

**Michelle Norman**, University of Utah, Salt Lake City, Utah, USA for their project:  
*Testing the utility of thallium isotopes as a paleosalinity proxy.*

I am a second year PhD student at the University of Utah. Guided by Dr. Chadlin Ostrander, my lab mates and I are attempting to answer questions about the evolution of ocean oxygenation across geologic time, from the strange oceans preserving the Great Oxygenation Event to modern day oceans. We employ a host of geochemical proxies to our samples, but our main tool to understand the evolution of ocean oxygenation is thallium isotopes. Thallium, which has two stable isotopes, fractionates in the presence of manganese oxide burial within oceanic bottom waters, which measures ocean oxygenation by proxy.

My project has two parts. The first studies shales from the Tonian Period, which occurred roughly 1 billion to 720 million years ago, ending with the first Snowball Earth glaciation. During the late Tonian, a eukaryote known as a Vase Shaped Microfossil became widespread. Very little is known about the environments these creatures lived and died in, and I am using thallium isotopes and trace metal abundances to understand salinity and ocean oxygenation during this time. My second project studies thallium isotope behavior in modern settings. Due to a binary offset between thallium isotope ratios in fresh and marine waters, thallium isotopes have potential utility as a paleosalinity proxy, but more work needs to be done to understand applications and constraints. The Lipman Fund will provide funding to continue investigating different brackish localities across the world and understand potential constraints.

I got my bachelor's degree from Utah State University in 2025, where I did undergraduate research studying middle Cambrian carbon isotope fluctuations in a key locality near my university. Outside of school, I enjoy skiing, hiking, running, reading, writing, and taking care of my Betta fish, Hank.

