



2017 MENTOR SELECTION LIST



BIOLOGICAL SCIENCE

1. **Dr. Godfrey Bourne – Facebook Page “CEIBA Biological Center, Madewini, Linden Soesdyke Highway”:** This research assignment requires the student to pay for travel to Guyana, South America. Please email maresk@umsl.edu for further information and details prior to selecting. Global Climate Change impacts tropical rainforest organisms of northern South America, especially on pollinators such as butterflies. The student projects are entitled “Organization and structure of a butterfly pollinator assemblage on forest daisy, *Wulffia baccata* in 2011 and 2017,” and “Organization and structure of a butterfly pollinator assemblage on sweet sage, *Lantana camara* in 2011 and 2017.” (2)
2. **Dr. Barry Burnette - <http://www.confluencediscovery.com>:** Intracellular signaling and targeted inhibition of kinases involved in cancer and inflammation. (1)
3. **Dr. Gerardo Camilo – <https://www.slu.edu/department-of-biology-home/faculty-and-staff/dr-gerardo-camilo>:** A new project this summer will be researching the relationship between bee diversity and food productivity in green roof gardens in downtown St. Louis. (2)
4. **Dr. Aimee Dunlap - <http://www.cognitiononthewing.com/>:** We study the evolution of information use (learning, memory, and decision making) using bumblebees and fruit flies as model systems. We test how bumblebees incorporate different aspects of their environment, like floral information and social information, to determine how they forage on flowers efficiently and track changes across the season. We use the same economic theory to test predictions about decision making in fruit flies, within lifetimes and across generations. The focus in each system is how animals balance multiple sources of information. (2)
5. **Dr. Joel Eissenberg -** The project will involve the purification and characterization of an enzyme (a serine protease) required in *Drosophila* (fruit fly) embryonic development to specify the dorsal-ventral polarity. (1)
6. **Dr. Uthayashanker Ezekiel - <http://www.slu.edu/doisy/faculty/ezekiel-uthayashanker.php>:** My laboratory research focus is to identify phytochemicals derived from plant sources that have anti-cancer properties and subject them to systematic study to define their effect on cancer cells. The proposed work focuses on elucidating: (1) effects of phytochemicals on colon cancer cell proliferation; (2) molecular mechanisms of phytochemicals that inhibit colon cancer cell proliferation; and (3) effects of phytochemicals as they inhibit or reverse mesenchymal transition of chemoresistant metastatic cells. (1)
7. **Dr. Jonathan Fisher – <http://sites.google.com/a/slu.edu/fisher-lab/>:** Many types of cells are able to export electrons across their plasma membranes to extracellular targets. We are examining the mechanisms for this electron export in muscle cells. In particular, we will examine whether manipulating the rate of electron export can affect intracellular metabolic signaling. (2)
8. **Dr. Blythe Janowiak - <https://sites.google.com/a/slu.edu/janowiak-lab/>:** 1) colonization & virulence of Group B Streptococcus in mice, 2) host-pathogen interaction between Group B Streptococcus and mammalian immune cells, 3) oxidative damage in Group B Streptococcus, 4) differential gene expression in Group B Streptococcus. (4)
9. **Dr. Joseph Jez - <http://pages.wustl.edu/jezlab>:** We explore a variety of regulatory networks in plants and microbes. Experimentally, we use a combination of biochemistry, protein engineering, x-ray crystallography, and cell biology to investigate the molecular basis of biological processes. (1)
10. **Dr. Jack Kennell - <http://bio.slu.edu/kennell/>:** The identification and characterization of cellular pathways involved in communication between mitochondria and the nucleus. (1)
11. **Dr. Elizabeth Kellogg – <http://kellogglab.weebly.com/>:** We study evolution of plants using bioinformatics approaches, as well as genetics and molecular biology. (2)

