

## **AN ARCHAEOLOGICAL ANALYSIS OF CA-MRP-402: INVESTIGATING BEYOND THE ROCK ART IMAGES**

CHRISTINE GRIMALDI CLARKSON  
DEPARTMENT OF ANTHROPOLOGY, MERCED COLLEGE

*Situated in the western Sierra Nevada foothills of California, CA-MRP-402 exhibits 103 rock art panels. By combining archaeological field research and excavation, this paper explores the ancient activities that took place at MRP-402. These efforts reveal that ancient Native Americans intentionally altered the landscape to create an astronomical observation area and generate consistent equinoctial solar and shadow alignments.*

Rock art is not found everywhere on the landscape; it is created in particular places and often on specific rocks. It is common to find a rock exhibiting numerous images while an adjacent rock of the same material is devoid of any cultural markings. This implies that the places where rock art was created held some significance for past peoples. The significance of each place likely varied depending on social beliefs and the desired outcome for the creation of the images. Recognizing the importance different places may have held for past peoples will help archaeologists interpret the possible meaning or function of the rock art created in those places.

Acknowledging this, some California archaeologists more recently have advocated exploring the landscape context of rock art (e.g., Button 2009; Gillette 2011; Quinlan 2007; Whitley 2011). This post-processual approach brings together both the “natural” and “cultural” dynamic landscapes (see David and Thomas 2008) in a unifying concept to understand how past people viewed their surroundings and engaged with significant places over time.

This paper employs formal landscape methods to determine what activities took place at MRP-402. Located on private property in Mariposa County, California, this site exhibits petroglyph panels, bedrock mortars (BRMs), and a modest scatter of quartz debitage (Figure 1). It is my hypothesis that MRP-402 also encompasses an ancient observatory.

Most of the recorded sites in the study area contain fewer than 10 rock art panels. MRP-402 was chosen for this research because it is distinct, with 68 recorded abstract petroglyph panels. Rerecording of this site was also necessary, as it has been 30 years since the rock art at MRP-402 was first recorded (Peak and Associates 1982a).

### **THEORETICAL APPROACH**

The theoretical approach informing this research is landscape theory. A landscape approach is one in which objects of archaeological inquiry—in this case, the rock art and other possible features at MRP-402—are considered within the broader “natural” and “cultural” landscapes (see David and Thomas 2008), archaeological evidence of human activity and culture, and the connections between rock art and other signs of human activity (Gillette 2011:11). This contextual approach aids in understanding the activities that took place at MRP-402.

Landscape is an interaction of both the geographical and the cultural landscape, with the cultural landscape “created by human activity and with human activity being framed by the landscape” (Gillette 2011:13). Landscape in archaeology can be viewed as a unifying concept that serves to draw together not only the geographical environment “onto” which people live out their lives, but also the meaningful location “in” which lives are lived. “This includes the trees and the rocks and the stars, not as abstract objects but as meaningful things that are located ontologically and experimentally in people’s lives and social practices (praxis)” (David and Thomas 2008:38). Landscape approaches are a study of how people



Figure 1. A map of California ethnolinguistic groups (Heizer 1978) showing the location of CA-MRP-402.

visualized the world, how they chose to manipulate their surroundings, and/or how they were subconsciously affected to do things by way of their surroundings (David and Thomas 2008:38).

Landscape approaches have been a fundamental part of much archaeological research conducted in the last two decades. One of the well-known proponents of landscape archaeology is Barbara Bender (1993), who employed this approach in her research on Stonehenge. Much of Bender's work focused on understanding the contestation and appropriation of landscape by various stakeholders. This was achieved through careful historic contextualization of the landscape. Layton and Ucko (1995) contended that landscape archaeology differs from other disciplinary perspectives in its "practical aspects (laboratory and field techniques, instruction in the recognition of elements of ancient activity in the landscape), its theoretical aspects (which include a history of the 'sub-discipline') and its philosophy and politics" (Layton and Ucko 1995:15). They also postulated that the advance of landscape studies coincided with a desire to "humanize" (Layton and Ucko 1995:16) the past, and led to a more interdisciplinary approach.

