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| Summer 2022 research experience  *Mentor: Andreas Madlung*  *Lab Website:* [*https://www.pugetsound.edu/biology-current-students/research/biology-faculty-research/andreas-madlung*](https://www.pugetsound.edu/biology-current-students/research/biology-faculty-research/andreas-madlung)  *Title of Research: Molecular analysis of light receptors in plants*  *Description:*  *Since plants do not have eyes with which to see but are dependent on light cues to direct their growth and development, plants have evolved specific light receptors that can detect light quality and quantity, such as day length and time of day, as well as air temperature. These light receptors, called phytochromes, are encoded by a small gene family. We use genetic mutants missing one or more of these light receptor genes to learn more about their specific functions, a process generally referred to as mutant analysis. We have a number of ongoing projects in the lab. Projects described here assume that in-person research will be possible in the summer of 2022. Should that be different, hybrid or remote research experiences could be developed.*  *Lab projects for summer 2022: Mutant generation and genotype analysis (genotyping) follows largely Mendelian genetics rules. The work involves growing plants in the greenhouse, DNA extraction, PCR, gene sequencing, and bioinformatic analysis of the results. Once the genotype of the mutants is determined, seedlings are grown under specific light and temperature conditions in growth chambers side by side with non-mutant plants and their growth is analyzed and compared to find out the function of the deleted gene. We also use transcriptomics (analyzing gene expression levels genome-wide) and bioinformatics to determine which downstream genes are regulated by the plant’s light receptors. This summer we will use quantitative PCR to verify expression levels of some candidate genes that are affected by light receptor signaling under varying light conditions. Students working in the lab also participate in weekly meetings where we present and discuss our own data to learn from each other, and engage in discussions of current research literature in the field of plant light receptors.* |
| Summer 2022, in-person research experience  ***Mentor:*** *Oscar Sosa*  ***Sosa Lab website:*** *https://sites.google.com/pugetsound.edu/sosalab/*  ***Title of Research:*** *In search of ocean genes and microbes that break down the natural product homarine.*  ***Description:*** *The Sosa Lab investigates the metabolism and genomes of bacteria associated with the cycling of organic matter in marine ecosystems. We use genetics and microbiology approaches in the lab and conduct field studies in the ocean. We also use computer programming and bioinformatics to analyze DNA sequencing data.*  *The research position available this summer entails a lab-based cloning project with Escherichia coli and marine bacteria. The goal is to obtain a strain of E. coli that can express genes to degrade homarine, an abundant marine natural product. Homarine is synthesized by algae and invertebrates but its fate in marine environments is unknown. We have identified genes in marine bacteria that are upregulated in response to homarine. We will determine if these genes are required for homarine degradation by expressing them in E. coli and testing if E. coli is then able to consume homarine. We will also construct mutant libraries of marine bacteria to screen genes required for homarine degradation.*  *Through this project, the student researcher will learn and apply PCR and cloning techniques, microbiology, and genome analysis. They will also receive mentoring in scientific writing and preparing science talks and posters. There will also be an opportunity to participate in a short oceanographic research cruise in Puget Sound with researchers from different institutions.* |
| Summer 2022 research experience  *Mentor: Stacey Weiss*  *Lab Website:* [*https://www.pugetsound.edu/biology-current-students/research/biology-faculty-research/stacey-weiss*](https://www.pugetsound.edu/biology-current-students/research/biology-faculty-research/stacey-weiss)  *Title of Research: Population and thermal ecology of the Western Fence Lizard,* Sceloporus occidentalis  *Description:* This field-intensive project will involve population census work of Western Fence Lizards using mark-recapture techniques. We are interested in basic population demographics and particularly in learning about the timing of the female reproductive cycle, egg laying, and hatching. Within this basic construct, students are encouraged to develop their own sub-question to address. For instance, past students examined the thermal ecology of the lizards. Students must be willing to spend long days in the field, in a remote setting, doing physically challenging work in the summer heat. Following a short training period with Weiss, a 2-person student team will work together at the study site (~45 min drive from Heritage University) to conduct the research, with frequent reporting and attendance at weekly (virtual) Weiss Lab meetings. |
| Summer 2022 research experience  *Mentor:*Leslie Saucedo  *Title of Research:* Investigating the roles of antioxidants in cancer.  *Description:* Our lab uses *Drosophila melanogaster* as a model system for understanding how alterations in gene expression enables cells to grow in an uncontrolled manner: a key attribute of cancer cells. We specifically focus on genes known to be conserved across species, including humans. Most recently we have been interested in how the cellular redox environment can either suppress or promote tumorigenesis. Thanks to the relative ease of manipulating and tracking genes in fruit flies, we are able to alter the activity of master regulators of antioxidant activity while simultaneously altering genes involved in cellular growth, division, apoptosis etc… We analyze our results primarily at the cellular level, using stains and microscopy.    *Lab projects for summer 2022:* Determining the how antioxidant levels affect apoptosis in normal cells as compared to cancerous cells. The work involves learning how to set genetic crosses and identify dominant markers in Drosophila, how to perform antibody staining and microdissections, and lasty, how to use fluorescence microscopy/confocal to quantify cellular phenotypes. |
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