. tularensis* to cause disease and to develop suitable vaccine candidates to protect against tularemia infection.

For more information: [http://stceid.utsa.edu/lab-Klose/](http://stceid.utsa.edu/lab-Klose/)

**DR. RICHARD G. LeBARON, Professor of Cell & Molecular Biology**

The overarching goal in my research program is to better understand, in healthy and diseased tissues, the cellular niche including its extracellular matrix proteins and ECM receptors on cell surfaces. In humans and animals, different cell types collaborate using receptor-mediated inter- and intra-cellular signaling to repair and regenerate functional tissue. One objective of my current research is to understand the biology of a proapoptotic ECM protein called BIGH3. My research has shown that BIGH3-mediated apoptosis (BMA) is involved in the progression of diabetic complications and in cancer progression. We have recently linked macrophages and TGF-β1 to BMA and have identified the signal in the BIGH3 protein that induces BMA. Our next goal is to identify the cellular cytosolic signaling pathway that promotes BMA in order to identify targets for diabetic and cancer therapeutic interventions. Another strong interest of my research program is in the field of ECM roles in the health and disease of connective tissue. Some individuals develop temporomandibular joint (TMJ) disorders (TMDs), which can result in TMJ deterioration that becomes exceedingly painful and debilitating. Interestingly, more females report TMD pain as opposed to males, suggesting a hormonal facet to TMD. An ECM protein called lubricin is the main lubricating molecule in most, if not all articular joints. We found that the lubricin gene promoter contains full-length and half-length estrogen-response elements (EREs). Real-time PCR and gene-reporter assays have documented that estrogen blocks lubricin gene expression in TMJ disc cells, possibly explaining part of the pathology underlying development of TMD. Our immediate goal is to test female and male TMJ cells, plus and minus estrogen, for lubricin expression and identify which EREs are active in the lubricin gene promoter. The biomedical research techniques we use in our studies include cell harvesting, isolation and expansion, cell culturing in two- and three-dimensions, apoptosis assays, introducing stress and strain to cells to mimic whole body physiology, protein and DNA gels, recombinant protein expression and isolation, column chromatography, real-time PCR, gene reporter assays, immunohistochemistry, light, phase-contrast and confocal microscopy.

For more information: [http://www.utsa.edu/biology/faculty/RichardLeBaron.html](http://www.utsa.edu/biology/faculty/RichardLeBaron.html)

**DR. HYOUNG-GON LEE, Associate Professor of Cell & Molecular Biology**

My research has been focused on the understanding of the pathological mechanism(s) underlying the selective neurodegeneration in Alzheimer disease (AD) and other neurodegenerative diseases. Several molecular mechanisms identified from previous research in the lab and we are continuing our research to reveal the pathogenesis of AD and develop the effective therapy. Among these identified mechanisms, our research is mainly focused on following topics. 1) the pathological role of cell cycle re-entry in neurodegeneration, 2) insulin signaling in neurons and its pathological significance in neurodegeneration.

For more information: [http://www.utsa.edu/biology/faculty/HyounggonLee.html](http://www.utsa.edu/biology/faculty/HyounggonLee.html)
DR. SOO CHAN LEE, Assistant Professor of Medical Mycology
My laboratory studies mucormycosis an emerging fungal infection that poses serious threats to public health. In particular, one of the goals of my research is to elucidate the interactions between hosts and human pathogenic Mucoralean fungi, which will subsequently contribute to the development of therapeutic options. My research takes advantage of the *Mucor* dimorphism as a tool to elucidate fungal pathogenesis and host responses against this life-threatening fungal infection. *Mucor* is a dimorphic fungus and the different morphogenic stages (spores/hyphae vs. yeast) result in different host-pathogen interactions. The key question is: what difference(s) between spores and yeast makes hosts respond differently? Our goal is to identify key virulence factors conserved in mucormycosis fungi, which enable the fungi to escape innate immunity. Another goal is to define the roles of the enteric mycobiota (fungi in the GI tract) in eating disorders. This could provide information for better understanding of the etiology and novel factors associated with eating disorders, which would facilitate the development of innovation and improved treatment options.

For more information: [http://stceid.utsa.edu/lab-Lee/](http://stceid.utsa.edu/lab-Lee/)

DR. CHIN-HSING ANNIE LIN, Associate Professor of Cell and Molecular Biology
Our research is focused on the stem cell and cancer biology. Ongoing studies in the lab related to stem cell biology include 1) understanding how stem cells in adult brain migrate and homing to their final destination to generate functional neurons, 2) how we can apply stem cells to the regenerative medicine for treating stroke, trauma, spinal cord injury, and neurological disorders. On the other hand, if neural stem cells did not make their commitment properly that potentially could cause brain tumor. Our research related to cancer biology is to dissect out the fine tuning process between normal and cancer stem cells. Thus, our work has potential implications for basic stem cell biology as well as translational significance for treatment and prevention of diseases. The approaches we use in the lab including animal models (rodents, primates), human tissues, various molecular biology techniques, as well as high-throughput genome-wide analyses.

