

**Figure 1:** Seen here are two examples of seemingly NA products that were made in foreign countries. The first has “made in China” covered, the second Has the word “not” covered by the image of the product itself.



## Introduction

In 1990 the Indian Arts and Crafts Act was enacted. The purpose is to protect the livelihood of native American artist as the market becomes flooded with up to a billion dollars a year in counterfeit goods. Many of these counterfeit products are made in foreign countries and not properly represented here in the US as seen above. The goal of this project is to look at two pre contemporary pieces and try to show their authenticity. Lakota Oral history, Literature Research, and Laboratory Tests are used to analyze the art. It should be mentioned that Lakota “art” from this period is practical first and then aesthetics usually spiritual in nature are then applied.

## Approach

Red Cloud Heritage Center provided the items to be tested. These were a pair of Moccasin’s that may have come from the 1890 wounded knee massacre., and a small pouch with unknown contents from a bustle. The purpose of the pouch is of interest. Initial background research was performed by literature search, several interviews, and visits to relevant locations in the area.

### VSC: Multispectral Analysis

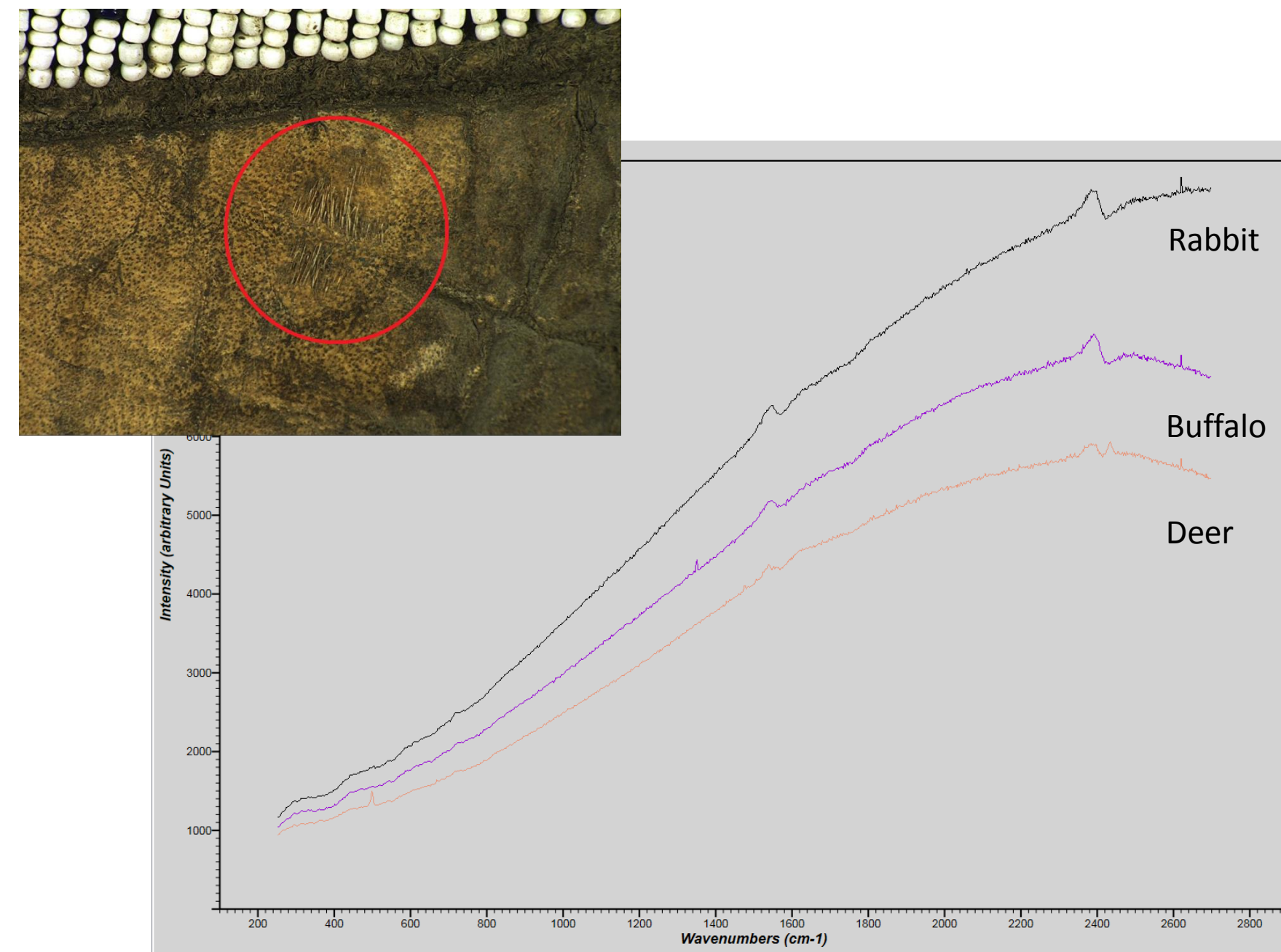
**Figure 2** shows the items as seen multispectral analyzer. The items were exposed to UV to IR light to examine for fluorescent properties. If any of the materials were to fluoresce further investigation would be made as it could easily indicate a modern material. No strong fluorescence was seen in either the moccasins nor the pouch.

