Lithic and Spatial Analysis of Kharaneh IV

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Hello, my senior thesis, and the topic of this paper, is the "Lithic and Spatial Analysis of Kharaneh IV." To Start with, I want to give some background information on the archaeological site that I am doing my research on—Kharaneh IV. It is located in the Azraq Basin of Jordan (see Figure 1), and the occupation of the site has been dated from about 20 to 18.5 thousand years ago using carbon-14 dating of organic materials. Other than its massive size of 21,000m^2, Kharaneh IV has many unique and interesting characteristics. One of which, is that it is hypothesized to be a prehistoric aggregation site. This means that many different cultures, or independent hunter-gatherer populations, from all reaches of the Levant congregated at this particular area at the same or similar times. This, along with one of the oldest stone hut structures ever found, places Kharaneh IV amongst the most complex and advanced archaeological sites of its kind.

Figure 1

Kharaneh IV is also one of the oldest, densest, and most resource rich sites of the Epipaleolithic. The Epipaleolithic is a culturally defined time period in the Levant that existed between the end of the Paleolithic and the beginning of the Neolithic. In fact, it is so artifactually dense that we have found over 4 million lithics so far, a truly incredible amount. Lastly, Kharaneh IV is part of a trade network, although we don't know too much about it. At the site, we find thousands of shells with holes intentionally put through them, most likely as some sort of beads or jewelry. What makes this interesting is that there is no natural shell at or near Kharaneh IV, and all of them have originated either from the Red Sea or the Mediterranean, upwards of 300 km away. So some sort of exchange system must have existed within this context. All this background information basically means one thing, the occupation and interactions at Kharaneh IV were very intense and very complicated, an archaeological equivalent to a large puzzle.

In an attempt to decipher just a small part of this puzzle, my Senior Thesis will utilize both lithic analysis as well as GIS in order to identify and understand cultural practices and their interactions at Kharaneh IV. I will quantify my findings with both spatial and statistical analysis, which will allow me to compare my results with other contemporary sites. In turn, this will allow me to look at Kharaneh IV from a broader perspective and see what is unique or commonplace about this site, specifically in terms of lithics and site structure. If all goes well, this would allow me to begin to identify and distinguish the different cultures that occupied Kharaneh IV. We

already know that Kharaneh IV was occupied, we also have strong evidence that it was an aggregation site, but what we are unsure of, is the who, the why, and the what. My thesis will be a preliminary step in understanding this, with the ultimate goal of putting a couple of the puzzle pieces together and to discuss future research directions.

The first part of my research is Lithic Analysis. But before I can explain what Lithic Analysis is, I need to explain what a lithic is. This (see Figure 2) is an obsidian node, an unaltered raw material commonly used to make stone tools. This (see Figure 3) is a bifacial scraper, a common type of stone tool. In order to get from this natural rock to this retouched tool a lot of reduction needs to be done to the node, and a lot of pieces of stone need to be removed. So when referring to lithics, I am talking about the stone tools themselves, as well as the byproducts created when making those stone tools.

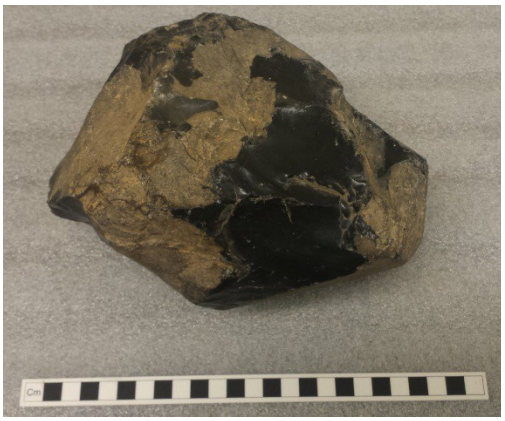

Figure 2: Raw Obsidian Node

Figure 3: Bifacial Scraper

Another important feature of stone tool manufacturing, is that it is not uniform. Think of the process of making stone tools like the process of making a ceramic pot. You could go to 5 different cultures and each of them could have their own style of pots with different manufacturing techniques. It is the same concept for stone tools. Even though 5 different cultures may have a scraper that would perform the same function, the final form, as well as the manufacturing process, and therefore the byproducts created, can be unique to each culture.

