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XRF ANALYSIS OF LATE BRONZE AND IRON AGE CERAMICS FROM WEST-CENTRAL SYRIA

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During the Fall 2015 semester I started the data acquisition process for my dissertation project. Funds obtained through the Stahl Endowment were used to pay for airfare necessary to travel abroad, to work in museum and university collections in Europe and Australia.

My research, which forms part of my dissertation project, consisted of using portable X-Ray Fluorescence (pXRF) on ceramic vessels from ancient Syria. Analysis focused primarily on storage and cooking vessels, but also included a number of painted vessels, as well as several examples of table wares that will function as a sort of “control group” against which the other types can be compared.

The ceramics were analyzed using a Bruker Tracer III-SD pXRF unit, which was used with a Cu-Ti-Al (green) filter and operated at 40kV and 40 μ A. For each sherd, three sampling spots were chosen on both the obverse and the reverse and each analysis was run for two minutes each (thus amounting to a total of six analyses and a total analysis time of twelve minutes per individual sherd). This procedure was used to alleviate the influence of the homogenous character of the clay paste (so-called “matrix effects”) and other factors. By calculating the mean values of all three instrument readings per surface, it is hoped that factors like inclusions, contaminations, or encrustations on the vessels, but also the unevenness of the vessel surfaces have less effect on the data than what would be expected from using just one analysis per sherd surface.

In addition to pXRF analysis, the ceramics were documented in a sherd catalogue listing Munsell color readings for surfaces, fabric, and core; vessel diameters (if applicable); surface treatment; vessel form; and their archaeological context. Where possible, sherds were classified according to established site and regional typologies as provided in the literature. In cases where sherds could not be matched to the published materials, vessel drawings at a 1:1 scale were produced for future analysis. Finally, every ceramic sherd was photographed, completing the documentation process.

Work started on September 17, 2015 at the University College London Institute of Archaeology. Over the course of about three weeks I analyzed a total of 145 ceramic samples, including 64 cooking and 51 storage vessels. These materials come from the Late Bronze Age levels of the citadel of Tell Nebi Mend, a large and important settlement mound in the southern Orontes Valley in Syria. Starting November 9, 2015 I started working on the Iron Age ceramics from the same settlement, housed at the Ian Potter Museum of Art at the University of Melbourne. At the time of writing, an additional 79 samples have been analyzed. After a month-long stay in Melbourne, I will travel to Copenhagen, Denmark to study ceramics from Hama, an equally important settlement in central Syria, currently in the National Museum of Denmark. This trip will last for one and a half months,

which is necessitated by the vastness of the collection as well as its rather poor state of documentation. Together, with ceramics from Tell 'Acharneh, currently in Quebec City, the data obtained during these research trips will form the core data for my dissertation project. These will be further augmented by ceramic samples from other sites and settlements that are currently available outside of Syria.

As the data acquisition is still ongoing at the time of writing this report, the results of the analysis are still pending. However, based on preliminary observations made during the gathering of the data, there appear to be recognizable differences in the chemical composition of the various vessel types. For example, comparing the chemical signatures of cooking vessels from the Late Bronze Age and the Iron Age (fig. 1), it can be seen that the most prevalent elements are Ca, Ti, Mn, Sr, Zr, and Pd with more-or-less pronounced differences in their respective intensities. At the same time, a comparison of Late Bronze and Iron Age storage vessels (fig. 2) shows a somewhat different pattern, the major trace elements being Ca, Fe, Rb, Sr, Y, Zr, Rh, and Pd. Again, differences in their respective intensities can be distinguished.

These observations, while preliminary, strongly suggest that subsequent analysis of the data will yield good results. Once the process of data acquisitions is completed, statistical analysis (such as principal component analysis or cluster analysis) will be performed in order to identify groupings within the data set. Analysis of the results is scheduled to start in Spring 2016.

