



Lakota Art Authentication

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ABSTRACT

Many artistic objects have been miss-represented over the years. This causes a misunderstanding of importance and worth. This project seeks to authenticate these artifacts using forensic examination as well as an intellectual investigation. Of consideration are the designs used, methods of construction, and authenticity of period materials. Multispectral visual examination, X-ray fluorescence, Micro CT, Raman Spectroscopy, and Cultural Research are all the tools will be implemented for this project.

INTRODUCTION

The Northern Great Plains had been inhabited since the retreat of the last ice age. Early life on the plains was hard. Travel was most accomplished by using river as routes across the vast plains. The 16th century brought horses to the continent and they spread quickly. European traders quickly introduced many new materials to the tribes. Metal tools, furs, beads, and other commodities were amongst these first items traded. Many times new uses for these materials were found in the regions cultures. Tins were modified to form bells for dresses, scrap metal was ground into knives, and ordinary ledgers were used as canvases for amazing art work. As reservations were being founded in the late 1800's, many materials, especially those from the buffalo, became scarce. Every material that entered the reservation was adapted to new uses, such as using metal lids to wrap into bells for dresses. Still stunning ceremonial attire was produced utilizing age old quill work along with newer bead work. Native American art was amongst the first materials traded between cultures.

Today, many artifacts sit in museums around the country, largely un-verified in origin. Often, very little is actually known about many of these artistic pieces. In order to verify that these pieces are in fact authentic a combination of material testing and historic correlation is needed to show whether these pieces are in fact authentic. In this case authenticity is governed by the Indian Arts and Crafts Act of 1990, where in order for a piece of art to be real it must be made by a member of a federally recognized tribe or at the from the direct decent of a tribal member. This act was put in place to prevent non-native people from marketing goods as authentic when they are not. An individual could end up paying as much as \$1,000,000 in fines for not following this regulation. Up

to a billion dollars a year in counterfeit Native American merchandise is sold each year in the United States. This staggering number means artist's livelihood is at stake. Since many items in museum collections were collected much earlier than the 1990 act they must be authenticated through this investigation. Not only do the materials used in the artifact need to be authentic but the techniques must also be authentic.

The procedures to authenticate Native American art are similar to those used to evaluate classical European art. The media used in the art must be verified via chemical composition and structural analysis. In this case, modern methods of tanning for instance generally contain heavy metal ions not found in age old brain tanning methods. Background information is just as important as the physical evidence. Do the art pieces at hand follow traditional methods? Is the piece relevant to the time period it was said to come from? These questions must be answered using a variety of data gathering techniques. For this project lives interview with artisans, literature review, and comparison to historic collection must be made in order to help determine the degree of authenticity for each item. In this way, a determination on the likelihood of authenticity will be made.

BROADER IMPACT

Recently a Museum found their collection of Zuni masks to be fakes. These had been on display and promoted as authentic artifacts. The museum had to remove the masks from their display, at a loss of time, energy, and money invested in the pieces. Museums as well as private collectors need to know that their pieces are authentic. Using techniques, like the ones described in this project, can protect investors from fraud and can protect history from inaccuracies. Also, catching those who break the law

in terms of the Indian Arts and Crafts Act will make a difference for those who produce this art for a living. **Figure 1** shows some bad business practices found in Keystone, SD. The price tags and packaging art work are seen hiding the fact that these products are not authentic. Protecting the livelihood of the Native cultures is very important as many as 80% of families in the Native community have a family member who makes a living through their art.



Figure 1: Products found in Keystone utilizing misleading practices

PROCEDURE

Red Cloud Heritage Center provided the items to be tested. The first item to be authenticated is a pair of moccasins. These were collected in the 1930's at an antique store near Denver, Colorado. The moccasins were said to have come from the 1890 Wounded Knee massacre on the Pine Ridge Indian Reservation in South Dakota. The second item received from the Heritage Center was a small pouch that was untied from a bustle. The bustle can be seen in **Figure 2**. The purpose of the bustle is to be part of a warrior's attire. The bustle was not original Lakota but was brought to the Lakota in the mid 1800's by the Omaha people. The pouch was tied with leather to the top of the

bustle. “For what purpose?” is the question for the pouch. Does it contain anti-insect remedies of the day to help preserve the Bustle? Is the pouch more relevant to the bustle as a medicine pouch would be? These are the questions that need to be answered in regards to the pouch.



