APPLICATIONS OF PXRF FOR CULTURAL HERITAGE DIAGNOSTICS: RAPID IN-FIELD ANALYSIS AT KHIRBAT FAYNAN, JORDAN

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During our 2009 and 2011 field seasons, the UCSD Edom Lowlands Regional Archaeological Project (ELRAP) employed a Bruker Tracer III-V PXRF unit as a tool for rapid analysis of archaeological sediments, geological samples, and multiple classes of artifacts from the ancient mound site of Khirbat Faynan located in the Faynan copper ore resource zone in southern Jordan. The excavations at the site show important settlement activity in the Early Bronze Age (ca. 3,000 – 2,000 BCE), Iron Age (ca. 1200 – 500 BCE) and Nabatean-Roman-Byzantine periods (ca. 168 BCE – 711 CE). The PXRF unit allowed us to examine changes in metal extraction from local ores, question previous hypotheses regarding the presence of poisons in local agricultural soils, and establish a baseline for metal content in the local geology in order to more accurately interpret geophysical data, among other applications. The results of this season’s experimentation show that PXRF is a useful tool for multiple aspects of archaeological investigation, most importantly, the rapid feedback it provides excavators given the limited time frame of most archaeological expeditions.

ELRAP is one of the primary ‘test beds’ for the UCSD NSF-funded IGERT-TEECH program aimed at developing cultural heritage methodologies. Within this program, we are developing methods to integrate data from instruments such as XRF and Fourier-Transform Infrared (FTIR) spectroscopy with an advanced, geo-referenced database. We are also moving toward rapid statistical analysis of XRF and other data with the goal of rapidly identifying more complete chemical characterizations of archaeological materials and their cultural contexts.