POSTER SESSION A

2:30-3:30pm, Friday, October 2

Click on student name to join Google Meet session and talk with the poster presenter(s) anytime during the hour.

Jessica Schwartz '23 – "The Photodegradation of Dicamba in a Gaseous State"

Dicamba is a post-emergent herbicide that is commonly applied to genetically modified corn and soybean fields. However, it is known to volatilize while being sprayed and drift to neighboring fields where it can damage non-genetically modified crops. Understanding degradation pathways, especially while the herbicide is in the air, is important to understanding how to best control and mitigate drift. The goal of this project is to determine the rate of photochemical degradation of dicamba while in the gaseous phase, then to use spectra to determine the structure of photoproducts. This will be done by exposing known concentrations of dicamba to relevant frequencies of light and analyzing the resultant gas over time. To date, research has focused on developing a method to sample dicamba using solid phase micro-extraction (SPME) fibers, and how to detect and quantify these analytes through the use of gas chromatography and mass spectrometry (GC/MS). (https://meet.google.com/ssw-geqb-cnm)

Timothy W. Hirsch '22 – "Titrating Polylactic Acid from Household Sources in an Analytical Chemistry Lab"

Polylactic acid (PLA) is a plastic polymer that can be made using corn instead of fossil fuel and is used as an alternative to traditional consumer plastics. The polymer is formed with ester bonds between lactic acid monomers. In this project the plastic was depolymerized and the monomer titrated in order to gain information on the pKa of PLA and the % composition of PLA in a mixture of PLA and a substance without acid-base properties, such as sucrose. A digestion solution of 1:1 EtOH:H2O 1.4 M KOH effectively digested PLA from pure and mixed polymer samples. The digested polymer solution was acidified and then titrated with KOH. Using this procedure the PLA from a plastic object can be digested and titrated to determine wt % PLA and its pKa, which we have adapted for use in an undergraduate analytical chemistry course. (https://meet.google.com/zkj-cedn-yxg)

Collin Carlson '22 – "The Leaching of DOC and Pb in the Marcell Experimental Forest"

Peatland systems in Northern Europe and North America have long been studied to understand the cycling and retention of dissolved organic carbon (DOC) and lead. One long-term research site is the S2 ombrotrophic peatland bog at the Marcell Experimental Forest (MEF), a research facility located in Northern Minnesota. Ombrotrophic peatlands are hydrologically isolated from the surrounding landscape and are dependent on atmospheric deposition for nutrients. Within the long-term research conducted at MEF, it has been shown that lead and DOC concentrations are highly correlated within this system. The relationship between lead and DOC has remained consistent throughout the data present in historical archives. The goal of this study was to observe the concentrations of DOC and lead overtime within peat cores from S2 that had consistent water table levels. By modeling S2 in this manner we have found that, over a six-month period, concentration levels of lead and DOC in leachate samples diverged from one another. Our results show that the concentration of DOC stayed consistently high, while the concentration of lead dramatically decreased overtime. However, after these cores dried for three months, lead concentrations initially increased then continued to decline once again. It suggests that lead is mobile in these systems to a specific point and are potentially impacted by the local water table. These results allow for further understanding of how the fluctuations in the water table impact lead exports from the S2 ombrotrophic peatland at MEF. (https://meet.google.com/boh-vvie-nkh)

D. Melanie Kistnasamy '22 – "Seven Mile Creek Watershed: Monitoring Water Quality and Ravine Erosion for a Sustainable Agriculture"

Southern Minnesota has undergone considerable land use change during the past 200 years from being a land of wetlands, prairie and woods to mostly intensive row-crop agriculture. On top of the consequences of monoculture cropping, one of the downsides of drain tiling is the movement of topsoil (total suspended solids, TSS) and pollutants from farm fields like nitrate, phosphorus and E.coli bacteria. Because Minnesota and the Upper Midwest are expected to receive an increase in precipitation from large storm events in response to climate change, the region could be facing further increases erosion and the movement of sediment. Our project monitors these pollutants and visual indicators of erosion to examine the effectiveness of land-management; Best Management Practices (BMPs). Here, we report multiple years of TSS data from tributaries to Seven Mile Creek, and show time-lapse images that illuminate the processes by which erosion occurs. We found that most of a season's sediment is delivered during the largest storm events, and that ravine erosion can produce sediment that is then available for transport to the stream over the next few months and years. As we track those BMPs, we hope to improve our soil health, reduce erosion and improve water quality while enhancing landowner engagement. (https://meet.google.com/aoh-saph-ygw)