NEVADA ARCHAEOLOGIST

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ADDITIONAL INSIGHT INTO NEVADA"S PAST

NEVADA ARCHAEOLOGICAL ASSOCIATION

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Nevada Archaeological Association

The design for the NAA logo was adapted by Robert Elston from a Garfield Flat petroglyph.

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The NAA is an incorporated, non-profit organization registered in the state of Nevada, and has no paid employees. Membership is open to any person signing the NAA Code of Ethics who is interested in archaeology and its allied sciences, and in the conservation of archaeological resources. Requests for membership and dues should be sent to the Membership Chairman at the address below. Make all checks payable to the Nevada Archaeological Association. Membership cards will be issued on the payment of dues and the receipt of a signed Code of Ethics. Active members receive a subscription to the *Nevada Archaeologist* and the NAA newsletter *In Situ*. Subscription is by membership only; however, individual or back issues may be purchased separately.

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Inquiries and general correspondence with the NAA should be directed to:

Nevada Archaeological Association
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Code of Ethics

The purpose of the NAA is to preserve Nevada‟s antiquities, encourage the study of archaeology, and to educate the public to the aims of archaeological research. Members and chapters of the NAA shall:

1. Uphold the purpose and intent of the NAA.
2. Adhere to all antiquities laws.
3. Seek the advice, consent, and assistance of professionals in archaeology and/or history in dealing with artifacts, sites, and other materials relating to antiquities.
4. Assist professionals and educators in accomplishing the objectives of the NAA.
5. Be a personal envoy of the NAA and responsible for conducting themselves in a manner so as to protect the integrity of artifacts, sites, or other materials.

Cover

Feature 1, West Brickworks, 26LA4354. Photo courtesy of Rob McQueen.

Table of Contents

Editor's Corner

Geoff Smith

Welcome to the latest edition of the *Nevada Archaeologist*. It has been a pleasure to edit another volume and hard to believe that another year has passed so quickly. It‟s once again time for college football, cooler temperatures, dark beer, and the *Nevada Archaeologist*.

Although the formatting has remained similar to that of previous editions, we‟ve made one major change – papers in this and subsequent editions will undergo a peer-review process. Most of you are likely familiar with how the peer-review process works: authors submit manuscripts for consideration in a journal and after an initial read-through, the editor sends them to anonymous reviewers, who comment on the quality and content of the papers. The purpose of this process is three-fold: (1) to ensure that the content of each manuscript is accurate and clearly presented; (2) to offer the authors suggestions on how to improve their manuscripts; and (3) make it more attractive for students and faculty – whose publishing productivity is often evaluated annually – to publish in the *Nevada Archaeologist*. I would like to thank both current and future authors as well as NAA President Craig Hauer and the NAA Board Members for being open to this idea, as well as the anonymous reviewers who offered their time to review the papers. Hopefully we can all agree that it has been a useful and welcome change to the *Nevada Archaeologist*. NAA members of all persuasions – avocational archaeologists, agency employees, students, faculty, and interested readers are encouraged to submit manuscripts to the *Nevada Archaeologist* (see "Call for Papers" at the back of this volume). This is your journal and it has and will continue to feature your work.

Thanks are especially due to the authors who submitted papers for Volume 26 of the *Nevada Archaeologist*. The range of paper topics and author backgrounds highlights the diversity of the NAA. This year, we received papers from undergraduate and graduate students, faculty members from institutions both within and beyond Nevada, CRM firm employees, and land managers. First, Sarah Cowie and Lisa Machado provide an overview of the Savage Mine, one of the many mining operations in our beloved Virginia City. They highlight the utility of exploring the rich record offered by historic documents, many of which are housed in the University of Nevada, Reno‟s Special Collections, and how they can guide archaeological fieldwork.

Next, Robert McQueen and JoEllen Ross-Hauer highlight an understudied but important aspect of Nevada‟s archaeological record: brickmaking. Drawing from an enormous dataset collected from the historic Cortez Mining District in north-central Nevada, their paper is just one of many that have and will continue to provide insight into life at Cortez.

Sarah Heffner presents a summary of her dissertation research on Chinese use of both traditional and Euro-American medicine using the Lovelock Chinatown Collection, collected not too far down I-80 from McQueen and Ross-Hauer‟s study area. Her work highlights the potential value of existing archaeological collections to further our understanding of the past.

Justin Goodrich presents the results of an experiment comparing the utility of unmodified flakes and projectile points for butchering game. A recent UNR graduate, Goodrich conducted the experiment while an undergraduate student and as his former instructor, I applaud the initiative that he showed and his willingness to go beyond simply writing a run-of-the-mill term paper in my lithic analysis class. His contribution highlights the potential that Justin has to go on to do graduate research in experimental archaeology.

A repeat contributor to the *Nevada Archaeologist*, William White summarizes the current understanding of Pahranagat rock art and the various motifs that characterize the style. White describes the range and potential age of the style and offers some explanations regarding its social and economic role. Finally, he points the direction towards future research and offers some topics for other scholars to pursue.

Another repeat contributor this journal, Steven Holm addresses a question that I posed in last year‟s Editor‟s Corner: why are historic archaeologists fixated on the potty? As a father who is currently training one child (Gavin) to use the toilet and tacking another new child‟s (Millie Grace, born September 6th) endless diapers, I find excrement a little less funny than I did at this time last year. Nevertheless, I sincerely appreciate Holm‟s willingness to dive into the deeper, darker, and richer side of archaeological research and outline why *all* archaeologists should learn to love coprolites and other fecal deposits. For researchers interested in embarking on any study of paleofeces, Holm‟s paper is flush with the critical references and they should take the plunge, grab a seat, and do a little light toilet reading. Potty jokes aside, this is a *really* well-researched paper that demonstrates Steven‟s ability to bring together a diverse set of references – historic and prehistoric – in a thoughtful and cohesive fashion.

Ruth Musser-Lopez builds on an earlier *Nevada Archaeologist* paper by Stearns and McLane, published a few years ago in Volume 22 (2007). She focuses on the enigmatic rock and gravel mound sites, of which at least three have been recorded in the region. Musser-Lopez highlights the Mojave Desert sites and presents a history of research at those locations. She builds what in my opinion is a compelling argument for the temporal and functional attributes of such features.

Finally, Melinda Leach (another repeat contributor) and colleagues are kind enough to share their experiences at Serendipity Shelter. Their paper highlights the joys and challenges of working in a Great Basin rock shelter, as well as the frustration of knowing that it and virtually every other such site in the region has been senselessly vandalized to some degree. By offering multiple perspectives on the work at Serendipity Shelter, Leach and her students highlight how archaeological fieldwork means different things to different people.

In closing, I want to again thank the authors, reviewers, and everyone who helped to make Volume 26 of the *Nevada Archaeologist* a reality. I hope that you enjoy this year‟s installment and have a safe and happy 2014. Please consider sharing your research with the NAA membership here. By doing so, you will help to ensure that the organization continues to grow and prosper in the coming years.

GMS
September 30, 2013
Sparks, Nevada

History, Technological Innovation, and Potential for Industrial Archaeology of the Old Savage Mine Site, Virginia City, Nevada

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The Savage Mine in Virginia City, Nevada was an early and significant mine in the history of the Comstock, a region whose innovations in technology influenced mining around the world. The Savage had two main shafts, one that operated from 1859 to at least 1866, overlapping with the second shaft that opened in 1864. The Savage Mining Company's efforts at these two shafts were highly successful and enjoyed a series of bonanzas fueled by innovative technology and a lot of luck. Here, we present the results of archival research on the Savage Mine, as well as a discussion of significant archaeological resources that are probably present at the mine's older shaft, although it has not yet been recorded archaeologically. The site offers potential for future studies in the industrial archaeology of an early and influential mine in the history of western mining, particularly in regard to technological innovations and daily life at the site.

Historians refer to the early Savage Mine in Virginia City, Nevada as a "Child of Fortune" because its location gave it access to two highly productive ore bodies that were discovered by neighboring mines, the Gould & Curry Mine and the Hale & Norcross Mine (Hermann 1981:125; Smith 1998:86). The Savage Mine claim dates to 1859, with the first main shaft opening in 1862 (Ansari 1989:19; Smith 1998:84, 86). It quickly became one of the most successful mines in the early years of mining the Comstock Lode, a region that was one of the world‟s leading producers of gold and silver (Carpenter 1998:1). The Savage Mining Company opened a second main shaft in 1864, and by the late 1860s, the newer Savage was the most productive mine on the Comstock (Ansari 1989:19). The focus of research presented here is on the history, significance, and archaeological potential of the earlier mine, which was used by the Savage Mining Company from 1859 to at least 1866 (Ansari 1989:19; King 1877).

A "CHILD OF FORTUNE": HISTORY OF THE SAVAGE MINE

The Savage Mine was an early, successful, and influential mine in the history of mining on the Comstock, a mining region whose innovations in technology influenced mining around the world. The history of the Savage Mine in the context of the Comstock is available from numerous historic sources available digitally and in archives, particularly in University of Nevada, Reno‟s (UNR) Special Collections, Nevada Historical Society, UNR‟s Keck Library, and Nevada Bureau of Mines and Geology, as well as from several histories of western mining.

Early Days of the Comstock Lode in Nevada

According to historian Grant Smith, William Prouse, a member of a wagon-train on its way from Salt Lake City, first found in gold in 1850. He located "a few small „colors‟" while gold panning in a gulch where a small stream met the Carson River, a site which would later become the town of Dayton, Nevada (Smith 1998:1). The wagon-train moved on, but two members of the train, John Orr and Nick Kelly, returned to the gulch after snow in the Sierra Mountains did not allow the party to continue past Carson Valley. Despite having found very little gold in the gulch, Orr named it Gold Cañon (Canyon) (Smith 1998:1). Hearing the story of the "cañon," men came to the region looking for gold. In 1857, near Six Mile Cañon, James "Old Virginny" Finney, a placer miner, found quality ground near the site that would later become Virginia City. Along with three other men, he discovered the "famous Old Red Ledge" in 1859 at the site of the later town of Gold Hill. The same year, Peter O"Riley and Patrick McLaughlin discovered the top layer of the future Ophir bonanza (Smith 1998:2-3). "Thus the Comstock Lode was discovered, both on its north and south ends, in the spring of 1859 by two groups of poor placer miners, working a mile apart, who had no thought of finding ore" (Smith 1998:3). These men were probably completely unaware that they had just discovered the Comstock Lode, which has a "glorious history as one of the world"s greatest mining camps and producers [of gold and silver]" (Carpenter 1998:1).

Henry Comstock, Lemuel S. Bowers, and other important individuals in the early Comstock years arrived in the area and staked claims to the land, soon after "Old Virginny"s" discovery of gold at Gold Hill (Smith 1998:5). A common Comstock legend recounts Henry Comstock coming across O"Riley and McLaughlin, soon after their discovery of gold at the future Ophir Mine (James 1998:8; Smith 1998:3, 7). The story goes that "[h]e immediately declared his right to the area and began negotiating" (James 1998:8). O"Riley and McLaughlin agreed to work with Comstock and his friend, Immanuel Penrod, to avoid any dispute and because of the belief in the minimal wealth to be found at the site. A wide trench was then dug which yielded both gold and silver; however, the miners had never seen silver sulphide and regarded it simply as a nuisance (James 1998:8-9; Smith 1998:7-8). Below the original layer of pay dirt, the men found a vein of bluish-gray quartz and quickly made a 1,500-foot claim along the vein. Because they had the idea of staking the Ophir Claim, Penrod and Comstock also received a claim of 100 feet near the Ophir, which would become the Mexican Claim (Smith 1998:8-9). The Central made a claim of 150 feet to the south of the Ophir, soon after the discovery of the vein (Smith 1998:16).

On June 27, Melville Atwood assayed the mysterious bluish-gray quartz, originally thrown aside by Comstock and his partners, in Grass Valley, California and determined that it was indeed silver. The result of this discovery was the first "„Washoe Rush"" of 1859 (Smith 1998:9-10).

The Founding of the Savage Mine in Virginia City

The founding of the Savage Mine remains a topic of dispute. One story describes a man named Savage, originally a miner in Downieville, California, who moved to Virginia City in 1859. He bought the land from some "jumpers" along with two or three other associates, but did not invest much time in the mine and soon sold his part of the claim (Carlson 1974:210; DeGroot 1985:65). An alternative version describes Henry Comstock showing Savage the claim after Comstock had already staked it (Carlson 1974:210). No matter which version is true, there is documentary evidence that Leonard Coates Savage, Abraham O. Savage, his second cousin, R. Crale, Charles C. Chase, Hezekiah Carmack, and W. P. Surtevant made their 1,800-foot claim to the land on July 4, 1859 (Ansari 1989:19; Browne 1926:297; Lord 1959:102). Leonard Coates Savage gave his name to the mine (Ansari

1989:19).

In 1860, the Savage only included 800 feet along the Comstock Lode, which was situated between the Gould & Curry Mine to the north and the Hale & Norcross Mine to the south (Browne 1959:98; Hermann 1981:125). The Savage Mining Company was incorporated on October 14, 1862 in the state of California. On October 15, 1862, the new company‟s Board of Trustees resolved to take over all rights to the Savage Silver Mining Company (Savage Mining Company 1862a, 1862b). The mine and hoisting works were eventually constructed on B Street in Virginia City (Collins 1864:47).

The Early Bonanza Years

It appears that the Savage sunk its first mine in 1862, following the discovery of a bonanza in the Gould & Curry Mine at the end of 1861 (Smith 1998:84, 86). According to historian Grant Smith (1998:86):

> "The Savage had spent little on the mine except for litigation when the Gould & Curry bonanza was discovered. That ore lay in the south end of the claim, and shrewd and aggressive Robert "Bob" Morrow, superintendent of the Savage, obtained permission from the Gould & Curry to drive a drift southward from the latter‟s "D" Street workings into the Savage. Just as Morrow expected, the bonanza extended southward into the Savage. The Savage then began to sink a new shaft in order to extract its ore and develop the mine and did not commence to produce until April 1863."

This ore body was the "largest and best defined yet discovered on the Comstock vein" (Raymond 1970:42). The Savage mining land became the second most valuable claim on the Comstock in 1863, after the Gould & Curry (Nevada Historical Society 1970; Yager 1971:33). Although the Savage was one of the most successful mines in the early Comstock years, the story was not entirely one of success. "The notion that these ores bodies were virtually inexhaustible led to gross extravagance and inefficiency in the early operation of the paying mines…. Even the bonanza mines were victimized by blatant stock manipulations and felonious mismanagement" (Lingenfelter 1974:32).

Captain Sam Curtis became the superintendent, and the company‟s original Virginia City office was built in the year 1863. The Savage Silver Mining Company office building that currently stands in Virginia City replaced the original building in the late 1860s after the first burned down (Hermann 1981:25; Smith 1998:87).

Shortly after the discovery of the ore body in the Gould & Curry Mine, the Savage Mining Company entered into a contract with J. H. Dall, who agreed to crush and beneficiate 500 tons of ore from the Savage at his mill for a price of $50 per ton. Dall sent the finished bullion to William Lent, the Savage Mining Company‟s President, at his office in San Francisco, California (Savage Mining Company 1863). Dall‟s water-powered mill, before it was destroyed in a fire, was capable of driving 30 stamps and was located at Franktown in Washoe Valley, more than 20 miles away (Kelly 1862:101; Nevada State Mineralogist 1867:85). The Savage Mine also did business with various other mills in the area, all of which were considerable distances away from Virginia City. Santiago Mill, a water-powered mill at Zephyr Flat with 24 stamps, was crushing 25 tons of Savage ore a day, as of November 10, 1864 (*Daily Alta California* 1864). In early 1865, the Savage was doing business with the Semelee Mill, located in Pleasant Valley in Washoe County. This mill was run by both a water wheel and a steam engine. About 35 tons of ore, not all belonging to the Savage, were crushed daily by a total of 15 stamps (*Gold Hill Daily News* 1865a).