For more information: [http://www.utsa.edu/biology/faculty/AnnieLin.html](http://www.utsa.edu/biology/faculty/AnnieLin.html)

DR. JOSE L. LOPEZ-RIBOT, Professor of Microbiology
The focus of my research is on the opportunistic pathogenic fungus *Candida albicans*. Studies in his laboratory try to integrate virulence and host immune responses to better understand and offer a more global perspective of *C. albicans* pathogenesis. Some of the highlights of my research program are: i) study of *C. albicans* biofilms, ii) development of novel immune-based therapies to combat candidiasis, and iii) role of morphogenetic conversions in the pathogenesis of candidiasis. Other areas of interest include genomics and proteomics, cell wall and adhesion, antifungal drug resistance, development of diagnostic techniques for candidiasis, and high throughput screening of small molecule libraries to study complex processes during candidiasis (with an emphasis on filamentation and biofilm formation).

For more information: [http://stceid.utsa.edu/lab-LopezRibot/](http://stceid.utsa.edu/lab-LopezRibot/)

DR. LINDSEY MACPHERSON, Assistant Professor of Cell and Molecular Biology
The Macpherson lab is interested in investigating the sense of taste and the molecules, cells, and circuits involved in chemosensation from the tongue and gut to the brain. Taste receptor cells on the tongue are specialized to be activated by only one of the five taste qualities, and signal that information to discrete populations of neurons in the gustatory ganglia through “labeled lines”. This hard-wired, labeled line connectivity pattern is essential for our ability to correctly detect and discriminate tastes. The lab is interested in understanding how this gustatory circuit is organized at the cellular and molecular level. Less well understood are chemosensory cells in the gut – which have many parallels to taste receptor cells – and may signal the presence of nutrients, toxins, and microbial metabolites to peripheral sensory neurons in the vagal ganglia. We aim to identify the cells and signaling mechanisms necessary for this gut-brain communication.

For more information: [https://www.macphersonlab.org/](https://www.macphersonlab.org/)
**DR. ASIF MIRZA MAROOF, Assistant Professor of Cell and Molecular Biology**

My lab is interested in understanding the molecular interactions and pathophysiological processes that occur with injury or disease progression in the central nervous system. Our approach takes advantage of human pluripotent stem cells that can be directed to differentiate into neurons and glia, which when combined with neural cells from transgenic mice, can be used to model dysfunction and disease progression *in vitro* during developmental windows of neural circuit maturation. These studies will establish cell-based paradigms using human cells to identify the pathogenic mechanisms responsible for the neurotoxicity clinically associated with Alzheimer’s-related dementias and other neurological diseases, which would enable novel strategies for therapeutic intervention.

*For more information: [http://www.utsa.edu/biology/faculty/AsifMaroof.html](http://www.utsa.edu/biology/faculty/AsifMaroof.html)*

**DR. JOHN McCARREY, Professor of Cell and Molecular Biology**

Research in my laboratory is centered on the development, differentiation, and epigenetic regulation of mammalian germ cells - the cells that form the gametes (sperm in males and eggs in females) and stem cells (cells that have the ability to give rise to other types of cells). Our primary experimental system is the mouse, however we also conduct studies in baboons, opossums, and other mammalian species. We are interested in 1) the occurrence of epimutations in the germ line and how these are or are not transmitted to subsequent generations, 2) the effects of assisted reproductive technologies on the induction of epimutations in the offspring produced, 3) the development of spermatogonial stem cells and how genetic integrity and epigenetic programming are established and maintained in these cells, 4) regulation of gene expression in germ cells, 5) X-chromasome activity and inactivity in germ cells, 6) genomic imprinting and how this becomes established during gametogenesis, and 7) developing the baboon as a nonhuman primate model for studies of stem cell-based therapeutic approaches.

*For more information: [http://www.utsa.edu/biology/faculty/JohnMcCarrey.html](http://www.utsa.edu/biology/faculty/JohnMcCarrey.html)*

**DR. CARLOS PALADINI, Professor of Neuroscience**

The goal of my lab is to focus on and investigate 1) the effects of direct manipulation of the receptor interactions on individual dopamine neurons to understand their normal physiology and function; and 2) the effects of drug self-administration on receptor interactions in dopamine neurons and whether these altered interactions can affect self-administration behavior. Through the combined effort of electrophysiological, imaging, pharmacological, and behavioral assays, we attempt to gain a better understanding of dopaminergic neuron function in both normal and pathological states.