Other archaeological studies emphasized the way landscape was perceived, experienced, and contextualized. Richard Bradley (2000) directed his attention to natural and unaltered features in the landscape, focusing on why caves, mountains, springs, and rivers held a sacred place in European prehistory. Christopher Tilley (1994) introduced an entirely different way of approaching landscape studies in archaeology with the publication of *A Phenomenology of Landscape*. Phenomenological archaeologists use contemporary experience to interpret how people living in the past may have understood and described the world. Tilley explored the relationship between "Being and Being-in-the-world," following on concepts introduced by Martin Heidegger (Tilley 1994:12). George Children and George Nash built upon this perspective and theorized that landscape "embodies the principles of organization and categorization within the human experience" (Children and Nash 1997:3). They contended that landscape "is an archaeology site" (Children and Nash 1997:2).

Rock art is created in or on the surface of the earth and therefore possesses an innate "security in place" (Chippindale and Nash 2004:7) that provides a stable basis for the application of landscape concepts in formal rock art studies. Some of the earliest works linking landscape epistemology to rock art studies were compiled in *The Archaeology of Rock Art* (Chippindale and Taçon 1998a). Included in this volume was the research of Sven Ouzman (1998), who considered foragers' perceptions of the landscape in southern Africa, and the work of Whitley (1998), who examined rock art and landscape symbolism.

A second compilation of research employing landscape approaches to rock art studies was published in 2004. This publication included Daniel Arsenault's (2004) research investigating whether landscape approaches can be applied to locate and reconstruct native sacred sites, as well as Tilman Lenssen-Erz's paper that introduced his idea of *Gestaltung*, defined as the "physical acts which bring about tangible change on a landscape endowed with meaning" (Lenssen-Erz 2004:131). Lenssen-Erz employed this approach at the Brandberg rock art region of Namibia to understand what "human decisions" (Lenssen-Erz 2004:131) led people to create certain images in this particular place in the landscape. He concluded that "painters" went to Brandberg to satisfy their basic material needs, but once they were there, they used this place for ritual activities. "The landscape had to be influenced in interactive processes in order to maintain it as a functioning organism" (Lenssen-Erz 2004:148).

Chippindale and Taçon (1998b:6-7) separated rock art studies into "informal" and "formal" methods. Informal approaches are those that employ emic, or insider, information typically acquired through ethnography or ethnohistory. Formal approaches, as employed in this paper, are those that utilize spatial analysis and quantitative data and offer an etic, or outsider's, interpretation of the rock art.

According to Whitley (2011:153), formal landscape approaches to rock art studies may be divided into three groups: (1) archaeoastronomical and acoustic, (2) communication studies, and (3) ethnicity and territoriality studies. Archaeoastronomy, or what is also referred to as "cultural astronomy" (Aveni 2008:6), is invoked in this study to test the hypothesis that MRP-402 encompasses an ancient observatory. This approach is concerned with the orientation and layout of sites—and how they relate to the earth and sky—and it is one of the more common forms of landscape approaches to rock art studies

(Whitley 2011:154). Another example is Lionel Sims's (2009) research on Silbury Hill in Wiltshire, England. Sims combined cultural astronomy with phenomenology to "reconstitute a reality which exists both through the individual agency of embodied experience ... [and] on the social-structural level of collective representations" (Sims 2009:389). His research combined these two "cohesive" data sets to "display an emergent property at a higher, ethnographic, scale of meaning." Sims suggested that if the definition of landscape were changed to include the skyscape, "we can transcend the nominalist barrier of structural interpretations." For the current research, the skyscape is included in the cultural landscape.

## **BACKGROUND**

MRP-402 is situated on the border of the Northern Valley Yokuts and Southern Sierra Miwok traditional territories, in an area for which very little direct ethnographic or archaeological information exists. Wallace (1978) assigned this area to the Northern Valley Yokuts. Similarly, Latta (1977) determined that Yokuts occupied the San Joaquin Valley and the adjoining foothills (see also Rosenthal et al. 2007). However, according to Kroeber (1925), the foothills were inhabited by the Southern Sierra Miwok, and the Northern Valley Yokuts occupied the San Joaquin Valley, while the first foothills marked the dividing line between the two groups.

Portions of the property on which MRP-402 is located were first surveyed by Mohr (1951) for the Smithsonian Institution's River Basin Surveys in 1950. The survey was conducted in order to determine the archaeological resources of several proposed reservoir areas. MRP-402 is adjacent to a creek in one of these reservoir areas but was not observed by Mohr. A dam was subsequently constructed southeast of MRP-402, and the site is now within the maximum pool level of the reservoir created by this dam.