In addition, the Savage also used mills of its own. The Savage invested in building a mill in Washoe Valley and purchased the Atchison Mill in Washoe City in 1866. As of 1865, the mill was powered by both steam and water and had 16 stamps, 16 Wheeler pans, and eight settlers (Ansari 1989:89; Smith 1998:86-87).

Although the mine operators were probably enjoying their successes in the productivity of the mines, many mineworkers were less inclined to celebrate. Outside of the mines, the miners along the Comstock began to fight for rights against the powerful mining companies. On June 6, 1863, the Miners‟ Protective Association was formally created to demand wages of at least $4; 300 to 400 miners joined this group before its dissolution. Around March 1864, the Miners‟ League of Storey County was created. Members pledged not to work for a wage below $4, but the League soon dissolved because miners outside the union took lower wages. However, while the unions did exist, the uniform wage did remain at least $4 (Bancroft and Victor 1981:130-132; Lingenfelter 1974:32-33). In the spring of 1864, there was a "scare that the mines were exhausted" and the inflated economy finally deflated, bringing stock prices way down. The Savage, along with other mines, was valued at less than one-fifth of its original value during this time. Companies wanted to cut wages, but because the miners had stock interest in the mines, they resisted. Miners organized in Gold Hill and moved to Virginia City to get more rebels for their cause against the mine owners (Lingenfelter 1974:33-34).

Despite turmoil among many mineworkers in Virginia City, the mines continued to produce. A total of 81,183 tons of ore, with a total yield of $3,600,709.26, was extracted from April 1863 to July 1865, according to a report submitted by Alpheus Bull, the company president, at an annual stockholders meeting on July 10, 1866 (Browne and Taylor 1867:81).

In 1864, the Savage began making improvements to the old shaft, including the use of a new 60-horse power engine, supplementing the engine previously in use at the mine (*Gold Hill Daily News* 1864a). As of March of 1865, the Savage was still investing time and money in the old shaft. The company was still improving the machinery, including replacing the reels and brakes in the hoisting gear, and increasing the depth of the shaft (*Gold Hill Daily News* 1865b). With the help of numerous technological innovations, the mine continued to grow. At the beginning of 1865, the Savage had about 150 employees, which rose to 176 in 1866 (*Gold Hill Daily News* 1865c; Lord 1859:225).

In 1865, the "rich upper ore body of the Savage seemed to be exhausted. It had produced $3,600,000 from its extension of the Gould & Curry bonanza, had only paid $800,000 in dividends, and was in debt nearly $500,000" (Smith 1998:58). Despite the improvements in the mine, the company was facing financial difficulties in the latter half of 1865. The price of Savage stock fell from $3,500, at its peak in July 1863, to $700 in December 1865 (Smith 1998:32, 59). The Savage luckily discovered the Potosi strike in 1865, just as the Gould & Curry bonanza ore was dwindling (Smith 1998:87). The mine got lucky again in December 1865 when the Savage realized that half of an ore body, found at 600 feet by the Hale & Norcross Mine, was in their territory (Smith 1998:87). The Savage was truly a "child of fortune"; neither of the two great bonanzas that sustained the mine was actually discovered in the Savage, but instead both were discovered by its neighbors (Hermann 1981:125; Smith 1998:86).

One of the final recorded references to the old shaft at the Savage stated that, by 1866, the old shaft had been sunk to a depth of 614 feet and was using one hoisting engine with approximately 60 horsepower (Nevada State Mineralogist 1867:81, 85). According to the United States Geological Exploration of the Fortieth Parallel, the seventh and final station of the old Savage shaft was sunk to a depth of 661 feet (King 1877).

The Savage's New Shaft and Later Years

As of May 19, 1864, the Savage had begun to sink a new shaft, which was the largest in the Territory (*Gold Hills Daily News* 1864c). Considering that after the year 1866 mention of the old shaft is negligible, it appears that the old shaft, if not abandoned, was probably utilized only minimally once the new shaft was in full use.

The new shaft was located on E Street, downhill from the old shaft on B Street. Many other mines had also begun to sink shafts to the east of their originals, and the new Savage shaft, sometimes referred to as the Curtis shaft, was considered a fine example of the newer set of shafts (Lord 1959:222-223). In the late 1860s, the new Savage was the most productive mine on the Comstock (Ansari 1989:19). In 1868, the Savage had produced a total of approximately $2,543,868 in bullion and $1,184,000 in dividends. The next most productive mine, the Kentuck, had $1,259,707 in bullion and $480,000 in dividends (Raymond 1970:57).

The Savage, Chollar-Potosi, and Hale & Norcross mines sunk the Combination Shaft in 1875, which proved to be very profitable. When the shaft closed in late 1886, it had a total assessment value of $7,000,000 (Smith 1998:90). The year after the Combination Shaft was sunk, the Savage flooded to the 1,800-foot level after it hit hot water 400 feet below. Only when the Savage joined the Combination Shaft in 1879 did the flooding cease (Smith 1998:87).

An important date in the Savage"s later history was 1878. That year, "history was made when the Savage was the first mine to be connected with the Sutro Tunnel" (Ansari 1989:19). Designed by Adolph Sutro, this tunnel was created to drain the mines along the Comstock (James 1998:58-59; Smith 1998:108).

Later Comstock Years

One of the major events along the Comstock in the late 1860s was the introduction of the railroad in 1869. The Virginia & Truckee Railroad, built by William Sharon, stretching from Carson City to Gold Hill, passed through the Carson River mills, where ore could be processed at a much lower cost than other mills in the region. The railroad greatly reduced the cost of delivering ore to those mills, and so greatly reduced the cost of milling ore overall (Smith 1998:123).

In 1873, the Consolidated Virginia Company discovered the biggest bonanza on the Comstock. The company continued to drive its mine shaft downward and it connected with the Gould & Curry shaft, which was also taking advantage of the large ore body, in September 1873 (Smith 1998:150-153). The year of 1875 brought the great fire in Virginia City that destroyed most of the city. Saving the mines was clearly the priority while the main part of the city continued to burn. However, this strategy appeared to pay off; the hoisting works of both the C. & C. and the Gould & Curry and the Consolidated Virginia shaft survived the fire. The Gould & Curry shaft continued to deliver bonanza ore following the fire (Smith 1998:191-194). In 1877, the Consolidated Virginia bonanza appeared to be all but depleted. This year marked the beginning of the end of the major producing days on the Comstock. 1880 marked the end of the "glory years" of the Comstock (Smith 1998:212-213, 229).

The Comstock was at least somewhat revived in 1886 when the Consolidated California and Virginia began making profits on low-grade ore. This development brought back a bit of hope to the Comstock. Even some of the original mine shafts were reopened to take advantage of what might be left of the ore in those mines. This small revival ended in 1894 (Smith 1998:284). In 1899, the North End Mines, including the Consolidated Virginia, Ophir, Mexican, Union, and Sierra Nevada, were revived at the decision of the Virginia City mine brokers. This proved to be a fairly profitable venture until 1920 (Smith 1998:286-288). The Comstock mines continued to produce intermittently through the rest of the twentieth century, frequently changing ownership and profitability. However, the years following 1920 proved overall to be economic failures (Smith 1998:291-307). Since then, there has been occasional revived interest in mining the Comstock region, especially in the 1980s, as well as current operations today (e.g., Comstock Mining, Inc. 2011).

TECHNOLOGICAL INNOVATION AT THE OLD SAVAGE MINE

The old shaft of the Savage Mine was at the forefront in the use of new technologies in the early Comstock years. In 1861, the Savage was one of the mines along the Comstock that adopted the method of square-set timbering, which revolutionized mining timbering on the Comstock in the early 1860s and in much of Western mining in subsequent years (De Quille 1876:135; James 1998:55, 56). Philipp Deidesheimer developed square-set timbering in December 1860 for the Ophir Mine when it required a new method of timbering due to the sheer size and instability of the Ophir bonanza. The system involved making wooden squares, using timbers six to seven feet long for the vertical supports and timbers four to five feet long for the horizontal pieces. If even more support was needed, timbers were placed in a diagonal position to strengthen the squares. The process involved connecting as many of these blocks together as deemed necessary to fill the space in the mine, greatly decreasing the probability of a cave-in and increasing the safety of the miners (James 1998:55; Smith 1998:23-24).

In addition to its early implementation of square-set timbering, the Savage was the first mine to use cages for hoisting, replacing the use of iron buckets in the early 1860s. The cage worked like an elevator and transported miners down into the mine. Some believed that a pitfall of this new method was its inability to hoist water, which was seen as an advantage of the earlier bucket; a bucket was attached to the bottom of the cage to rectify the problem (Richnak 1984:38; Smith 1998:46).

By May 27, 1865, the Savage was using a newly invented safety cage, designed to decrease the number of accidents in the mine. Henry Berry, H. Hochholzer, and Frank Denver invented the cage. Denver had been in charge of implementing new machinery in the Savage in March of that year and so was associated with the mine"s workings, while Berry may have worked there as a foreman. This hoisting cage had the improvement of safety bars, which would extend outward and sink into the surrounding wood, to stop the cage from falling if the cable broke. The cage was designed so that its weight would "drive [the bars] so securely in the yielding wood that any further descent [would be] impossible." According to a reporter at the *Gold Hill Daily News*, based in Gold Hill, Nevada, the safety cage easily stopped itself from free-falling in the Savage shaft, despite its being loaded with a ton of ore. This safety cage was an important innovation on the Comstock, no doubt saving the lives of many miners during the years of its use (Doten 1973:849; *Gold Hill Daily News* 1865b; *Gold Hill Daily News* 1865d; Nevada Inventors Database 2008).

The Savage Mine began using a new timber framer, invented and later patented by Hochholzer and Denver, around early June 1865. The new timber framer was run by steam and according to Sam Curtis, Superintendent of the Savage, was about one-fourth the cost of the previous method. Mead and McCone‟s Foundry built the framer in Johntown, California. One advantage of this timber framer was that the wood used did not have to be uniformly shaped. If the timber was not square prior to use in the machine, it would be marked with chalk, which would be lined up with the middle of the iron rings that held the timber securely in place to the machine on either side. The timber would then be driven toward the saws on a sliding-table, which would cut the tenent and a "square shoulder on the timber." The timber would then be rotated 90° and the process would be repeated until all four sides were uniform. Two additional saws were used to "square the ends" after the four sides were cut (*Daily Evening Bulletin* 1865; *Gold Hill Daily News* 1865e; *Gold Hill Daily News* 1865f).

PHYSICAL REMAINS OF THE OLD SAVAGE MINE

In August 25, 2011, the senior author visited the approximate location of the site with University of Nevada, Reno (UNR) Anthropology graduate student Steven Holm and Ron James, who was the Nevada State Historic Preservation Officer (SHPO) until his recent retirement. The team visited the site as one of several sites under consideration for an archaeological field school planned for the following summer. While the site is located within Virginia City, it is in a relatively isolated locale on the outskirts of the town. It is situated on a fairly steep slope, and because nearby roads have not been maintained, most of the site is only accessible by foot.

During the site inspection, historic maps and illustrations gave some indication of the site‟s approximate location and possible archaeological features. For example, Hugo Hochholzer‟s 1865 "Map of the Savage Co‟s Ground, Located in Virginia City, Nev." clearly indicates that the old Savage Mine is located on B Street, uphill from the newer Savage shaft on E Street (Hochholzer 1865) (Figure 1). The map depicts two large buildings, most likely a hoist house over the main shaft and a smaller, rectangular building that probably contained ore bins used prior to transporting the ore elsewhere for beneficiation. On the map, the footprints of the two buildings appear to be connected by two lines, probably representing one or more tramways for the transportation of ore and waste rock away from the shaft (Hochholzer 1865).

An 1864 lithograph of the old Savage Mine supports these interpretations (Brown 1864) (Figure 2). The lithograph depicts a building that is clearly the hoist house accompanied by at least two stacks, indicating the use of steam to power a variety of equipment. At least three tramways branch out from the hoist house. The trams are elevated on wood posts to keep them horizontal, as they project outward and downslope. Two tramways appear to be used to transport waste rock from the shaft, which is then dumped in two locations on the hillslope by workers pushing ore carts by hand. A retaining wall separates the central waste-rock pile from the lower building, preventing the waste rock from accumulating against the building‟s walls. The other tramway leads to the top of the lower building, which is labeled on the map as the "Savage Mining Co. Scales," where ore was dumped down chutes and weighed before transport to a mill for beneficiation. Horse drawn carts are depicted on the street on which the building sits, presumably B Street (Brown 1864).

These historic images aid in the interpretation of archaeological remains visible on the ground surface upslope from this location on B Street. Although the team did not formally survey or record the site, physical remains of mining activity are clearly visible on the surface. There are several depressions that are filled-in and partially filled-in shafts. One of these shafts is the main

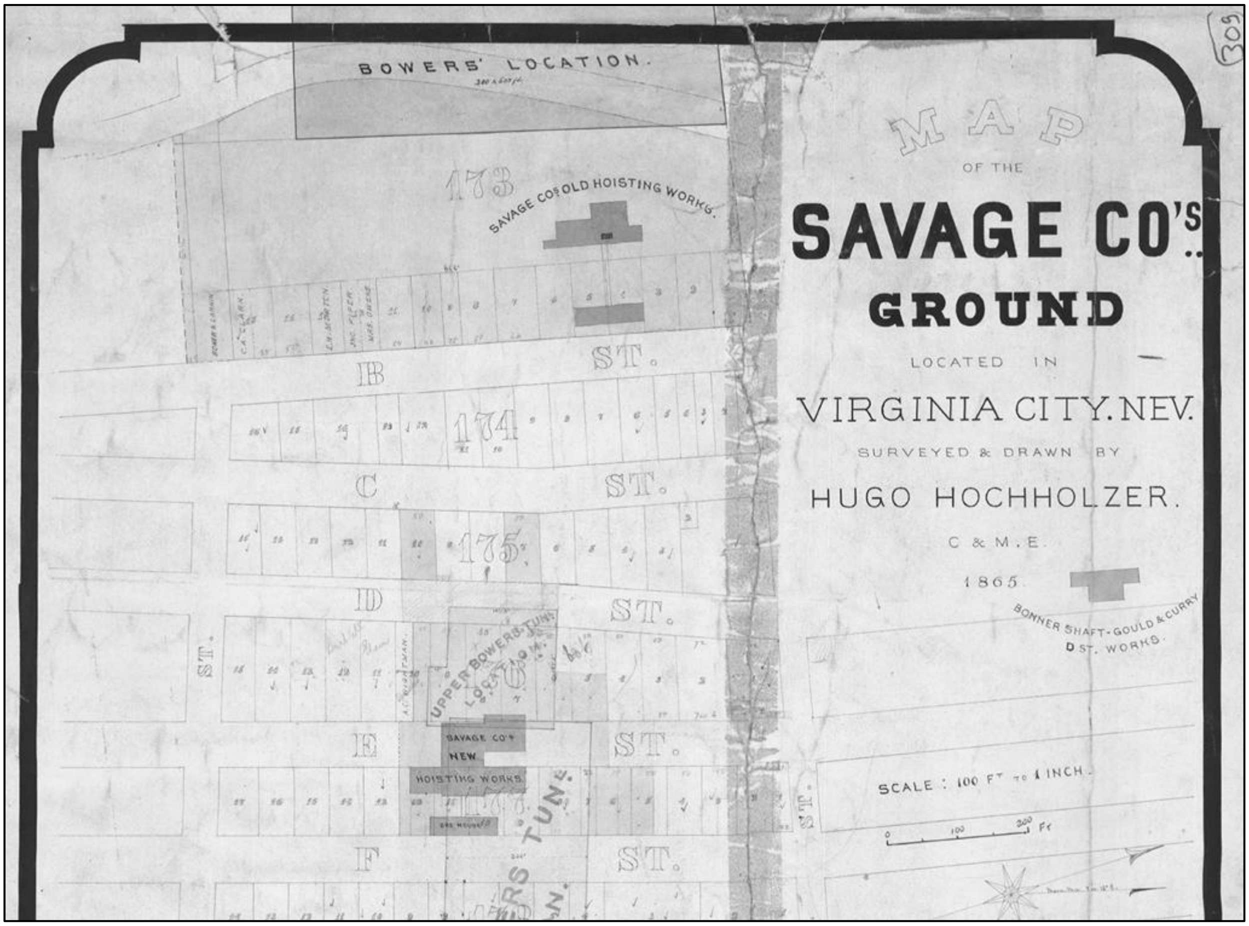

Figure 1. Detail from an 1865 plat map depicting the old Savage mine works on B Street and the new Savage Mine works on E Street, Virginia City, Nevada (Hochholzer 1865). Note that in 1865, the map already refers to the site as the "*Old* Hoisting Works" (emphasis added). Courtesy Nevada Bureau of Mines and Geology.