Figure 2: Bustle

Each of the Lakota cultural objects will be analyzed below using physical and information correlations. The procedure is as follows: Cultural Investigation, Multispectral Analysis, Raman Spectroscopy, Hair/Fiber Identification, X-Ray Fluorescence, and Micro CT scans for the pouch.

RESULTS

Cultural Investigation

Two interviews were conducted with Mr. Tomayo, and Mr. Goes In Center. These two specialized in Lakota culture and art. The Journey Museum and Red Cloud Heritage Center were both visited and interviews with the perspective curators were

performed. Also several businesses were visited for reference on the availability of materials in the modern era. Extensive literature research was also performed.

From the cultural investigation it was found that the moccasins were indeed Lakota. Lakota culture is reflected in the used of back to back triangular patterns that form a diamond. There is spiritual pathway along the centerline of the foot that is not impeded by the patterns. This is another indicator that the moccasins are Lakota in origin. They appeared to have belonged to a female. Due to size and patterns used, the woman was most likely in her adolescent years. The moccasins seen in [figure 3](#) are 7.5 inches long, indicating this person was not a child. The decorations strongly suggest a female owner as they are decorated with sought after red felt along the ankle. If this woman was of the age to be married she would have a greatly different pattern as it would instead be a series of straight bars. This suggest that woman who owned these was in here adolescence.

The Pouch from the Red Cloud Heritage Center's bustle can be seen in [figure 4](#). The Pouch is suspected of being an environmental protector for the bustle or a medicine pouch. Often plants like cedar or sage were used to ward of insects as their natural chemistry repels many of them. If not for anti-insect purposes then the pouch may very well be a medicine pouch. The purpose of these is to place medicines in a pouch, sometimes also special objects to the person, and include much prayer with them. This helps to keep the prayers close the intended recipient, in this case, the owner of the bustle. It was advised to not open the pouch if found to be medicine as it is inappropriate to interact with the original intent of the pouch.

VSC: Multispectral Analysis

In the world of anti-counterfeiting, the VSC6000 is an invaluable tool. This multispectral analyzer can expose an object to a variety of lighting condition from the ultraviolet to the infrared range. It is even capable of analyzing the effects of spiral polarized light. Often this tool is used on documents such as bank notes or checks. In the art authentication world this equipment is also used to examine the accompanying documents for art works. Forgeries often can be exposed using this machine.

In this case the VSC will be used to examine the items for fluorescence, absorption on fluorescing backgrounds, and visible spectrum photography. Seen below in [figures 3 and 4](#) are the visible light photographs. When exposed to infrared light no changes were seen in either the pouch or the moccasins. [Appendix A](#) shows the ultraviolet lighting conditions at 365nm wavelength. No extreme fluorescence or absorption was seen in the items. If the materials were fluorescing it would help indicate where to test for modern materials as many modern beads do fluoresce. Also things like blood can be seen as absorbing UV light if the background is fluorescing. This was not seen and the multispectral analysis only yielded the photographs below.



Figure 3: VSC visible light images of moccasins



Figure 4: VSC visible light images of the pouch

Raman Spectroscopy

Raman spectroscopy is another method of material characterization. The composition of a material is not expressed by the data, instead, structural qualitative information is given. Utilizing a microscope and an inelastic scattering of monochromatic light and the energy of photons are either shifted up or down. Raman spectroscopy gives low frequency modes of the material as well as vibrational modes.



Figure 6: Hair on the underside of moccasins 5X Mag

This method was used to examine hair found on the underside of the moccasins. This hair can be seen in **figure 6**. This hair is an unknown so it was compared to types of hair commonly found on the Pine Ridge Indian Reservation in the late 1800's. Rabbit, buffalo, and deer hairs were examined to look for unique characteristics among them. It should be mentioned that rabbit is a little thing of a hide for a moccasin sole, and buffalo hide was hard to come by at the time, so deer tends to be the most likely.

