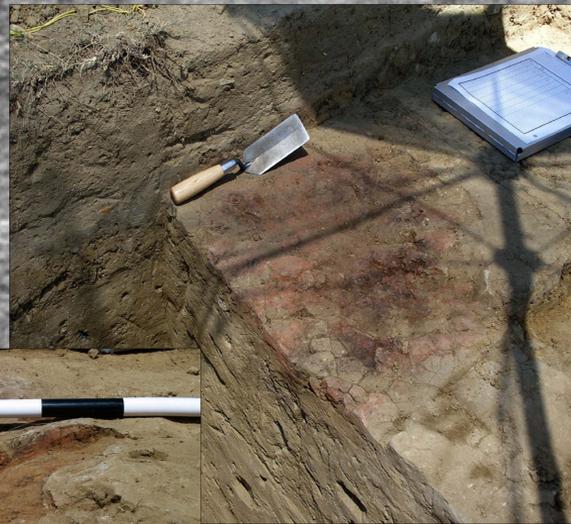


Bighorn Basin Wyoming Pictograph Pigments

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Introduction

In the summer of 2007 a feature was exposed at the Legend Rock Petroglyph site during test excavations. The feature is a shallow basin, stained deep red, and contained a 2.5cm long piece of ochre. This feature was interpreted as a hearth used to process ochre processing. The resulting question was whether the ochre in the hearth could be connected to remaining pigment in the rock art. The current project begins to address this question by doing two things 1) do known ochre sources have a signature that can be measured and 2) does heating ochre change that signature? Preliminary additional steps were taken to match these raw materials with pictographs and ochre staining on artifacts curated at the Washakie Museum.

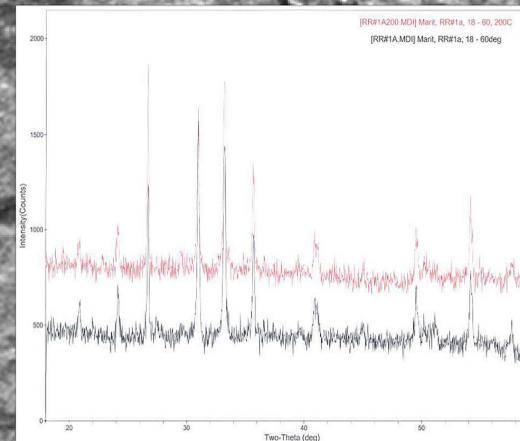


Test 1 – Raw Material

Results

Differences were found between raw material sources, as were similarities within sources. There is a significant difference ($p < 0.01$) between all sources. However, the results are not clear cut and similarities or differences were found where they weren't expected. For instance, there was no significant difference between one sample from Weatherman Draw and the Guernsey sample. And there was a significant difference between all but one of the Rawlins Red samples, where none were expected.

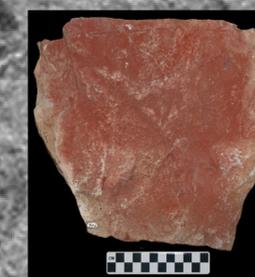
Heating of the raw material samples created no significant difference in element content. There was a visual difference in all samples; noted in a darkening of reds and a fading of yellows. The hue and chroma in a Weatherman Draw sample changed from 10YR6/4 to 5YR4/6. One sample did show a significant difference ($p < 0.01$), further analysis of the source is needed to determine the reason.



Test 3 – Raw Material v. Artifacts

Results

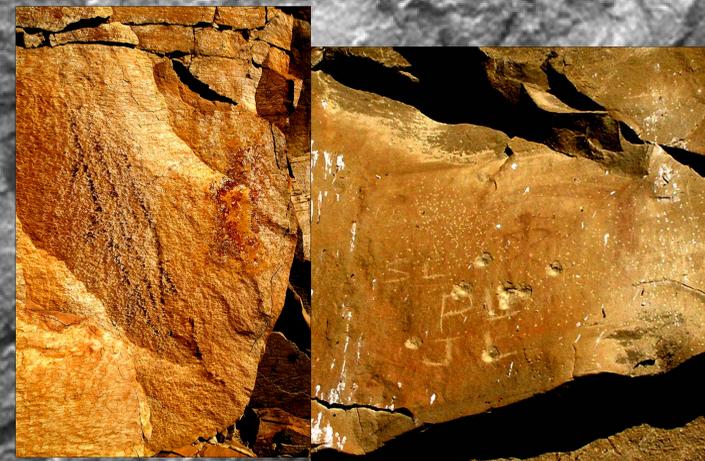
Readings with the XRF element analyzer were obtained from four ochre marked artifacts: a metate used to grind ochre, ochre excavated from Legend Rock, an ochre stained foreshaft, and ochre excavated from 48WA302. There was no significant difference ($p > 0.01$) in the trace elements between ochre from Weatherman Draw, ochre from Legend Rock, and the foreshaft. Also, there was no significant difference between Guernsey and the foreshaft.



Test 2 – Raw Material v. Rock Art

Results

Readings were obtained with the XRF from Legend Rock. This site has three pictographs panels; a fish, horse, and man with horse. No significant difference ($p < 0.1$) was found between ochre from Guernsey and the man with horse.



Conclusions

These are preliminary results and additional research is planned. However, there are significant differences between ochre sources. It is possible to identify those differences in artifacts and rock art of ochre. The next step is to determine how those differences can best be measured. Though it must be kept in mind that pigment on the rock or on artifacts is likely not pure, but rather a concoction of binding agents and multiple sources.



Methods

Test 1: A hand held x-ray fluorescence (XRF) element analyzer was used to measure ground samples from three known sources in Wyoming: Weatherman Draw, Rawlins Red, and Guernsey. Three readings from each sample were read and averaged. A diversity T test was run on the averaged results looking for a significant difference ($p < 0.01$) between the sources. Next a sample from each source was heated to 200 C for six hours and measured again with the XRF. These results were also subjected to a diversity T test. For additional information and identify significant differences between sources, one sample from each source and the heated samples were measured with an XRD machine.

Test 2: Pictographs from Legend Rock Petroglyph site were analyzed with the XRF analyzer. Pigment readings were averaged and compared with the raw material results through a diversity T test.

Test 3: The hearth from Legend Rock and the artifacts with ochre staining were analyzed with the XRF analyzer. Several readings for each artifact were taken and averaged; the average was compared with raw material results through a diversity T test.

With all comparisons, Fe and Mn were removed. These are the most common elements in all samples, because ochre is iron oxide (FeO_3). Any elemental signature would be present in the trace elements.

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