A proposal was made to increase the height of this dam in 1975, and a second archaeological survey of the reservoir area encompassing MRP-402 was completed. Clewlow (1976) examined 100 percent of the total reservoir area, or roughly 380 acres, and recorded 12 archaeological sites, including MRP-402. Clewlow noted that MRP-402 consisted of BRMs, a cluster of pestles, and a vertical petroglyph panel on the west side of the creek (Clewlow 1976:37). Subsurface tests and precise documentation of sites were recommended. The dam was not altered at that time, but in 1981 the proposal once again gained interest, and a third archaeological survey was required.

The subsequent intensive five-day cultural resource survey was undertaken by Peak and Associates (1982a:30), who assessed 836 acres within the boundaries of the proposed reservoir enlargement area. At MRP-402, they documented 68 petroglyph panels, 57 BRMs on 17 outcrops, and three lithic scatter areas. A sketch map of the site was prepared, illustrations were made of the petroglyph panels, and three auger tests were completed. One auger test revealed that the southeast lithic deposit measured 55 cm in depth and contained debitage, ground stone tool fragments, and fire-cracked rock (Peak and Associates 1982a:65). Thirty sites within this survey area, including MRP-402, were recommended as eligible to the National Register of Historic Places as an archaeological district, and the proposed dam alteration was deferred (Clay 1993:1; Peak and Associates 1982b:25).

Clay was hired in 1992 by the U.S. Army Corps of Engineers to inspect the sites in this area and assess impacts that had occurred after 10 years of probable damage caused by impounded waters. The final report included an updated sketch map documenting a small amount of erosion to the west bank and a few photographs of MRP-402. Clay (1993:15) concluded that the site had not changed significantly since 1982. No further archaeological investigations were undertaken at this site in the last 30 years. Therefore, a more recent assessment of this site was necessary as part of this research.

## **RESEARCH AND ANALYSIS METHODS**

To identify the actions that took place at MRP-402, field research included survey of the site and surrounding cultural landscape, recordation of the rock art and the possible cultural astronomy feature at the site, and excavation of a test pit.

Field studies began with the surface inspection of MRP-402 to define the extent of the cultural deposits and features and update the previous site record. Data were recorded on artifacts, ecofacts, soil and midden deposits, vegetation, and disturbances. Site overview photographs were also taken.

A Garmin eTrex Vista Global Positioning System (GPS) was used to record significant data points and elevations at MRP-402. The GPS data were uploaded into a private Google Earth file along with locational data on the other rock art sites in the surrounding area. This provided a broad view of site locations, possible associations, and lines of sight. Although this application has its limitations, it proved useful for gaining a tangible understanding of the geographical landscape and site context.

Since the rock art at this site had already been drawn, photography was chosen as the primary means to record all the images. The use of a Nikon D60 digital camera permitted the quick and accurate recording of a large number of images from various perspectives and angles. Close-up shots of individual elements and symbols were taken, as well as photographs of entire panels and groups of panels, both with and without a scale. The visibility of the petroglyphs is greatly affected by light and atmospheric conditions, which can make the act of locating and recording them quite challenging. Therefore, the photographs were taken over many days at various times; this allowed for recording images when they were most visible.

Between 2009 and 2013, numerous trips were taken to MRP-402 on the morning of and around the autumnal and vernal equinoxes, the summer and winter solstices, and additional random mornings, to record the position of the sunrise with respect to cultural features and rock art panels, any possible cultural features associated with astronomical events, and the potential relation of astronomical events to the rock art panels. During these visits, compass readings, digital videos, and copious high-resolution digital photographs of the site were taken from various points to record the petroglyphs and any visual phenomena from multiple perspectives. The results of these efforts are described below.

A 1-x-0.5-m test pit was placed at MRP-402 in a clearing under a wall of rock art panels. It was anticipated that data obtained from the test pit would provide information on the activities undertaken here and the age of the deposit. The test pit was excavated in 10-cm arbitrary levels since there was no visible natural or cultural stratigraphy. When a depth of 30 cm was reached in the unit, the pit was expanded to 1 x 1 m in order to gain a better understanding of the site formation. The previously unexcavated portion was excavated down to 30 cm, as well, at which point the unit was reduced back to the original 1 x 0.5 m to focus on recovering temporally diagnostic artifacts or datable material at greater depth. The first 30 cm of excavated sediments were dry-screened through a 1.5-mm ( $\frac{1}{16}$ -in.) screen and then through a 3-mm ( $\frac{1}{8}$ -in.) screen, but the 1.5-mm screen was found to be unnecessary and its use was suspended when the unit was expanded in size. The rest of the excavated sediments were dry-screened through a 3-mm screen, and 5-x-10-cm soil samples were taken from the west wall at 2-cm intervals. The unit was terminated at a depth of 50-54 cm in the uneven, tightly packed layer of cobble rocks at this depth. The results of the excavation are presented below.