Shown in **figure 7** is the Raman data. The three hairs analyze show striking similarities. The slopes of the lines are very similar and follow the same trends. The magnitude of the photon counts (y axis) vary slightly most likely due to the fact that each hair has a slightly different position in the laser light. The real indication that these hairs are yielding similar data is the peaks. Three main peaks can be seen at wavenumbers 1500, 2400, and 2700. This indicates that the material in the hairs is reading nearly identically to each other. This method is not effective for determining species amongst hairs. The result is that hair reads yield similar data to hair at least among these species.

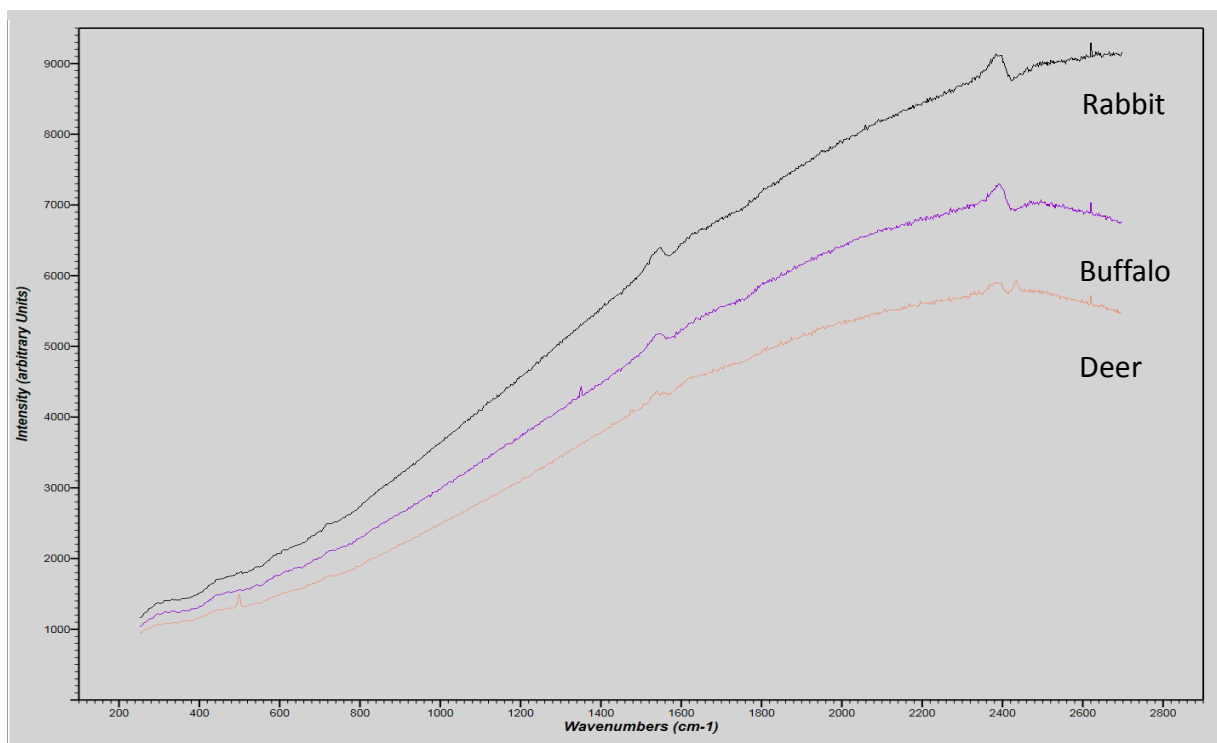


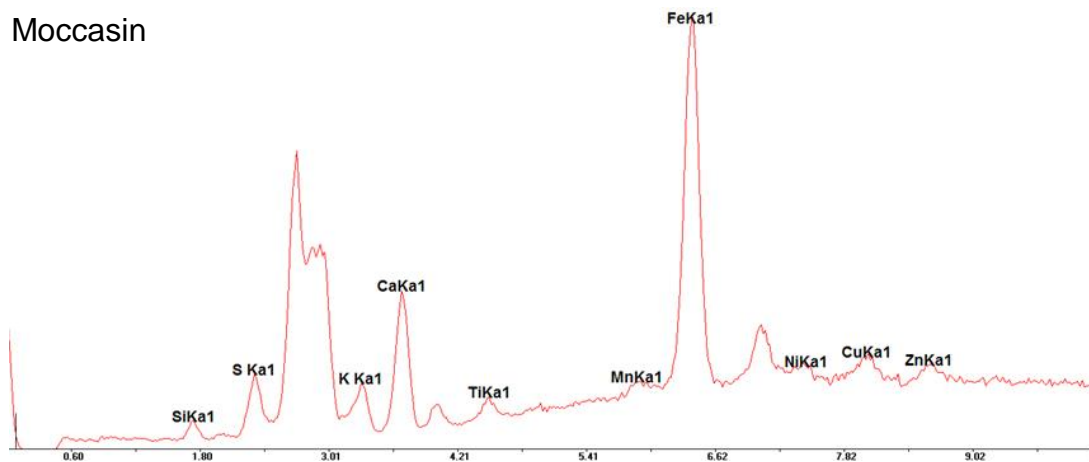
Figure 7: Raman Spectroscopy data 532nm Laser Wavelength