**Figure 2:** VSC images of the art pieces. The color images are in white light and the dark image in the lower left is UV light at 365nm.



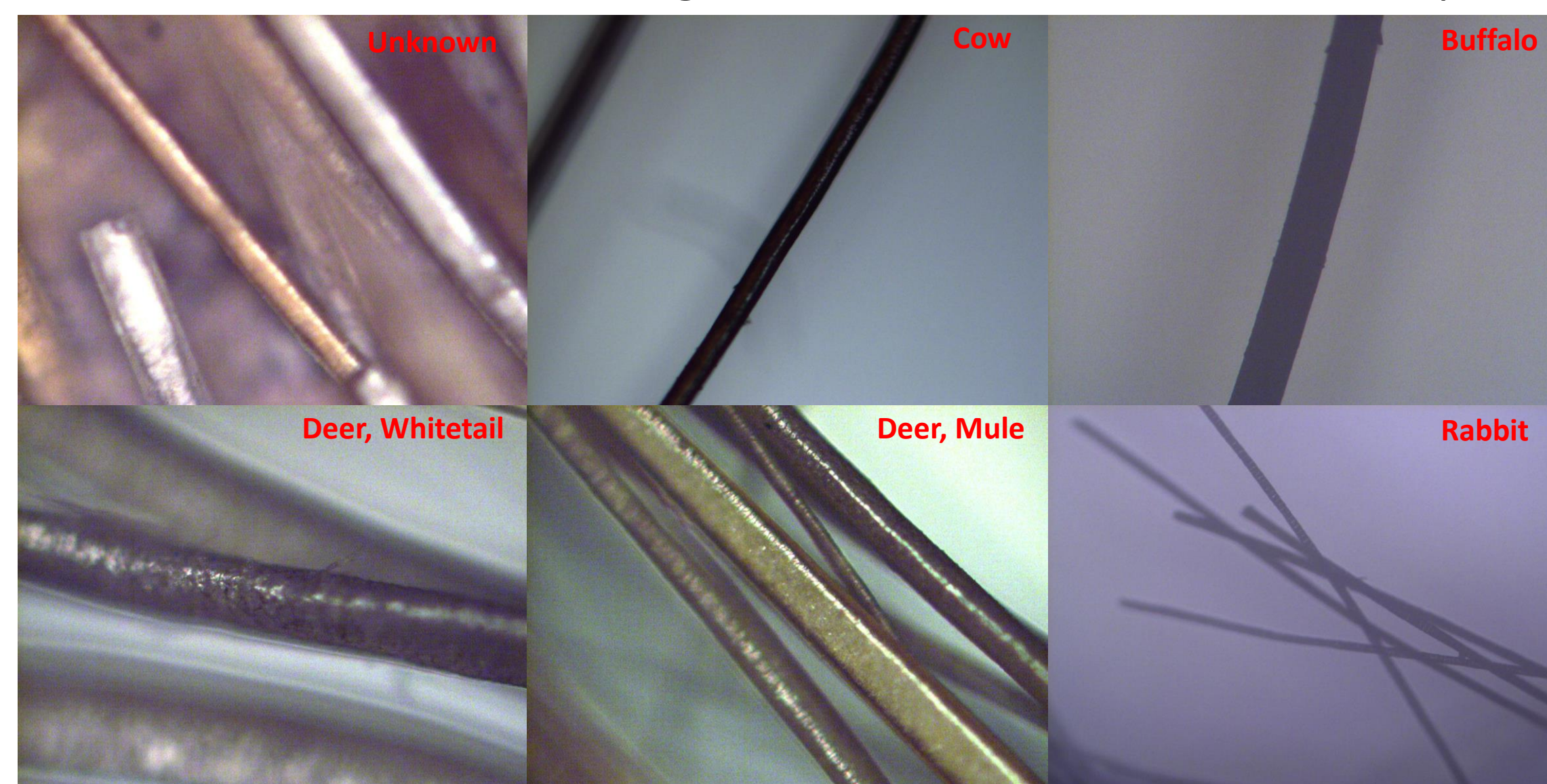
## Acknowledgements:

