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Essential building blocks for successful provenance studies: Lessons from the *Southern Africa Lead Isotope Project*

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The study of materials provenance has changed greatly over the last 20 years, thanks to improvements in instrumentation, the formulation of multi-proxy approaches, and the integration of principles from geochemistry and materials science. This talk frames these changes through the lens of the *Southern Africa Lead Isotope Project*, which David Killick (University of Arizona) and I have run since 2015. We apply a combination of lead and tin isotopic analyses and bulk chemical analysis to reconstruct the provenance of copper, tin, and bronze artifacts from dated archaeological sites within this large region. When we started our project, there was very little lead isotopic data on archaeological metals from southern Africa and no regional isotopic database for ore minerals. By reversing the typical orientation for archaeological applications of lead isotopic analysis, in which artifacts are analyzed first and only then fit to existing geological data, we were able to cultivate a detailed geological understanding of the region and assess three important questions. These are: 1) what isotopic data on ore deposits from the region exists in the geological literature and what are the gaps that need to be filled before archaeological applications? 2) What is the isotopic heterogeneity in the region and can the combination of these methods answer our questions? 3) How can a deposit/district's metallogenetic history and mineralogical composition translate across technological processes to be emplaced in an object? Accordingly, we were able to establish that southern Africa is one of the most suitable regions on earth for non-ferrous metal provenance studies. This conclusion is driven by the region's unique geological history and resulting isotopic and chemical diversity. In grounding our project through these geologically oriented questions, we have been able to trace the movement of metals across hundreds of kilometers, demonstrating links between precolonial communities previously perceived as isolated from each other.