



# Smithsonian Center for Materials Research and Education

## Topics in Conservation Science Lecture

### Chalcolithic Metallurgy: A Re-evaluation of the Chemical Composition of Nahal Mishmar Hoard by Portable XRF

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Scholars have long been fascinated with the provenance and fabrication techniques of the Nahal Mishmar hoard of copper objects. Discovered in the mid 1960s, the objects date to the Chalcolithic period in the Southern Levant (c. 4500-3600 BCE). Traditional destructive chemical analysis has been limited because the hoard is considered too valuable for full sampling. However, recent developments in miniature X-ray tube technology has led to handheld portable XRF (x-ray fluorescence) machines, which can be used for *in situ* non-destructive analysis. In cooperation with the Israeli Antiquities Authority and the Israel Museum, the entire hoard of copper objects was analyzed by portable XRF. Results of this work will be compared to recent studies showing that the majority of remnant mold material comes from the Shfela region in Israel. A review of the metallurgical traditions of the Ghassulian Culture will be presented, and a possible link between groups of compositionally similar objects in these regions will be discussed.

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