The use of digital photographs for image documentation also allowed for numerous editing options for enhancing the rock art images. The digital image enhancement program DStretch was used to analyze several photographs of the rock, to search for traces of pigment around the petroglyphs. DStretch also proved to be a useful tool for accentuating some of the detail of the petroglyphs and making them easier to view.

## **MRP-402: OBSERVATIONS**

MRP-402 measures 132 x 84 m and is situated in a narrow canyon at an elevation of 124 to 135 m (Figure 2). A seasonal creek flows from north to south through the middle of the site. A natural geologic fold at the north end of the site creates an area where the creek is significantly narrowed by exposed bedrock before widening into a perennial pool in the center of the site. On the east bank, a low, rolling hill curves around the pool to create a natural, though steep, amphitheater, and steep hills rise from the west bank. To the south, the creek meanders to the west and disappears from view.





*Figure 2. View of MRP-402 from the east bank.*

Site investigations completed for my research revealed a high concentration of white quartz cobbles and debitage on the surface in three lithic scatters in the northeast site area and several pestles scattered along the east bank. The lithic scatters indicate that stone tool production took place at the northeast end of the site. However, while there are natural quartz veins at this site, the concentration of quartz debitage is unusual and its purpose is unknown, as quartz was not typically the preferred material for the production of stone tools.

There are 33 BRMs on eight outcrops on the east bank, with mortar cups ranging from 2 to 34 cm in depth; some still hold pestles. On the west bank, there are 24 additional BRMs on nine outcrops that measure from 2 to 12 cm in depth. Even though there are plenty of boulders that appear suited to this purpose on the west bank, the majority of the deeper mortars are located on the east bank. The different mortar depths may be indicative of different functions (Barrett and Gifford 1933:208; McCarthy et al. 1985).

The petroglyphs at MRP-402 are dispersed across the bedrock boulders that line both sides of the creek. Some of the images were pecked through a natural red patina that has formed on the surface of many of the rocks. The petroglyphs demonstrate varying degrees of weathering, and lichen has grown over some, making it challenging or impossible to discern all or portions of some images. There is overlap of some of the designs, though it is not possible to determine how much time passed between the creations of the overlapping elements. The potentially significant age of some images is evident from the patina that has formed over them. There is no visible pigment on or around any of the rock art, and the use of DStretch did not reveal any pigments. There also appear to be at least two distinct methods used to create images within the site. The first is indicated by fine, deep lines and appears more controlled and deliberate, exhibiting effort in their construction. The second form is more haphazard, with less definitive lines and more obvious peck marks. Payen's (1966) Style 6 and Heizer and Clewlow's (1973) Central

Sierra style best describe the rock art elements at MRP-402, which include straight, curved, and wavy lines, circles, connecting circles, divided circles, rayed disks, parallel lines, grids, and amorphous elements. The design elements are too abstract to state whether or not there are any definitive anthropomorphic or zoomorphic images.

An additional 35 previously unrecorded petroglyph panels were discovered over the course of my research, establishing a total of 103 petroglyph panels at MRP-402, the majority encompassing multiple images. There were also several elements discovered that were not observed in the previous panel drawings.

To facilitate the discussion, the remaining archaeological features of the west and east bank are described separately here. The most prominent features on the west bank are two large boulders at the north end of the site that exhibit numerous petroglyphs, and a rectangular clearing in the boulder-strewn landscape that appears of cultural rather than natural origin. The first large boulder, Boulder A, measures approximately 3 m in height by 4 m in width. On the boulder is a large, northeast-facing circle with a cross in the center, a small circle with a cross in the center under an overhang on the northeast face, and several geometric designs, including grid patterns on the southeast and southwest faces of the boulder (Figure 3). A patina has formed over the circle designs so that they are barely discernible, attesting to their relative age.

The second large boulder, Boulder B, is located 11 m south of Boulder A, and is roughly 2.5 m in height by 2 m wide. Boulder B has petroglyphs on every face, especially the top surface, which is entirely covered in abstract designs, including one unique circle with an abstract design in the center (Figure 4).

