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REPORT

Radiocarbon dating a pictograph at Medicine Lodge Creek, Wyoming

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Wyoming State Parks recovered a large chunk of the Medicine Lodge Creek Archaeological Site cliff wall, which had fallen away, with rock paintings on it. A sample from one of the paintings was dated to 800 BP with the Plasma Oxidation dating method. Comparison to regional sites suggests the dated painting is part of the Foothills Abstract tradition or a variant of the Columbia Plateau tradition.

KEYWORDS Medicine Lodge Creek site, rock art, foothills abstract, plasma oxidation dating

The rock art at the Medicine Lodge Creek site (48BH499) is an important component of the site (Francis 2007). The main panels are along the high expanse of the sandstone canyon wall in the area of the major site excavations. Pecked, abraded, incised, and painted shield bearing warriors dominate the panels. Other notable figures are large outline pecked elk and other large outline pecked figures (Francis and Loendorf 2002). Dozens of painted figures are in the main site area.

Less is known about the rock art at locations away from the main panels. Mike Bies (personal communication 2015) has recorded some areas where the rock art is less concentrated. These outlying areas include rock art panels downstream from the main site along both banks of Medicine Lodge Creek (MLC), and on and around Shiprock, a major rock feature at the confluence of Medicine Lodge

and Dry Medicine Lodge creeks. The second volume of the MLC site report will include results of these investigations. In this paper we report a radiocarbon date on one of the MLC upstream panels and discuss implications of this date.

The upstream panels

Upstream panels are upstream from the main site area, but still within the confines of site 48BH499. The panels contain multiple types of pictographs and petroglyphs with charcoal figures, large incised designs, and a variety of pecked figures. One group of paintings, dominated by abstract designs, was briefly described by Sundstrom (2004:63–67) in an overall discussion about geometric figures in the South Dakota Black Hills. These MLC upstream abstract paintings are in red pigments although some are such a dark reddish brown that they appear almost black. The majority of these figures are forms that include: (1) rows of vertical lines or tally marks; (2) rows of dots with some that run together in dotted lines; (3) vertical lines with crossing horizontal lines that are sometimes recognized as one-pole ladders; and (4) straight lines, wavy lines, and curved lines or arcs; and lines that spread out from a point in fan-like patterns (Figure 1).

The paintings are on a rock outcrop that is in very poor condition. The interbedded sandstone contains layers of softer matrix, which has eroded away in places. The erosion creates an unstable surface by undercutting large blocks of the sandstone that fall from the wall. These softer sediments also produce mud slurries that run down the wall and over areas that contain some of the paintings. Paintings on the undersides of the sandstone ledges tend to escape this over wash and therefore appear to be brighter.

The deterioration of the canyon wall has caused several large slabs of the sandstone to break off and tumble to the ground (Figure 2). A large sandstone slab that contains abstract paintings fell away in the autumn of 2014. Brooks Jordan, the MLC site manager, recognized the importance of the slab and stored it.



FIGURE 1 Painted abstract figures in the Upstream Panels. Note the heavy impact from graffiti and what may be pecked designs superimposed on the painted figures.



FIGURE 2 Fallen slab on the ground below the Upstream Panels. Pictographs are found on several of the eroded surfaces of the slab.

The sample

Experimental procedure

After receiving the MLC samples in the Center for New Mexico Archaeology plasma laboratory, we subjected the sample and background to a rinse in pH 8 phosphate buffer solution, a treatment shown to be efficient for removal of humic acid contamination (Armitage et al. 2012; Ellis 2008). To get as little of the basal rock as possible required careful scraping the pigment from the sample. The pigment sample thus obtained weighed only 27 mg.

Before introduction of the sample into the plasma chamber, the empty chamber was repeatedly subjected to oxygen plasmas until negligible CO_2 ($<0.5 \mu\text{g}$ carbon) was released. That procedure ensures oxidation to CO_2 and removal of any residual organic material in the chamber. Placing the sample into the chamber, successive argon (Ar) plasma discharges removed adsorbed CO_2 by surface ablation of the sample and chamber walls. Argon is an inert gas that will not react with organic material in the sample. Argon is also ideal as an atomic sand blaster to dislodge CO_2 because its atomic weight (40 atomic mass units, AMU) is very close to that of CO_2 (44 AMU), resulting in a high efficiency in elastic collisions with the CO_2 . Again, after the CO_2 released by the argon plasma is $<0.5 \mu\text{g}$ carbon, the sample is deemed ready for oxidation.

