The following faculty have directly indicated their interest in having a Biology Honors Student in their laboratories. Please feel free to contact them regarding your interest in working with them!

Dr. Ulrike Muller – umuller@csufresno.edu
In my lab, we study how carnivorous plants catch their prey. We have two main lines of research: (1) figuring out the mechanics of prey capture, and (2) quantifying how good these plants are at catching prey. We use bladderwort, a genus of carnivorous plants with more than 200 species that comprise the smallest and fastest suction predators as well as have the smallest angiosperm genome. We study questions such as "how small can you get and still successfully capture prey using suction feeding?"; "are bladderwort collecting or selecting their prey?"; "how good are bladderwort at catching prey and how does this change with age and size?"; "how do bladderwort take up nutrients from their prey?". We use high-speed cameras and robotic models to study the mechanics of prey capture; we are developing new methods to study predator-prey interactions using dyes and hearing aids (yes, you can hear the traps snapping). We collaborate with researchers in Florida, Germany, the Netherlands, Israel, and Japan.

Dr. Joe Ross – jross@csufresno.edu
Part of our research group seeks to understand how genetic changes (mutations) cause parents to have unhealthy (sterile or dead) offspring. More broadly, this is called the study of species formation. To study this question, we use microscopic worms (like *C. elegans*) and tools like measuring the fitness of parents, then mating them, measuring the health of their offspring, and extracting and analyzing DNA of healthy and unhealthy worms to find the regions of their chromosomes that contain fitness-reducing mutations. Recently, some projects in the lab have focused on our prior result that some offspring have dysfunctional mitochondria, and future questions we hope to study include: a) what aspects of mitochondrial biology are not functioning properly? b) does reduced mitochondrial function cause slow development? c) do these unfit worms consume less oxygen (a potential collaboration with Dr. Dejean in the Department of Chemistry)? Another line of inquiry involves mitochondrial inheritance. Normally, animals inherit all of their mitochondria only from their mothers, but we have found that our worms occasionally inherit some mitochondria from their father. We have positions (perhaps paid) to study the mechanisms that enable these weird worms to avoid inheriting mitochondria solely from their mothers. A third broad question to be addressed seeks to identify genetic differences between different populations of our worms (e.g. from India, Japan, Ohio, Kenya) that help them adapt to life at different temperatures. The broad outcome of this type of project is to better understand the extent to which genetics can limit the ability of natural populations to withstand climate change.

Dr. Alexandria Hansen – akhansen@csufresno.edu
As a new faculty hire this Fall, I am interested in starting a research lab - come be a founding member! My research focuses on effective teaching practices for K-12 STEM education. I am interested in developing curricula, professional development opportunities for local teachers, and outreach programs to support and create more pathways for all students to become STEM-literate in the 21st century. I am also interested in understanding how to better support teachers and students in using technology as a means of creation (think 3D-printers, laser cutters, arduinos, etc.) to learn about both engineering and computer science. I employ qualitative research methods -- interviews, focus groups, observations, ethnographies, and video analysis.

Dr. Jason Bush – jbush@csufresno.edu
My research group broadly investigates a range of biological problems addressing breast, thyroid, and pancreatic cancer models as well as aspects of stem cell biology. We often take larger-scale 'omic' approaches to problems such metabolomic signatures in breast cancer models; effect of bisphosphonate drugs on osteotropic breast cancer cells; stem cell markers in drug-resistant pancreatic cancer cells; and recently, investigation of the adipokine profile in different adipose tissue depots from patients with coronary artery disease. Among these projects, students learn marketable laboratory skills with the opportunity to work in a team-based science environment.

Dr. Steve Blumenshine – sblumens@csufresno.edu
Organism & Population Responses to Environment
A current focus in our group is the bioenergetics of juvenile salmon. We collaborate with university and agency collaborators on this topic, including experiments at a new $26M hatchery in Friant operated by CA Fish & Wildlife. Undergraduate research projects could address basic biological questions of 'nature vs. nurture' as an experiment this fall addresses variation in salmon fry survival and growth as a function of parental crosses (genetics), temperature, and feeding rates. We also have need for students on very promising field-based projects that would support larger research objectives focused on environment-community relationships and hydrology.

We have a very strong history of including undergraduate research within our larger projects, and are averaging >20 research presentations/year from these efforts. Students in the lab have been extremely successful in obtaining their own funding through university and CSU sources. Recent and former Smittcamp students in the lab have earned prestigious research opportunities with Auburn University, the University of Notre Dame, and the U.S. Forest Service. Our lab has also produced a number of

research awards in the past few years. We look forward to hearing from you and discussing mutually supportive research development.