So when actually doing lithic analysis, I have a collection of lithics that I separate into one of potentially hundreds of categories based on physical observable features and the purpose or function of its removal. Once separated into categories and counted, the patterns, compositions, quantities, or ratios that are produced are representative of the associated cultures manufacturing process. These results can then be used to identify one culture and distinguish it from another, as well as be compared with other relevant assemblages to potentially understand aspects of the associated cultures. To better explain the theory behind lithic analysis, I'll give a specific example from Kharaneh IV.

At Kharaneh IV, there are two main areas of excavation, Area A and Area B. Area A consists of material remains that are associated with the middle Epipaleolithic, while area B is associated with the earlier Early Epipaleolithic. The Early Epipaleolithic is associated with the Non-Geometric Kebaran tool industry, and the Middle Epipaleolithic is associated with the Geometric Kebaran industry. Both of these cultures have microliths, small blades that have been

retouched or altered so it can hafted into a weapon or used for another purpose. [Figure 4] demonstrates each of these cultures version of a microlith. As you can clearly see, the design is very different.

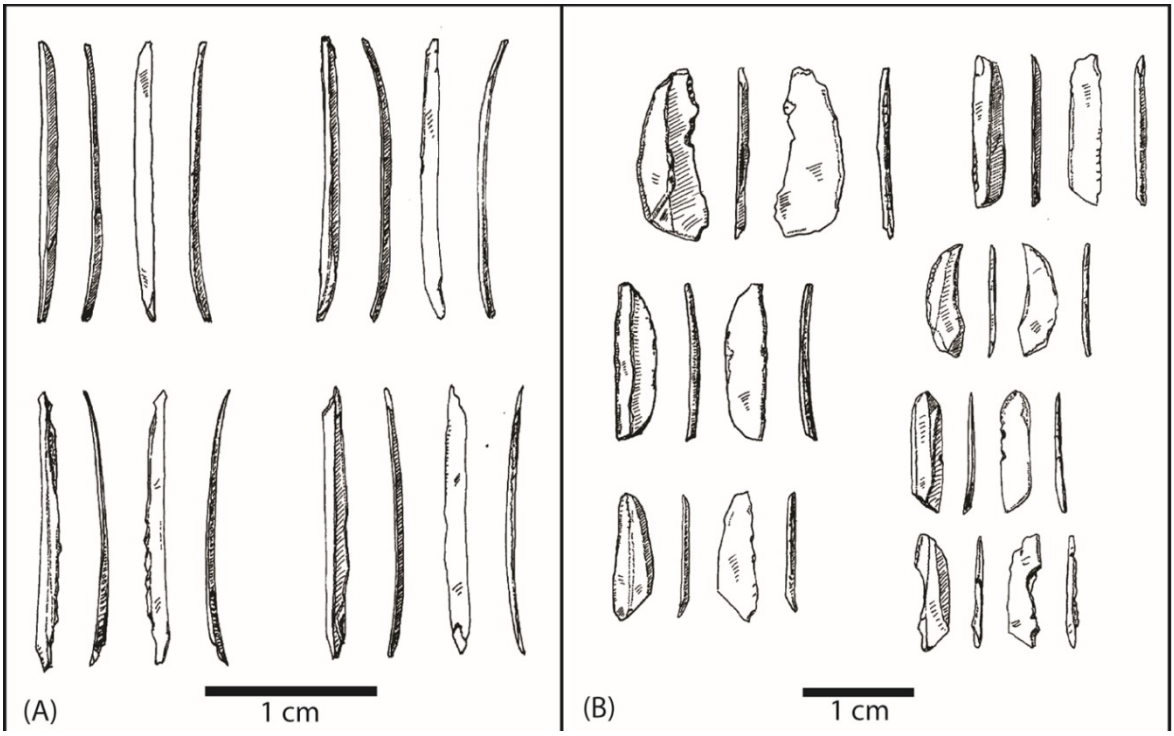

Figure 4: Non-Geometric Kebaran Microliths (A) and Geometric Kebaran Microliths (B)

What is important to understand for lithic analysis, is that not only are the microliths themselves indicative of each culture, but the processes of making these 2 microliths styles are completely different.

In simplified terms, non-geometric microliths are produced using a technique call “Core Preparation”, and Geometric microliths utilize the “Core Maintenance” technique. Although both of these methods have the potential to produce all the same types of byproduct categories, the quantities and ratios of these byproducts are very different with each technique.