Even though the sample was small (27 mg), the oxygen plasma produced $50 \mu\text{g}$ of carbon, enough for a date. The CO_2 gas produced was trapped in 4 mm diameter glass tubing cooled to liquid nitrogen temperature (-196C) so that the CO_2 converted to solid dry ice. The CO_2 was then isolated in the glass tube by heat sealing the tube. The CO_2 sample was then submitted for radiocarbon analysis to the Zürich-ETH accelerator mass spectrometry laboratory. A basal rock background sample as similar as possible to the pigment sample and near the pigmented sample yielded negligible CO_2 .

With the cooperation of Wyoming State Parks, we were able to obtain a small sample of the painting on the fallen sandstone slab for use in radiocarbon dating. (Figure 3). Development 25 years ago of the plasma-chemical technique for the extraction of minute amounts of organic carbon permits prehistoric rock paintings to be radiocarbon dated by accelerator mass spectrometry (Russ et al. 1990). In 2009 Row reviewed the technique and about two years ago with colleagues at the

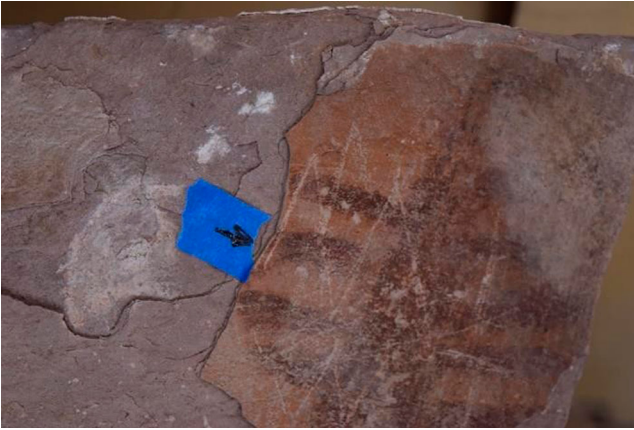


FIGURE 3 A small piece of the painted area was removed from the point of the arrow for the radiocarbon analysis.

Museum of New Mexico began construction of a new plasma-chemical device at the Center for New Mexico Archaeology in Santa Fe (Rowe et al. 2016). The organic binder from an MLC sample was converted to carbon dioxide (CO_2) with the new device for radiocarbon dating at the Zürich ETH accelerator mass spectrometry facility (Fahrni et al. 2013; Ruff et al. 2007; Wacker et al. 2013).

The radiocarbon date

The radiocarbon age obtained for the MLC sample was 800 ± 55 BP (ETH-65334; pictograph pigment; $\delta^{13}\text{C} = -32.7\%$, uncorrected) which is calibrated in OxCal to AD 1050–1290 (2σ) with a median probability of AD 1225 as the age for the paint sample. Because the paintings look old, the age is more recent than we originally thought. The eroded paintings seem to be abstract forms like ancient ones in the Black Hills (Sundstrom 2004:67). The superposition of several figures by recent graffiti and pecked blobs or incised figures suggested an old pedigree for the paintings.

Classifying the upstream panels

In retrospect, the belief that the upstream panels contain older images is probably an illusion. We should have considered other variables at the site. First, the paintings are on eroded and exfoliating surfaces, which suggests that they must be younger. The entire area of the upstream panels is so eroded and unstable that imagining any surface surviving more than a thousand years is hard. The fact that figures are under other pecked and incised figures is certainly not a problem. The age of AD 1225 allows 800 years for the addition of the pecked and incised forms.

A careful examination shows that not all figures are abstract. At least one figure appears to represent a stick-like human form with a straight-line body, a round head and crossed arms and legs (Figure 4). The arms appear to end in three digits. In



FIGURE 4 Anthropomorph associated with the abstract figures on the Upstream Panels. Note the incised figure superimposed on the painted one.

addition, a probable quadruped appears to have been made using the same dark reddish-brown pigment as other nearby figures. The quadruped has an oval body with straight legs that end in inverted hook-like hooves. The head is hard to see but it is large and oval-shaped. The figure may represent a bison, but that assessment requires better photographs and drawings to confirm that identification.