shaft, while others were probably used for mine ventilation. There are several flattened areas on the landform that may represent platforms for additional, smaller buildings and machinery. One dry laid masonry archway was observed, mostly buried in the waste rock that covers most of site; some of the waste rock piles seem to be quite deep and probably bury additional, earlier archaeological features. Also observed was a large rock retaining wall that could be the retaining wall depicted in the lithograph. There is a substantial scatter of nineteenth-century trash scattered over the surface of the site, and likely could be found under the waste-rock piles, as well. The trash scatter includes refuse such as metal, wire scraps and milled lumber, which are probably remnants of the site‟s architecture and industrial activities. However, there are also other artifacts such as bottle glass, cans, and ceramics that point to the everyday activities of living and working at this industrial site. A brief examination of surface remains suggests that most of the immediately identifiable artifacts date to the nineteenth century and that the site is relatively undisturbed.

Considering the presumably rich archaeological remains and their apparent integrity at this important site, we attempted to deduce current land ownership of the site, in hopes of attaining the archaeological permits to survey,

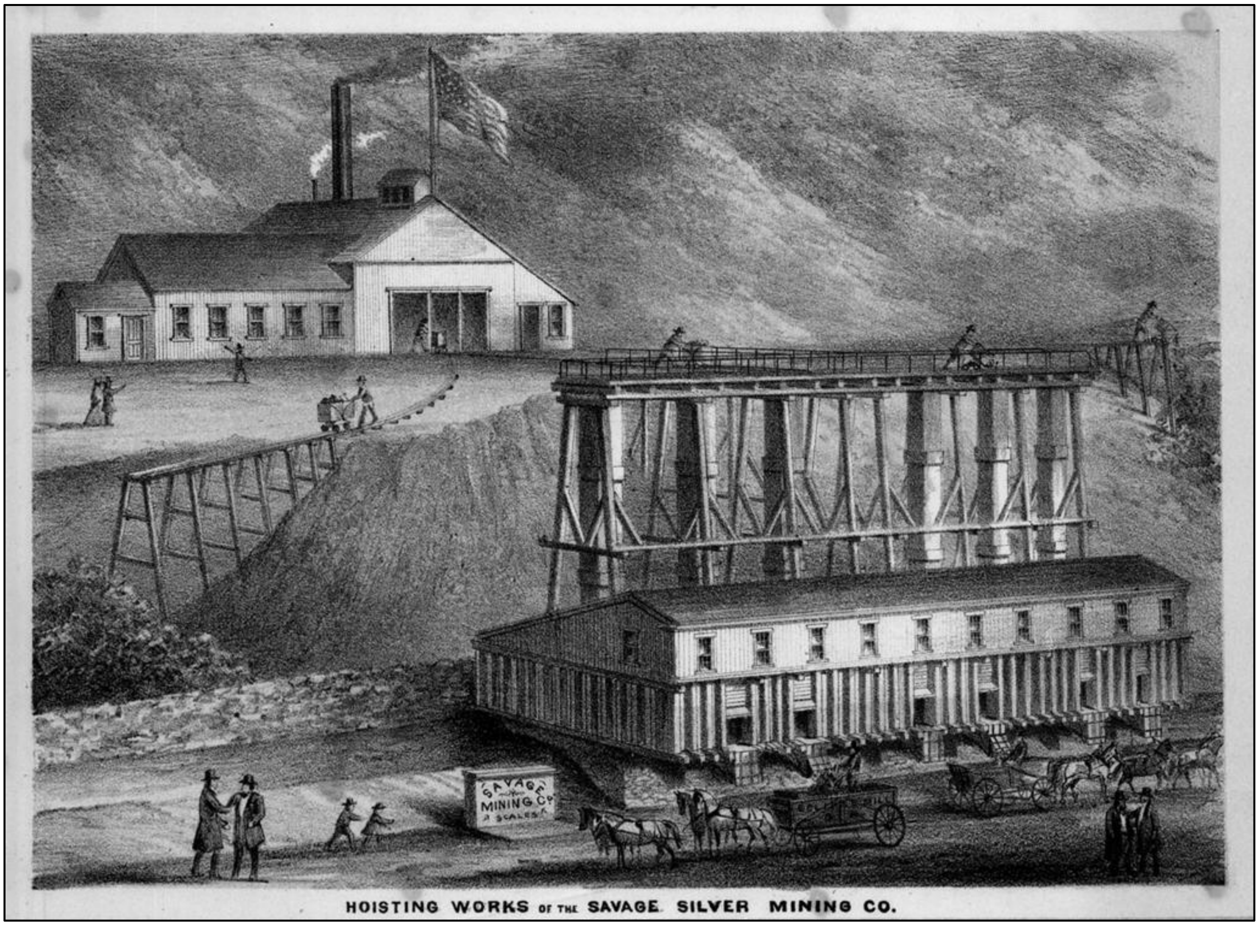

Figure 2. "Hoisting Works of the Savage Silver Mining Co." Grafton Brown, lithographer, 1864 (Brown 1864). Courtesy Special Collections, University of Nevada-Reno Library.

record, and excavate portions of it. Records searches from the Storey County Assessor‟s Office and the Bureau of Land Management give different indications of landownership. All or part of the site might be privately held by two different owners, though the BLM may actually own the site instead. This is complicated by the possibility that Howard Street, located to the west and upslope of the site, may have shifted at some point in history. Further record searches in the future could clarify the issue, but the authors decided that the complication of land ownership and permits precluded further research at this time. It is our hope that publishing this preliminary data could help other archaeologists, historians, and land managers in the future.

CONCLUSION: SIGNIFICANCE AND POTENTIAL FOR INDUSTRIAL ARCHAEOLOGY OF THE OLD SAVAGE MINE

Although it is not possible to be certain of the site‟s integrity, and therefore, its eligibility for the National Register of Historic Places with this level of effort, the site appears to have potential for eligibility under Criteria A, C, and D. Historian Ron James summarizes the site‟s importance in the history of the Comstock and its worldwide influence:

> "I find the upper Savage site of interest because it was developed during a critical period

> when the Comstock was shifting from individual entrepreneurs to the realization that large corporations were needed to develop the mining district. The early Savage appears to be advanced when it came to technology and corporate structure, but it was nevertheless part of this early transition, which was echoed throughout the mining world, following the Comstock example (Ron James, personal communication, 2011)."

This mine‟s early shift from individual to corporate structure, as well as the early adoption of cutting-edge technologies such as square set timbering, the new timber framer, and the safety cage represent important transitions in mining history and the history of technology that warrant further study.

Further archival research will need to be conducted, especially to use historic photos of the early Savage Mine to identify potential archaeological features and industrial artifacts in the field. Additional historic photographs of the Savage mines exist, although it is difficult to discern without further research whether each photo is of the old mine or the new one (but are more likely from the newer mine). For example, historic photos taken from 1867-1868 by photographer Timothy O‟Sullivan are available online (Nevada Observer 2013), and the Yale University Library has an extensive collection of documents from the Savage mines (Bock 1989). The University of California, Berkeley‟s Bancroft Library has additional O‟Sullivan photos, including an image of a cage used at the Savage (Calisphere 2013). Archival sources would also be useful in exploring the management‟s motivations at the Savage Mine for improving mine safety (e.g., with the implementation of the safety cage) in a time period that predates the Progressive Era‟s widespread reforms in industrial safety.

Survey and testing of the site could yield information about the industrial history of the site as an archaeological example of a bonanza mine on the cusp of technological change. Milled lumber on the surface of the site should be examined for information about the architecture of the site‟s buildings, as well as to see if there is any evidence of the type of timber framer used for mining timbers and to see if there are any identifiable parts of safety cages reported to have been used at the site. Archaeometric studies of waste rock, ore, and slag samples from the site could also yield evidence for the effectiveness of mining methods and assaying employed at the site. Archaeological survey and testing could also indicate how long the site was in use, which is unclear from the documentary record. It could also reveal whether the mine was reworked in later years and, if so, to what extent.

Furthermore, even a brief surface inspection of the site indicates the opportunity to study daily life at the Savage Mine, which would be an important step toward blending the subdisciplines of historical and industrial archaeology. While the study of industrial structures and machine technologies are often categorized as industrial archaeology; daily activities indicated by the bottle glass, cans, and ceramics at the Savage often fall in to the realm of historical archaeology. Stark differences between articles published in *Historical Archaeology* and the *Journal of the Society for Industrial Archeology* attest to a rather strict division between these two realms in many archaeologists‟ minds. Archaeologists focusing on industrial sites usually privilege the technological record, and rarely spend much time examining the "domestic" remains beyond cursory reporting. There are notable exceptions to this bias (e.g., Hardesty 2010; Knapp et al. 1998), but additional work is needed to provide a more complete view of life at mining sites; the Savage site offers that opportunity.

If future fieldwork is conducted at the Savage, archaeologists should exercise extreme caution. As Ron James has pointed out, the dangers of entering an unstable historic mine might outweigh the benefits of research (James 2012:6). “Mining is too often a compromise between safety and cost”, and even if the miners‟ expedient shoring of rock walls and ceilings was sufficient at the time, many of the timbers in such mines are now decomposed (James 2012:11). In addition, the air inside mines is often toxic, and typically there are additional interior shafts that are difficult to see, increasing the likelihood of deadly falls (James 2012:14).

Instead, the future researchers at the Savage Mine should focus on surface features and artifacts. However, even an above-ground survey of an abandoned mining site is not without its hazards. At the Savage, for example, there are several depressions in the ground. While some of these could represent privies and other pit features, some of them are filled-in and partially filled-in shafts. Archaeologists should avoid stepping into or near the edge of these depressions, which could collapse and result in a deadly fall. Future researchers who record this and other abandoned mines should work with an archaeologist who has extensive experience recording such sites. There are a number of resources that can be consulted for further procedures on recording and evaluating abandoned mining properties (e.g., Cowie et al. 2005; Hardesty 2010; Hardesty and Little 2009; Noble and Spude 1992; Poirier and Feder 2001).

In sum, the old Savage Mine has research potential and appears to have integrity as an archaeological site upon initial inspection. A critical first step for future research is a formal evaluation of the site, especially a detailed analysis of its integrity. It could provide information about an important period in the development of mining on the Comstock, which itself was influential in much broader contexts. We hope that this important site will be recorded and tested at some point in the future.

ACKNOWLEDGEMENTS

Ron James, recently retired Nevada State Historic Preservation Officer (SHPO) brought our attention to this important site, providing relevant historic sources, and showing us the site‟s approximate location. Much of the archival work for this project was made possible by the Department of Anthropology at the University of Nevada, Reno, which provided Lisa Machado with a research assistantship under the direction of Sarah Cowie. Thanks to Donnelyn Curtis and staff at the University of Nevada, Reno‟s Special Collections who made important archival sources available in digital format and helped locate additional sources. The Nevada Historical Society, UNR‟s Keck Library, and Nevada Bureau of Mines and Geology also provided important archival sources. We would also like to thank Ron James and an anonymous reviewer who provided helpful comments on earlier drafts of the manuscript. Thanks also to Geoff Smith and his colleagues at *Nevada Archaeologist* for their support and guidance in the preparation of this manuscript. Of course, any errors here are our own.

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Brick Manufacturing in the Cortez Mining District, Nevada

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Summit Envirosolutions, Inc., Reno, Nevada

This paper highlights research on two brick manufacturing sites in central Nevada's Cortez Mining District. In 1885, thousands of bricks were ordered as a key component for the new Tenabo Mill. The mill used the Russell lixiviation process to process the silver ores, and needed brick for the numerous ore roasting components. Rather than importing such a large and bulky commodity, they chose to manufacture the brick locally. Archaeologists identified two brick making sites in the district, which were excavated as part of a large mitigation project. One site contained evidence of mining local clay and molding and firing brick, and both sites had evidence of brick clamps (a type of kiln). Archaeological evidence suggests the manufacturing technique was not complicated, yet the quality of the brick was consistent and reliable. While manufacturing brick in Nevada's physically remote mining districts was not uncommon, these are the only sites known to have systematic excavation done on them. The two sites complement one another and provide a blueprint of small-scale, nineteenth-century brick manufacturing as practiced in this period.

INTRODUCTION

Karl Gurke (1987:xi) wrote that brick is one of the most prevalent yet underappreciated building materials at historic sites. Nearly every developed mining district in Nevada contained brick, yet there has been very little research on local brickmaking industries. In Nevada, known brick manufacturing sites are rare, and those that are documented remain unstudied. This article presents the results of excavations at two small brickworks sites in Nevada, both of which are in the Cortez Mining District. To the best of our knowledge these are the only brickworks systematically excavated in Nevada.

The Cortez Mining District was a silver camp in north-central Nevada. A party of prospectors organized the district in 1863 after they discovered several ore veins on the slopes of Mt. Tenabo (Bancroft 1889:11; Hardesty 2010:110). In 1864, the Cortez Gold and Silver Mining Company constructed a mill near Cortez Camp in Mill Canyon (*Reese River Reveille* 1864). Delivery of the ore from the mines to the mill required transporting the material by mule over or around the 2,792 m (9,162 ft.) Mt. Tenabo. The task was treacherous, inefficient, and expensive. The mill also lacked the appropriate technology for the district"s complex ore. By the early 1880s, Simeon Wenban, the principal owner and operator of the Cortez mines, decided a new mill was needed. Wenban designed his new mill with the latest milling technology, known as the Russell Process of lixiviation (Eissler 2006 [1891]:282). The Russell Process (as applied at the Tenabo Mill) involved roasting ore before leaching it. Roasting required several large furnaces, and the furnace complex in turn required prodigious amounts of brick.