A 3-x-5-m clearing located in the middle of a cluster of boulders on the west bank is the most unusual feature at MRP-402 (Figure 5). The clearing is 30 m south of Boulder B. Along the west edge of the clearing are four large boulders that form a wall of rock panels. The wall of rock panels measures approximately 3 m in height by 3 m in width and has four triangular-shaped niches spaced 50 cm apart along the base. The niches are clear of any rocks or debris. Numerous varied abstract petroglyphs are dispersed across the entire wall of rock panels, including three vertical “ladder” designs and a large circle with an abstract “star” design in the center that are found only on this wall (Figure 6). Smaller boulders that display various abstract petroglyphs line the north and south sides of this clearing. The space in front of the wall of rock art panels is open and fairly level except for three boulders protruding from the floor in an east-pointing triangle formation.

The test pit excavation at the base of the rock art wall panel uncovered pebbles of red, yellow, and white mineral pigment, one piece of clear quartz debitage, five pieces of white quartz debitage, one small white quartz crystal, one white quartz crystalline pebble, a couple of pieces of greenstone debitage, two charred pine cone spines thought to be *Pinus sabiniana* (gray pine), and two “limonite-over-pyrite pseudomorphs” (Robert Davies, personal communication 2013). A compact 1-cm-thick soil layer containing abundant chiastolite was recorded at a depth of 20 cm. Small pieces of charcoal (< 1 cm) were also found scattered throughout the unit to a depth of 43 cm. The radiocarbon ages of the charcoal recovered ranged from 190 ±20 B.P. (142423; wood charcoal;  $\delta^{13}\text{C}$  -23.3) to 745 ±20 B.P. (142421; wood charcoal;  $\delta^{13}\text{C}$  -88.5). Excavation ceased at an uneven layer of cobbles, as well as two angular pieces of white ochre, at a maximum depth of 54 cm.

The absence of some items is also noteworthy, as this information can help define the activities that likely did not take place at MRP-402: no hunting or fishing tools, faunal remains, obsidian debitage, or shell, stone, or glass beads have been found in the current or previous research at the site.

The prominent features of the east bank are two boulders located on top of the bank, due east from the wall of rock art panels and the clearing. The two boulders, or E Boulders, measure 1 m wide and 1.5 m high and are devoid of any rock art (Figure 7). When viewed from the clearing, the two boulders appear to be one and are a prominent feature on the east bank, standing taller and appearing more angular than the neighboring outcrop 3 m to the northwest. The adjacent bedrock boulders are visibly lower to the



*Figure 3. Geometric designs on the southwest face of Boulder A.*

ground with naturally flat top surfaces, while the E Boulders are angular on the top and vertically flat on their south face. These boulders are not in their natural position.

### **THE USE OF MRP-402 AS AN ASTRONOMICAL OBSERVATION SITE**

Geologist Robert Davies of Merced College was invited to assess the geological formation of MRP-402 and confirm if the formation of these features was natural or part of the cultural landscape. He examined the clearing on the west bank for signs of weathering or sediment deposits from the creek and determined it is plausible this area was intentionally cleared and shaped to expose the rock panels and the niches at the back of the clearing. Moreover, ochre is not known to be a natural geologic occurrence within the study region. The ochre and small pieces of charcoal recovered from the excavation were most





*Figure 4. The top surface of Boulder B.*



*Figure 5. The unusual clearing on the west bank.*





*Figure 6. Varied abstract petroglyphs are dispersed across the entire wall of rock panels.*

likely left there as a result of human activity. Their presence throughout the soil deposits also indicates the clearing is likely the result of intentional human behavior, although excavation has not been undertaken elsewhere at the site for comparison.

Davies also measured the strike and dip of the foliation surfaces of the E Boulders and the surrounding outcrops on the east bank. These values were compared using analysis of variance (ANOVA). Davies confirmed that it is statistically probable the top of the E Boulders were to the north and were deliberately arced up to the south roughly 90 degrees into their current position (Davies 2013). That is, the E Boulders were evidently lifted into their current position.

Therefore, it seems the E Boulders and the rock panels were in a fortuitous location for measuring the position of an equinox, and were subsequently intentionally altered by native peoples to create the solar and shadow alignments that occur during the time of the equinoxes and are part of the cultural landscape. The equinoctial solar and shadow alignments are discussed next.

Between 2009 and 2013, numerous trips were taken to MRP-402 on mornings of and around the autumnal and vernal equinoxes, the summer and winter solstices, and additional random mornings to record the position of the sunrise with respect to cultural features and rock art panels and any possible cultural features associated with astronomical events. One low, level rock at the northeast border of the clearing served as a datum point on the west bank from which to make consistent recordings. These efforts have confirmed there are certain consistent solar and shadow alignments that can be observed at sunrise during the time of the equinoxes.