*For more information: [http://www.utsa.edu/biology/faculty/CarlosPaladini.html](http://www.utsa.edu/biology/faculty/CarlosPaladini.html)*

**DR. GEORGE PERRY, Professor of Biology**

Our studies are focused on the mechanism of formation and physiological consequences of the cytopathology of Alzheimer’s disease. We have shown that oxidative damage is the initial cytopathology in Alzheimer's disease. Our research is working to determine the sequence of events leading to neuronal oxidative damage and the source of the increased oxygen radicals. Our current studies focus on (i) the mechanism for RNA-based redox metal binding; (ii) the consequences of RNA oxidation on protein synthesis rate and fidelity; (iii) the role of redox active metals in mediating prooxidant and antioxidant properties; (iv) the signal transduction pathways altered in Alzheimer’s disease that allow neurons to evade apoptosis; and (v) the mechanism of phosphorylation control of oxidative damage to neurofilament proteins.

*For more information: [http://www.utsa.edu/biology/faculty/PerryLab/](http://www.utsa.edu/biology/faculty/PerryLab/)*
DR. ROBERT RENTHAL, *Professor of Biochemistry*
My research laboratory focuses on two areas. 1) Insect Olfaction: How do odors and pheromones cause ion channels to open in olfactory receptor neuron membranes? How do ants use pheromones to organize their colonies? 2) Membrane Protein Folding. What are the forces that stabilize integral membrane proteins in compact structures? His lab uses techniques of biochemistry, molecular biology, proteomics, microscopy, and fluorescence spectroscopy.

Forg more information: [http://www.utsa.edu/biology/faculty/RenthalLab/](http://www.utsa.edu/biology/faculty/RenthalLab/)  
[http://stceid.utsa.edu/lab-Renthal/](http://stceid.utsa.edu/lab-Renthal/)

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DR. STEPHEN SAVILLE, *Associate Professor of Molecular Microbiology*
Research in this laboratory is centered primarily around the opportunistic fungal pathogen *Candida albicans* and in particular the role that morphogenetic and associated changes play in the virulence of the organism. Ongoing research in his lab involves (i) constructing genetically modified strains of *C. albicans* and testing their pathogenic potential in both animal and mucosal tissue culture models of disease, (ii) exploring the global gene expression changes that occur in the fungus as the disease progresses and (iii) screening small molecule compound libraries in an attempt to identify new potentially therapeutic compounds which prevent *C. albicans* filamentation.

For more information: [http://stceid.utsa.edu/lab-Saville/](http://stceid.utsa.edu/lab-Saville/)

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DR. JANAKIRAM SESHU, *Professor of Microbiology*
My research interests focus on molecular microbiology and immunology of Lyme disease and Q fever. Lyme disease is the most prevalent tick-borne infection in the US and is caused by a spirochetal pathogen called *Borrelia burgdorferi*. His laboratory is interested in the various molecular mechanisms adopted by the *Borrelia burgdorferi* in the infectious processes that result in Lyme disease. We employ several experimental tools in the fields of Microbiology, Molecular Biology and Biochemistry to find answers as to how this pathogen is able to cause disease. The lab is also interested in defining and modifying antigens from an intracellular, biodefense-related pathogen *Coxiella burnetii* that causes Q fever. There are several research opportunities for undergraduates who plan on majoring in Biology with an emphasis in Microbiology and Immunology.

For more information: [http://stceid.utsa.edu/lab-Seshu/](http://stceid.utsa.edu/lab-Seshu/)

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DR. GARRY SUNTER, *Chair and Professor of Plant Molecular Virology*
My laboratory explores various aspects of host-pathogen interactions using geminiviruses, an emergent group of plant single-stranded DNA viruses that cause devastating disease in food crops worldwide. Ongoing studies in the lab focus on 1) Analysis of the viral chromatin state to understand how chromatin structure and epigenetics plays a role in regulating viral gene expression; 2) The study of host transcription factors that mediate expression of viral genes; 3) determining how geminiviruses manipulate the cellular environment to overcome host defense responses; 4) Network discovery to increase our understanding of plant immunity, and to identify key regulatory points that determine infection outcome. Current control measures include limiting vector populations using pesticides, which is a significant health concern, as pesticides work by disrupting nervous system function. Thus, our work has potential implications for alternative ways of controlling geminivirus infections is warranted to reduce the incidence of geminivirus disease.

For more information: [http://stceid.utsa.edu/lab-Sunter/](http://stceid.utsa.edu/lab-Sunter/)
DR. YUFENG WANG, *Professor, Bioinformatics and Computational Biology*

Research in my laboratory focuses on the comparative genomics, molecular evolution, and systems biology of gene families. Approaches range from the use of cutting edge bioinformatic and genomic tools, to the statistical modeling and analysis based on evolution and population genetics theory. My laboratory is particularly interested in (1) evolutionary mechanism and systems biology of infectious disease and (2) molecular evolution of vertebrate gene families. My laboratory is using genomic and related data, coupled with other biochemical and microbiological information, to identify new therapeutic targets and to further study the underlying evolutionary mechanisms in diseases such as malaria. We are also interested in the association between sequence evolution and gene network regulation.