Construction of the Tenabo Mill commenced in 1884, with contracts let for brick and other building materials. Brick was a bulky commodity and prohibitively expensive to import (the district did import some firebrick, from England, in limited amounts and for specialized uses). Exactly how many bricks were needed at the Tenabo Mill is uncertain, but historic photographs suggest it numbered in the tens of thousands (Figure 1). Thousands of bricks were used to construct three large smokestacks, and several thousand more were needed for the level containing the furnace complex. While the mill was under construction, the community of Upper Cortez sprang up. However, only two other buildings in the entire town were made from brick, and both appear directly associated with the Tenabo Mill. One building was the assay office and shops; the other was a small, windowless outbuilding of unknown purpose. The only other site with a substantial amount of brick was at a water pumping station in Grass Valley. The steam-operated machinery used brick in construction of the boiler‟s firebox and smokestack. Incidentally, that site was also a major component of the Tenabo Mill.

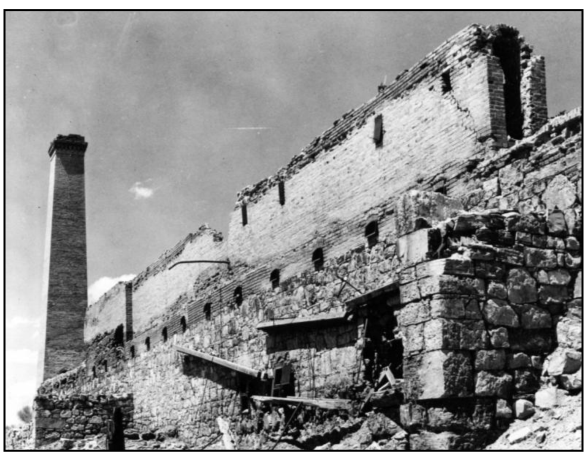

Figure 1. Tenabo Mill ruins, ca. 1950. Note the copious use of brick on the upper terrace and the smokestack. Image courtesy of UNR Special Collections, Gus Bundy Collection.

Brickmaking at Cortez was a short-term, project-specific job for one client: Simeon Wenban and his Tenabo Mill. There is no indication that brick making was ever a large, commercial enterprise. As a result, historic references to brick making in the Cortez District are scarce at best. Historic photographs show almost no brick in the district except for a few chimneys attached to wooden commercial buildings. Lloyd High, a resident of Cortez in the 1950s, recalled folks "making their own brick from a clay deposit seven miles from here" (Murbarger 1959:13). Another reference is a ledger containing the "Summary of Stores and Materials Accounts" (Cortez Mines Ltd. 1899). Unfortunately, the ledger starts in 1899, 13 years after construction of the Tenabo Mill, and only lists small quantities of brick utilized "at the mine" and "at the mill," presumably for maintenance and repair of existing facilities. The ledger does record the purchase of additional brick (e.g., in March 1897 they purchased $160.48 worth of brick) but does not say where they obtained it or where it was used.

TECHNOLOGY OF BRICK PRODUCTION

The process of manufacturing brick is straightforward; however, slight modifications can achieve a wholly different product in terms of quality, consistency, color, and durability. Like any craft, the artisan‟s skill is also a significant factor in the final product. The following section describes the basic brickmaking process, with emphasis on small operations, and physical components that may provide an archaeological signature.

Brick production typically occurs adjacent to a good source of clay. Surface clays can be obtained through simple open-pit mining, similar to the creation of a gravel pit (termed „winning the clay‟ or „taking off the kelly‟). Once obtained, the clay is weathered and tempered. The tempering process could be done by hand, by use of a ring-pit, or a churn known as a pug mill. A pug mill is basically a wooden tub with a rotating shaft to which several mixing blades were attached (Garvin 1994:19). Depending on its size and complexity, the pug mill could be powered by hand, by a horse walking in a circle (similar to an arrastra), or by steam (Manufacturer and Builder 1877:33).

Once the clay was tempered and mixed to the desired consistency, it was then molded, dried, and fired in a clamp, a type of kiln specific to brickmaking. The molding process was done by hand or by machine, with wooden or metal molds (Hammond 1981:11). To prevent the brick from sticking to the mold, the brick is coated in either sand or water. Named „slop molding‟ when dipped in water and „sand struck‟ when coated in sand, both leave an unusual, indelible mark on at least one long surface of the brick.

A brick clamp (Figure 2) could be a variety of sizes and shapes, depending on the amount of brick being fired (Garvin 1994:23-25). Clamps are constructed by stacking unfired brick in such a way that the brick itself becomes the firing chamber. A clamp may have a hard packed clay floor or a floor of previously-fired brick. The brick is stacked on the narrow face with gaps between each one, and a series of flues or tunnels are left along the base for the fuel. The tunnels would have wood, charcoal, or (in Nevada) sagebrush, stacked inside and breeze or kindling would be spread on top of the green bricks (Gurcke 1987:32). The outer layer was sealed with tightly-stacked, previously fired bricks. A clamp would burn for several days and require constant attention.

RESULTS OF INVESTIGATIONS

In 2009, Summit Envirosolutions, Inc., mitigated two brick manufacturing sites (26LA4408 and 26LA4354) in the Cortez Mining District. The two sites contained the remains of three brick clamps. The sites are both located in Grass Valley, approximately 3.1 and 1.9 km from the Tenabo Mill. The results of data recovery at each of the sites, for simplicity referred to as the south brickworks and the west brickworks, are summarized below.

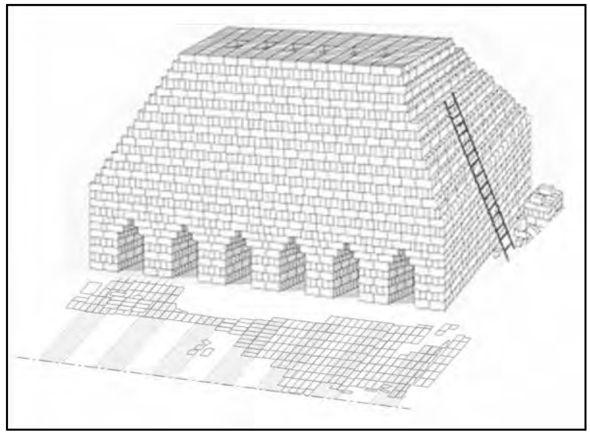

Figure 2. Typical small brick clamp superimposed over sketch of the Cortez clamp. Alternating gray and white bands delineate the flues in the Cortez clamp. Image modified from www.fastonline.org.

South Brickworks (26LA4408)

The south brickworks site is the smaller of the two sites. The site is in north-central Grass Valley, adjacent a buried pipeline called “Wenban‟s Pipeline”. Built in 1884, the pipeline was the main waterline for the Tenabo Mill (McQueen 2006:109). The pipeline is the only water source in this part of the valley, and we presume one of the reasons the brick clamp was constructed here is because they had access to the water (the second reason being a good source of raw material). The site consisted of six clusters of highly deteriorated and eroded brick piles, with associated orange-stained soil, and a large borrow pit feature. The borrow pit measures 30 x 15 m x 1.5 m deep (100 x 50 x 5 ft.). Artifacts were also present but scarce, and included a fire door and wood fragments that might be part of a brick mold (Figure 3).

After clearing the dense sagebrush, it was

Figure 3. Wood and brick sample recovered from the south brickworks (26LA4408). The wood is probably part of a mold. Also note the inconsistent veneer on the brick.

observed that the brick piles were surrounding a dark-stained soil. These piles are either discarded „waster" brick or they were pulled from the floor of the clamp. Excavation of the feature revealed *in situ* brick on the outermost edges of the stained area. It was determined that this was the edge of the brick clamp. While most of the brick was absent from the rest of the clamp, the sediment had a very distinct, black thermal signature underlying the feature. The thermal signature provided an estimate that the clamp measured 9 x 7 m (30 x 23 ft.). This pitch-black sediment also attests to the extreme heat generated by the clamp. We estimate the clamp was capable of producing 30,000-40,000 bricks per firing, and the associated borrow pit yielded enough material for two or three times that many bricks.

West Brickworks (26LA4354)

The west brickworks site is the larger of the two sites. It contains at least two clamps, a possible tent flat, and several cleared areas. The site is in northwest Grass Valley. Like at site 26LA4408, the water source here is also a small, buried pipeline. Excavation of the main clamp feature (Figure 4) revealed an intact brick floor at approximately 30 cm below surface. Sediments above the floor consisted of decomposed brick, clay, and some ash. Sediments below the floor were again a blackened, thermal signature, which helped delineate the clamp"s original size. This clamp was approximately 9 x 9 meters (30 x 30 ft.), capable of producing up to 40,000 bricks per firing. This is the largest clamp identified in the Cortez District.

The bricks comprising the floor of the clamp displayed wide, alternating bands of pink and white (see Figures 2 and 4). The white bands are permanent ash discolorations delineating the flues. The main clamp had at least seven flues. The flues are the chambers for the fuel (ILO 1990). An interesting artifact found just outside this clamp is a long iron rod, essentially a fire poker, measuring 4.5 m (15 ft.) long. The rod has a handmade handle on one end, and a simple handmade pointer attached at the other. An 1884 treatise on brick-making (Davis 1884:146) shows a similar tool, called a „moon" that is "a little longer than one-half the width of the kiln," which is precisely the situation with this artifact and the main clamp.

The second clamp at this site was originally defined as an artificial terrace or flat. There was no brick or orange staining anywhere on the surface. It was not until the black thermal signature was uncovered that excavators realized it was another clamp. The telltale blackened sediment was encountered at 15-25 cm below surface. This is a small clamp, about half the size of the main clamp (4.5 x 4.5 m; 15 x 15 ft.). It is uncertain why this clamp is so small compared to the other clamp. Perhaps the brick makers were firing extra or under-fired bricks, or they may have been experimenting with their technique. This could also be a later clamp producing replacement bricks or a specialized brick, which might explain why nearly all the brick was taken away, versus the abundant *in situ* „common" brick left-

Figure 4. West brickworks (26LA4354), Feature 1, a partially intact clamp floor. The alternating bands of color on the brick delineate the flues.

over at the main clamp.

CONCLUSION

The simple discoloration associated with the flues told us much about the brick making technique used in the Cortez District. Brickmaking in the Cortez District utilized temporary or periodic kilns known as clamps. Clamps are the simplest means of making brick; however, they are also the most inefficient in terms of energy consumption and labor expenditure. This apparent disregard for fuel economy seems incongruous in this desert environment, with its supposed limited fuel resources. Perhaps it was an unavoidable consequence of the brickmaking process or was overridden by the simplicity of design.

Cordwood, charcoal, and sagebrush are all possible fuel sources. While we do not know for certain which fuel they used, we suspect it was cordwood. Clay for the brick came from local sources. The clay needed to be weathered, tempered, and molded. Interestingly, neither brick clamp is located at a high-clay content area. Both sites sit on fine sandy loams, with inclusions of gravelly clay or small gravels (USDA 1980). It is possible this type of sediment, with its inclusions that can aid tempering, was preferred over a more purer clay source. As noted above, tempering and conditioning can be done by hand or in a pug mill. Evidence of pug mills was lacking at both sites, suggesting that the clay was hand-tempered using an alternative technique called soak heaping. The type of temper used appears to be the natural sand and fine gravels.

Molding the clay can take a variety of forms. The small wood fragment found at the south brickworks might be part of a wooden mold. The presence of finger markings in some of the brick indicates they molded the bricks by hand, and the bricks were probably a soft mud. The bricks have a variety of hues, many are misshapen, and there are other general deformities or inconsistencies (see Figure 3). While the brick appears rudimentary or even poor quality, it is important to remember that these are discarded, unwanted bricks. To understand the brick maker"s skill, it is necessary to look at brick at the Tenabo Mill. Unfortunately, at some point in the last 50 years salvagers have carried nearly all the brick off the site.

Brickmaking at Cortez was a short-term, limited affair initiated by construction of the Tenabo Mill. Use of brick elsewhere in the district was very limited. The techniques for making brick employed at Cortez do not appear significantly different from small-scale brickmaking elsewhere in the country (cf. Balicki et al. 2004; Hart 2000; O"Neill 2001; Smith et al. 1977; Wingfield et al. 1996). The closest comparative example of brickmaking is a primitive clamp in California"s Sierra Nevada (Hart 2000). There the author describes a simple skove kiln structure considerably smaller than those observed at Cortez (skove kilns and clamps are very similar and different authors use the phrases interchangeably to describe these kiln structures). He determined that work was labor intensive and the final product was inconsistent and generally poor. Similar to our situation at Cortez, Hart had very few associated artifacts, and very little archival information.

Archaeological research at clamps in Kentucky, Tennessee, and Maryland are also comparable to Cortez, even though most date considerably earlier (Balicki et al. 2004; Smith et al. 1977; Wingfield et al. 1996). They note a similar distinct, dark colored thermal discoloration in the subsoil at all three locations, as well as a lack of associated artifacts. In fact, kilns/clamps (the terms are used interchangeably by the different authors) examined at several sites show tremendous redundancy. Whereas many nineteenth century technologies or industrial processes had to be adapted to Nevada"s desert frontier – charcoal production, mining, and especially milling, for example – brickmaking does not appear to fall into that category. Of course, a larger dataset of brickmaking sites would greatly help define a „Nevada" or „Western" brickmaking pattern, if in fact such a pattern exists.

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Exploring Healthcare Practices of the Lovelock Chinese: An Analysis and Interpretation of Medicinal Artifacts in the Lovelock Chinatown Collection

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This article examines medicinal artifacts recovered from the 1977 excavations of Lovelock Chinatown - 26Pe356. A total of 115 medicinal artifacts are located in the Lovelock Chinatown Collection and include embossed Euro-American patent medicine bottles, Chinese medicine bottles, paper medicine packaging, herbal materials, glass syringes, and a variety of other medicinal items. The Lovelock Chinatown Collection contains treatments for upset stomach, rheumatism, headaches, skin disorders, reproductive disorders, and so on. Chinese medicinal artifacts in the collection reflect cultural beliefs regarding the relationship between food and medicine and views of the human body. The presence of Euro-American patent medicines in the Lovelock Chinatown Collection provides evidence of Chinese consumption of Euro-American medicines. Possible reasons for Chinese consumption of Euro-American medicine are outlined in this article[i].

INTRODUCTION AND PROJECT BACKGROUND

Lovelock is located 93 miles east of Reno in Pershing County, Nevada, and was founded in 1868 when the Southern Pacific Railroad established its station in Big Meadows, an important stop along the Humboldt Emigrant Trail (City of Lovelock 2012; Rusco 1979a:637). Compared to other Chinatowns in Nevada – whose populations generally decreased in the late nineteenth century – the Chinese population of Lovelock increased by ~63% in 1880 and a further ~26% by 1900 (Rusco 1979b:45). In 1880 there were 19 Chinese living in Lovelock and in 1900 there were 39 Chinese living in Lovelock (Rusco 1979b:46). Lovelock Chinatown had several Chinese businesses including laundries, a hotel, restaurant, and a gift shop, which Euro-Americans frequently patronized. A Chinese religious shrine was located in Block 22 on the corner of Ninth and Amherst (Hart 1979:30).

Lovelock Chinatown was excavated in 1977 by archaeologists from the Nevada State Museum before the expansion of I-80 West could legally commence (Rusco 1979c:1). Three small frame buildings (B1, B2, and B3) were identified as structures formerly occupied by Chinese. B1 and B2 are shown on the earliest Sanborn map from Lovelock, which dates to 1904, and records indicate that B3 was moved onto the site after 1923 (Jensen and Rusco 1979:92). These buildings were all that was left of Lovelock's original Chinatown, which had once contained five structures. Letters, magazines, and newspapers indicate that the structures were occupied up until the late 1950s and early 1960s; however, the exact date at which these buildings were last occupied is unknown (Jensen and Rusco 1979:92, 99).