12. **Dr. Sergey Korolev** - <http://biochem.slu.edu/faculty/korolev/Home.html>: Structural and mechanistic studies of 1) cancer-related proteins involved in DNA repair, and, 2) calcium-independent phospholipase implicated in neurodegeneration and cardiovascular diseases. (1)
13. **Dr. Zhenguo Lin** – <http://www.slu.edu/~shenguo/lin/>: My lab mainly focuses on studying the evolution patterns and mechanisms of genome and gene regulation through integrative analyses of “omics” data (students with Linux experience preferred). (2)
14. **Dr. Adriana Montaña** - <http://www.slu.edu/medicine/pediatrics/divisions-and-faculty/medical-genetics/adriana-m-monta%C3%B1o-phd>: We are focused on the research of lysosomal storage disorders. We have been studying the basic biology of the Mucopolysaccharidoses in order to develop novel treatments. In addition, we are conducting a pilot study to establish newborn screening of Mucopolysaccharidoses. (2)
15. **Dr. Wendy Olivas** - http://openwetware.org/wiki/Olivas_Lab: The Olivas lab studies how members of the Puf family of eukaryotic RNA-binding proteins stimulate the degradation of specific mRNAs, thus controlling protein production from those mRNAs. We use both the yeast *Saccharomyces cerevisiae* model system as well as human cell lines to perform experiments investigating the mechanisms by which Puf proteins stimulate mRNA degradation and the pathways by which Puf protein activity is altered by varying environmental conditions, and the roles of Puf proteins in Parkinson's disease. (1)
16. **Dr. Laurie Shornick** - <http://www.slu.edu/department-of-biology-home/faculty-and-staff/dr-laurie-shornick>: Infants are very susceptible to infection. My laboratory is interested in understanding the differences between the neonatal and adult immune response to respiratory viral infections. (2)
17. **Dr. Dorota Skowrya** – <http://biochemweb.slu.edu/people/faculty/skowrya.shtml>: 1) the immunoproteasome in the onset of type I diabetes (autoimmune disorders); 2) proteasomal proteolysis in liver disease associated with antitrypsin-deficiency (diseases associated with protein misfolding); 3) poxvirus-mediated changes in ubiquitin-mediated proteolysis of mouse macrophages (proteasome/viral infections/antiviral responses); 4) new pharmacological regulators of the 26S proteasome (drug discovery). (1)
18. **Dr. Xuemin (Sam) Wang** - <http://danforthcenter.org/scientists-research/principal-investigator/sam-wang>: Cell signaling, lipid metabolism, and biotechnology to improve plant oil production, drought tolerance, and N/P use efficiency. (1)
19. **Dr. Wenyan Xiao** - <http://www.slu.edu/department-of-biology-home/faculty-and-staff/dr-wenyan-xiao>: Genetics and plant biology. His laboratory studies the mechanisms underlying DNA methylation and demethylation in regulating imprinting and reproduction in plants. (1)
20. **Dr. Fenglian Xu** – <https://sites.google.com/a/slu.edu/xu-lab/>: Our lab studies the cellular and molecular mechanisms that control neuronal growth, synapse formation, neurodegeneration and regeneration processes. These are critical processes that are involved in normal brain development and function, as well as in repairing neural damage after stroke or trauma. We conduct our research using primary cell cultures of rat or snail neurons in combination with several modern neuroscience techniques including electrophysiology, immunohistochemistry, confocal microscopy and molecular biology. Results from our research contribute to our fundamental understanding of neurodevelopmental and neurodegenerative disorders. (2)

CHEMISTRY

21. **Dr. Eike Bauer** - www.eike-bauer.net: Our research is directed toward the development of new catalyst systems based on ruthenium and iron. The catalysts speed up chemical reactions and may find applications in pharmaceutical production. (1)
22. **Dr. Dana Baum** - <http://www.slu.edu/~dbaum1/>: We are interested in using DNA as a catalyst in a variety of applications. DNA is known for its coding role in cells, but DNA also has properties that make it a useful tool outside of the cell. Possible projects involve using DNA as a catalyst in biofuel cells and using DNA in sensors for pollutants in the environment. (1)
23. **Dr. Janet Braddock-Wilking** - <http://www.umsl.edu/chemistry/Faculty/braddockwilking.html>: Our research interests involve the synthesis, characterization, and reactivity studies of luminescent heavier Group 14 analogs of metalloles, metallafluorenes, and metallafluoresceins. These molecules are of interest for their unusual optoelectronic properties and potential applications as components for organic light emitting diode devices (OLEDs), and as chemical and biological sensors. (1)