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### Raman Spectroscopy

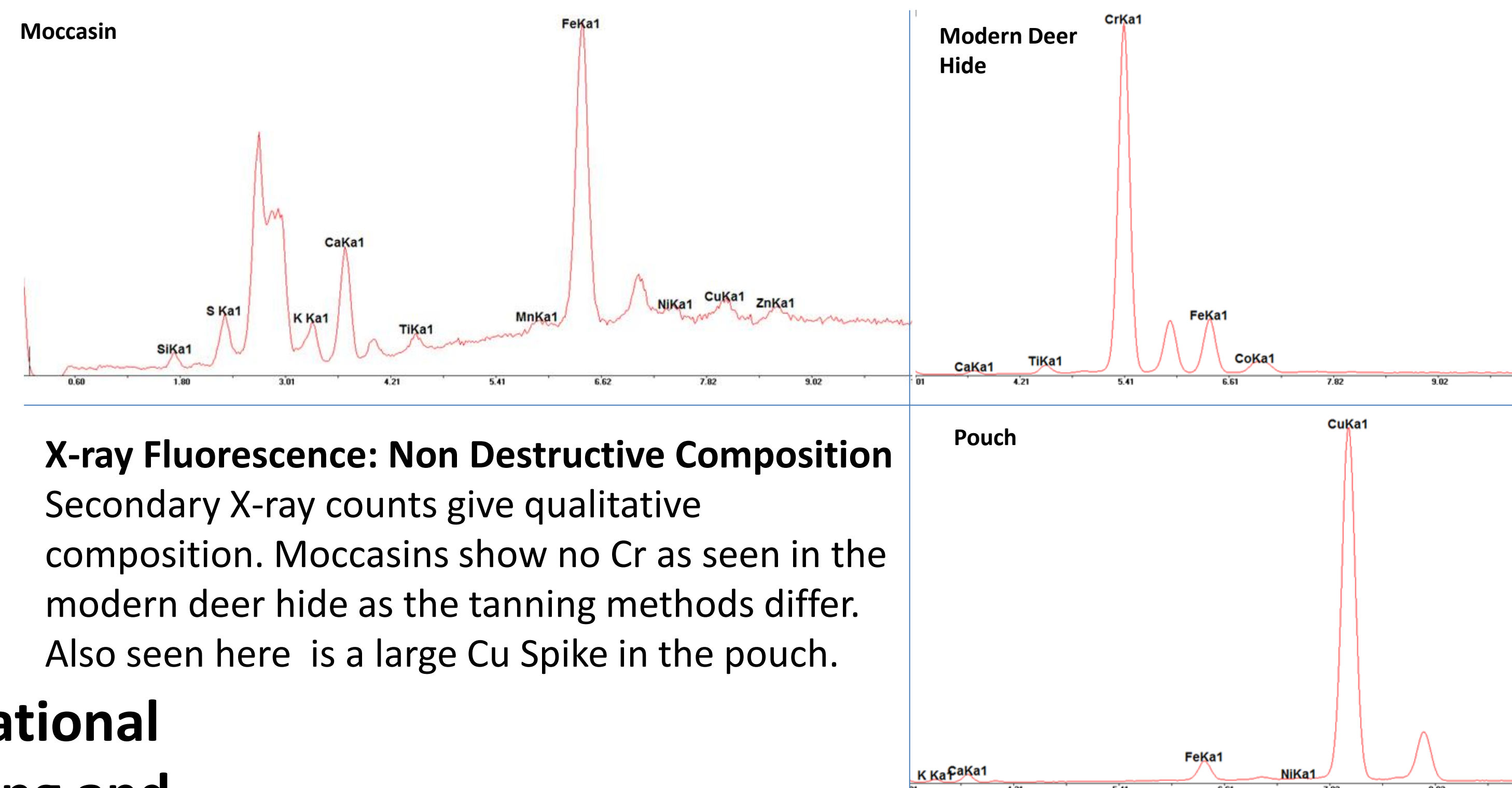
Utilizing a microscope and inelastic scattering of monochromatic light it is used to see low frequency modes of the material and give an idea of structure. Shown in **figure 3** is the Raman data. The three species show similar slopes and identical peaks, indicating they are similar enough to not allow for differentiation using this method. In other words hair seems to give the same data no matter the species