As the sun rises on the equinoxes, the sunlight shines on the west bank and makes its way down the wall of rock art panels until the top two-thirds of the wall of panels is in sunlight and the bottom one-third is in darkness (Figure 8). At this point, the sunlight shines from behind the E Boulders on the east



*Figure 7. The E Boulders on the east bank.*

bank, and a shadow in the form of a triangular peak appears on the wall of rock art panels on the west bank (Figure 9). This shadow then moves downward over the wall of panels and covers one of the niches at the bottom, leaving that niche shadowed in darkness for anywhere between 1 to 3 minutes while the rest of the wall of rock art panels is illuminated by the sunlight (Figure 10). As the sunlight reaches the ground in front of the wall of rock art panels, the sun becomes visible on the south side of the E Boulders (Figure 11). The sun then rises along the south edge of the E Boulders. On several occasions, it has also been observed that as the sun rises, the shadow covering the niche continues moving downward until the peak of it touches the peak of the northernmost of the three boulders that remain protruding from the floor of the clearing (Figure 12). The shadow then disappears as the sun rises away from the E Boulders. For at least four days surrounding the equinoxes, the shadow forms and covers a different niche each morning.

Numerous, consecutive visits to witness this process confirm this repeated occurrence. For at least four days surrounding the equinoxes, as the earth revolves around the sun, the shadow forms and covers a different niche each morning. The shadow moves to the north during the autumnal equinox, and to the south during the vernal equinox. The sun rises next to the E Boulders and creates this visual effect only during the few days around the time of the equinoxes. After those few days, the sun has moved far enough away in either direction from the E Boulders that these solar and shadow alignments no longer





*Figure 8. The top two-thirds of the wall of panels is in sunlight, and the bottom one-third is in darkness.*

occur. Visits to MRP-402 at sunrise in February, April, July, and August confirmed that these equinoctial solar and shadow alignments do not occur in this way at any other time.

## CONCLUSION

My research incorporated landscape approaches, field survey of MRP-402, photo-documentation of images and astronomical events, and excavation. These efforts resulted in a greater understanding of the activities that took place at MRP-402.

Systematic data collection for the current study has revealed that MRP-402 encompasses 103 petroglyph panels, and that the observed solar and shadow alignments that occur at MRP-402 during the time of the equinoxes are the result of intentional behavior and, therefore, not random or coincidental. The excavation of the test pit and the geologic analysis verified the niches and clearing in front of the wall of rock art panels on the west bank are the result of ancient acts rather than natural processes. The geologic analysis of the east bank also confirmed the E Boulders were lifted into their current position. The equinoctial solar and shadow alignments are the result of these modifications of the cultural landscape. This alteration of the landscape created a fixed point on the horizon from which to make consistent astronomical observations.

Moreover, the creation of the observation area would have required an investment in time and labor—to notice the natural fortuitous rock alignments at the site, to alter spaces and features to create the clearing, niches, alignments and shadow effects, and repeatedly observe the results. Therefore, it is reasonable to conclude that the people who created the observation area must have occupied this site at least seasonally over a number of years during the time of the vernal or autumnal equinox, or both. Furthermore, the excavation of the clearing and the lifting of the E Boulders would probably have





Figure 9. A shadow in the form of a triangular peak appears on the wall of rock art panels.

required the participation and cooperation of several people sharing a common desired result. Therefore, this alteration of the cultural landscape can be construed as a testimony of the social and cosmological beliefs of the group. More significantly, this research suggests astronomical observation may have been a wide-ranging practice among the native peoples of California.

#### REFERENCES CITED

- Arsenault, Daniel  
 2004 From Natural Settings to Spiritual Places in the Landscape: An Archaeological, Ethnological and Ethnographic Analysis of Canadian Shield Rock-art Sites. In *The Figured Landscapes of Rock-Art: Looking at Pictures in Place*, edited by Christopher Chippindale and George Nash, pp. 289-317. Cambridge University Press, New York.
- Aveni, Anthony (editor)  
 2008 *Foundations of New World Cultural Astronomy: A Reader with Commentary*. University Press of Colorado, Boulder.
- Barrett, Samuel A., and Edward W. Gifford  
 1933 Miwok Material Culture. *Bulletin of the Public Museum of the City of Milwaukee* 2(4):117-376. Milwaukee, Wisconsin.
- Bender, Barbara (editor)  
 1993 *Landscape: Politics and Perspectives*. Berg Publishers, Providence, Rhode Island.
- Bradley, Richard (editor)  
 2000 *An Archaeology of Natural Places*. Rutledge, New York.

