**Hutchison Medal Lecture Tour 2019-2020: Brian Kendall Talk**

Title: Non-traditional redox-sensitive metals in sedimentary rocks as tracers of global ocean redox conditions: Lessons from Phanerozoic anoxic events


## Abstract:

Global ocean redox conditions can be inferred from the concentration and isotopic composition of redox-sensitive metals in sedimentary rocks (particularly black shales and carbonates) when these metals have oceanic residence times significantly longer than typical ocean mixing times. Mass-balance models can use the sedimentary data to infer the global extent of seafloor covered by oxygenated, anoxic/non-sulfidic, and euxinic waters. These models take advantage of distinctive metal burial rates and isotope fractionations in different oceanic redox settings and are becoming more sophisticated. Molybdenum and uranium isotope data from sedimentary rocks can constrain the extent of ocean euxinia but are more ambiguous regarding the extent of oxygenated versus anoxic/non-sulfidic marine environments. Rhenium enrichments in black shales are a potential tracer for the extent of total global ocean anoxia (euxinic and non-euxinic) whereas thallium isotope compositions from black shales may constrain the extent of well-oxygenated seafloor where manganese oxides are buried. Using these redox proxies, studies of Phanerozoic sedimentary rocks deposited during large igneous province events (and their associated mass extinctions) suggest that ocean anoxia expanded by ~1-2 orders of magnitude relative to the modern ocean. A multi-proxy approach applied to the same samples, coupled with improved mass-balance models, has potential to yield more precise estimates of global ocean redox changes.


**Hutchison Medal Lecture Tour 2019-2020: Brian Kendall Biography**

Dr. Brian Kendall uses the concentration and isotopic composition of redox-sensitive metals in sedimentary rocks to reconstruct changes in atmosphere-ocean redox conditions and seawater chemistry through time and infer their impacts on biological evolution and mass extinction. This effort initially focused on the rhenium-osmium geochronology of Precambrian black shales, leading to MSc and PhD degrees from the University of Alberta in 2003 and 2008, respectively. Subsequently, Dr. Kendall held a two-year Agouron Institute Geobiology Postdoctoral Fellowship at Arizona State University where he expanded his research program to include non-traditional metal isotope systems, particularly molybdenum and uranium. After four years at Arizona State University, Dr. Kendall moved to the Department of Earth and Environmental Sciences at the University of Waterloo in 2012 to begin a faculty position and establish a new metal isotope geochemistry laboratory. Dr. Kendall teaches undergraduate courses in introductory geochemistry, petrography and igneous petrology, as well as graduate courses in radioactive/radiogenic isotope geochemistry and metal stable isotope geochemistry. A Tier II Canada Research Chair in redox-sensitive metal isotope geochemistry was awarded to Dr. Kendall and will begin September 2019.