Archaeologists excavated 40% of the area beneath and around the buildings and a smaller sample of the rest of the site (Rusco 1979c:2, 4). Excavations uncovered 55 archaeological features including refuse pits, cellars, postholes, wells, earthen mounds, and trenches (Jensen and Rusco 1979:92–96) (Figure 1). One of the more interesting finds from the investigations was a cache of gold coins found beneath the cellar of B1 (Jensen and Rusco 1979:93). In the loft of B2, archaeologists discovered the personal effects of Woo Sum Waw and Hop Lee (and perhaps other individuals as well) who operated a laundry in Lovelock (Jensen and Rusco 1979:99). These materials included letters and a ledger, food remains and containers, health care and hygiene items, tobacco and smoking paraphernalia, gaming pieces, and religious accoutrements (Brown 1979:551).

Over 13,000 artifacts were recovered from the Lovelock Chinatown excavations and are curated at the Nevada State Museum in Carson City. The collection contains 115 medicinal artifacts representative of both Chinese and Euro-American manufacture. In 2012, I reexamined the medicinal artifacts, with a focus on the kinds of treatments represented, Chinese cultural beliefs related to the treatment of disease, and Chinese use of Euro-American medicines. This study represents the first in-depth archaeological analysis of Chinese use of Euro-American medicine.

FINDINGS

Of the 115 medicinal artifacts in the Lovelock Chinatown collection, 29 are Euro-American and 83 are Chinese. An additional three artifacts were used for administering medicine. All 29 Euro-American medicinal artifacts are medicine bottles and bottle parts including embossed and unembossed bottles, insulin bottles, and insulin stoppers. Of the 83 Chinese medicinal artifacts, there are embossed and unembossed bottles, paper packaging (including a medicine wrapper and herbal packet), herbal materials, a wax pill ball, and an opium can. The herbal materials include turtle carapace, bobcat bones, cuttlefish bones, viper bones, betel nuts, and a mineral. There are three syringes used for administering medicine.

Chinese medicinal artifacts represent the largest percentage of artifacts recovered, making up ~72% of the assemblage. Euro-American medicinal artifacts comprise ~25% of the assemblage. The three glass syringes used for administering medicine make up only ~3% of the artifacts. The largest category of Euro-American medicinal artifacts is embossed patent medicine bottles, which comprise ~17% of all artifacts in the assemblage. Unembossed medicine bottles make up the largest category (~34%) of the Chinese medicinal artifacts.

Euro-American Medicinal Artifacts

Medicine Bottles and Parts. The Lovelock Chinatown Collection contains 20 embossed medicine bottles, one unembossed medicine bottle, three insulin bottles, and two insulin bottle stoppers of Euro-American origin (Table 1). Only complete Euro-American medicine bottles were identified in the collection, as other glass bottle fragments in the collection were too fragmentary to properly identify. The embossed bottles represent patent medicine cures for upset stomach, rheumatism, inflammation of the sinuses, headaches, and eye disorders.

There are also cure-alls designed to treat many different ailments, such as Sloan's Family Liniment and Perry Davis's Vegetable Painkiller. A bottle of Sloan's Family Liniment contained a paper label that on one side states: "Recommended by us in the treatment of wind colic, muscular cramp, bronchial cough, spasmodic croup, and acute pleurisy," (Figure 2) and on the other side states: "…Rheumatism, lumbago (lower back pain), stiff neck, neuralgic headache, neuralgia, sciatica, sprains, bruises, chil-

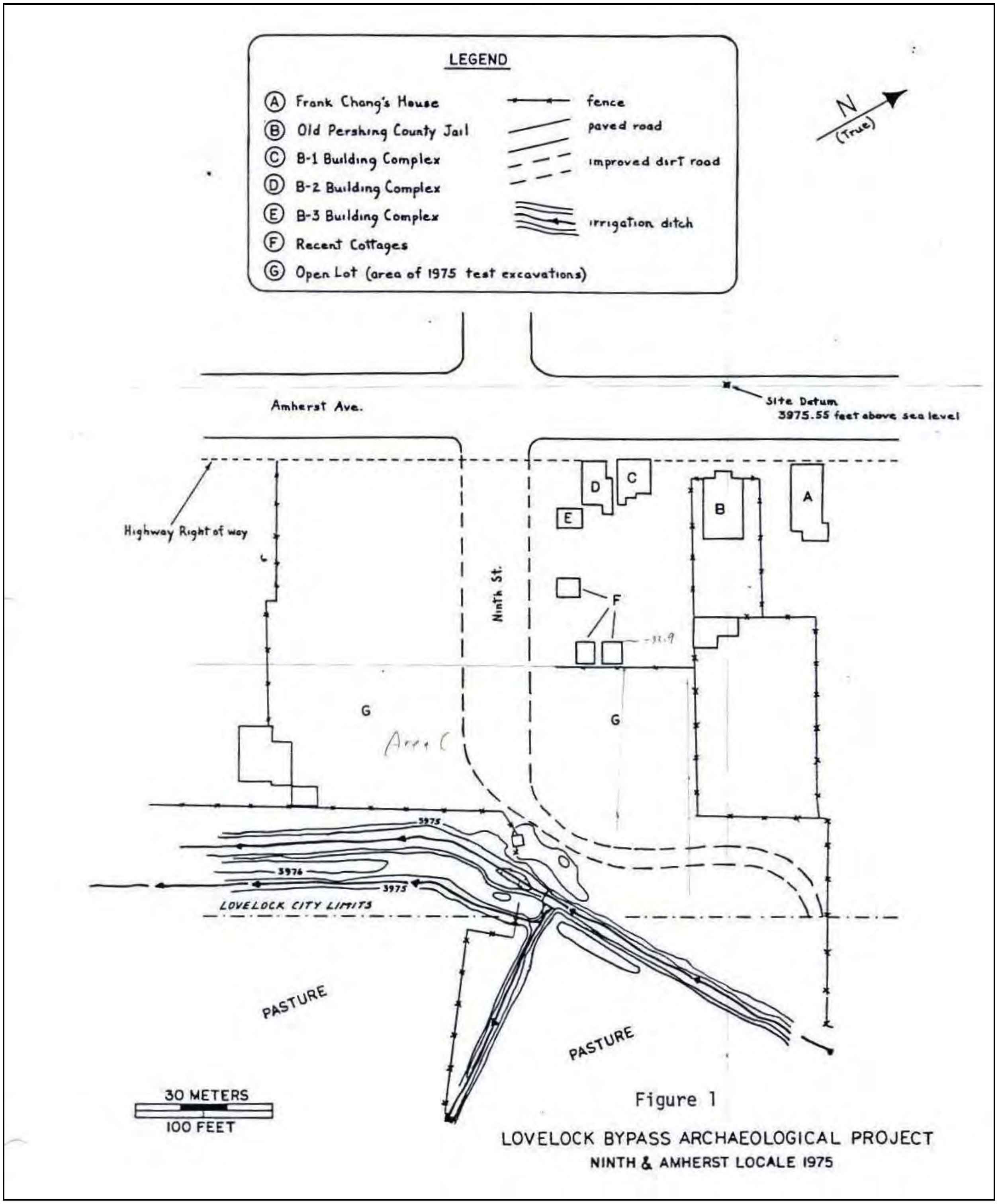

Figure 1. Map of Lovelock Chinatown Project (Hattori et al. 1979:62).

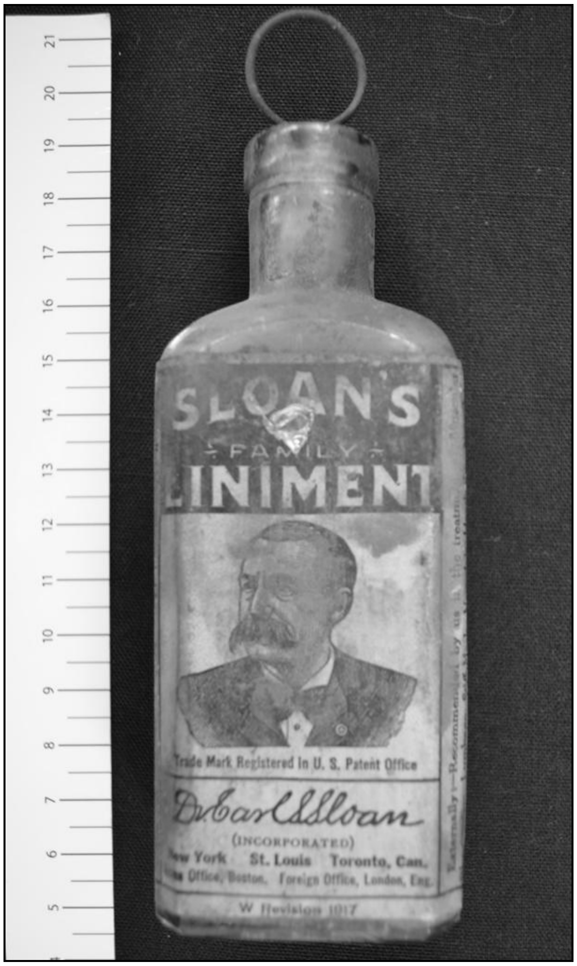

Figure 2. Bottle of Sloan's Family Liniment with paper label.

lains [and] mosquito bites," among the many ailments that this product could treat[ii].

One unembossed medicine bottle contained castor oil and has a paper label indicating that it was purchased at the Lovelock Pharmacy. Castor oil is a traditional Euro-American purgative (Brown 1979:571). There is a bottle of Dr. J. Hostetter's Stomach Bitters, which was marketed for the treatment of malaria, fever, and indigestion (Fike 2006:36; Gerth 2006:43; Wilson and Wilson 1969:35). Two of three insulin bottles held the diabetes medication Iletin, made from pork insulin and manufactured by the Eli Lilly Company from 1923 to 2005 (Eli Lilly 2005; Science Museum 2012). Two small rubber stoppers are likely from the tops of the insulin bottles.

Medicine Jars. Two colorless glass medicine jars are embossed with "CHESEBROUGH/ MANFG.CO./NEW-YORK" on the sides and likely contained Vaseline. One of these jars has an applied color label indicating that the product was intended to treat skin irritations and minor wounds and bruises. A third embossed glass medicine jar is made from white glass and contained mentholatum ointment. Mentholatum purported to treat a range of ailments including headaches, rheumatism, catarrh (common cold), hay fever, toothache, sprains, and hemorrhoids (Taylor 2006:11, 13).

Table 1. Euro-American Medicinal Artifacts in the Lovelock Chinatown Collection.

Artifact Type	*N*	%*
Medicine Bottles and Parts		
Embossed Medicine Bottle	20	17.4
Unembossed Medicine Bottle	1	0.9
Insulin Bottle	3	2.6
Insulin Bottle Stopper	2	1.7
Sub-Total	**26**	**22.6**
Medicine Jars		
Glass Medicine Jar	3	2.6
Sub-Total	**3**	**2.6**
Total Euro-American Medicines	**29**	**25.2**

* Percent of all medicinal artifacts.

Chinese Medicinal Artifacts

Medicine Bottles and Parts. There are nine embossed medicine bottles and 39 unembossed medicine bottles of Chinese origin (Table 2). All of the embossed bottles are machine-made. Two of the embossed bottles contained tonic medicine for strengthening the kidneys and one contained "dripping pills," the exact purpose of which has not been determined. Six small bottles are embossed on the base with what may represent the name of the manufacturer. The unembossed medicine bottles are small, vial-shaped, and usually contained a single dose of medicine, either in the form of pills, powder, or liquid (Armstrong 1979:236). To remove the contents of these medicine bottles, the user would snap off the bottle"s neck (Hunt-Jones 2006:120). Some of these bottles have traces of labels, corks, or wax seals.

One small bottle is embossed with Chinese characters on the front and back and contains traces of a black substance inside. It was originally broken into two pieces but was later mended. Side A is embossed with the characters "*XIANG GANG TIAN YI YAO FANG YU*" (Name of the drugstore, based in Hong Kong). Side B is embossed with the characters "*LU WEI BA* (deer's tail) *HAI GOU BIAN* (testes and penis of an ursine seal) *QIANG SHEN WEN* (tonify the kidney pills)" (Figure 3) (Peng Li, personal communication, 2012). In addition to helping strengthen the kidneys, these ingredients were employed in Chinese medicine to treat issues of impotence and premature ejaculation (Lei et al. 1996:197).

Herbal Materials. Herbal materials include both faunal and floral materials and one mineral. Faunal materials include turtle carapace, bobcat bones, cuttlefish bones, and viper bones. Floral materials in the collection include betel nuts, and mineral herbal materials include one piece of alum. In addition to being used in Chinese medicine, turtles, cuttlefish, and snakes were also consumed as food. The relationship between food and medicine in Chinese culture is addressed more thoroughly in the Discussion section (see below).

There are twelve fragments of turtle carapace that represent the remains of at least two Pacific pond turtles, *Clemmys marmorata* (Dansie 1979:377). Chinese used turtle carapace as a tonic to strengthen and nourish the kidneys, blood, and skeletal system (Hempen and Fischer 2009:812). It could also be used to treat headaches, dizziness, and could be externally applied to wounds (Hempen and Fischer 2009:812). There are three bobcat bones that may have substituted for tiger bone, which was an expensive herbal ingredient used to make powerful tonic wines (Young 1913:37). Tiger bone also had supposed anti-inflammatory properties and was ground and applied as a plaster for treating rheumatism (Mainka and Mills 1995:195).

Table 2. Chinese Medicines and Medical Packaging in the Lovelock Chinatown Collection.

Artifact Type	*N*	%*
Medicine Bottles and Parts		
Embossed Medicine Bottle	9	7.8
Unembossed Medicine Bottle	39	33.9
Sub-Total	**48**	**41.7**
Herbal Material		
Turtle Carapace	12	10.4
Bobcat Bone	3	2.6
Cuttlefish Bone	5	4.3
Viper Bone	3	2.6
Betel Nut	6	5.2
Mineral	1	0.9
Sub-Total	**30**	**26.0**
Paper Packaging		
Medicine Wrapper	1	0.9
Herbal Packet	2	1.7
Sub-Total	**3**	**2.6**
Metal Packaging		
Opium Can	1	0.9
Sub-Total	**1**	**0.9**
Other Packaging		
Wax Pill Ball	1	0.9
Sub-Total	**1**	**0.9**
Total Chinese Medicines	**83**	**72.2**

* Percent of all medicinal artifacts.

Six fragments of betel nut, sliced into thin wafers, are located in the Lovelock Chinatown Collection. Seeds of the betel nut palm, *Areca catechu*, are used in Chinese medicine to expel parasitic worms and are an important complementary medicine in the treatment of malaria

Figure 3. Side B of embossed Chinese medicine bottle. From right to left, top to bottom, characters read: *LU WEI BA* (deer's tail) *HAI GOU BIAN* (testes and penis of an ursine seal) *QIANG SHEN WEN* (tonify the kidney pills). In addition to strengthening the kidneys, this medicine was used to treat impotence and premature ejaculation.

(Hempen and Fischer 2009:860). A fragment of potassium aluminum sulfate, or alum, was identified. It measures approximately 50 mm by 35 mm and resembles a quartz crystal. Alum is used as an astringent to stop bleeding, cure diarrhea, expel mucous, dry oozing skin, and stop itching (Hempen and Fischer 2009:876).

