Summer Bridge 2021 Faculty Mentors and Research Projects

**Marine Natural Product Drug Discovery** – Dr. Amanda Waters, UCO Department of Chemistry

Pharmaceuticals have become an everyday part of our lives from taking an aspirin to relieve pain to complex chemotherapies to cure cancer. Do you ever stop and think about where these drugs come from? Nature is a treasure trove of biological diversity and has provided humanity with the cures to many complex diseases. Chemical compounds that come from nature are called natural products. From 1981-2014, 33% of the FDA-approved small-molecule drugs were either natural products or derived from natural products. Add to that another 27% of compounds that mimic natural products and you have nearly 60% of the drugs approved by the FDA in the last 30 years based on natural products. Since natural products have an outstanding track record for pharmaceutical development, my laboratory’s interest is to identify new natural products from interesting biological sources and identify new biological activities for already known compounds. Students this summer will focus on extracting marine invertebrates, primarily sponges, from around the world and testing these extracts in various biological assays. Once an extract shows promising biological activity, students will isolate the pure compound(s) that are responsible for the activity. Identifying compounds that have promising biological activity is key to furthering the pharmaceutical pipeline which leads to FDA-approved drugs to treat human diseases. UCO Summer Bridge students will have the opportunity to learn and conduct research in the field of natural product drug discovery. They will learn valuable skills in the fields of both chemistry and biology including chemical isolation and elucidation techniques along with biological techniques related to assay development.

**Cardiotoxicity of environmental contaminants** – Dr. Christopher Goodchild, UCO Department of Biology

Prenatal exposure to environmental contaminants is a human health concern as well as an ecological hazard for wildlife, including birds. Similar to humans, mother birds can transfer pollutants to their eggs, which poses a risk to developing embryos. The Avian Physiology and Ecotoxicology lab at UCO is interested in how prenatal exposure to contaminants affects heart development and function in avian embryos. Students who participate in this Summer Bridge project will learn about the ecotoxicity of environmental chemicals by engaging in research experiments. Specifically, students learn how to measure and analyze heart rates from avian embryos exposed to various environmental contaminants. This information will be used to determine which contaminants are of greatest concern.

**Zoo Animal Care and Research** – Dr. Vicki Jackson, UCO Department of Biology; Dr. Rebecca Snyder, Director of Conservation and Science, OKC Zoo, Dr. Lisa Barrett, Postdoctoral Fellow in Animal Behavior, OKC Zoo

Modern zoos are not only places to learn more about wildlife from across the world, but also provide us with individuals that can help us understand more about the biology and behavior of their wild relatives. Students who participate in this Summer Bridge project will learn more about how zoos care for diverse living collections. Specifically, students will learn how zoos cooperatively manage populations, provide suitable environments, meet the animals’ dietary needs, maintain their health, engage them in training and enrichment activities, and conduct research. Students will spend a portion of their time at the Oklahoma City Zoo meeting curatorial, veterinary and research staff who will explain different aspects of care and provide tours of some of the facilities. Additionally, students will learn about observational methods for studying animal behavior and have the opportunity to practice collecting behavioral data on some of the animals.
**Measurement of aerosolized formaldehyde from cutting tissue samples** – Dr. Morshed Khandaker, UCO Department of Engineering and Physics

Tissue samples in hospitals and other pathology facilities are stored in formaldehyde solution. Pathology saw produces aerosolized formaldehyde in the air during the cutting process of tissue samples. Two summer bridge students' responsibilities will be cutting various pathology samples and measure the amount of aerosolized formaldehyde during the tissue cutting process using a formaldehyde meter under negative pressure and normal laboratory conditions. The Summer Bridge project will evaluate whether a pathology saw needs to be used in a negative pressure environment or can be used in a regular laboratory environment.

**Optical Imaging and Computer Modeling of Hearing Loss** – Dr. Scott P. Mattison, UCO Department of Engineering & Physics

Hearing loss is the most prevalent form of sensory loss in the world, affecting nearly 1/3 of individuals over the age of 50. Using optical imaging techniques, we will measure the role of the interaction various components of the inner ear of a chicken. Using this data, we will develop a computer model of the inner ear’s response to sounds in order to develop accurate computational models of hearing loss. The long-term goal of this project is to use our computer models to guide treatment of hearing loss. Student participation in this project through the UCO Summer Bridge Program will have the choice to focus on techniques for imaging the inner ear or working on the development of computer models of hearing loss.

**STEM Cell Biology** – Dr. Nikki Seagraves, UCO Department of Biology

Students who participate in this Summer Bridge project will learn about how to grow mammalian cells in culture. The student will work with O9-1 cells, a Mouse Cranial Neural Crest cell line with stem cell-like characteristics. Students will spend their research time learning how to keep cells happy, dividing and testing different treatments that mimic a human disease, Maternal Phenylketonuria. Our lab is interested in how this disease in mom leads to heart defects in babies. Specifically, students will culture cells in the presence and absence of treatments and measure the effects on activation of different genes in the cells. The student will work with the mentor and peer mentors to collect and analyze the data. We will use this data to determine the effects of treatments on development in a chicken embryo model.