Most important, however, is that the age of AD 1225 is appropriate when compared to sites with other similar painted figures in Montana. The DesRosier site 24ME1002, for example, on the eastern flanks of the Big Belt Mountains contains very similar finger applied red abstract and human figures (Keyser 1981). Sundstrom (2004:65) noted the similarity between the MLC and DesRosier figures.

The DesRosier site rock art is of the Columbia Plateau tradition (Keyser 1981; Keyser and Klassen 2001:98–100). Along the Columbia River and its tributaries in the northwestern United States and adjacent Canadian provinces, the Columbia Plateau tradition can be ancient. However, we think that the approximately 20 known sites to the east of the Rocky Mountains, including DesRosier, date to the Late Prehistoric Period (Keyser and Klassen 2001:99). Thus, an age of AD 1225 is acceptable for these sites.

The MLC upstream panels may also represent Foothills Abstract rock art, another painted rock art style in Montana to the east of the Rocky Mountains (Greer 1995; Keyser and Klassen 2001). Originally named Central Montana Abstract, the name was changed to Foothills Abstract, partly to account for the wider distribution (Keyser and Klassen 2001:153). Importantly the criteria differentiating Columbia Plateau rock art from Foothills Abstract rock art is not clear-cut. Classifying abstract rock paintings into a type or style, like those on the MLC upstream panels, is not an easy task mainly because the different rock art types are not well defined. Keyser and Klassen (2001:166) note that the differences between Foothills Abstract and

Columbia Plateau rock art is often a matter of degree. In other words, these authors recognize subtle differences like the fact that stick-like human figures are more common at Plateau than at Foothills sites.

If the MLC upstream panels are part of the Foothills Abstract, the age of AD 1225 is within the suggested time period for the figures. Using the plasma oxidation method for painted sites in central Montana, dates of 1170 ± 45 , 1225 ± 50 , and 1280 ± 50 BP were assigned to red paint smears, abstract tally marks, and a stick-like anthropomorph considered to be Foothills Abstract (Scott et al. 2005:67).

An important study of Foothills Abstract rock art was Greer's (1995), who used examples of superimposed painted figures, executed in different colors and application techniques, to develop a paint chronology. For example, she identified an orange liquid paint that was older than a medium-light red liquid paint and found that both of the paints were older than dark red, black, and purple liquid paints. Still more recent was a yellow liquid paint and black and yellow crayon applied pigments. The most recent was a white liquid paint. Using the estimates that Greer established, the MLC upstream panels that were created using dark red liquid paint would date from the Late Archaic through the Late Prehistoric periods.

To summarize, the abstract painted figures with a stick-like anthropomorph and a possible quadruped in the upstream panels might represent the Eastern Columbia Plateau tradition or they could also be examples of the Foothills Abstract tradition. Both of these rock art types were made in the Late Prehistoric Period on the Northwestern Plains and the date of AD 1225 for an upstream panel abstract figure is within the range for either of these rock art types.

Comparable sites in the region

Painted rock art sites in the Bighorn Basin are not nearly as common as petroglyph sites. Several sites with painted figures found on the Tensleep Nature Conservancy property, like the Tensleep Alcove (48WA2285) and the Sheep Site (48WA2288) include abstract figures. However, these abstract figures are sufficiently different from the MLC upstream panels and thus excluded as the same type of rock art (Francis and Loendorf 2002:170; Mack 1971).

Little Canyon Creek (48WA323) contains mostly representational figures (Francis and Loendorf 2002:153–155), but a number of abstract forms including a row of comma-like motifs are also present as are several sets of intersecting lines that have horizontal tops and inverted v-shaped bottoms, and a red vertical line figure with crossing horizontal lines. Some of the Little Canyon Creek abstract figures are similar to the MLC upstream panels, but need to be recorded in detail to learn if they represent the same kind of rock art.

June's Pictograph site (48WA1924) is high on the canyon wall to the east of Tensleep (Loendorf and Newman 2006). The figures include quadrupeds, painted circular areas, and abstract forms. Tally lines, nested curved forms, and some grid-like figures are among the abstract motifs at the site. The figures do not resemble the MLC upstream panels. June's pictograph site images probably represent a different tradition, but may be a variant of Foothills Abstract art.