Paper packaging. There is one medicine wrapper and two herbal packets in the collection. The herbal materials originally contained within these packaging materials are not present in the collection. Chinese characters on the medicinal packages were translated by Peng Li. A portion of a Chinese medicine wrapper with red lettering and a drawing of a stupa (Buddhist shrine) contained "*bao ji wan*" (pills of relief) (Figure 4). The bottom half of the red box below the stupa translates to: "*yu you jia mao zhongsheng tang baoji wan zi hao*, *tianzhu dimie*, *jinduo jingshe, zhu junzhu yi*." This is a warning to anyone who would try to copy this particular medicine for doing so would bring a powerful and deadly curse upon the individual and the family of the individual who committed the forgery. The large red letters that run down to the right of the box with the drawing translate to: "*yong xing wu pao qi*" (Please do not throw away). These pills were used for the treatment of summer colds, vomiting, fever, headache, motion sickness, cholera, alcoholism, and additional ailments (Lister and Lister 1989:71).

Two herbal packets contained Chinese medicine. Both packets are made of brown paper and are painted with Chinese characters. The first packet contained "*luo han guo*" which is the Chinese word for *Siraitia grosvenorii*, or monk fruit. Monk fruit was used to treat coughing, sore throat and hoarse voice, and constipation (Wu 2005:432). The second packet contained "*chuan xiong*," which is the Chinese name for *Lingusticum wallichii* or Sichuan lovage rhizome. Sichuan lovage rhizome was primarily for women to take during their menstrual cycle to help ease symptoms, replenish the blood, and regulate menstruation (Wu 2005:376).

Metal Packaging. An opium can in the collection retained its paper label, indicating that it contained "*qing ning wan*" (Brown 1979:564) which translates to "Clear and Quiet Pills" (Wiseman and Feng 1998:731). According to the label, these pills were manufactured in Guangzhou City, Guangdong Province (Peng Li, personal communication, 2012). Prepared smoking opium from China was exported in rectangular metal cans containing around 6-$^{2}/_{3}$ ounces of opium (Wylie and Fike 1993:261, 287). Though typically exported in solid form, opium also

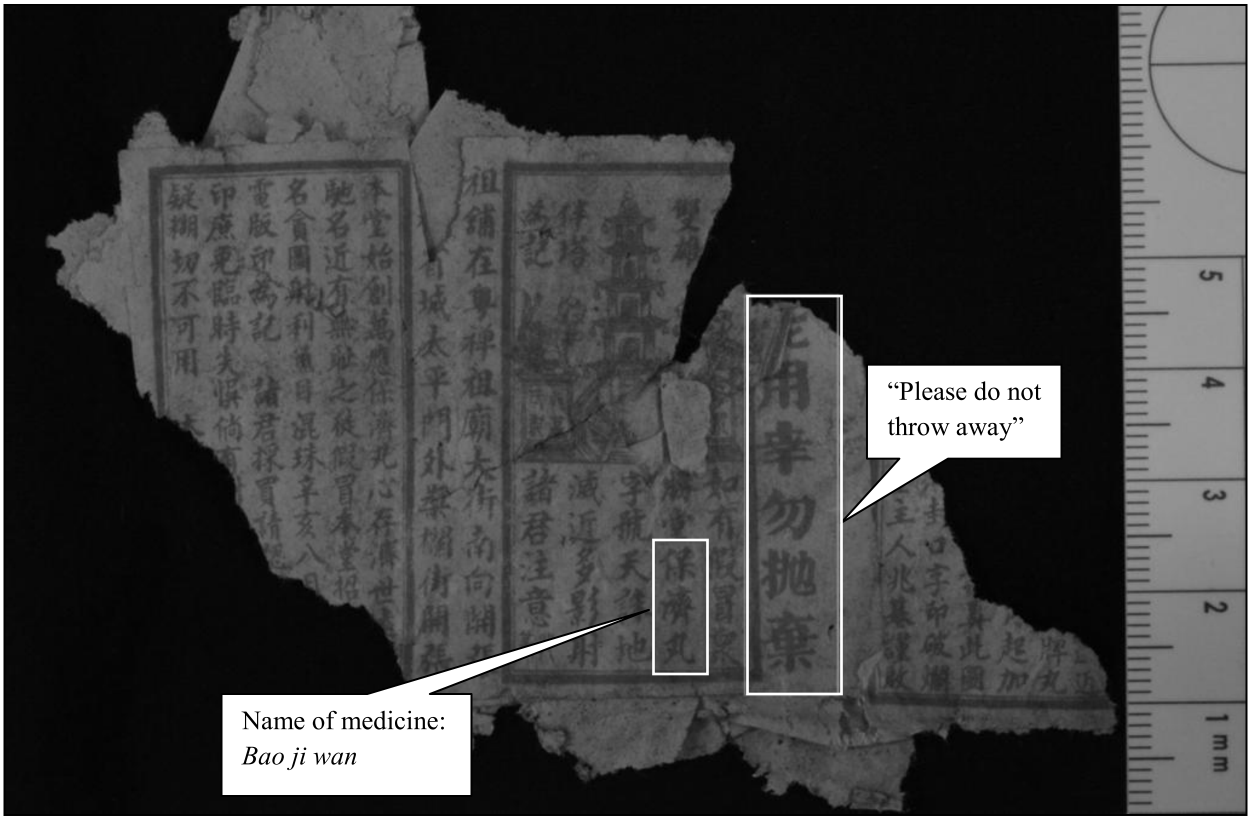

Figure 4. Medicine wrapper from *Bao ji wan* (pills of relief) used to treat summer colds, vomiting, fever, headache, motion sickness, cholera, alcoholism, and additional ailments.

came in small pellets, or pills, that were smoked using a short, tiny pipe (Wylie and Fike 1993:266). It is possible that these opium pills were used as a form of medicine, as the label indicates these pills could make one "pure, strong, healthy, and well" but there is no indication of the specific ailments they treated (Brown 1979:564).

Other Packaging. There is one wax pill ball, or bolus. The wax was used as a protective coating to keep out moisture and prevent the pill's contents from decaying (Unschuld 2000:47). Boluses could be nearly an inch in diameter and only one was taken per dose (Culin 1887:5). The most expensive boluses contained ginseng and powdered deer antlers (Culin 1887:5).

Devices for Administering Medicine

Finally, there are three unmarked glass syringes without glass plungers used to administer medication. Syringes were used to inject drugs, including morphine and mercury, subcutaneously (*British Medical Journal* [*BMJ*] 1867:428; Walker 1869:30–31). Morphine was used as a sedative prior to surgery and to reduce pain and inflammation (*BMJ* 1867:428). Mercury was used to treat syphilis (Walker 1869:30–31). Syringes were also attached to rubber irrigators and used to inject topical solutions into the urethra to treat venereal diseases such as gonorrhea (Brittan 1857:498). These appear to be subcutaneous syringes. It is possible these syringes were used to administer the diabetes medication Iletin (Greene 2009).

DISCUSSION

The Lovelock Chinatown Collection contains cures for a variety of ailments including digestive disorders, sinus infections, skin irritations, headaches, eye and nose disorders, and lung diseases. There are also treatments for diabetes, rheumatism, sexual and reproductive disorders, and parasitic infections. Many of the medicinal artifacts in the collection were designed to treat more than one type of ailment. Euro-American patent medicines such as Sloan‟s Family Liniment and Perry Davis's Vegetable Painkiller were marketed as "cure-alls." Artifacts used for administering or applying medicine include the syringes and adhesive tin.

Herbal materials like viper bones, turtle carapace, and cuttlefish bones had multiple applications in Chinese medicine and were also consumed as food. Food and medicine are closely related in Chinese culture. In the third century BCE, Chinese physicians began applying Five Elements Theory to food and developed a system of five flavors (Lo 2005:164). These are sour, bitter, sweet, pungent, and salty (Farquhar 2002:63). The Five Element Theory, or *wǔ xíng*, is used to interpret the relationship between seasonal changes and the organs of the body and their various functions. Each food item was given a quality of *Qi*, or effectiveness and by the late medieval period, individual foods and medicines were being assigned medicinal properties (Lo 2005:164). These include (in addition to the five flavors) thermal properties (warming, cooling), organ networks (spleen, stomach, kidney, etc.), and direction of movement (upwards, downwards, floating, falling) (Kastner 2004:21). By the sixteenth century, knowledge of and experimentation with cooking different foods increased within an exclusively medical context (Lo 2005:175).

Particular treatments reflect cultural beliefs regarding the structure of the human body. The small embossed bottle of "Tonify the Kidney Pills" and an embossed bottle of "Artificial Self-Generated Blood" (also located in the Lovelock Chinatown Collection) may have contained deer parts. Antlers from the Sika deer (*Cervus Nippon*) are used in Chinese medicine to help tonify the kidneys, treat fatigue, stop uterine bleeding, strengthen the blood and bones, and cure infertility (Hempen and Fischer 2009:734). Medicines containing deer parts were typically marketed for use by men because of their additional ability to treat impotence and spermatorrhea (Hempen and Fischer 2009:734). Turtle carapace is also used in Chinese medicine as a tonic to build up the blood and strengthen the kidneys. The use of remedies that strengthened the blood and kidneys reflects an important concept in Chinese medicine. In Chinese medicine, kidneys store reproductive essence or *jīng* which influences growth, reproduction, development, sexual maturation, fertilization, and pregnancy (Maciocia 1989:38-39, 95). *Jīng* is inherited from ones‟ parents and can determine an individual‟s physique, strength, and vitality. As a person ages, the kidneys become weakened, leading to frail bones, brittle hair and teeth, and infertility (Maciocia 1989:41).

Chinese Use of Euro-American Medicines

The presence of Euro-American patent medicines is evidence of Chinese consumption of Euro-American medicines. Chinese individuals chose to purchase and consume patent medicines for several reasons – practicality and frugality, distance from Chinese doctors and lack of access to traditional medicines, and the high alcohol content of many patent medicines.

Chinese immigrants may have chosen to purchase patent medicines for the same reasons that many Euro-Americans purchased patent medicines – they were affordable and convenient. Doctor visits were expensive and many individuals in rural areas and frontier mining towns simply could not afford to pay for treatment. Some doctors charged their patients exorbitant fees, leading to the frontier expression, "M.D. stands for money down" (Steele 2005:181). Additionally, the nearest doctor may have been many miles away and in cases of less-serious ailments it would have been more practical to rely on home remedies or patent medicines (Steele 2005:170). Inability to access traditional medicines would also influence the decision of the Chinese to consume Euro-American medicines. Patent medicines provided a convenient form of self-dosage medication and, to the busy settler with little time and money, these pre-mixed preparations were a commonsense solution to problems that required medical or pharmaceutical attention (Griffenhagen and Young 1959:156).

Orser (2007:170) proposed a similar argument to describe the presence of over 50 patent medicine bottles at the site of a Chinese laundry in Stockton, California. The two most commonly represented cures in the collection were "Dr. J. Hostetter"s Stomach Bitters" and "Lash"s Kidney and Liver Bitters," both of which were popular patent medicines during the late nineteenth and early twentieth century (Orser 2007:170). Orser (2007:71) argued that, "In self-administering such widely available medicines, the Chinese immigrants working and living at the laundry appear to have been no different from thousands of other people living in the United States."

High alcohol content is another possible factor for Chinese use of Euro-American patent medicines (this made patent medicines attractive among Euro-Americans as well). For example, bitters bottles frequently contained high levels of alcohol but were historically classified as non-potable alcohol and were excluded from high taxes placed on other spirits (Parsons 2011:12). Stomach bitters, such as Dr. J. Hostetter's Stomach Bitters, could have an alcohol content as high as 40% and a required dosage that was equivalent to three or four wine glasses per day (Toulouse 1970:63).

CONCLUSION

This article presented a unique interpretation of Overseas Chinese healthcare practices based on the analysis of both Euro-American and Chinese medicinal artifacts located in the Lovelock Chinatown Collection. Research on these artifacts provides information on ailments suffered by the site's occupants. Chinese medicinal artifacts in the collection reflect cultural beliefs regarding the relationship between food and medicine and a complex understanding of the human body. Euro-American medicines in the collection provide evidence of Chinese consumption of Euro-American medicine. This research has shown that a number of different, complex factors may have influenced the decision of the Chinese to purchase and consume Euro-American medicines. This study of the intersection of Chinese and Euro-American medicine through an archaeological perspective is a topic that has not been thoroughly explored. I hope that this study will help pave the way to more research on this subject.

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NOTES

[i] This research is based on my dissertation, *Investigating the Intersection of Chinese and Euro-American Healthcare Practices from 1860-1930*, which I completed in August 2012.

[ii] Medical terminology. *Acute pleurisy*: "Sharp and stabbing pain (stitch) in the side, increased by breathing and coughing; by fever, and by a friction-fremitus felt by on palpation and a to-and-fro friction-sound heard on auscultation" (Gould 1896:502); *Chilblains:* Also known as pernio or erythema pernio. "A congestion and swelling of the skin, due to cold, and attended with severe itching and burning..." (Gould 1896:184); *Croup:* "A disease of the larynx and trachea of children, prominent symptoms of which are a harsh 'croupy' cough, and difficulty in breathing; it is often accompanied by the development of a membranous deposit or exudate upon the parts. It is usually caused by the diphtheria-bacillus..." (Gould 1896:212); *Neuralgia:* Sudden, severe pain along the length of a nerve (Gould 1896:442); *Sciatic:* "Pertaining to the ischium [pelvis]" (Gould 1896:568); *Spasmodic croup:* Spasms of the larynx caused by the croup with slight inflammation (Gould 1896:212); *Wind colic:* "Pain the bowels due to their distension with air or gas" (W. B. Saunders & Co. 1965:323).

Experimental Comparison of Projectile Points and Unmodified Flakes for Butchering

Justin M Goodrich
Cardno ENTRIX

Based on studies of both macro- and microscopic use-wear of projectile points, some researchers have argued that prehistoric groups used projectile points not only to hunt game but also to butcher carcasses. Others have argued that simple, unmodified flakes would have made better cutting tools than bifacial implements like projectile points. Although studies of use-wear on lithic tools clearly have merit, arguments about point function can be bolstered by replicative experiments that compare the effectiveness of using projectile points for tasks other than piercing. Here I report on the results of an experiment that compares the effectiveness of projectile points to that of unmodified flakes for butchering small game. Effectiveness was measured by both the number of cutting strokes and amount of time that it took to butcher rabbit carcasses. By both measures, unmodified flakes are more effective than projectile points at butchering small game.

Experimental use-wear analysis is an important method that archaeologists can use to make inferences about past activities (Schiffer 1979). Use-wear analysis can help to identify a tool's function; however, Andrefsky (2005) notes that numerous variables can complicate inferences about the function of a tool. Thus, determining tool function can be a murky enterprise. Bamforth (2010) states that there is an important distinction between *actual use* and *potential use* of stone tools. The actual use of projectile points consists of a tool used as a weapon to kill animals. The potential use is simply the other tasks that projectile points could perform. This paper describes an experiment that I conducted to test the assumption that past peoples used projectile points to butcher, in addition to kill, animals.

Johnson (1997) posits that prehistoric people primarily used projectile points as weapons for hunting animals but also utilized points as tools for butchering. Johnson also states that the dual functionality of projectile points saved people time, and that made projectile point manufacture more advantageous since time was conserved by not producing additional tools required for butchering.