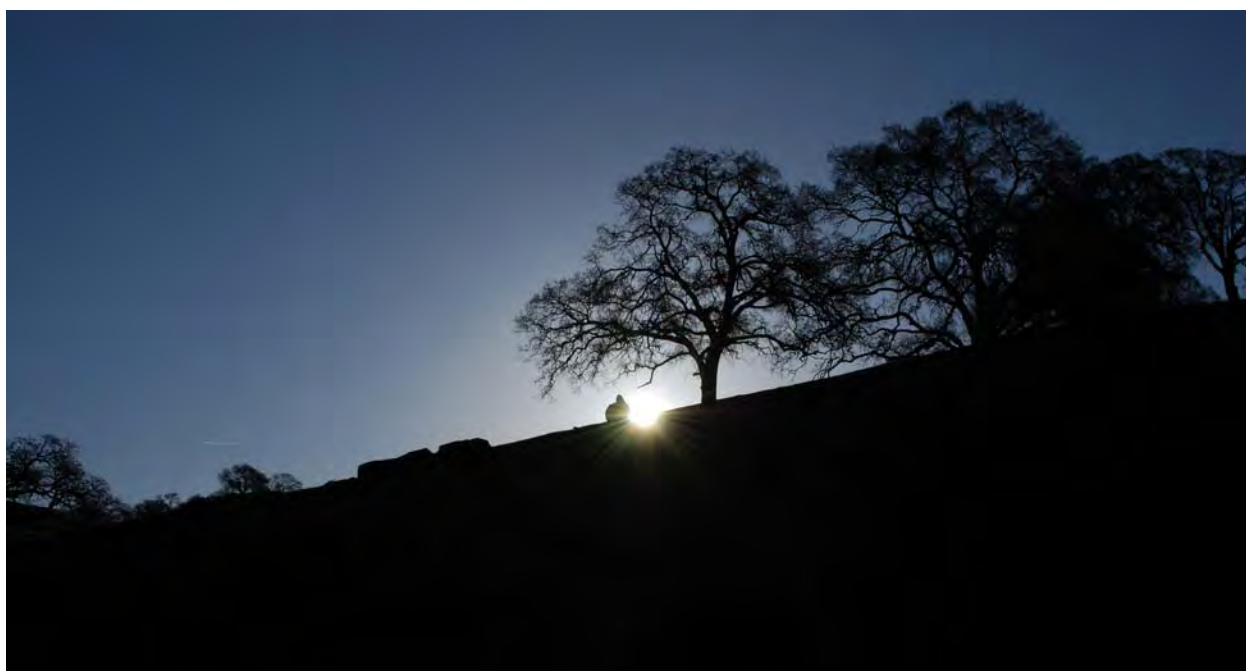
- Button, Melinda  
 2009 Multiple Ways of Seeing One Place: Archaeological and Cultural Landscapes of the Sutter Buttes, California. Unpublished Master's thesis, Department of Anthropology, California State University, Chico.
- Children, George, and George Nash  
 1997 Establishing a Discourse: The Language of Landscape. In *Semiotics of Landscape: Archaeology of the Mind*, edited by George Nash, pp. 1-4. Archaeopress, Oxford.
- Chippindale, Christopher, and George Nash  
 2004 Pictures in Place: Approaches to the Figured Landscapes of Rock-Art. In *The Figured Landscapes of Rock-Art: Looking at Pictures in Place*, edited by Christopher Chippindale and George Nash, pp. 1-36. Cambridge University Press.
- Chippindale, Christopher, and Paul S. C. Taçon (editors)  
 1998a *The Archaeology of Rock-Art*. Cambridge University Press.  
 1998b An Archaeology of Rock-Art through Informed Methods and Formal Methods. In *The Archaeology of Rock-Art*, edited by Christopher Chippindale and Paul S. C. Taçon, pp. 1-10. Cambridge University Press.
- Clay, Vickie L.  
 1993 *Merced County Streams Group Cultural Resources Status Report for Bear Reservoir, Mariposa County, California*. Army Corps of Engineers, Sacramento, California.
- Clewlow, C. William, Jr.  
 1976 *Final Report on the Archaeological Reconnaissance of the Merced County Streams Project, California*. Army Corps of Engineers, Sacramento, California.
- David, Bruno, and Julian Thomas (editors)  
 2008 *Handbook of Landscape Archaeology*. Left Coast Press, Walnut Creek, California.
- Davies, Robert  
 2013 *Geology Report for MRP-402*. Report on file at the Geology Department, Merced College, Merced, California.
- Gillette, Donna Lee  
 2011 Cultural Markings on the Landscape: The PCN Pecked Curvilinear Nucleated Tradition in the Northern Coastal Ranges of California. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Berkeley.
- Heizer, Robert F. (editor)  
 1978 *California*. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- Heizer, Robert F., and C. William Clewlow, Jr.  
 1973 *Prehistoric Rock Art of California*. Ballena Press, Ramona, California.
- Kroeber, Alfred L.  
 1925 *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin No. 78. Washington, D.C.
- Latta, Frank F.  
 1977 *Handbook of Yokuts Indians*. Bear State Books, Santa Cruz, California.
- Layton, Robert, and Peter J. Ucko  
 1995 Introduction: Gazing on the Landscape and Encountering the Environment. In *The Archaeology and Anthropology of Landscape*, edited by Peter J. Ucko and Robert Layton, pp. 1-20. Routledge, London.
- Lenssen-Erz, Tilman  
 2004 The Landscape Setting of Rockpainting Sites in the Brandandberg (Namibia): Infrastructure, *Gestaltung*, Use and Meaning. In *The Figured Landscapes of Rock-Art: Looking at Pictures in Place*, edited by Christopher Chippindale and George Nash, pp. 131-150. Cambridge University Press.