24. **Dr. Benjamin Bythell** - <http://www.umsl.edu/chemistry/Faculty/bythell.html>: My research is half computational chemistry and half mass spectrometry. I am interested in molecular shape, structure and ways to determine this by smashing ions into pieces then looking at the fragments. (2)
25. **Dr. Sophia Hayes** - The Hayes Lab conducts studies of semiconductors and thin film materials used in advanced electronic devices. They study these by a form of spectroscopy called "NMR". Even though the group is housed in Chemistry, many students who come to the group have an interest in physics or engineering—especially those who are comfortable around "home-built" instrumentation. (2)
26. **Dr. Istvan Kiss** - <http://www.slu.edu/~izkiss/>: Chemical Brain: Complex dynamics of networks of electrochemical reactions. Overall goal in our group is the development of a nanoscale chemical computing device that can process information, incorporates battery and sensors to perform higher-level functions such as memory and adaptation. To achieve this goal we investigate collective dynamics (e.g., synchronization and chaos) of networks of current generating chemical reactions with electrochemical cells. (1)
27. **Dr. Richard Mabbs** - Using mass spectrometry, ultrahigh vacuum equipment and pulsed lasers, we image photoelectrons to probe molecular electronic structure. STARS participants will experience state of the art physical chemistry research techniques and develop simple qualitative models to explain experimental results. These will serve to provide better understanding of the fundamentals of chemistry. Participants will also explore methods of incorporating this material into pedagogical tools aimed at illustrating and clarifying essential basic concepts of quantum chemistry. (1)
28. **Dr. James O'Brien and Dr. Leah O'Brien** - High Resolution Molecular Spectroscopy conducted by Intracavity Laser Absorption Spectroscopy (ILS) and Fourier Transform Emission Spectroscopy (FTS). Diatomic gas-phase free radicals such as Platinum Fluoride, Germanium Hydride and Copper Oxide are created for spectral observations in RF and DC plasma discharges. Our aim is to characterize the electronic, vibrational and rotational structure of these species which can be important in catalysis, for semiconductors and theoretically. Over the past several summers, STARS students engaged in such work have been co-authors of papers published in top journals such as the Journal of Molecular Spectroscopy. In summer 2017, hollow cathode and planar electrodes will generate plasmas used to generate the absorbing or emitting species. Dye or Ti:Sapphire lasers will be used for ILS studies and a state of the art Bruker 125M FTS instrument may be used to obtain FTS spectra. (2)
29. **Dr. Bryce Sadtler** - <http://www.chemistry.wustl.edu/faculty/sadtler>: We use solution phase chemistry to design inorganic nanostructures for applications in solar energy conversion and catalysis. (1)
30. **Dr. Vijay Sharma** - <http://vijaysharmalab.wustl.edu>: My research interests are at the interface of radiopharmaceutical chemistry, medicinal chemistry, and biology, to discover and develop molecular probes, for addressing important biological questions across multiple disciplines. Specific emphasis is towards the design of small organic molecules, peptides, and metalloprobes, including their radiolabeled counterparts for diagnosis of diseases, such as Alzheimer's disease and coronary artery disease (Myocardial Perfusion Imaging), tumor imaging, to understand protein-protein interactions via imaging of reporter gene expression *in vivo*, and to investigate biological mechanism(s), using agents designed and developed within the group for rapidly emerging fields of molecular imaging. (3)
31. **Dr. Keith Stine** - <http://www.umsl.edu/chemistry/Faculty/stine.html>: The project will involve the use of electrochemical methods to create gold nanostructures for potential use as chemical or biological sensors for the detection of disease-related molecules. (1)
32. **Dr. Chung Wong** - www.umsl.edu/~wongch: Computer-aided drug discovery. Pathogen detection by whole-genome sequencing. (3)
33. **Dr. Grigoriy Yablonsky** - http://en.wikipedia.org/wiki/Grigoriy_Yablonsky: The topic of this project will be the Mathematical Model of Pressurized Oxy-Combustion Chemical Process which is one of the most perspective processes of energetic technology. Working on this project, the student will gain skills of both physico-chemical understanding of modern technology, and mathematical modeling (see books by Yablonsky, "Kinetics of Chemical Reactions", Wiley, 2011; "Advanced Data Analysis and Modeling in Chemical Engineering" Elsevier, 2016). (1)
34. **Dr. Brent Znosko** - <http://www.slu.edu/~znoskob/>: My research lab studies RNA structure and stability. This STARS project will involve using software and computer programming to examine and compare solved 3D structures of RNA in an attempt to find structural patterns that can be applied to RNA sequences for which we have no 3D structure. (1)