The hypothesis tested in my experiment is that projectile points are not as effective for butchering as unmodified flakes. This is due to at least two factors: (1) the cutting edge of projectile points are scalloped while unmodified flakes have straight cutting edges; and (2) projectile points have steeper edge angles, while unmodified flakes have sharper edge angles. Tools" edge angles are important because they can be helpful indicators of function and can be a crucial factor that determines butchering effectiveness (Lozny 2004). In an effort to determine tool function based on edge angle, Wilmsen (1968) examined a large sample of tools and associated them with specific functions. Wilmsen specified a tool"s function based on its respective edge angles: (1) meat cutting (25-35°); (2) skinning and hide scraping (46-55°); and (3) wood and bone working (66-75°). Therefore, including the edge angle in use-wear experiments is a relevant component to ascertaining tool function. Most experimental archaeologists include these data in their analysis; however, some provide little or no information concerning the edge angle of artifacts used in their experiments (Anderson 1970; Dockall 1997; Jones 1980; Lawrence 1979).

Microwear analysis has four goals: (1) identify the edges of the tools used; (2) identify the use(s) of the tools; (3) identify the hardness of the contact material(s); and (4) identify the contact material(s) (Bamforth 2010). This study is primarily concerned with examining the edges and uses of the tools. Myriad archaeologists have carried out experiments to gain a better understanding of the implications that cutmarks have regarding the actions of prehistoric people (Braun et al. 2008; Fisher 1995; Greenfield 2006). Cutmarks, however, may have a limit to the amount of helpful information they can provide. For example, Braun et al. (2008) posit that cutmarks are mistakes made by butchers processing animal carcasses. This argument is based on the assumption that butchers would want to avoid slicing into bone because it would damage stone tools. If cutmarks are mistakes, then it is reasonable to assume that there should not be ample cutmarks present on fauna recovered from archaeological sites. Even with that limitation, there are potential data to be obtained from the study of faunal cutmarks; however, because cutmarks were not examined in this experiment, they will not be discussed further here.

MATERIALS

Materials used in this experiment consisted of six skinned rabbit carcass acquired from a local butcher. I purchased the rabbit carcasses from the butcher frozen, and the carcasses thawed for one day before they were butchered. Stone tools used in this experiment consisted of six replicated black chert Elko Eared projectile points and six unmodified black chert flakes. I obtained the replicated projectile points and flakes from skilled flintknapper Allen Doyer. I classified the projectile points using Thomas‟ (1981) Monitor Valley Typology. Flakes used in the experiment were chosen based on three criteria: (1) they weighed less than 5 g; (2) they were greater than 7 cm^2; and (3) they had edge angles of ≤ 50° – all attributes deemed necessary to make unmodified flakes suitable for cutting (Prasciunas 2007). The weights, lengths, widths, cutting edge lengths, and edge angles of the flakes and projectile points were also recorded (Tables 1 and 2). These data, as well as those generated during the experiment, were recorded using a Canon Rebel XS camera, stopwatch, digital scale, digital calipers, and a goniometer (to measure edge angle).

Table 1. Metric Attributes of Unmodified Flakes.

Weight (g)	Length (mm)	Width (mm)	Cutting Edge (mm)	Edge Angle
22.9	99.7	35.6	5.8	32°
30.9	92.6	33.4	5.3	32°
25.8	86.2	35.8	5.4	27°
39.7	99.8	33.7	4.1	35°
32.4	73.7	52.2	4.2	27°
24.8	73.4	20.9	4.6	28°

Table 2. Metric Attributes of Projectile Points.

Weight (g)	Length (mm)	Width (mm)	Cutting Edge (mm)	Edge Angle
6.5	58.4	30.5	4.9	45°
8.3	54.7	26.5	4.7	47°
7.1	59.4	23.9	4.5	43°
8.4	56.5	31.9	4.7	48°
6.4	62.9	28.5	5.1	44°
9.5	50.9	24.6	4.2	45°

METHODS

Bamforth (2010) states that lithic use-wear experiments can be conducted in two ways. The first type of experiment is designed to emulate the conditions experienced by prehistoric people; thus, the experiment is conducted in outdoor, field-like conditions. Field-like conditions provide a more realistic idea of the difficulties experienced by prehistoric people. The second type of experiment is carried out in the laboratory, but the goals are very different than the natural environment experiment. Experiments conducted in a laboratory have the added benefit of controlling for certain variables, which is important since there are numerous factors that can complicate the results of an experiment (Keeley 1974; Lawrence 1979). For example, Lawrence (1979) conducted an experiment that tested the attrition on a tool's edge by using an Instrom machine. The Instrom machine controlled for variables such as the amount of force applied to the tool. Using a tool by hand can provide variable results since each experimenter exerts a different amount of force. A machine can eliminate that variable. That experiment illustrates the benefits of a controlled laboratory experiment, but it is also crucial to keep in mind the benefits of more field-like experiments. I chose to conduct this experiment in a field-like setting to recreate conditions similar to those encountered by prehistoric people.

As demonstrated in past actualistic studies, a stone tool‟s effectiveness to butcher animal carcasses can be tested using two methods. The first method counts the number of tool strokes required to complete the prescribed butchering goal, while the second method measures the total time elapsed of the butchering episode (Lafayette 2006). My experiment used both stroke count and elapsed time to measure tool effectiveness. Both measurements were collected concurrently because they can each be used to test the hypothesis that unmodified flakes are more effective than projectile points for butchering animals. There can be an enormous amount of variability in stroke counts due to the amount of force used to butcher the meat; however, Lafayette (2006) stated that tools should be used in a consistent method to avoid those complications. Another reason to use consistent force when butchering is that microflaking varies in relation to the pressure exerted on the contact material (Vaughn 1985). In other words, more pressure exerted produces more microflaking.

I butchered the rabbits in a grassy backyard. Paper was placed underneath the carcass to aid in the dismemberment and kept the area fairly clean. While the conditions were not analogous to those found thousands of years ago, the area provided the conditions that I wanted to emulate a more natural setting. The experiment consisted of me quartering six rabbit carcasses with a projectile point and an unmodified flake. The tools were used in a single capacity: slicing. Richards (1988:57) describes the action of slicing as a "one-way longitudinal motion undertaken with the tool edge at a high angle to the contact material." Using a slicing motion, I first disarticulated the right forelimb with an unmodified flake and then disarticulated the right hind limb with the unmodified flake (Figure 1). Next, the left forelimb was disarticulated with the projectile point and the same was done to the left hind limb with the projectile point. I took care to accurately count the number of strokes required for each disarticulation and an assistant helped to measure the elapsed time of each disarticulation. I recorded the results on a form following each joint separation to ensure accurate data collection.

RESULTS

The goal of the experiment was to test each tool‟s effectiveness for butchering and discern if there is a marked difference in their ability to effectively butcher animal carcasses. The mean values of the cutting strokes and time measurement of the limb removals show that unmodified flakes are more effective for butchering than projectile points (Figures 2 and 3). Mann-

Figure 1. The author using an unmodified flake to remove the right hind limb of a rabbit carcass.

Whitney tests were run on four data sets and the results of the analyses show a trend of flake effectiveness. In terms of both strokes and time, flakes were significantly more effective for disarticulating rabbit limbs, regardless of whether front or rear limbs were being removed: (1) front limbs stroke count (U = 5.00, Z = -2.08, p = .041); (2) rear limbs stroke count (U = 4.00, Z = -2.25, p = .026); (3) front limb time (U = 2.00, Z = -2.56, p = .009); and (4) rear limb time (U = 0.0, Z = -2.89, p = .002). In all measures, unmodified flakes were better suited than projectile points to remove small game limbs.

DISCUSSION AND CONCLUSION

The results of my butchering experiment show the effectiveness of unmodified flakes as butchering tools. The unmodified flakes required fewer strokes to complete the butchering of the rabbit carcasses. The edge angles of each tool type also reveals which function may be best suited for the projectile points and flakes. The average edge angle of the unmodified flakes is 30°, while the average edge angle of the projectile points is 45°. Wilmsen (1968) states that the tools best suited for cutting have edge angles ranging from 25° to 35°. All six projectile points have greater edge angles than the flakes, suggesting that projectiles are not as well-suited for butchering activities as unmodified flakes.

This assertion contradicts the idea that projectiles were used as butchering tools. Some could argue that even though the tools are not effective, situations may have arisen where prehistoric people had no other choice than to utilize a projectile point for butchering. Andrefsky

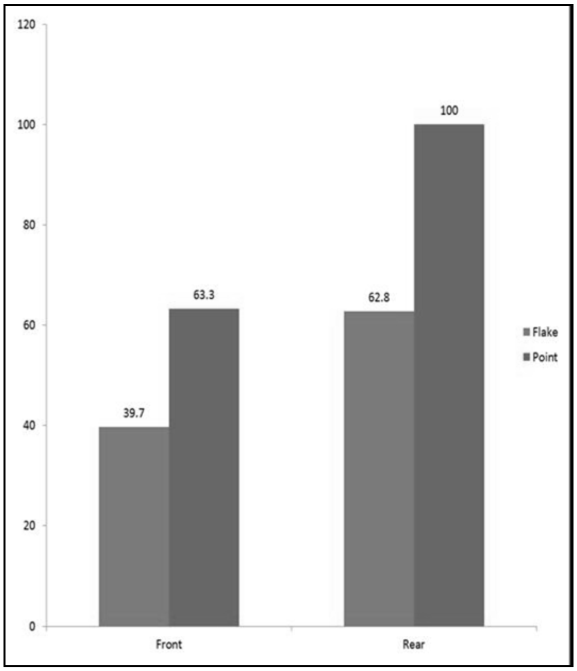

Figure 2. Mean time measurements of flakes and projectile points.

(2005) asserts that tools did not have a sole function, but rather existed as multipurpose implements. More research is needed to understand exactly if and how prehistoric people used projectile points for activities other than killing game.

After conducting this experiment, an observation was noted concerning the butchering. This experiment has demonstrated the inevitability of cutmark formation on the contact materials. Bunn (2001) posited that cutmarks are mistakes made by butchers, so it could be presumed there would not be a high accumulation of cut marks on bones. Interestingly, Braun et al. (2008) conducted an experiment testing the correlation between cutmark creation and tool edge attrition, and found that there was not a significant correlation between the two variables. Still, their experiment indicates that cutmarks, regardless of number, are a consequence of butchering. Cutmarks were not considered in this experiment, but they can provide archaeologists with clues that can help to identify the type of tool that made the cuts and even the raw material type of that tool (Greenfield 2006). Further research could be done to study the cutmarks produced by both projectile points and unmodified flakes to have an understanding of their unique characteristics. Then cutmarks from faunal assemblages could be examined to ascertain whether or not there is evidence of projectile points being used for butchering.

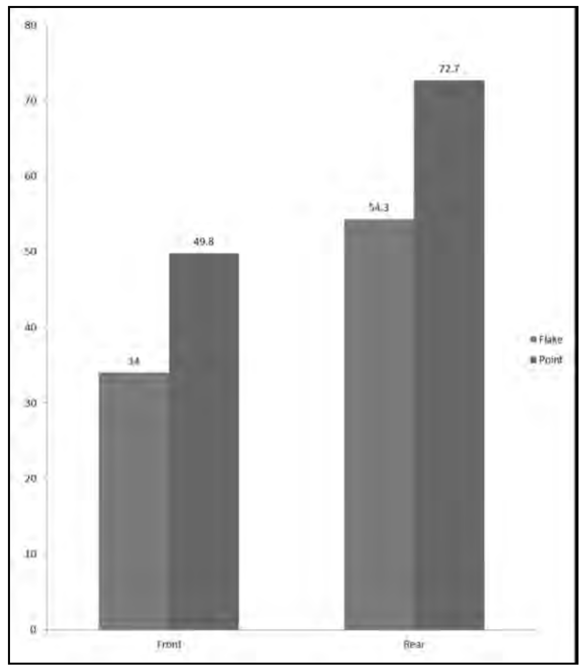

Figure 3. Mean stroke count of flakes and projectile points.

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Pahranagat Representational Style: A Unique Rock Art Tradition in and Surrounding the Pahranagat Valley, Lincoln County, Nevada

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National Park Service

A unique iconographic style of prehistoric rock art exists in Lincoln County, Nevada, that is spatially limited specifically to the Pahranagat Valley region. This rock art tradition is primarily characterized by two anthropomorphic elements, Pahranagat Man and the Pahranagat Patterned Body Anthropomorph, with variants, collectively referred to as Pahranagat Representational Style. Recent research has encouraged a refinement in the definition of the style. This paper summarizes previous research, outlines the defining formal attributes of the style, and offers how the iconography might have functioned within the culture, possible origin, and its temporal definition.

Many years ago, Alvin McLane, his faithful dog Petroglyph, and I sat around a hearty campfire on the southeastern slope of Mt. Irish, struck by the depth of the Milky Way overhead, satisfyingly exhausted from a successful day"s search of surrounding rock art sites. Among the many varied topics discussed that starry night we focused on the distinctive anthropomorphic images we had observed that day and were each familiar with from years of kicking around in the Pahranagat Valley region. It was then decided that the information we held in common needed to be written up and presented to a larger audience. A stumbling block, however, was terminology. Alvin expressed that the anthropomorphic figures should be referenced as Pahranagat Men. I, on the other hand, took a more traditional and commonly accepted division referring to the two basic and separately distinctive elements as Pahranagat Man (P-Man) and Pahranagat Patterned Body Anthropomorphs (PBA). Unfortunately, Alvin passed away before we could complete the task. Though I discuss here the two basic petroglyph design elements separately in this paper, I compromise with Alvin, at this late date, and refer to both anthropomorphic types collectively as Pahranagat Men (P-Men). Given the current status of knowledge as reflected below, Pahranagat Men might be a mute issue after all these years. Yet, I am comfortable that Alvin would "generally" agree with this presentation, the subject matter well deserving of more detailed, problem-oriented research and discussion than humbly offered here.

