POSTER SESSION B

3:30-4:30pm, Friday, October 2

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

Morgan Mellum '23—"Ecology and Climate Sensitivity of Ancient Polar Forest Ecosystems, Antarctica"

The Permian (300-251 Ma) to Triassic (251-200 Ma) transition marks the most severe mass extinction in the history of life on Earth and was caused by an icehouse to greenhouse climate transition. A significant change in high-altitude forested ecosystems occurred during the timeframe of the Permian–Triassic, however, the function and stability of these forests remain poorly understood. We applied the dendrochronology technique of cross-dating to measured ring widths of fossil trees from the Permian through the Triassic in Antarctica, at two locations separated by 9º latitude, to evaluate the effects of climate and ecology through time and space in this study area. Ring width variation, reflecting enhanced versus suppressed growth, occurs at different frequencies through Permian and Triassic time intervals. An unexpected result is that the distributions of ring width variations are similar between the latest Permian samples and all of the Triassic samples regardless of sample location. Older Permian samples, however, display variation across the two study locations, reflecting the only clear spatial trend in ring width variation. This data supports the working hypothesis that climate gradients decreased in the study area from the Permian to the Triassic, and that a rapid climate shift occurred following the latest Permian sample set studied here. (https://meet.google.com/etv-hinr-haj)

Caden Gunnarson '23 – "Effect of Flow Splitting on Peak Dispersion in HPLC"

High performance liquid chromatography (HPLC) continues to improve the separating power available to chromatographers. These capabilities are expanded through extension of the technique to two dimensions (2D-LC), or by coupling liquid chromatography with spectrometric detection (LC-MS). However, these approaches sometimes have the drawback that unreasonably high mobile phase flow rates are required. These problems are often mitigated by use of a flow splitter, which diverts the majority of the mobile phase into waste while optimizing the flow into the rest of the instrument (i.e., second dimension of 2D-LC, a mass spectrometer, or both). However, the use of a flow splitter comes with its own effects, one of which is the potential for increase in peak dispersion, which lowers peak resolution and capacity. Here, a theory accounting for the extra-column dispersion caused by a simple tee flow splitter is introduced and tested using both UV-visible absorbance and laser-induced fluorescence (LIF) detectors with various flow split ratios and post-split configurations. Theoretical predictions and experimental results match pretty well over a variety of conditions. Experimental results show that the diameter and length of post-split tubing has the greatest impact, in very extreme cases increasing the variance by over 500% from that observed when using small diameter tubing. Ultimately, post-split tubing dimensions should be carefully considered when using a flow splitter in order to minimize extra-column dispersion. (https://meet.google.com/tyu-tsxb-dmh)

Haley Jostes '23, Erin Beer '23 – "Mercury Analysis and Method Development"

Mercury is naturally occurring, but human activity has greatly enhanced environmental levels of this element which bioaccumulates and is a neurotoxin; thus having accurate measurements is imperative to public health and indicative of the well-being of an ecosystem. Current analysis methods are time-consuming and expensive as they require two different procedures to determine the values of total and methylmercury (an organic form of mercury). The currently accepted procedures involve using cold vapor atomic fluorescence spectroscopy (CVAFS) to measure total mercury content, and an additional step to measure methylmercury in an inductively coupled mass spectrometer (ICP-MS) via the isotope dilution method, this often also involves distillation. Due to the costs of current practices, the development of a new method using high-performance liquid chromatography (HPLC) coupled with ICP-MS was started. HPLC allows for the separation of compounds using a mobile and stationary phase each of which has multiple manipulatable variables. The purpose of this project was divided into two components, sample and automation. The sample goals were to advance from mercury spiked water to biological standards and ultimately to field samples. The automation goal was to progress from a manual fraction method to an automatic system. Throughout the course of the project, spiked water was successfully separated and initial runs with biological standards were completed. Should these goals eventually be met, one would be able to run a single method to obtain values for both total and methylmercury, making analysis of samples less time consuming and much more cost-effective. (https://meet.google.com/ftn-kzji-swr)