In a lithic collection that was made using the core preparation technique, there would be a significantly greater quantity and higher ratio of ‘shaping pieces’ compared to ‘corrective pieces.’ Alternatively, a core maintenance assemblage would be the complete opposite, having a higher ratio of ‘corrective pieces’ compared to ‘shaping pieces.’ So even if I don’t find any of the microliths that define each lithic industry, I would still be able to determine whether the culture is from the Early or Middle Epipaleolithic by only examining the byproducts, which would create the foundation that future research will build on. Now that I have given a basic understanding of the theory behind Lithic Analysis, I can show you what I have actually been doing this summer.

I am based out of Professor Maher’s ‘Geoarchaeology and Southwest Asia Prehistory Laboratory’ located in Kroeber hall. The first step of my lithic analysis is selecting a relevant bag

for analysis. These bags do not only contain lithics, but they also have almost all the material that was removed from its corresponding unit in Jordan. This includes dirt, bone, shell, ochre, and other things. Which leads me to Step 2, which involves dumping the contents of the bag on a table, and then separating the lithics from everything else (including dirt, bone, ochre, and shell) so that I am left with only lithics. Only then can I actually begin step 3, analyzing the lithics.

This is the step where I separate all the lithics into categories based on the appearance of the piece and the purpose of its removal (see Figure 5). The image shows what a slightly larger than average collection, specifically 4,678 lithics, looks like when fully analyzed.

The next task, step 4, involves sizing each lithic, separating the burnt from the unburnt, and then counting each category. After everything has been counted and recorded, I bag each category separately, and repeat the entire process with a new bag. That is what I have been doing the whole summer and most of last semester.

In total, I have so far spent over 500 hours in the lab, and have analyzed and counted 59,094 lithics. Additionally, around 15,000 more lithics have been analyzed and just need to be counted. I am estimating that there is somewhere around 20,000 more lithics that need to be analyzed until I am completely finished with the lithic analysis part of my research and can focus my efforts on the GIS portion.

Figure 5: Seperated and Analyzed lithics

To start with, GIS stands for Geographic Information Systems. There are many different programs for it, but I will be using ArcGIS. It is a very powerful, complex, and versatile software that is used for pretty much everything visual spatial across many different disciplines. I will be using it to virtually and accurately recreate Kharaneh IV, and then spatially input all analyzed lithics. In addition to this, I will also incorporate all site features including burials, hut structures, ochre caches, and everything else. This will allow me to recreate the site and get an understanding of how Kharaneh IV was structured as well as what site activities consisted of.
Also, I will utilize some of ArcGIS software that allows for advanced statistical and spatial analysis. This information will quantify both the lithic analysis and spatial organization of the site. Unfortunately, I do not know exactly how I will be doing this just yet, but a large amount of my research next semester will focus on developing the skills necessary to do this. I will only begin to use a GIS after all the relevant lithics have been analyzed.

As a result, I do not have any graphical or statistical results ready to share, but I have observed a very clear and emerging pattern. If you can recall that of the two main types of microliths found at Kharaneh IV, Area A, the middle Epipaleolithic, where my research is

focused, is composed of the geometric Kebaran tradition. So far, my research has been in complete agreement with this. The far majority of microliths found are geometric in shape, and the byproducts are very clearly the result of the core maintenance technique.

Another finding is that there is a lot of evidence to support the hypothesis that Kharaneh IV is an aggregation site, especially when examining Trapeze variants. Even though 5 different cultures can have their own unique style or design of the trapeze microlith, very rarely will more than one type be found at a single site. Kharaneh IV is unique in that there is no other site from this period that has so many variants at one place. In addition, all of these variants are found at different sites in the Levant. For example, the Denticulated Trapeze and Harif points are found only at one other site in the world located hundreds of kilometers away in the Negev. The only explanation for so much variation at one site is that cultures from around the Levant congregated at Kharaneh IV.

I am excited to put my energy next semester towards trying to understand the intricacies of these cultural interactions and getting a better understanding of the site itself.

I wanted to thank my Mentor Dr. Lisa Maher for teaching me everything I know about this subject and being a very involved and supportive mentor. Most of the information I have provided is either from personal communication with Dr. Maher, or from literature she has authored. I also want to thank Oliver Hegge who has helped conduct some of the lithic analysis. Thank you all for your time.