Dr. Joshua Reece – joreece@csufresno.edu
The Reece lab has room for student researchers interested in working on several different projects that range from molecular DNA laboratory work to computational analyses to field work. We are a community of researchers that values field work, analytical skill development, interdisciplinary collaborations, team building, student-driven projects (you are more than just a cog in my research machine!), and professional development. Project opportunities include:

1) Environmental DNA sequencing of reptiles, amphibians and fish in rivers of Sequoia and Kings Canyon
2) Acoustic bat monitoring of bats and placement of bat box habitat on CSU Fresno campus and at the Fresno Chaffee Zoo
3) Molecular DNA sequencing and analysis of Western Pond Turtles
4) Ultrasonic soundscape analysis and spatial imaging of Fresno State campus
5) Comparative phylogenetic analysis of moray eel body shape and size
6) Bird and invertebrate surveys of Morro Bay to assess the impact of dredging
7) Assessment of sea-level rise on the biodiversity of Georgia's coastline

Dr. Emily Walter – ewalter@csufresno.edu
The Walter lab is seeking undergraduate student researchers interested in solving the national issues of scientific literacy and use of ineffective classroom practices at the college level. Science education is an emergent field with high demand in STEM departments, making it a good option for students considering a career that balances teaching and research. Our work is a combination of biology, psychology, and statistics. Experts in this field know and teach science courses, but focus their research expertise is in education. The Walter Lab focuses on college science teaching and learning, as well as understanding how to help faculty improve their teaching practices. This research also supports understanding and improving diversity and inclusion in STEM. Our lab is a community environment in which you have the opportunity to have a major leadership role on your choice of project (see below). You will have one-on-one meetings with me as the PI, as well as meetings to work in a group environment with your peers. Many of our students have traveled to national and international conferences to present their work. More information about our lab can be explored at https://walterresearchgroup.com

Current Walter Lab Projects (and primary methods of data collection)
-- *Faculty Teaching Practices.* Bulldogs for Excellence in STEM Teaching (survey, interview, observation)

-- *Project Evol-V.* Students' Evolution knowledge and Acceptance (mostly survey, some interview)
-- *Building Biology Experts.* Exploring the relationship between learning attitudes about science and knowledge. (all survey data)
-- Undergraduate Research Experiences in Biology (All survey data)
-- First Year Experience and its Ties to Building a STEM Identity (survey, network analysis, interview)
-- New project (starting Jun 2019): Exploring STEM faculty teaching practices in Egypt (unknown)

Dr. Katherine Waselkov – kwaselkov@csufresno.edu
Plant Evolutionary Biology
The Waselkov lab studies plant evolution, using a variety of different systems. Undergraduate honors students are encouraged to pursue their own research interests in plants, genetics/genomics, bioinformatics, ecology, evolution, natural history specimen curation, and/or agricultural weed science, through involvement in one of these projects. Students learn techniques ranging from field collection methods to molecular laboratory basics to bioinformatics analysis of next-generation sequencing data. No matter which system the student is involved in, they gain experience in experimental design to start their project, and statistical and/or population genetic and phylogenetic analysis of their results at the project's conclusion. Research is often presented at local, regional, or national scientific meetings, and students are authors on peer-reviewed scientific publications. See more: https://waselkovlab.com/
Current research opportunities:
· Species delimitation in the agriculturally-important genus *Amaranthus*
· Herbicide resistance evolution in the agricultural weed hairy fleabane
· Investigating the recent agricultural invasion of Palmer amaranth, using population genomics
· Population genetics and taxonomy of showy phlox, a mountain wildflower
· Digitization and analysis of plant specimen data from the Fresno State Herbarium to study flowering time shifts due to climate change
· Conservation genetics of native plant species in Fresno County

Dr. Brian Tsukimura – briant@csufresno.edu
The Tsukimura lab team studies reproductive physiology at numerous levels, from molecular expression of yolk proteins, to physiology regulation, to ecological impacts of climate change and ocean acidification effects on fecundity. Though we use molecular and ecological techniques, our research questions are along organismal levels. My laboratory develops researchers with the goal that their work will be included in a conference presentation or journal article. The research performed is will be confluent

with ongoing studies, which include ocean acidification, thermal and behavioral stress due to climate change, and endocrine regulation of reproduction in crustaceans. Current funding includes studies on thermal stressors on reproduction associated with climate change, and the transduction of these stressors onto other species.

