ΣΕΜΙΝΑΡΙΟ ΔΠΜΣ Νανοεπιστήμες και Νανοτεχνολογία

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Αίθουσα Συνελεύσεων Τμήματος Φυσικής – 4ος Όροφος ΣΘΕ

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Where Chemistry Meets Antiquity: Case Studies in Provenancing Ancient Iron and Glass

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Abstract

This lecture presents selected case studies from my research at the interface of chemistry, materials science, and archaeology, illustrating how (Geo)chemical approaches can be used to reconstruct ancient technologies and trace the provenance of archaeological materials.

The first case study focuses on the provenance of ancient iron, one of the most transformative materials in human history, using the rhenium–osmium (Re–Os) isotope system. Based on controlled bloomery smelting experiments with ores from the Southern Levant, Israel, the study demonstrate that the $^{187}Os/^{188}Os$ isotopic signature is preserved from ore to metal without fractionation, while osmium concentrations vary systematically between ore, metal, and slag. When combined with trace-element analysis, this approach offers a powerful tool for reconstructing early iron production and exchange networks.

The second case study explores Roman-period soda-lime glass production through experimental replication using coastal sands from Israel. Analytical characterization of the experimental glasses (XRF, SEM-EDS, FTIR) reveals regional differences in sand suitability, with northern coastal sands enabling glass production with natron alone, while southern sands require additional stabilizers. These findings provide new insights into ancient raw-material selection and the organization of glass production in the Eastern Mediterranean.

Together, these examples highlight the value of integrating high-resolution analytical methods, with experimental archaeology, and archaeological context providing insight into technological decision-making, resource procurement strategies, and production organization in antiquity.

By the hand of the smelter: tracing the impact of decision-making in bloomery iron smelting.

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Short CV: Adi Eliyahu-Behar is Professor of Archaeological Science at Ariel University, holding a dual appointment in the Department of Archaeology and Land of Israel Studies and the Department of Chemical Sciences. She earned her PhD in Chemistry from the Weizmann Institute of Science (2008) and completed postdoctoral research at Tel Aviv University and the Weizmann Institute within an ERC-funded project on Iron Age metallurgy in ancient Israel. Her research focuses on ancient pyrotechnological materials, including metals, ceramics, and glass, and integrates advanced analytical and experimental approaches to investigate technological choices, raw-material procurement, provenance, and production organization. Her work contributes to broader discussions on technological innovation, economic networks and trade, and cultural practices in past societies.