ENGINEERING / EARTH & ATMOSPHERIC SCIENCE / COMPUTER SCIENCE

35. **Dr. Ramesh Agarwal** - <http://www.mems.wustl.edu>: Problems in the areas of Energy and Environment. (1)
36. **Dr. Parag Banerjee** - <http://research.engineering.wustl.edu/~parag.banerjee/>: Atomic layer deposition (ALD) of thin films, solar cell fabrication. (1)

37. **Dr. Jeffrey Catalano** - <http://aggeochem.wustl.edu/>: We are seeking students to work on two projects (1 student each): (1) Minerals serve as natural water filters that remove contaminants from water. This project will study how minerals made from aluminum hydroxide remove the carcinogen arsenic from different types of water. (2) Trace metals like nickel and zinc occur in soils and are both essential nutrients for plants and microorganisms but also can be contaminants that negatively impact human health. This project will investigate how natural organic compounds produced by plants roots affect how soil materials bind and trap trace metals, affecting their bioavailability. (2)
38. **Dr. Amanda Cox** - <http://parks.slu.edu/faculty-staff/parks-faculty/amanda-cox>: Research is in the area of Hydraulic Engineering with a focus on open-channel flow applications including river engineering, urban drainage, and erosion control. The primary methods used are scaled-physical models and numerical models including computational fluid dynamics. (2)
39. **Dr. David Fike** - <http://biogeochem.wustl.edu/>: **(Click on the Research tab and find Sulfur cycling in seafloor methane seeps)**. In the Stable Isotope Biogeochemistry lab, we study geochemical signatures of sulfur cycling to understand how environmental conditions are preserved. By studying modern environments (such as methane seeps), we can look for causal relationships between the instantaneous record captured from the water in the sediments and the more permanent archive that is the mineral record. (1)
40. **Dr. Daniel Giammar**- <http://users.seas.wustl.edu/degiammar/ACL/>: Chemical reactions for treatment and supply of safe drinking water. Particular interests are reactions that can be used to control lead concentrations in tap water. (1)
41. **Dr. Young-Shin Jun** - <http://encl.engineering.wustl.edu/>: The Jun group is exploring the environmental impacts of human activities through improved understanding of the fate and transport of contaminants and nanoparticles. In particular, we aim to improve our understanding of environmental impacts of climate change. We study biogeological cycling in complex environmental systems from nanoscale to macroscale, with a view to conserving and restoring sound water environments. Based on our strong scientific understanding of nanoscale interfacial chemistry and solid nucleation, we seek innovation for sustainable water. We develop new treatment techniques and catalysts for purifying drinking water and remediating contaminated water and soil, benefiting water reuse, managed aquifer recharge, and reverse osmosis processes. In addition, the ENCL investigates biomineralization and bio-inspired chemistry for novel materials development. To address challenges in energy-water nexus, our group research involves a more comprehensive investigation of energy-related subsurface operation systems for sustainability, including geologic carbon dioxide sequestration and conventional and unconventional oil and gas recovery, hydrothermal energy, and nuclear waste disposal. (1)
42. **Dr. Henry Kang** – www.cs.umsl.edu/~kang/: Computer graphics, computer games and computational art. (3)
43. **Dr. Jianfeng (Jeff) Ma** – <http://parks.slu.edu/faculty-staff/parks-faculty/jeff-ma-phd/>: Research areas include computational solid mechanics, designing and optimizing of tires (NASA lunar tires), investigation of advanced manufacturing processes, mechanics/robotics, and micro- and nano-manufacturing of brittle materials. (2)
44. **Dr. Mark McQuilling** – <https://sites.google.com/a/slu.edu/mmcquill2/>: This summer we will be using our new polysonic wind tunnel to explore the aerodynamics around a linear turbine cascade of high pressure turbine airfoils in collaboration with Honeywell Aerospace. Student(s) will have the opportunity to run the tunnel, calibrate instrumentation, analyze acquired data, and work with a team of undergraduate and graduate students in assessing what the measurements tell us about secondary flows throughout the turbine geometries. (3)
45. **Dr. Ramesh Raliya** – <https://sites.wustl.edu/rameshraliya/>: Advance nanomaterial synthesis and characterization for biological application. (2)
46. **Dr. Scott Sell** - <http://parks.slu.edu/faculty-staff/parks-faculty/scott-sell/#/biography> : The focus of our lab is the fabrication and evaluation of tissue engineering scaffolds capable of replicating both the form and function of the native extracellular matrix (ECM). Through the creation of idealized tissue engineering structures, we hope to harness the body's own reparative potential and accelerate regeneration. We are primarily interested in utilization of the electrospinning process to create nanofibrous polymeric structures that can be applied to a wide range of applications. Of principal interest to our laboratory is the fabrication of scaffolds capable of promoting wound healing and the filling of large tissue defects, as well as orthopedic applications such as bone and ligament repair. (4)
47. **Dr. Srikanth Singamaneni** - <http://softnano.wustl.edu/Pages/default.aspx>: The research project involves the design, synthesis and assembly of metal nanoparticles for ultrasensitive biodetection and bioimaging applications. (1)
48. **Dr. Abuduwasiti Wulamu** – www.remotesensing.org: This summer we will be working on several STEM research projects including: 1) Unmanned Aerial Systems, agricultural robots, and imaging, 2) biofuels and deep learning, 3) understanding regional crop responses to climate change induced water and ozone stress, and 4) monitoring and predicting toxic algae outbreaks in surface waters in Missouri. We use hyperspectral-imaging systems deployed on drones and satellites and field-based investigations to carry out the research. (4)