Dr. Mamta Rawat – mrawat@csufresno.edu
Our research concerns bacteria and their stress responses, in particular the role of low molecular weight thiols in protecting bacteria against stress. We use molecular and biochemical techniques to understand the function of genes and proteins associated with protection against stress in pathogenic bacteria and environmental bacteria. We are particularly interested in thiol dependent detoxification of toxins, such as antibiotics, in disease causing bacteria. This thiol dependent detoxification may be responsible for inherent drug resistance in pathogens such as *Pseudomonas aeruginosa*, *Staphylococcus aureus* and mycobacteria and thus we are characterizing the genes and proteins involved in this mechanism. Since thiols also play a critical role in protection against reactive oxygen and nitrogen species that the pathogens face within the human host, we are examining these protective processes in these bacteria. This research has major implications for understanding pathogenesis and antibiotic resistance in these pathogens and has been funded by National Institutes of Health. The research on *P. aeruginosa* is performed in collaboration with Dr. T. Van Laar and collaborators from other parts of the country and world.

In addition to working with medically relevant bacteria, we are also interested in non-pathogenic bacteria. We perform research on stress responses of cyanobacteria which are responsible for more than a quarter of the carbon fixation through photosynthesis in the world. This research is funded by the National Science Foundation. We have also isolated and enriched for bacteria from highly alkaline and salt-laden soils and lakes and are interested in how these bacteria survive such hostile environments. Lastly, we are interested in the plant microbiome and how the bacteria help with plant growth and development. The research on plant microbiome is performed in collaboration with Dr. J. Constable and Dr. K. Waselkov.

Dr. Alija Mujic – amujic@csufresno.edu
Systematics, taxonomy, and ecology of fungi.
The Mujic lab uses molecular genetic tools to study the systematics, taxonomy, and ecology of fungi. Research in our lab group has a special focus on ectomycorrhizal fungi which form mutualistic symbioses with forest trees and support ecosystem stability and function through nutrient exchange with their hosts. Many of these fungal species form large fleshy mushrooms that are of economic importance as gourmet and subsistence human foods.

Work in our lab uses direct field collection, in-vitro culture, and container plant assays. Much of my field work has been international and has produced ongoing collaborations with colleagues in Japan, China, Taiwan, Mexico, Chile, and Argentina. A primary method of our lab is phylogenetic analysis of DNA sequence data generated through Sanger sequencing and next generation sequencing techniques. The whole genome datasets we work with require the use of bioinformatic tools and computer programming. Future research in the lab will include study of gene transcription responses (RNA-seq) to symbiosis as well as fungal community ecology using metagenomic barcode sequencing of environmental DNA.

While much of my work has focused on ectomycorrhizal fungi, I have a broad general interest in fungi and the symbioses they form with other organisms. Ultimately, any project you get involved with in the lab should be something of interest to you and I would like to hear more about your own research interests and career goals. Here are a just a few of the current research opportunities in the lab:

--Investigating the potential for co-cropping gourmet truffles (Tuber spp.) in California pecan orchards.

--The diversity of ectomycorrhizal fungi associated with the Santa Lucia fir (*Abies bracteata*), a rare tree restricted to the mountains along the Big Sur coast.

--Global Phylogeography of the ectomycorrhizal fungus, *Rhizopogon.*

--The North American Mycoflora Project, sequencing fungal diversity through citizen science.

--Biogeography of introduced and naturalized ectomycorrhizal fungi in Mexican and U.S. pecan orchards.

David Lent

The goal of my research is to understand the use of spatial information at a behavioral level and to analyze the neuronal circuitry that supports spatial behavior and the formation of memories.

Such studies should inform us about ways in which behavior changes as a consequence of learned spatial associations, the structural and physiological changes that support spatial associations, and how neural networks have evolved to solve general and specific spatial problems. This research will allow us to understand how perception of the environment is computed and stored in the nervous system and acted upon by an organism and how the behavior declines as a consequence of damage and changes in neural circuitry.

My lab uses a number of approaches and we have a number of groups:

1) Computation and engineering: developing open and closed-loop simulation and virtual reality. Modelling visual perception, learning, memory and navigation.

2) Learning and memory: localization of associative and spatial memory processes in the brain.
3) Control: sensori-motor integration processes used to control dynamic movements through complex, naturalistic environments.
4) Sensory perception: visual, olfactory and multimodal sensory mechanisms underlying perception of the environment.
5) Neurobiology of disease: Behavioral and neural deficits associated with Alzheimer’s disease and Parkinson’s disease.