X-Ray Fluorescence

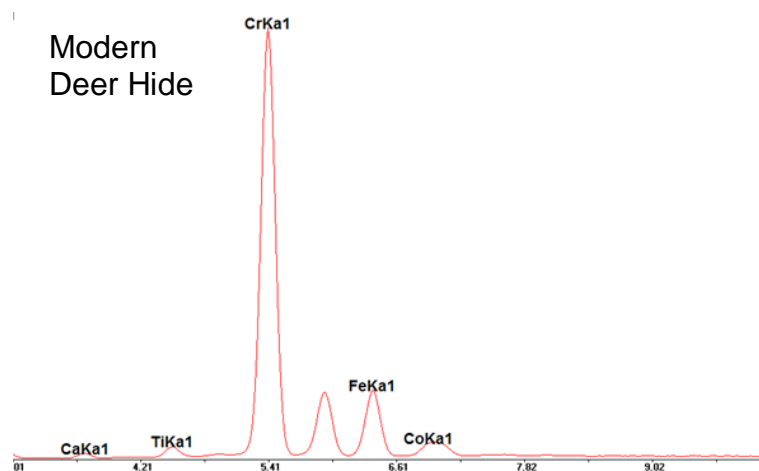
X-ray fluorescence is the process by which x-ray emissions are used to give qualitative data on the chemical composition. The process involves the emission of the original x-ray. The x-ray contacts the material and secondary electron emission are collected to show the chemicals contained within the sample. Once again this a qualitative information and must be combined with other methods to yield quantitative data. In this case a hand held XRF was used. This uses a weak x-ray emission. This causes the top third of the periodic table to not show up very well in the data. In other words, the heavier the atom being measure by the gun the more accurate the data returned.

Appendix B contains the data from the x-ray fluorescence not seen below in figure 8. On the moccasins, several bead colors were tested for authenticity of composition. Also the moccasin hide was tested. Then, modern tanned hide was tested for comparison. It was found that the beads were true in composition to the period as they were mostly lead glass. Seen below in figure 8, the moccasin hide contains mostly lead and calcium which are very naturally occurring ions in the hide. Also seen below is a modern tanned hide. A large chromium spike is seen indicating modern Cr tanning. This confirms that the moccasin hide was tanned in the traditional Lakota brain tanning method. This method is used because the enzymes in the brain help the break down glycerin in the hide and leaves it soft. The pouch was also test via XRF. The pouch showed a small amount of iron but this can easily be naturally occurring in many of the organic materials expected to be within. The surprise here, as seen in figure 8, is a large copper spike. The source of which was unknown as this point in the project.

Moccasin



Modern
Deer Hide



Pouch

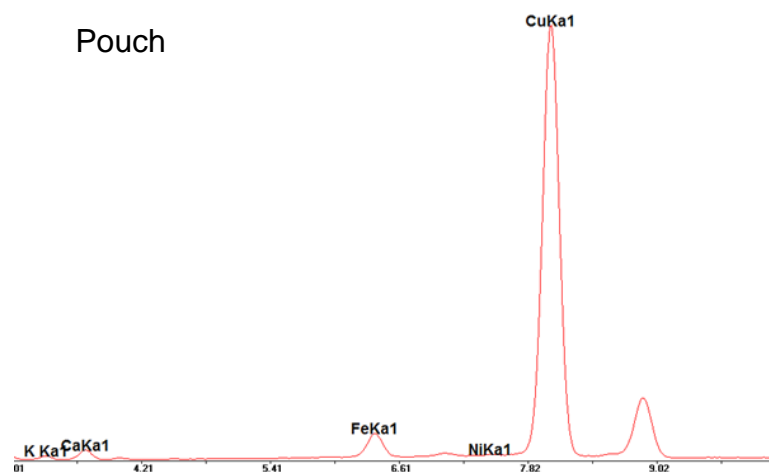


Figure 8: XRF Qualitative Data (Moccasin Hide, Modern Hide, and Pouch)