49. **Dr. Silviya Zustiak** - <http://www.slu.edu/~szustiak/>: We develop hydrogel biomaterials to use as in vitro cancer models and as drug delivery vehicles. The broader name for our research is soft tissue engineering. (2)

MEDICINE / PSYCHOLOGY / ALLIED HEALTH

50. **Dr. Michael Anch** - <https://sites.google.com/a/slu.edu/neurolab/home>: The study of how anesthesia would affect (or replace/modify) slow wave (deep sleep) in rats.

51. **Dr. Mikhail Berezin** - www.berezinlab.wustl.edu/index.php?id=18: The student will search for optical signatures using hyperspectral imaging from UV to short-wave infrared. (1)

52. **Dr. Zhou-Feng Chen** - http://csi.wustl.edu/labs/lab_overview/chen_lab: We study the neural basis of itch sensation in mice. (1)

53. **Dr. Angela Hirbe** – http://oncology.wustl.edu/people/faculty/Hirbe/Hirbe_Res.html: As a practicing medical oncologist who treats sarcoma, my research focuses on utilization of genomic information from sarcomas to better understand the pathogenesis of these tumors and to identify biomarkers and therapeutic targets for these aggressive cancers. (1)

54. **Dr. Kory Lavine** – http://dbbs.wustl.edu/faculty/Pages/faculty_bio.aspx?SIC=6598 OR <https://cardiovascularresearch.wustl.edu/labs/kory-j-lavine-md-phd/>: The primary focus of my laboratory is to identify mechanisms that govern the pathogenesis of heart failure with a focus on understanding the role of macrophage diversity in heart failure progression, tissue repair/regeneration, and coronary growth. (2)

55. **Dr. Mark Knuepfer** - <http://www.medschool.slu.edu/pharmphys/index.php?page=mark-m-knuepfer-ph-d>: We study the role of the renal nerves in causing hypertension and other cardiovascular diseases. We study the effects of renal nerve activation in rats. (2)

56. **Dr. Amit Mathur M.D.** – www.research.peds.wustl.edu/labs/mathur_a: My area of research involves the study of brain development and brain injury in premature and full-term newborn infants. I use a combination of bedside EEG monitoring, near infrared spectroscopy and MRI scans to evaluate brain injury and development. (2)

57. **Dr. Sara McBride-Gagyi** - <http://orthopedics.slu.edu/index.php?page=sara-h-mcbride-ph-d>: Our lab researches surgical procedures to regenerate amounts of bone too large for the body to do on its own. (2)