*For more information: [http://stceid.utsa.edu/lab-Wang/](http://stceid.utsa.edu/lab-Wang/)*

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DR. FLOYD WORMLEY JR, *Associate Professor of Microbiology & Immunology*

My research laboratory focuses on studies involving the use of Cryptococcus neoformans as a model organism to study host-fungal interactions for the purpose of developing novel immune therapies and/or vaccines to treat or prevent invasive fungal infections. Our ability to disrupt, introduce, and/or recover genes from C. neoformans coupled with the availability of effective animal model systems provides them with the capability to study both sides of the host/pathogen paradigm. We are able to study the effects of various genetic manipulations on the virulence of the yeast as well as the host immune response. Our expectation is that these studies will lead to the development of therapies and/or vaccines to treat or prevent fungal infections in immune compromised individuals.

*For more information: [http://stceid.utsa.edu/lab-Wormley/](http://stceid.utsa.edu/lab-Wormley/)*
Dr. Timothy Anderson, Adjunct Professor

Parasitic diseases still plague broad swaths of the world’s developing countries, reducing childhood survival rates and stunting economic growth. My laboratory focuses on the genetic basis and evolution of biomedically important traits in two of the most important human groups of parasites:

- Malaria parasites (>400,000 deaths per year)
- Parasitic blood flukes (Schistosoma spp.) responsible for schistosomiasis (~200,000 deaths per year)

We use population genomics methods to understand the genetics and evolution of biomedically important traits such as drug resistance and host specificity, and to explore fundamental aspects of pathogen biology and epidemiology. We combine analyses of field collected parasites from Asia, Africa and South America, with experimental analyses of parasites maintained in the laboratory, and genomic data. Current interests include:

1. Spread of Artemisinin resistance in SE Asian malaria parasites and (2) Application of linkage mapping and exome sequencing for Schistosome parasites. Recent highlights include identification of *Plasmodium* genome regions involved in artemisinin resistance in malaria in SE Asia, the development of a humanized mouse model for conducting genetic crosses in *P. falciparum*, and characterization and functional analysis of mutations underlying Oxamniquine resistance in *Schistosoma mansoni*.

Dr. Marie Claire Gauduin, Adjunct Associate Professor

Dr. Gauduin has more than 25 years of experience in HIV/AIDS research and medical microbiology. She has been working extensively on HIV and the development of novel vaccine strategies using the non-human primate model for AIDS. In her work, she uses epithelial stem cells and weakened recombinant papillomavirus as vaccine vectors to protect against multiple low-dose mucosal challenges. Dr. Gauduin is also developing a neonatal model for tuberculosis to study HIV/TB co-infection in pediatric AIDS.

Her specific research interests are:

- Early events of simian immunodeficiency virus (SIV) transmission in a macaque model
- Host immune responses to infectious diseases
- Early virus-specific T cell responses in neonates
- Tuberculosis/SIV coinfection in pediatric AIDS
DR. LUIS GIAVEDONI, Adjoint Professor
Dr. Giavedoni focuses his research on viral infections and the development of vaccines and therapies. He is particularly interested in understanding the immune responses to retroviral infections (e.g. HIV) in animal models. His lab works on cytokines, which are molecules that mediate communication between the immune system and the whole organism. His group has been developing technology for the identification of cytokines in nonhuman primates and also studies the potential use of cytokines.
- AIDS vaccine development using the rhesus macaque/simian immunodeficiency virus (SIV) model
- AIDS cure using CRISPR/Cas system and nanoparticle technology

Dr. Giavedoni is the leader of the Immunology Core Laboratory at SNPRC. He contributes more than 25 years of expertise in virology and more than 20 years of experience working with nonhuman primates; his scientific contributions led to an increase in the safety of vaccines.

DR. JEAN PATTERSON, Adjoint Professor
Dr. Jean Patterson’s research focuses on emerging viral infections. She has directed the BSL4 maximum containment laboratory since 2000, and has extensive experience with advanced development of vaccine and therapeutics against hemorrhagic fever viruses as well as development of new animal models for hemorrhagic fever. In addition, the Patterson lab has also served as a mentor to graduate students and continues to work with graduate students.