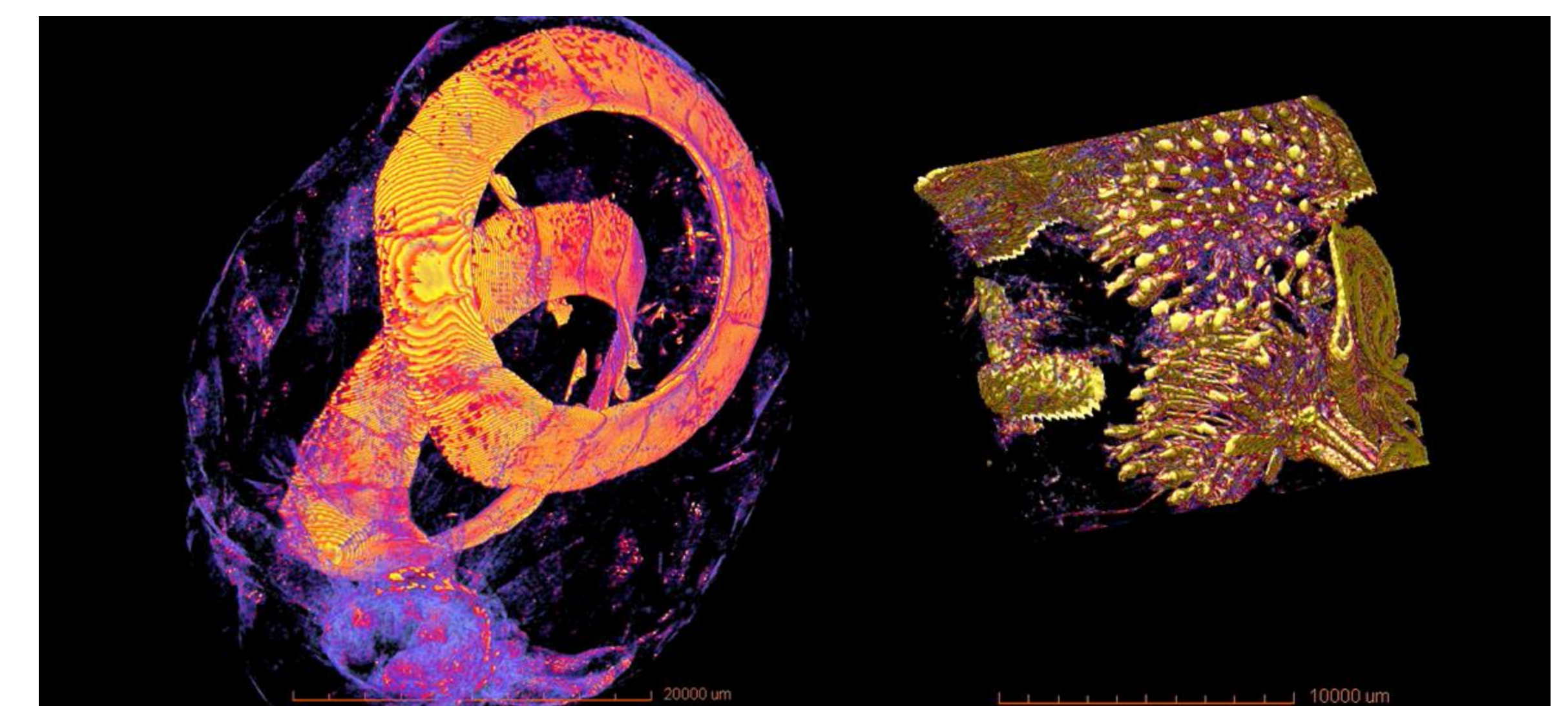
**Figure 4:** Optical Microscope Images of the unknown hair from the moccasins compared to various species. Same lighting conditions and all pictures at 10x magnification.

### Optical Microscope: Hair Identification

Using the same lighting and magnifications the unknown sample from the moccasins was compared to known sample collected from local sources. The only hairs that have the same size , texture, and reflective properties are the deer hair samples. The color most closely resembles mule deer hair specifically.



**Figure 5:** XRF data for analysis of composition in a non destructive manner. All natural ions can be see the moccs. The modern deer hide shows Cr tanning. The pouch gives a strong Cu spike.



**Figure 6:** Micro CT scans of the pouch. On the left, two rings with high density appear to be within the pouch. On the right, an organic material, most likely a plant, also seems to be contained within the pouch,

### Micro CT

X-ray images are taken at many angles in order to give a three dimensional picture of what is contained in the pouch. The color gradient in **figure 6** expresses differences in density. The brighter the color the more dense the material. Two rings are seen within the pouch. Also, there appears to one or more plants within the pouch.

## 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 the came from the Wounded Knee Massacre was not determined, however all data shows them to be from the same period.

### Pouch

The pouch came from a bustle with little known about it. All indication from the bustle show it to be at least eighty years old. Two good indicator of this are un-dyed areas made by non-machined clamps ( as seen in **figure 7**) 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 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.

**Figure 7:** The bustle that the Pouch was tied to is shown. Seen on the far right in the circle is the area of un-dyed material. The left most feathers are cut for counting coup.

