Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17045

How clean is our city? Let our biomonitors (honey, salmon, ...) tell us.

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Rapid urbanization and increasing human population, coupled with urgent environmental threats, such as climate change, call for innovative and adaptive environmental monitoring methods to archive and respond to changing conditions on earth. Using biomonitoring to glean geochemical data from an area of interest has been well-established by sampling organisms or their byproducts. Further, the combined use of lead (Pb) isotopic composition with trace element concentrations can be applied to elucidate metal distribution patterns while providing insight into dominant sources. Honey from *Apis mellifera* (Western honeybee) is an effective biomonitor for small-scale pollutant distribution investigations within a city or region. A pilot study in Metro Vancouver (BC, Canada) concluded that trace element concentrations and Pb isotopic compositions of honey reflect nearby land use and anthropogenic activities such as shipping ports and heavy traffic (Smith et al., 2019). These results have been replicated in subsequent beekeeping seasons (Smith and Weis, 2020) and other settings, where honey as a geochemical biomonitoring tool has been applied to archive acute changes in atmospheric metal composition, such as the burning of the Notre Dame Cathedral (Smith et al., 2021) and, globally, the COVID-19 pandemic. This work united scientists and community beekeepers through citizen science and demonstrated the mutual benefits of interdisciplinary partnering to make environmental inquiries. In parallel, we are investigating the primary contamination sources and regional transport of Pb and other trace metals proximal to the British Columbia (BC) coast and in the open ocean of the northeast Pacific using species of Pacific salmon. Understanding globally significant anthropogenic metal inputs, such as the eastward deposition of Pb and other trace metals into the Pacific Ocean, is imperative. Marine biomonitors enable biologically-integrated sampling of their environment that provides crucial information about such geochemical impacts and further quantifies and characterizes harmful elements in the biosphere. This talk will examine the differences between terrestrial and marine biomonitoring systems while exploring how they can be applied to investigate different spatial and temporal scales. Further, we will assess the limitations and benefits of applying biomonitoring and how it can help us effectively answer pertinent questions about metals in our environment.