DR. RUTH RUPRECHT, Adjoint Professor
HIV infections continue to be a global health threat, and there is still no vaccine or cure available. Dr. Ruprecht’s research is focused on lentiviruses such as HIV, where she develops strategies for treatment and prevention. Her special interest is to develop vaccines against HIV/AIDS, particularly against the world’s most prevalent subtype of HIV (HIV-C) in Sub-Saharan Africa and India. Her research strategy is to:
- Develop vaccines to block HIV at portals of entry: mucosal sites
- Construct multi-component vaccines that enlist as many host defense mechanisms as possible

DR. LARRY SCHLESINGER, Adjoint Professor
Dr. Schlesinger studies the pathogenesis of tuberculosis and other airborne infectious agents that subvert lung immune mechanisms. The primary focus is on models of human lung macrophage biology, including phagocytosis, intracellular trafficking, inflammatory signaling pathways, non-coding RNAs and cell death mechanisms. His lab also uses functional genomics to define individual variation in innate immune responses to pathogens. Additional projects are human in vitro models of granulomas, TB & diabetes, HIV and aging.
Dr. Jordi Torrelles’ research is focused on the study of the human lung environment and its effect on the outcome of TB disease due to *Mycobacterium tuberculosis* (*M.tb*) infection. He also aims to improve the diagnosis of susceptible and drug resistant TB in high burden areas.

Dr. Turner studies the changes that take place in the immune system during the natural aging process and how those changes can influence both innate and adaptive immune function when infected with *M. tuberculosis*. The primary focus of Dr. Turner’s aging research is the association of inflammation with susceptibility to develop TB. She also studies immune responses that correlate with an individual’s age-associated susceptibility to reactivate a previously latent infection with *M. tuberculosis*. An additional area of research in Dr. Turner’s laboratory is focused on using different genetic mouse strains to better model immune responses in humans. By doing so, her team has defined a major role for an immune-suppressive cytokine, interleukin 10, in TB susceptibility.
ADJOINT FACULTY- United States Army Institute of Surgical Research (USAISR)

Adjoint Faculty in the CMB Ph.D. program are those in whose labs CMB students can pursue doctoral dissertation research.

**DR. DAVID BURMEISTER, Adjoint Assistant Professor**

Research in my laboratory at the United States Army Institute of Surgical Research focuses on the treatment of trauma, with specific interest in burn injury. With a background in regenerative medicine and a degree in Physiology and Pharmacology, research questions involve all aspects of burns, from resuscitative measures in the acute period post-injury to healing of wounds in the longer time frame. Our typical model system is swine, however other *in vivo* and *in vitro* systems have been employed. Current research projects include: exploring alternative and limited-volume resuscitation strategies; discovering the potential for the gut microbiome as a diagnostic or therapeutic tool in traumatic injury; examining treatment strategies for mitigating multiple organ dysfunction due to extensive burn injury with a focus on acute kidney injury; identifying novel measures for the diagnosis of sepsis in the absence of positive blood cultures; investigating the effect of IV fluids on organ function and metabolic status; and examining the metabolic derangements of on stem cell mitochondria post-injury.

**Dr. James Bynum, Adjoint Assistant Professor**

I have been working at the U.S. Army Institute of Surgical Research since 2003 where my work has involved research in several areas including damage control resuscitation, molecular biology, and coagulation and blood. I am currently serving as principal investigator on a collaborative research grant focused on the upscale production of mesenchymal stem cells for treatment of trauma-related indications. This work will define clinical potency, dosing, and safety guidelines for future human clinical trials using cellular therapeutics.

Combat injuries cause major bleeding that is often worsened by exhaustion of the blood’s normal ability to clot. Blood products are vital to treating severely injured casualties, but lose function during processing, storage and transportation. We focus on understanding these complex problems and on finding ways to deliver safe and effective blood products to the battlefield.

Research in our lab is focused on basic and translation research in metabolic function, blood product storage, and transfusion. The overall goal of our department is to deliver novel approaches to blood product storage and treatment of coagulation disorders that ensure an adequate supply of safe and effective blood products and cellular therapies to support the care of trauma patients in military operations around the globe.
FACULTY RESEARCH INTERESTS 2018-2019

DR. ANDREW P. CAP, Adjoint Professor

Research in the Department of Coagulation and Blood Research focuses on translating basic science in hematology, transfusion medicine and integrative physiology into clinical solutions for the care of traumatically injured patients. Our lines of effort include blood product development and blood safety; the study of acquired coagulation disorders in trauma, sepsis and use of extracorporeal life support systems; and the study of mesenchymal stromal cells in immunomodulation and wound healing following trauma. We employ in silico, in vitro and in vivo models and participate in multi-center clinical trials and other collaborative projects to make advances in these areas. Our department is comprised of 35 investigators, technicians and staff and is supported by a dedicated research blood bank, clinical instrumentation laboratory and flow cytometry facility. We have sponsored several MS and PhD students from the UTSA Departments of Cell and Molecular Biology and Biomedical Engineering and mentored post-doctoral candidates and junior faculty from UTSA and UT Health – San Antonio to successfully compete for DoD and NIH funding. We look forward to working with you.

