Jennifer Cullison

Grant Proposal

Abstract

Using a pXRF device I will be collecting elemental spectrums from known chert quarries used by Mississippian peoples, a Native American group that inhabited the eastern half of the United States between 800 and 1600 CE, in order to create a comparative collection that can later be used on other archaeological sites. After the data is gathered it would be put on an online database so other archaeologists also working in this region and culture could access the data as well. I would be focusing in on four major quarries to begin (the Crescent Quarry, the Buffalo River drainage, the Mill Creek Quarry, and the Dover Quarry). A pXRF would be used as it is relatively free to use if you have access to one and in most cases, will carry out the same function as more expensive methods. This collected data would provide a greater understanding of trade networks that the Mississippian peoples had in place.

Introduction

Mississippian peoples were around from approximately 800 CE to 1600 CE (Lipo et al. 1997). They influenced a large portion of the eastern half of the United States and therefore had large and complex trading networks (Bowne 2013). Their main hub of commerce was Cahokia, which is near modern day St. Louis. Cahokia controlled politics by controlling the economy and trade networks (Pauketat and Emerson 2000). The decent of Cahokia’s power was caused by increased flooding and climate change (Whyte 2013). They were known for their large mound-like structures that they would build in their cities and towns. Mississippian peoples were also skilled flintknappers who created intricate lithic tools out of a stone called chert (White 2012).
studying the chert deposits and mines in the eastern United States, using portable x-ray florescence (pXRF), because the information gathered can elude to greater trade networks in Mississippian culture.

I would only be looking at chert outcroppings that were known to have been used as mines by Mississippian peoples and not any settlements or points. While University of Iowa Office of the State Archaeologist is currently working on building a database for chert outcroppings within its own state, a comprehensive database of elemental signatures for chert in North America has yet to have been developed (Anderson 2015). With the money from a grant I would be able to create a compressive list of various ancient Mississippian chert quarries to help aid researchers in the form of a database. The database would be built by myself using a website template freely available on GitHub, an online site dedicated to the sharing of website coding. I would edit a template to my desired needs and as I already know coding this would not be too difficult of a feat. I would also need to rent space on a server to actually store the data I would be curating for the database. This has never before been done outside the state of Iowa for American sites, let alone Mississippian sites. Due to the fact that Mississippian culture was so widespread and that their trade networks were vast, ranging from the gulf and the Atlantic coasts to Michigan and the western plains (Brown et al. 1990), it is common that an archaeologist will have artifacts and not know their source. This database would help eliminate that issue for anyone with the same type of pXRF as the one I will be using. Unfortunately, in order for pXRF spectrums to be comparable they have to be from the same brand. This means that I would need to state what specific make and model I would be using for the database. While this is unfortunate for archaeologists who do not have the same brand accessible to them, it is still better than the complete lack of a database that exists now. I would start by adding the more
large and noteworthy quarries by going to the quarries themselves to preferably retrieve samples or, in the instance of the chert not being allowed to be removed (like in a national park), simply taking readings in the field. There are various different types of chert that vary based on location of origin and their differences can be measured using a pXRF to learn which quarry they excavated from. I would be using some of the more major quarries, such as the Crescent Quarry, the Buffalo River drainage, the Mill Creek Quarry, and the Dover Quarry.

**Background**

I will be looking at various quarries and outcroppings within the Mississippian people’s occupational range. For this study, I have chosen several sites that vary in location and are known for being very actively utilized by Mississippian peoples. I will be selecting some of the more major mines as my source samples as they will be more helpful to the majority of the researchers. Since they had an extensive trade network that spanned most of the eastern half of the United States (Morse and Morse 2009) it would be of little value to a large majority to look at some of the smaller mines, as artifacts made from those stones are likely few and far between.

One very important site that would need to be included is the Crescent Quarry, as it lies near Cahokia. This was the major chert source for Cahokia which was the central hub of Mississippian culture in general. Furthermore, in a recent study at Carson mounds, chert that was originally thought to be from Crescent is from the Buffalo River drainage in the Ozark Mountains (Mehtaa et al. 2017). Incorrect identifications of chert origins has likely occurred at other sites as well. It is very helpful to have two different quarries with Burlington chert as it was the most common cherts they used (William et al. 1993). The quarries in Mill Creek need to be a part of the quarry selection, as this chert was very popular for hoe manufacturing in
Mississippian culture (Cobb 1989). The Dover Quarry in Tennessee was used by Mississippians to make chert “swords” and other blades. This quarry was well known as a source for the chert used in ceremonial blades (Parish 2011). Figure 1 show the quarries’ locations. The chert cores mined from these sites today would be practically the same as that of the ones mined by the Mississippians (Teltser 1991). I will be collecting six different samples from each quarry in order to better account for any variation in the elemental composition from stone to stone within the same quarry. I will travel to each of these quarry locations to either gather the samples or, in the case of a National park, take the readings in the field.

Figure 1: Quarry Locations on Map
Methodology

The analytical method I would be using would be pXRF, as it costs no additional money once the devise is purchased and while the data is not as precise as more expensive methods like LA-ICP-MS it will still give accurate enough data to be useable (Olivares et al. 2009). Furthermore, it is non-destructive, so the samples can be kept for other types of analysis (Williams et al. 2012). Moreover, while basic Identifications of chert can be made by appearance and texture they are not nearly as reliable for exact sourcing as what can be told by a pXRF (McElrath and Emerson 2000). A pXRF device is able to measure the presence of an element by looking at the spectrum of waves from the stimulated atoms that the machine then detects. This is similar to that of light waves, as different elements emit different wavelengths of energy like different frequencies of waves of light. This is useful to archaeologists, because the presence of different elements can lead to the identification of its material and sourcing (Tykot 2016). For instance, in this study, the source of the artifacts material is unknown. This information could be determined by analyzing the trace elements involved in the material. One main disadvantage to this device is it does not allow for an easy comparison of the ratios between the different elements as it picks up some better than others. This is because some elements on the lighter end like sulfur are too light for the pXRF to pick up. That means that comparisons between elemental levels are not possible with this device. There can also be issues with the various methods of pXRF as older models are even less reliable and there is often confusion between the portable XRF and lab based XRF (Speakman and Shackley 2013). Due to the portable nature of the pXRF, if a sample cannot be taken from the location like if it is part of a geological outcropping that Mississippians were known to use in a National Park then the data can still be collected (Foster and Graves 2012).
Expected Outcomes

The desired outcome would be an online database that is categorized by location and/or chert type that would allow archaeologists to better understand trade networks. I would in a best case situation have spectrums from each quarry that show distinct differences that allow archaeologists to make accurate identifications. Each quarry should have a different elemental composition that should be easily distinguished. In a worst case scenario, there would be no distinctions between the different chert samples from the different quarries. While this would be highly unlikely, due to the fact that other studies have found differences it is still a possibility. However, it is more likely that the different quarries will be different but not as distinct and uniform as I would like.

Significance

Public access to the data gained from these pXRF readings at the various chert outcroppings would provide invaluable information to archaeologists attempting to source their lithics. If the raw data was accessible, then greater knowledge of Mississippian trade networks and other similarly geographically located cultures could be ascertained. This could lead to validation for the method in this specific area of study and an increase of research of sites using the pXRF. Archaeologists could compare the readings of the lithics at their sites to learn who that group of people were trading with. This greater understanding of Mississippian culture that can be ascertained will show the impact that different cultural groups had on each other in the past. Knowing how goods were transferred in the ancient American world shows archaeologists
how people interacted and can help revive some of the forgotten knowledge that was lost due to European colonization.

### Budget

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