Rediscovering the sources of Egyptian metals

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Two new studies, published in the *Journal of Archaeological Science*, offer the first comprehensive analytical datasets of Protodynastic to Old Kingdom Egyptian copper-based artifacts (c. 3rd millennium BC), analyzing the provenance of Egyptian copper. As elaborated in a [methodological comment](#), the studies constitute an important step forward in current knowledge on copper provenance and the subsequent economic, social and cultural insights into ancient Egypt.

Advancements in scientific analyses have allowed archaeologists to reconstruct the prehistoric trade of metals around the Mediterranean in remarkable detail. However, there was a notable gap in Egypt, one of the most important ancient civilizations, due to the difficulties in accessing Egyptian metal artifacts for analysis. Two teams of researchers have overcome this challenge by using collections of Egyptian objects held in Europe, providing the first glimpse of how Egyptians sourced their metals, encouraging further research in the field.

The first study by Frederik W. Rademakers, Georges Verly, Luc Delvaux and Patrick Degryse, based on artifacts from the Royal Museums of Art and History (RMAH) in Brussels, suggests predominant reliance on relatively local ore, from the Eastern Desert and Sinai Peninsula. The study carried out lead isotope and chemical analyses on a total of 40 metal samples and seven ore samples dating from the
Predynastic, Protodynastic and Old Kingdom Periods. The results suggest significant developments in smelting technology that may have been adapted to different ore types.

"These findings are based on a very particular segment of the ancient Egyptian metal economy (namely funerary consumption) and thus only reveal the tip of the iceberg," said Frederik W. Rademakers, Ph.D., Earth and Environmental Sciences, KU Leuven in Belgium. "The underlying organization of early supply networks, clearly reliant on a variety of mining and production zones, and the development of copper production technology are only slowly revealed through ongoing research."

Archaeometallurgist Georges Verly, Royal Museums of Art and History in Brussels, added, "We integrated field excavation with technology and provenance studies of these museum artifacts. We aim to understand how these objects were made and used within their particular ancient contexts, with arsenical copper alloys being a specific point of interest for these earliest periods."

The second study from four Czech institutions, led by Ph.D. candidates Jiří Kmošek (University of Pardubice) and Martin Odler (Charles University, Prague), investigates Egyptian copper-based artifacts from the Egyptian Museum of Leipzig University in Germany, found at the sites of Abusir, Abydos and Giza. The 22 artifacts show similar production technology, but diverse origins of the metal, including an Early Dynastic Egyptian object from Abusir, high nickel metal in which is consistent with ores and artifacts from Early Bronze Age Anatolia, in present-day Turkey.

"Lead isotopes showed us where the ore was most probably coming from," said archaeometallurgist Jiří Kmošek. "The results were quite unexpected," added Egyptologist Martin Odler. The study confirms that
special metals had circulated around the Ancient Near East earlier than previously thought.

Finally, in a methodological comment responding to the two studies, Prof. Erez Ben-Yosef, Ph.D., based at the J. M. Alkow Department of Archaeology and Ancient Near Eastern Cultures, Tel Aviv University, Israel, indicates that despite the similar context of the artifacts, all from funerary sites, these new studies exemplify the great potential of analytical data to shed new light on various topics related to ancient Egyptian society, and encourage future research. The commentary highlights the importance of maintaining curated, shared, and constantly updated databases to the progress of provenance research.

"These studies constitute important steps forward in our understanding of early Egyptian metallurgy and raw materials procurement strategies. These and future studies can benefit from a modular presentation of interpretational insights that takes into account differences in the insights' robustness and susceptibility to change as more data become available," Prof. Ben-Yosef concluded.


Frederik W. Rademakers et al. Copper for the afterlife in Predynastic to Old Kingdom Egypt: Provenance characterization by chemical and lead

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