Micro CT

Micro tomography is a process similar to your average X-ray diagnostic at the doctor which has a couple key differences. The first is that the scale of the data collected is on the micro scale. The second difference is that this machine spends hours, sometimes days, to collect many individual X-ray images. These are then combined with software to complete a three dimensional model of the targeted object. These images contain data about material density differences within the material.

The micro CT will not be used for the moccasins as there is no use for such data. However, this tool is perfect for examining the unknown contents of the pouch. In figure 9 you can see the resulting CT images from the pouch. Figure 9 shows two rings approximately an inch and a half in diameter. They appear to be the source of the copper as they are the most dense material in the pouch. These rings are scaly in appearance. This could indicate excessive cold working of the Cu material. Figure 9 also shows some organic materials also present in the pouch. These are clearly vegetation. The exact species of plant or plants in the pouch is not known. The pouch will not be opened during this project. More images from the micro CT can be seen in [appendix C](#).

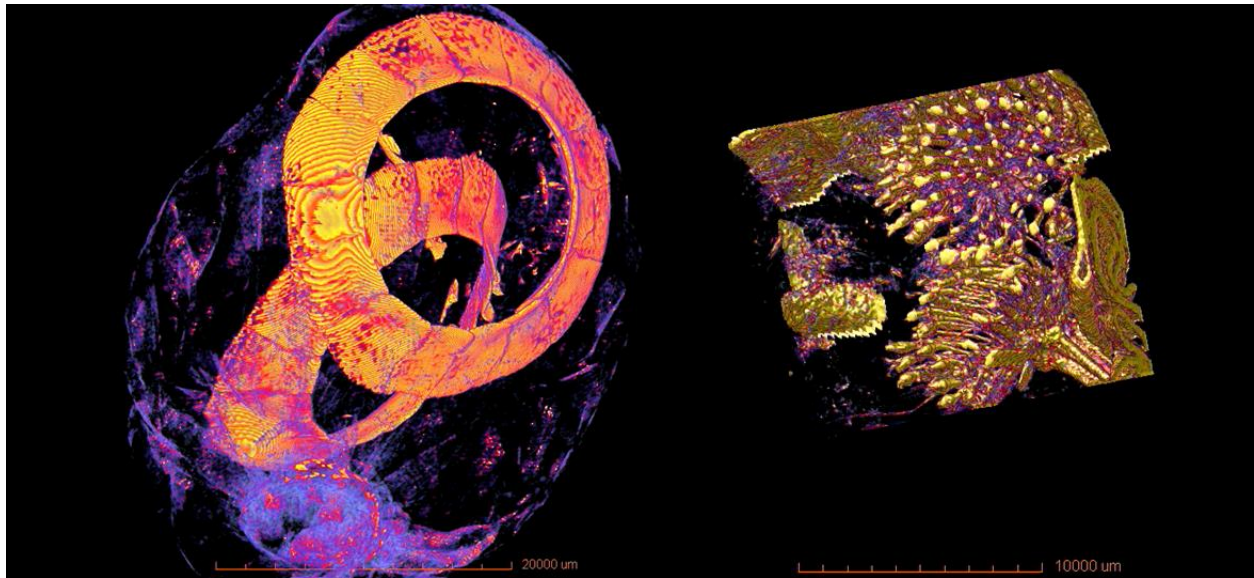


Figure 9: Micro CT Images (Copper Rings on the Left, Plant Material on the Right)

DISCUSSION

Art authentication is not always an exact process. In the case of the Warhol Authentication Board, too little care was taken in treating the client and artwork well. People were often told their work was worthless and the board even went so far as to stamp each non-authentic piece aggressively. Combine this with the fact that the board was populated by mostly people that were previously unknown to the rest of the Andy Warhol art community. This board is now shut down due the fact that most of their funding has been spent defending themselves in court over the past decade. We cannot physically trace these moccasins to a specific owner or location. Instead the determinations here are commenting on the likely hood that the moccasins are as represented but the accompanying paperwork. The pouch is simply going to be a determination of whether it is purely practical or spiritual in nature. This will affect how the object is handled.

