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Editorial: Novel insights into mercury sources and behavior in the surface earth environment

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Editorial on the Research Topic
Novel insights into mercury sources and behavior in the surface earth environment

Mercury (Hg) is a highly toxic, non-essential, naturally occurring metal with a variety of uses. It poses significant threat to terrestrial and marine food webs, primarily due to its potential to be transformed to methylmercury, a neurotoxin (Ha et al., 2017). Natural processes (e.g., volcanic and hydrothermal degassing) and long-term anthropogenic activities (e.g. the use of cinnabar as vermilion, silver/gold extraction and mining, fossil fuel combustion, non-ferrous metal smelting, chlor-alkali plants, and the use of liquid Hg in manufacturing electronic devices) liberate Hg from Earth's lithosphere into the surface environment (Selin, 2009). Understanding natural and anthropogenic Hg cycles is critical to 1) quantify how much anthropogenic legacy Hg has accumulated at the Earth's surface and 2) predict how enforcing the legally binding Minamata Convention on Mercury will affect Hg cycling in surface earth reservoirs.

Historical uses of Hg and other toxic metals have been often overlooked and considered a "past issue" that no longer represent a problem to the environment (Unger, 2014). This approach is a reoccurring problem for society, as the longevity of Hg in the environment means that historic legacy Hg continues to contribute to current environmental pollution (Guerrero, 2016). The impact of historical and contemporary releases of Hg in non-western regions is understudied, and this lack of knowledge limits the formulation of legally-binding policies on Hg pollution control (Schneider et al., 2020). For instance, there has been no consideration to date of the environmental legacy of the long history of Hg use in ancient Mesoamerica, where Hg has been extensively used by past societies.

Research on Hg releases has been largely western-centric and addressed by single disciplines to date. The continued use of single disciplinary research methods is disadvantageous to the advancement of historical Hg use research (Selin and Selin,

2020). A complete understanding of both historical and contemporary uses of Hg and subsequent environmental impacts will only be achieved if an interdisciplinary approach is considered (Schneider and Haberle, 2019). Therefore, this special issue aims to leverage interdisciplinary research on historical and contemporary uses of Hg, to communicate the impacts of this toxic element and facilitate Hg analysis in relevant fields across archaeology, environmental sciences, and analytical chemistry. Contributing papers examine how Hg releases shape local communities and landscapes, influence policy decisions, and transform society.

This collection of articles features critical interdisciplinary questions related to the Hg cycle and uses in understudied regions worldwide. It approaches a series of key questions surrounding the long-term uses of Hg and the legacy left in the environment. The authors of contributing papers are uniquely placed to debate the theme of historical and contemporary Hg uses. The contributors come from a range of disciplines, including Science, Technology Engineering and Mathematics (STEM) as well as Humanities Arts and Social Sciences (HASS) and their papers deal with real-world, urgent challenges that affect a range of societies. Of special interest is the discussion on the history of Hg use in Mexico and Central American that began at least two millennia before European colonisation in the 16th century.

We hope this Special Issue can illuminate the opportunities and challenges involved in rethinking Hg research and the need for a multidisciplinary approach to fully understand the impacts of historical and contemporary Hg releases and uses. This has important implications for public health, policy guidelines, and practical solutions. To this end, we encourage more research to advance the topics of the papers contained herein, particularly with regards to the unique aspects of integrating HASS and STEM disciplines to Hg research. We hope the papers will foster dialogue, promote the exchange of ideas, and generate a productive discussion with readers of this Special Issue.

Author contributions

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