DR. MICHAEL DUBICK, Adjoint Professor

Dr. Dubick is the Chief of the Damage Control Research (DCR) Program at the US Army Institute of Surgical Research and an Adjunct Professor in the Department of Surgery at the University of Texas Health Science Center in San Antonio. He earned a Master’s degree in Physiology and a PhD in Pharmacology and Nutrition both from the University of Southern California, Los Angeles. In the past 30 years with the Army, his research has focused on the physiology and pharmacology of fluid resuscitation from hemorrhagic and burn shock, including the use of blood products, small volume drug adjuncts and hypertonic/hyperoncotic fluids. He is also involved in hemorrhage control research efforts investigating various technologies such as hemostatic dressings and tourniquets. Additional research investigates the expression of oxidative stress and inflammatory responses after traumatic injury to identify therapeutic targets and investigate potential therapies to improve patient stabilization and survival after traumatic injury. He has over 600 published manuscripts, technical reports and abstracts.

DR. CARMEN HINOJOSA-LABORDE, Adjoint Professor

My research incorporates an integrated physiology approach to understanding how multiple organ systems contribute to the regulation of blood pressure during hemorrhage. On the battlefield, traumatic injury is usually associated with blood loss which elicits cardiovascular compensatory responses to maintain hemodynamic stability. Pain control on the battlefield may suppress these compensatory responses and compromise survival of the injured soldier. Using animal models of hemorrhage, my laboratory studies the effect of pre-hospital (on the battlefield) pain control on the compensatory responses to hemorrhage. We investigate the effect of analgesics recommended for use on the battlefield on the animal’s ability to tolerate and survive blood loss. These studies will help define best practices and innovative alternatives to current medical guidelines for pre-hospital care of the wounded soldier.
DR. KAI LEUNG, Adjoint Professor

My research centers on infections and wound healing. My earlier research focused on the physiology of macrophages and their interactions with neutrophils. To further my understanding of disease processes in wound infection, I have been studying the mechanisms by which bacteria adhere, colonize, and damage host cells and tissues. Successful adherence and colonization by microbes result in the formation of biofilms, which contribute to the development of many non-healing chronic wounds. We established a number of animal models including rodents, rabbits, and pigs for studying biofilm infections in wounds and for testing treatment modalities. We successfully used antimicrobial peptides and peptide mimetics as countermeasures to reduce biofilm burden in wounds. Using systems biology, we began to understand the key transcriptomic signatures essential for the fitness of some pathogens during early active and late-stage biofilm-dominant infection in wounds. In the past 5 years, we have also worked on eschar stabilization and mechanisms of hypertrophic scar formation as a result of burn injury. Complete List of Published Work in MyBibliography.

DR. ANTHONY E. PUSATERI, Adjoint Professor

Research interests include the identification of mechanisms of coagulation dysfunction following trauma and the development of improved blood products for transfusion. Currently the technical lead for a multicenter DoD Systems Biology Program in Trauma-Induced Coagulopathy. This project involves comprehensive biochemical evaluation of blood samples from patients with severe trauma to identify potential mechanisms of coagulopathy, and potential targets for development of diagnostics and therapeutics. Also involved in clinical development programs to obtain FDA approval for products for blood transfusion, resuscitation, and hemorrhage control. Research also includes clinical studies related to coagulopathy of trauma, prehospital treatment of patients with severe bleeding, and others.

DR. KATHY L. RYAN, Adjoint Professor

I have been a Research Physiologist at the US Army Institute of Surgical Research for over 18 years, primarily working in problems of cardiovascular physiology. I lead a research team that is focused on providing knowledge, techniques and solutions for prehospital care of combat casualties. To do this, we use animal models such as rats, pigs and baboons, but we also perform retrospective studies using clinical data from wounded soldiers. We currently have research programs in: 1) understanding physiological responses to airway obstruction and providing novel ways to manage airways; 2) ascertaining analgesic effects on cardiorespiratory function following hemorrhage; 3) understanding the development of acute kidney injury following hemorrhage and resuscitation; and, 4) understanding how the addition of traumatic brain injury affects the ability to survive hemorrhage.

For representative publications: https://www.ncbi.nlm.nih.gov/pubmed/?term=ryan+k
**DR. IVO TORRES FILHO, Adjoint Associate Professor**

Our research focuses on physiological mechanisms affecting the distribution of oxygen and blood flow in the microcirculation. Experimental strategies are used to investigate the pathophysiology of specific cardiovascular conditions and their treatment, particularly hemorrhagic shock. Whenever possible, we help develop new tools for diagnosis and interventions against these conditions. Major study areas include endothelial cell function and glycocalyx structure/function in vivo. We have developed and extensively used noninvasive techniques for measuring glycocalyx thickness and oxygenation in vivo. Our approach integrates traditional systemic physiological parameters, biomarkers, and microvascular variables such as microvascular permeability, leukocyte-endothelial interactions, platelet-endothelial interactions, local blood flow measurements, and in vivo glycocalyx determinations. Our focus is on translational physiology, and questions related to treatment of ischemia, hemorrhagic shock and trauma, primarily at microcirculatory level. Using techniques such as confocal intravital video-microscopy, we evaluate the efficacy of different fluids and other interventions in the treatment of trauma and hypovolemia following hemorrhage. Using a comprehensive approach, glycocalyx degradation and platelet function in vivo are integrated with coagulopathy in fluid resuscitation efficacy studies.