CONCLUSION

Moccasins

The style and size of the moccasins indicate they belong to a young woman. This is supported by the absence of post-adolescent patterns that would show she was of age to be married. Also the use of coveted red felt around the ankle further supports the idea they were a young woman's. The lack of heavy metal in the hide indicates an authentic tanning method of the 1890's. The deer hairs on the soles are most likely mule deer, but deer for sure. This was the most readily available hide to find on pine ridge in the 1890's as non-deer hide were scarce and not generally used to moccasins.

All materials in the moccasins are true to the period and show great care to use anything available, as can be seen by the use of light blue beads in place of white beads. They are authentic in relation to being Lakota and around the time Pine Ridge Indian Reservation was formed. Whether they came from the Wounded Knee Massacre was not determined, however all data shows them to be from the same period. The moccasins are found to be most likely as represented by the supporting documentation.

Pouch

The pouch came from a bustle with little known about it. All indications from the bustle show it to be at least eighty years old. Two good indicators of this are un-dyed areas made by non-machined clamps (as seen in **figure 2** in the red circle) and the presence of counting coup feathers on the bustle. The heritage center wanted to know the purpose of the pouch as it could have been used to things like insect repellent or spiritual protection in battle. The answer to this question could affect the manner in which the pouch is handled in the future by the heritage center.

XRF data shows large amounts of Cu. The micro CT imaging revealed two rings of high density within the pouch. These appear to be the source of the Cu and prove it to be much more than an insect repellent. The presence of complex plants within also show this to be a medicine pouch. Since opening the pouch is not necessary at this time that is where the analysis will end.

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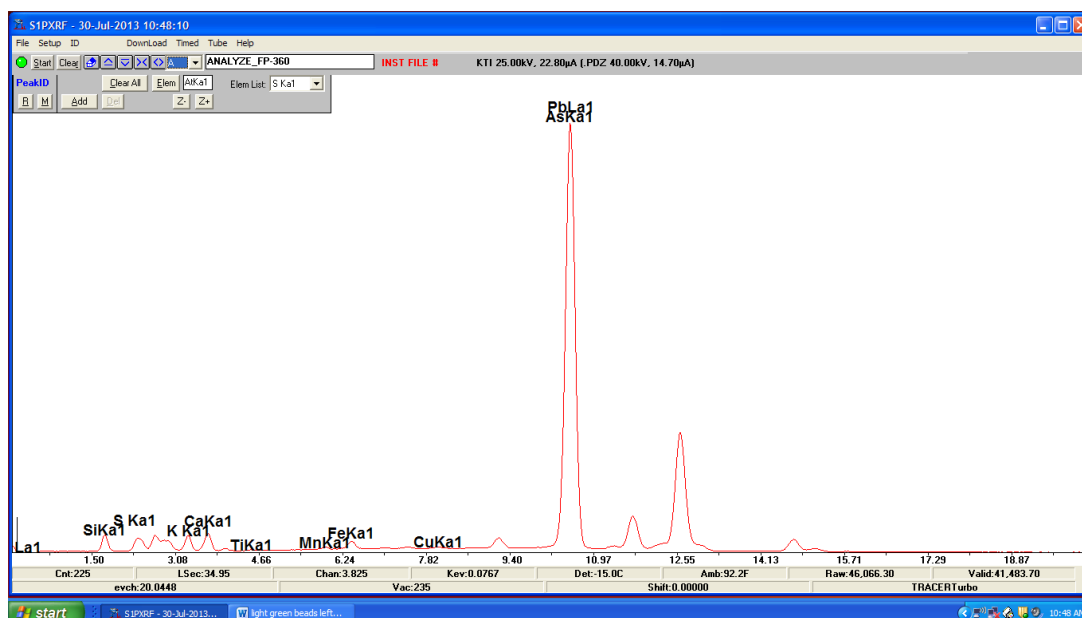
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APPENDIX A