FIGURE 5 DStretch (LDS) image at Beaver Creek (48BH4293). Incised plant-like figures are superimposed on red tally lines, dots, and hand prints that appear to represent Foothills Abstract rock art.

The Beaver Creek site (48BH4293) is situated on a cliff face to the north of Shell, Wyoming. Although partially recorded by Bureau of Land Management personnel, no published accounts regarding the types of rock art at the site exist. However, the site is relatively complex with multiple panels of incised figures, solid pecked and outline pecked quadrupeds, bear claws, and painted abstract motifs. The incised figures include vertical lines with crossing or branching horizontal lines that are plant-like in appearance. In one panel the most obvious figures are red painted horizontal rows of dots, short lines, and red handprints (Figure 5). These red figures, which are under the incised motifs, appear much like those at Foothills Abstract sites in Montana (Scott et al. 2000, 2005).

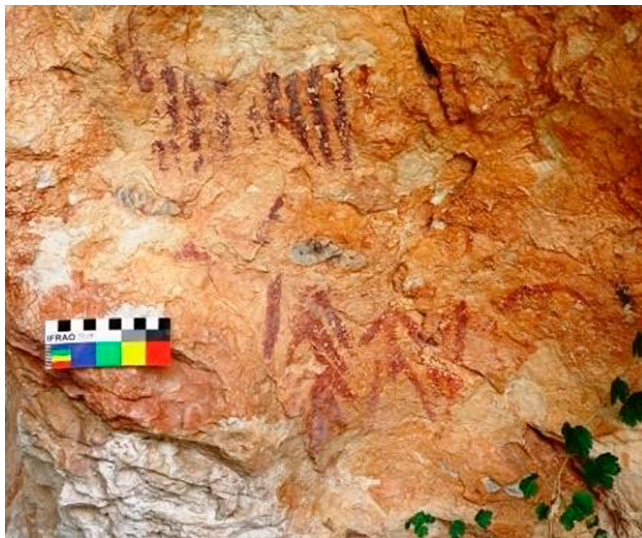


FIGURE 6 Foothills Abstract-like painted figures at the Fortified Cave site (24BH881).

The Fortified Cave site (24BH881) is another comparable site along Bighorn Canyon about 100 kilometers to the north of MLC (Loendorf and Good 1981). The figures, which are finger applied in red and black pigments, include tally marks, herringbone designs, a stick-like human figure, and other abstract designs (Loendorf 2015). They are very similar to the figures at the DesRosier site and therefore quite similar to the MLC upstream panel figures (Figure 6).

To summarize, the painted sites around MLC contain more representational figures than abstract figures. Little Canyon Creek cave may have abstract figures that resemble the MLC upstream panels, but any association between the sites is not possible until Little Canyon Creek is better recorded. Two sites with the most comparable figures are to the north near Shell, Wyoming, and along Bighorn Canyon in Montana.

Conclusion

The MLC upstream panels include mainly abstract figures, with a stick-like human figure and a possible quadruped that are all in a dark red liquid paint. The figures were probably made by applying the paint with a finger. The paint on an abstract figure was radiocarbon dated at AD 1225, an acceptable date for similar abstract designs.

Foothills Abstract and Eastern Columbia Plateau rock paintings contain designs similar to the MLC upstream panels. The MLC paintings probably represent an extension of one of these rock art traditions into the Bighorn Basin. Because Foothills Abstract sites are to the north in Montana, they seem to be the most likely candidates for the MLC abstract painted figures.

An Indian trail through Bad Pass connected the Yellowstone River region in Montana to the southern Big Horn Mountains in Wyoming. South of Bad Pass the trail went south along the western flank of the Bighorn Mountains (Loendorf and Brownell 1980) and directly past MLC. The trail passes site 48BH4293 along Beaver Creek and then continues south past MLC to Tensleep. From Tensleep it goes south to Lysite or east to Buffalo (Frison 1981). The trail system use continued for thousands of years (Loendorf and Brownell 1980:32, 75) and represents the probable route used by the groups who left the Montana style abstract paintings at Wyoming sites.

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