For more information: [http://scholar.google.com/citations?user=1aysmooAAAAJ&hl=en](http://scholar.google.com/citations?user=1aysmooAAAAJ&hl=en)

**DR. ERIK K WEITZEL, Adjoint Professor**

Research in my laboratory focuses on leveraging advanced surgical models of porcine vascularized composite allografts to enhance biologic survival. In a battlefield setting, tissue separated from the service member may play a useful role in both their short term and long term rehabilitation. Preserving this tissue through ex vivo transport techniques for eventual replant or secondary regeneration is critical in the promise of optimizing combat casualty care. The RESTOR regenerative medicine laboratory leverages its 10 surgeons and multiple scientists to focus on two major challenges in the transport and use of recovered battlefield tissue: 1) local immunosuppression techniques (as opposed to systemic) for allograft transplantation and 2) ex vivo perfusion with blood substitutes for extended detached graft.

**DR. JOSEPH C. WENKE, Adjoint Professor**

Joseph C. Wenke, PhD arrived at the US Army Institute of Surgical Research in San Antonio, TX as a National Research Council Postdoctoral fellow in 2003. The following year he accepted a position at ISR as a Research Physiologist and is now the chief of the Orthopaedic Trauma Department. His primary research focus is improving outcomes of open fractures, which are fraught with complications such as infection and nonunion. Much of his previous work has been on improving early therapies (e.g., wound irrigation techniques, negative pressure wound therapy and local delivery of antibiotics); current and future projects focus on regenerating bone in a contaminated bone defects and in polytrauma patients, targeted therapies for biofilm-related infections, and regenerating skeletal muscle. Many of these projects involve the dysregulated immune response to trauma on healing and immunoengineering approaches. One of the main strengths of his research program is the ability to utilize or develop clinically-relevant orthopaedic trauma animal models to evaluate different therapies or develop clinical guidelines. Besides conducting his own research efforts, Dr. Wenke was previously the government program manager for the Major Extremity Trauma Research Consortium ([www.metrc.org](http://www.metrc.org)), which is the largest orthopaedic trauma consortium ever. Over 9,000 patients have been enrolled in their prospective studies.

Dr. Wenke received a Bachelor of Science from Baylor University in 1997 and a PhD from Texas A&M University in 2003. Skeletal muscle plasticity and injury was his main areas of research while in graduate school.
**AFFILIATED FACULTY**

Affiliated Faculty serve on dissertation committees and provide research consultation for dissertation research.

**DR. EDWIN BAREA-RODRIGUEZ, Professor**

My main interest is scientific teaching. Scientific teaching is a pedagogical approach whereby teaching STEM courses is approached in the same way we conduct science. Scientific teaching has three main principles: 1) Active learning, 2) Assessment and 3) Diversity. My laboratory research expertise is behavioral neuroscience.

For more information: [http://utsa.edu/barealab/](http://utsa.edu/barealab/)

**DR. AARON CASSILL, Associate Professor of Cell & Molecular Biology**

My research laboratory is interested in the mechanism of signal transduction in the Imported Fire Ant olfactory system. My laboratory is currently using molecular biology techniques to isolate odorant binding proteins and serine/theonine protein kinases which might regulate the system.

For more information: [http://www.utsa.edu/biology/faculty/AaronCassill.html](http://www.utsa.edu/biology/faculty/AaronCassill.html)

**DR. M. NEAL GUENTZEL, Professor of Microbiology**

The main focus of my research is on bioremediation, which involves the use of microorganisms for removing toxic contaminants from the environment through metabolic activity. In addition to bioremediation, the laboratory also focuses on health effects studies and investigations into virulence factors of the human pathogens *Candida albicans* and *Vibrio cholerae*.

For more information: [http://stceid.utsa.edu/lab-Guentzel/](http://stceid.utsa.edu/lab-Guentzel/)

**DR. LUIS S. HARO, Professor**

Dr. Haro’s research program has centered on the identification, isolation and characterization of new human pituitary and placental hormones (growth hormones/cytokines/chemokines) and delineation of their biological roles in normal physiology (metabolism, growth, differentiation, aging, immunology, brain function) and abnormal physiology (cancer, diabetes, HIV infection). The hormones studied include synthetic mutants (site-directed mutants, deletion mutants), naturally occurring hormones, and post-translational or alternatively spliced hormones. After isolation of these hormones, their structures are determined and their biopotencies were tested in a variety of in vitro (cell culture and organ explant culture) and in vivo bioassays that measure the immunologic, lactogenic, metabolic, physiologic, and anatomic affects associated with these hormones. These types of studies help us understand the structure-function relationships of these hormones. In order to carry out physiological investigations of these hormones, the lab has developed novel protein separation methodologies, radioimmunoassays, radioreceptor assays, and immunological techniques used for their isolation, detection, and quantification in tissues and in biological fluids. The study of these hormones and their receptors help us understand how they regulate cell and organ function in normal and abnormal physiology.