58. **Dr. Adriana Montano, PhD** – <http://www.slu.edu/medicine/pediatrics/divisions-and-faculty/medical-genetics/adriana-m-monta%C3%B1o-phd>: We are focused on the research of lysosomal storage disorders. We have been studying the basic biology of the Mucopolysaccharidoses in order to develop novel treatments. In addition, we are conducting a pilot study to establish newborn screening of Mucopolysaccharidoses. (2)

59. **Dr. Steve Mumm** – <http://bonehealth.wustl.edu/research/laboratories/mumm-lab/>: We study the molecular genetics of rare inherited bone diseases, such as hypophosphatasia, juvenile Paget's disease, X-linked hypophosphatemic rickets, and many others. The major goal is to identify specific gene mutations in patients' DNA as the cause of their bone disease. (1)

60. **Dr. Bobbi Pineda** – <http://www.ot.wustl.edu/about/our-people/faculty/bobbi-pineda-270>: I do research on infants born very preterm who are hospitalized in the neonatal intensive care unit. Areas of inquiry can involve infant development, infant feeding, the neonatal intensive care unit environment, pain in the newborn or the effects of early therapy/enrichment. Students have the opportunity to observe medical rounds in the NICU, learn about infant behavioral assessment, and engage in a project using existing data. (4)

61. **Dr. Terri Rebmann** – https://www.slu.edu/public-health-social-justice/research/centers_institutes/institute_bsdph.php: The research project will not involve any laboratory work as I do not work in a lab. There are multiple studies occurring through the Institute for Biosecurity and students could decide between the project options. The most likely projects available will be related to one of the following topics: 1) assessing community resilience as it relates to the integrity of existing local hospital and regional stockpiles regarding supply integrity and existing policies and procedures, and 2) assessing changes in preparedness over time (from 2012 – 2016) in the St. Louis County closed POD (points of dispensing) network in preparation for distributing medical countermeasures during a pandemic or bioterrorism attack. Other disaster-related research projects may also be available this summer, depending on data availability. (2)

62. **Dr. Phyllis Stein - www.hrv.wustl.edu:** Our laboratory analyzes information from heart rate patterns on long-term continuous electrocardiograms, usually 24-hour ambulatory recordings or overnight sleep studies. These patterns can be quantified mathematically as heart rate variability measures or analyzed graphically in different ways. What I have in mind for this summer is the performance of graphical heart rate pattern analysis from a set of 24-hour recordings on people who do and do not have chronic multi-symptom illness (fibromyalgia or chronic fatigue syndrome). These recordings have already been analyzed enough so that heart rate patterns can be plotted using software that we already have. We expect that heart rate patterns, especially during sleep, will be different who are healthy and those who are not. Thus, the student will be working on finding and quantifying any differences in heart rate patterns between these two groups. The student will be using an existing dataset to create a matched set of people to compare, matching cases and controls on both age and gender. (2)

THE COMPLETE APPLICATION PACKAGE MUST BE SUBMITTED AT ONE TIME AND MUST INCLUDE ALL ITEMS LISTED BELOW IN THIS ORDER:

- 1) **\$80.00 non-refundable, application fee - this check must be made out to UMSL and clipped TO THE TOP - we are not able to accept credit cards.**
- 2) **2017 application (not handwritten) available on the STARS website**
- 3) **signed PERMISSION AND BINDING COMMITMENT AND AGREEMENT**
- 4) **YOUR COMPLETE SCHOOL TRANSCRIPT**
- 5) **scores of all standardized tests taken (PSAT, SAT, PACT, ACT, etc.)**
- 6) **your one-page essay**
- 7) **financial aid application if applicable**
- 8) **Recommendation Letter: You must follow the instructions on the STARS Recommendation form on the last page of your application. Your application will not be processed before receiving this information from your science teacher, counselor or principal.**

The complete application packet must be post marked between March 2 and Wednesday, March 25.

MAIL TO:

**STARS PROGRAM
239 RESEARCH BUILDING
UNIVERSITY OF MISSOURI-ST. LOUIS
ONE UNIVERSITY BLVD.
ST. LOUIS, MO 63121-4400**