- McCarthy, Helen C., Robert A. Hicks, and Clinton M. Blount  
 1985 Appendix F: A Functional Analysis of Bedrock Mortars: Western Mono Food Processing in the Southern Sierra Nevada. In *Cultural Resources of the Crane Valley Hydroelectric Project Area, Madera County, California. Vol. 1, Ethnographic, Historic, and Archaeological Overviews and Archaeological Survey*, edited by S. K. Goldberg, pp. 189-214. INFOTEC Research, Sonora, California.
- Mohr, Albert  
 1951 *Archaeological Appraisal of Burns Reservoir, Merced County, and Bear and Owens Reservoirs, Mariposa County, California*. River Basin Surveys, Smithsonian Institution, Washington, D.C.
- Ouzman, Sven  
 1998 Towards a Mindscape of Landscape: Rock-Art as Expression of World-Understanding. In *The Archaeology of Rock-Art*, edited by Christopher Chippindale and Paul S. C. Taçon, pp. 30-41. Cambridge University Press.
- Payen, Louis A.  
 1966 Prehistoric Rock Art in the Northern Sierra Nevada, California. Unpublished Master's thesis, Department of Anthropology, California State University, Sacramento.
- Peak and Associates  
 1982a *Merced County Streams Project, Bear Reservoir, California: Intensive Cultural Resources Survey*. Army Corps of Engineers, Sacramento, California.  
 1982b Historic Registry Nomination Form. National Register of Historic Places, Washington, D.C.
- Quinlan, Angus R.  
 2007 Integrating Rock Art with Archaeology: Symbolic Culture as Archaeology. In *Great Basin Rock Art: Archaeological Perspectives*, edited by Angus R. Quinlan, pp. 1-8. Reno, Nevada.
- Rosenthal, Jeffrey S, Gregory G. White, and Mark Q. Sutton  
 2007 The Central Valley: A View from the Catbird's Seat. In *California Prehistory: Colonization, Culture, and Complexity*, edited by Terry L. Jones and Kathryn A. Klar, pp. 147-164. AltaMira Press, Lanham, Maryland.
- Sims, Lionel  
 2009 Entering, and Returning from, the Underworld: Reconstituting Silbury Hill by Combining a Quantified Landscape Phenomenology with Archaeoastronomy. *Journal of the Royal Anthropological Institute* 15:386-408.
- Tilley, Christopher  
 1994 *A Phenomenology of Landscape: Places, Paths and Monuments*. Berg, Providence, Rhode Island.
- Wallace, William J.  
 1978 Northern Valley Yokuts. In *California*, edited by Robert F. Heizer, pp. 462-470. Handbook of North American Indians, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.
- Whitley, David S.  
 1998 Finding Rain in the Desert: Landscape, Gender and Far Western North American Rock-Art. In *The Archaeology of Rock-Art*, edited by Christopher Chippindale and Paul S. C. Taçon, pp. 11-29. Cambridge University Press.  
 2011 *Introduction to Rock Art Research*. Left Coast Press, Walnut Creek, California.





*Figure 10. The shadow covers the niche.*



*Figure 11. The sun rises along the south edge of the E Boulders.*





*Figure 12. The peak of the shadow touches the peak of the northernmost of the three boulders in the clearing.*