For more information: [http://www.utsa.edu/biology/faculty/LuisHaro.html](http://www.utsa.edu/biology/faculty/LuisHaro.html)
DR. HANS HEIDNER, Professor of Microbiology
The primary focus of my research laboratory is the design and development of alphavirus-based vectors for vaccine and cell targeting applications. Alphaviruses are small RNA viruses that are transmitted to humans and other vertebrate hosts through the bites of infected mosquitoes. The alphavirus genome can be easily manipulated and this has led to the development of genetically modified alphaviruses capable of expressing foreign genes of interest in cultured cells or within living animals. They are using recombinant Sindbis viruses to evaluate new strategies for targeting alphavirus vectors to specific cell types that play an important role in the immune system. These efforts are intended to improve the immunogenic properties of alphavirus based-vectors that have been designed for use as vaccines. Our research also may lead to the development of modified viruses that can specifically target and eliminate tumor cells.

For more information: http://stceid.utsa.edu/lab-Heidner/

DR. MARTHA J. LUNDELL, Professor of Molecular Biology
The research interests in my laboratory focus on elucidating mechanisms that specify cell fate during neurogenesis. In particular, we are examining the developmental pathway of neurons that synthesize serotonin in the Drosophila CNS. By using a combination of genetics, molecular biology, immunohistochemistry and confocal microscopy, we have characterized a number of genes that are essential in the progression of the lineage from the progenitor neuroblast to the differentiated serotonin cells. Our characterization of the hierarchy of genetic interactions necessary for the differentiation of serotonin neurons will provide molecular tools that can be used to investigate the physiological function of serotonin in a genetically tractable organism.

For more information: http://www.utsa.edu/biology/faculty/MarthaLundell.html

DR. CLYDE PHELIX, Professor of Anatomy and Neurobiology
Emphasis is on extrahypothalamic influences on hypophysiotrophic and hypophyseal hormonal systems in CNS stress arcs. The majority of our anatomical work deals with chemical identification and morphological verification of brainstem and limbic afferents. Functional correlates involve neuroanatomical and pharmacological investigations of the role of neuronal pathways, between limbic-hypothalamic regions and brainstem cardiovascular regulatory centers in hemodynamic regulation during stress. The influences of environmental factors on gene expression in neuronal populations participating in the development of hypertension are a primary interest. Collaborations allow correlative investigations of chemoreceptive functions of area postrema, neurophysiological functions of transmitters in the hippocampus, and neurochemical effects of cocaine and other drugs of abuse on dopamine and serotonin in the basal forebrain.

For more information: http://www.utsa.edu/biology/faculty/ClydePhelix.html

DR. DAVID M. SENSEMAN, Associate Professor of Neuroscience
Research in my laboratory is focused on how visual information is processed within the vertebrate central nervous system to guide behaviors such as prey tracking and capture using turtles as an experimental model. A combination of experimental techniques including (1) high-speed voltage-sensitive dye imaging, (2) large-scale computational modeling, and (3) kinematic analysis combined with EEG and recordings form free-behaving turtles are being used to examine this problem. At present, the lab’s particular focus is on how visual information might be encoded in the dynamics of propagating cortical and tectal waves.

For more information: http://www.utsa.edu/biology/faculty/DavidSenseman.html
DR. VALERIE SPONSEL, Professor of Plant Physiology
My research focuses on the gibberellin group of plant hormones (phytohormones) that control many phases of plant growth and development, either alone, or in conjunction with other phytohormones. Understanding how the level and location of bioactive gibberellin is regulated throughout a plant’s life cycle can lead to opportunities for manipulating plant growth and development for the enhancement of food, fiber or fuel production. Currently students in my laboratory are studying gibberellin-auxin crosstalk, using biochemical, molecular biological, and bioinformatics approaches. This work is being conducted in conjunction with Drs. Garry Sunter (Biology) and Jianhua Ruan (Computer Science). Additional research projects include work on medicinal plants, such as Artemisia annua, which produces a valuable drug for treating malaria. Quantitation of artemisinin levels in phytohormone-treated Artemisia plants is being conducted in collaboration with Dr. Stephan Bach (Chemistry).

For more information: http://www.utsa.edu/biology/faculty/ValerieSponsel.html