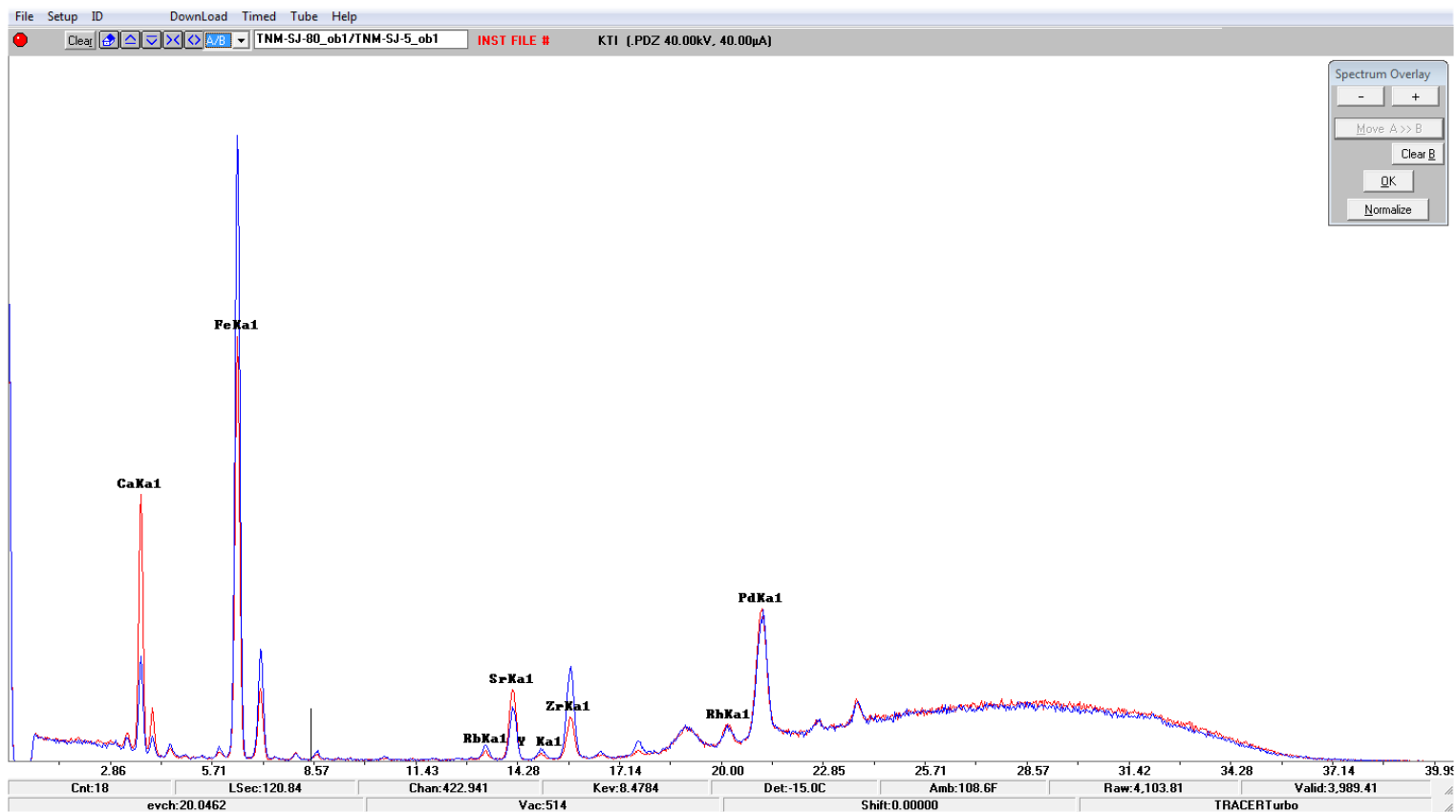


Fig. 2: Comparison of spectral signatures of Late Bronze (blue) and Iron Age (red) storage vessels from Tell Nebi Mend, Syria.