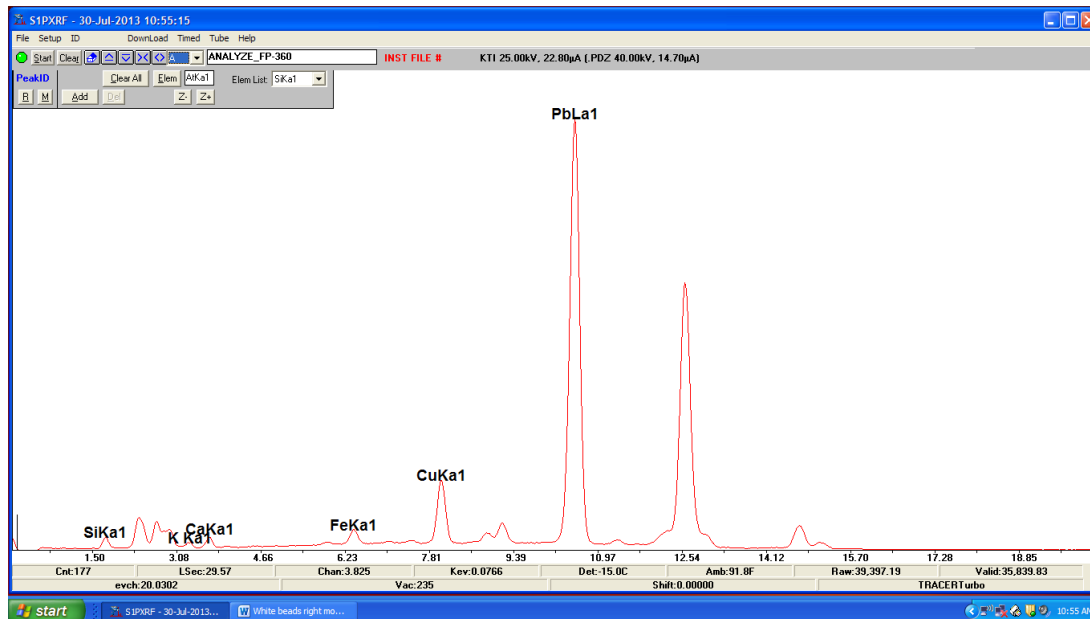


APPENDIX B

White Bead from Moccasins

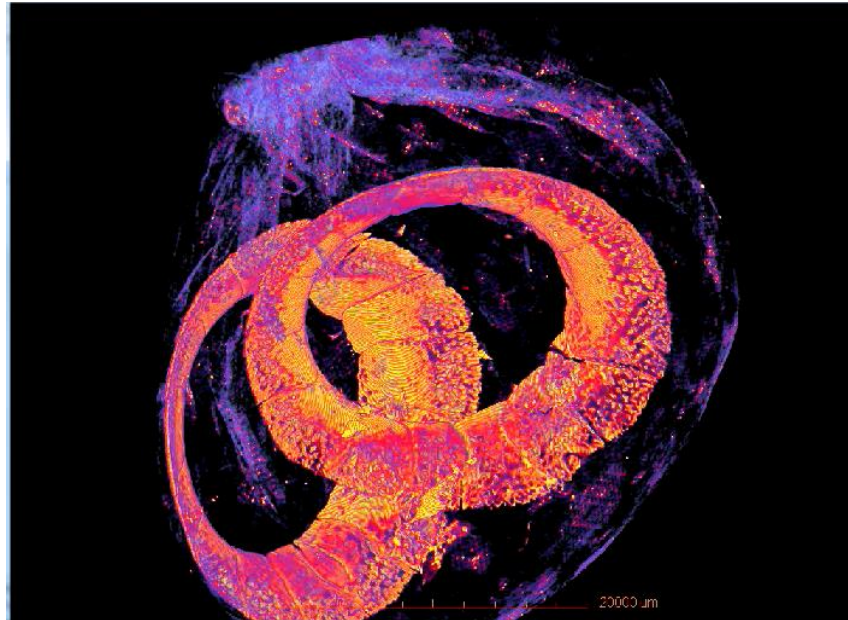


Green Bead from Moccasins



APPENDIX C

Copper Rings in the Pouch



Plant Material in the Pouch

