FURMAN

Chemistry Department
2021 Summer Research Program

John and Sandy Wheeler Research Group

The Wheeler group is active in three areas of research:

(1) Investigating the ability of select compounds to protect against (S, Se) OR initiate (Cr^{3+}) DNA damage in cancer prevention and treatment;

(2) Developing novel strategies for characterizing the properties of commercial biocides; and

(3) Developing and understanding the capacity of mushrooms to bioremediate pesticides and other organic contaminants contained in polluted soils.

During the summer of 2021 we will be focusing most of our work on the environmental side of our projects which is area (3) above.

In our most recent project, we are exploring the potential application of mycelium (mushrooms) to bioremediate soils rendered toxic by the over-application of certain pesticides (e.g., atrazine and diuron) or other organic contaminants which could affect human health. Mycologists are working directly with students in the Wheeler lab to develop analytical strategies aimed at isolating, identifying, and quantifying these compounds and then subsequently examining uptake/bioaccumulation, metabolism, and the potential for remediation using these natural fungi. This is possible because fungi do not rely on photosynthesis for energy; thus, pesticides that work by interfering with photosynthesis have little toxic effect on mushrooms. To this point, we have characterized the enzymatically-produced breakdown products of pesticides using three mushroom species and are working to gain an increased understanding of the relationship of fungal growth cycle to maximum rate of remediation.

In order to characterize the metabolite formation, we will be using several high precision analytical instruments. Research students in our laboratory become very comfortable utilizing Ultra-Performance Liquid Chromatography (UPLC) as well as Quadrupole Time of Flight Mass Spectrometry (QTOF). Not only do we use these instruments for data analysis we also provide the opportunity for those in our group with interest to maintain and perform daily maintenance and calibration on this equipment. This knowledge is key to learning about troubleshooting analytical problems and working with extremely high-end equipment. There will also be opportunity to use other sophisticated equipment as the projects increase in size and scope during your tenure in our group.