ENVIRONMENAL AND CULTURAL SETTING

As one might infer from the name, the subject rock art tradition is found in a confined region, principally focused on the Pahranagat Valley, Lincoln County, Nevada (Figure 1). Though located in the Basin and Range Physiographic Province, the valley is actually part of the Colorado River system via the ancient White River drainage which courses south through the valley. Otherwise, the valley is typical of the Basin and

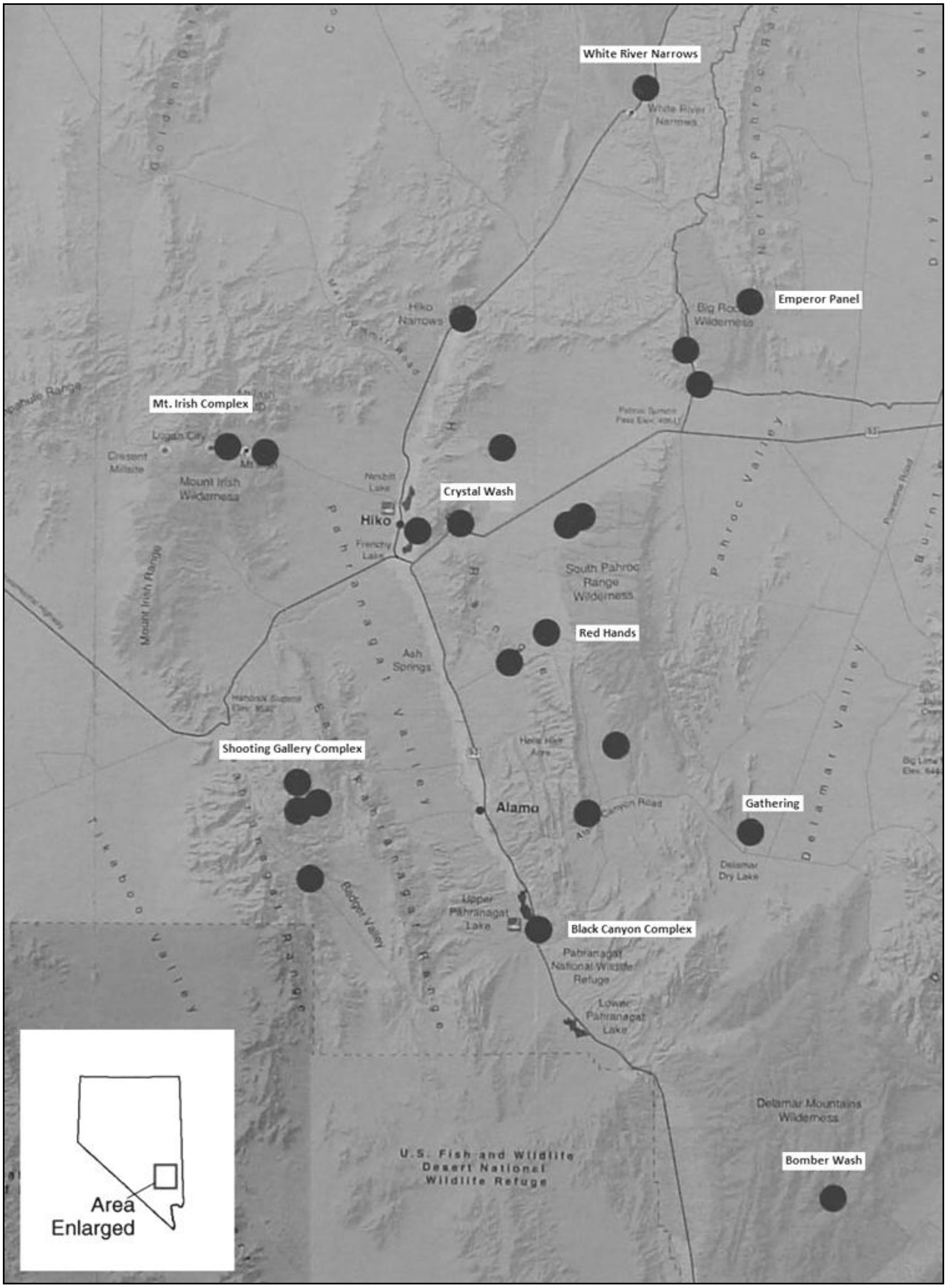

Figure 1. General location of the Pahranagat Valley and spatial extent of Pahranagat Representational Style rock art sites discussed (Adapted from White 2005).

Range topography with narrow, steeply uplifted north-south trending mountain ranges on either side of the broad intervening valley. Unlike most other Great Basin valleys, however, the Pahranagat Valley is fed by a continuous and dependable flow of water from numerous springs that support lush meadows, marshes and lakes, essentially making it an oasis of life in this part of the Great Basin. The region experiences hot summers and mild winters with relatively stable fair-weather conditions. Located in a transitional zone between the Mojave Desert to the south and the Great Basin desert scrubland to the north and west, a wide variety of flora and fauna are offered ranging from the riparian zone on the valley floor, sage/mesquite and grasses on intermediate scrubland alluvial fans, and pinyon-juniper and pine forests on rising mountain slopes, all within a day‟s walk east or west of the valley floor.

While archaeological work dominated by surface inventories has been conducted in the Pahranagat Valley region since the late 1960s as a result of federal and state mandated cultural resource protection laws, a satisfactory synthesis of what is known about the region‟s prehistory has not been prepared. Generally, the Pahranagat Valley and the surrounding region exhibit human adaptation to a hunter-gatherer subsistence strategy typical of the Great Basin. Archaeological investigations have concluded that the valley has been used prehistorically from Western Archaic to ethnographic times (Fawcett et al. 1993; Fowler et al. 1973). Identified pottery types and rock art suggest that the valley and mountain elevations were also exploited by the Virgin Anasazi and Fremont cultures, probably as a result of resource foraging into the area rather than permanent or semi-permanent occupation. Recent research, however, hints at the possibility of a small semi-permanent Fremont village located in the valley (Stearns 2002, 2009). Analysis of carbonized seeds recovered from pithouse floors at this site suggests a late summer/fall occupation and utilization of wild plants from the nearby wetlands (Schaaf 2006). Ethnographically, the valley was occupied by the Pahranagat Band of the Southern Paiute, the name Pahranagat referring to "those who stick their feet in water" (Kelly 1934:554). Band members practiced a hunting and collecting subsistence economy supplemented with a limited degree of irrigation-based horticultural crop production (Fawcett et al. 1993; Stoffle and Dobyns 1983) and practiced shamanism (Kelly 1939). Pressured to abandon the area by increased Euro-American mining and ranching activities beginning in the mid-1860s, remnants of the Pahranagat Paiute Band relocated to the southeast with members of the Moapa Band on their established reservation. Mormon agriculturalists under the leadership of John Ely established the community of Alamo and provided food in support of fledgling mining establishments at nearby Mt. Irish and at Hiko in the northern valley (Angel 1881; Hulse 1971). Alamo continues to be the largest concentration of people in this sparsely settled, remote valley.

Previous Research

The following is a synopsis of principal studies, in general chronological order, representing the work of academic scholars, professional and agency archaeologists, and avocational researchers. It will never be known exactly when the first non-indigenous recognition of the many petroglyphs in the Pahranagat Valley occurred. Perhaps Black Canyon, a natural north-south travel corridor, was the first location where it was noted. Certainly prospectors swarming the flanks of Mt. Irish in the mid-1860s in search of silver deposits would have at least observed the strange graphic designs found there. Shaman Knob/Hill, upon which much of the rock art is inscribed, was then named Target Hill (Hyko Silver-Mining Company 1869). At Black Canyon, "F. L. Kelsay" left his moniker and date, "Aug. 19, 1899" on a heavily patinated boulder amongst the petroglyphs at that location. By the late 1930s Willis Church, an architect with the Nevada Department of Highways, took interest in "rock writings on the walls of a small canyon" in the vicinity of Alamo (*Reese River Reveille* 5/22/1937:1).

After a day‟s visit to the Black Canyon archaeological site, Heizer and Hester (1974) became the first professional archaeologists/scholars to publish a treatise regarding the unique anthropomorphic petroglyph designs found there, thus creating the type site for the style. There, they found the petroglyphs dominated by headless "rectangular outlined" figures with various internal grid patterns and "solid-bodied" figures depicting "peephole eyes" and "spike-top" heads (Heizer and Hester 1974:15). Solid pecked bighorn sheep were also noted in direct association with the two anthropomorphs. Given their stylized form, Heizer and Hester (1974:15) surmised the rectangular figures to be "atlatl-bearing hunters." Of the solid-bodied designs, the two archaeologists thought the motifs were representative of a "standing human whose body is covered with… some kind of garment with a fringed bottom… a spiked top, armholes and eyeholes and extending to the lower legs" and provide an illustration of what they envisioned as a "disguised hunter" (Heizer and Hester 1974:17). They were, however, quick to admit that such disguises are not reported in Great Basin ethnographic literature. In regards to style, they considered that the distinct Black Canyon petroglyphs did not fit "comfortably into any of the several Great Basin or Glen Canyon styles as presently recognized" (Heizer and Hester 1974:19). Chronologically, the duo felt comfortable of placing the origin of the petroglyphs in a time frame of between ~300 B.C. and A.D. 500, corresponding to the Basketmaker period of southern Nevada. Also, because of the suspected hunting theme depictions and geographic location of the designs, Heizer and Hester used Black Canyon to further support their hunting magic hypothesis to explain their presence, a functional interpretation at the time.

Later in comparison with six Great Basin rock art sites, Nissen (1982) briefly commented in her dissertation on the unique representational designs found in the study area. Nissen generally agreed with Heizer and Hester‟s interpretation of the Black Canyon figures representing disguised hunters based on an ethnographic reference she found mentioning one-person hunting blinds constructed bee-hive fashion out of rushes. She also agreed with Heizer and Hester‟s timeframe for the graphic imagery based on atlatl depictions (bifurcated circles). Although the Pahranagat images reflect some general correlations with other stylized anthropomorphs, such as Coso Range "costumed hunters" and "medicine bags," Nissen (1982:228) stated that "the [Pahranagat] form itself is separate and unique and apparently is a localized cultural manifestation." Green (1987) also recognized the uniqueness of the rock art in the Pahranagat Valley in her thesis based on a cultural ecological approach to the study of rock art.

After considering numerous sites in southern Nevada, Stoney (1990) presented data related to a classification scheme of anthropomorphic body shapes comprised of stick, multi-legged, thin, triangular, wide, and shield figures. Stoney‟s wide body shape includes both the linear patterned body and the unique solid body anthropomorphs of the Pahranagat region as variants within his classification. While subsequently visiting a large shelter site, Lion‟s Mouth, west of Cedar City, Utah, Stoney (1991) observed a solid body anthropomorph centrally located among other petroglyph designs and similar in many defining attributes to those found in the Pahranagat region. Stoney (1991:6-7) speculates that the design, with its "rounded tabular body," can be attributed to the "Pahranagat cultural region," approximately 90 miles west of the Utah site. He then pleaded for other researchers to be on the lookout for similar body-shaped designs to help further establish the geographic spatial distribution of the unique elements beyond the core Pahranagat region.

Zancanella and Ferris (1990) discussed linear patterned bodied anthropomorphs in a general examination of the distribution of two selected petroglyph elements found at seven Pahranagat region archaeological sites. Based on a comparative literature review, the two archaeologists found a strong connection with petroglyphs depicted at Grapevine Canyon and to a lesser extent at the Valley of Fire, both sites located in extreme southern Nevada. They also perceived a connection with the Coso Range, California, petroglyphs, "in a general sense," referring to the "great numbers of bighorn sheep" depicted there (Zancanella and Ferris 1990:13). In reference to the Glenn Canyon Linear Style of the Colorado River, Zancanella and Ferris (1990:14) determined that Glen Canyon anthropomorphic figures are less elaborate than the Pahranagat elements and speculate that "although forms and patterns are similar, the composition of the panels in these two distant areas are not." The researchers conclude that patterned bodied anthropomorphs depicted in association with bighorn sheep occur over a large geographical region at roughly the same time, prior to the introduction of the bow-and-arrow.

Ben Swartz, Jr. (1992) of Ball State University worked with students and volunteers investigating and systematically recording petroglyph panels at a prominent landscape feature known as Shaman Knob/Hill in the Mt. Irish Archaeological District (this site was later tested by Fawcett et al. [1993] and re-recorded by the Nevada Rock Art Association). There, students recorded 176 rock art panels, many of which contained the characteristic rectangular outlined and solid body anthropomorphic design elements along with numerous sheep and ubiquitous abstract-geometric figures common in the Great Basin. Swartz (1992:9) refers to the rectangular elements as "rug" figures and to the solid body images as "Pahranagat Man." Swartz (1992:10) summarizes general attributes of each design element and proposes that P-Man is the diagnostic element of a "Pahranagat Style," but is uncertain about its overall spatial distribution. Additionally, utilizing a contextual analysis approach to interpretation, Swartz identified three natural "enclosed spaces" or rock alcoves where the petroglyphs were dominated by a P-Man figure, which was clearly visible from any place within the surround. He noted that the focal P-Man figure was placed upon a boulder or escarpment that either held a *tinaja* for water catchment or flat surface that might accommodate a standing person. Swartz (1992:11) referred to this natural feature as a "perfect set up as a pulpit before a primeval assembly." Thus, he interprets Shaman Knob/Hill as an "assembly area" or even a sacred "shrine" which was defended by the Southern Paiute in a vain effort against Euro-American miners in the mid-1860s. Using a unified space model and architectural concepts, Swartz and Hurlbutt (1994:21) later refined and further developed a hypothesis that Shaman Knob/Hill was a religious center or socially valued territory within a larger core area for "cult activity" and that P-Man is a "representation of a power being, perhaps of spiritual or supernatural nature."

In 1998, archaeologists from the Harry Reid Center for Environmental Studies were contracted with the U.S. Air Force to conduct a comparative study to essentially determine effects of sonic noise and vibration posed by supersonic military aircraft on selected rock art sites in southern Nevada (White and Orndorff 1999). Four study sites were chosen, two within the North Nellis Air Force Range and two within a large non-military overflight area in Lincoln County authorized for supersonic activity. Red Pigment Canyon, a rock art site within the larger Shooting Gallery Complex, was selected for documentation in the non-military overflight area as well as portions of the White River Narrows. Both petroglyphs and pictographs are depicted in Red Pigment Canyon, a 90-m long site that also contains a rock shelter, bedrock milling slicks, a plunge pool and numerous *tinajas*, likely the primary source of water for the nearby habitation sites of the archaeological complex. Twenty-eight rock art panels were documented in the canyon depicting a total of 113 graphic elements of which 56% are representational, including Pahranagat figures, compared to abstract/geometric designs. In comparison of graphic images, it was determined that the two sites located in the North Nellis Range are closely associated with the Great Basin Abstract Style, White River Narrows with both the Great Basin Painted and Great Basin Representational Styles, the latter possibly Fremont influenced, and Red Pigment Canyon with the unique Pahranagat Style. While a single archer with bow-and-arrow is depicted in the canyon, the archer glyph was produced more recently than the earlier atlatl carrying PBAs. Finally, the two researchers determined that the Pahranagat Valley is in a zone of overlapping rock art traditions and cultural areas comprised of the Great Basin, Virgin Anasazi, and Fremont.

Using UTM locations for 26 archaeological sites known to contain Pahranagat Style rock art, Brock et al. (2003) conducted a GIS-based least-cost path analysis of topography and elevation to study how prehistoric people may have traveled between two related points. The study determined that most of the sites are located within a day"s walk of each other, assuming a conservative 12- to 15-mile walking distance, and that the sites can be reached along natural paths of least resistance, such as washes or directly across alluvial plains. Additionally, the study found through viewshed analysis that many of the rock art locations are within a visual line of sight, albeit distant.

Also interested in landscape spatial relationships, White (2003, 2005, 2008a, 2008b) began presenting generalized data regarding the subject petroglyph style accumulated over a decade and half of archaeological site identification and documentation in the Pahranagat region. Based on his observations from 26 rock art sites depicting P-Men, White (2005) offered a refined definition of the Pahranagat Representational Style. Spatially, he determined that the style ranged from the White River Narrows on the north, Bomber Wash to the south, Delamar Dry Lake on the east, and the east flank of the Pahranagat Range on the west, covering approximately 1,100 square miles of territory. Distribution of sites in an environmental context revealed that 14 sites are located in the pinyon-juniper zone, eight are located in the intermediate dry scrubland, and four are situated in the valley bottom, ranging in elevations from 3,000 to 6,000 feet. Additionally, White (2005) determined that the Pahranagat Style co-occurs with subsistence activity and/or domestic habitation debris and feature sites. Of the 26 study sites, only two were identified without accumulated cultural materials.

On the east flank of the Pahranagat Range, Lee (2004) conducted an inventory at the Shooting Game Drive District (Shooting Gallery), a large complex of rock art and habitation sites including stacked rock features thought to have functioned in association with game-drives, thus the district"s name. Out of a total of 20 identified archaeological resources, 15 rock art sites were documented, collectively comprising 516 panels depicting 1,930 elements. A majority of the elements are abstract, while roughly 24% of the depicted elements are representational, primarily dominated by quadrupeds, 266 recognizable bighorn sheep, for example. Twenty-seven P-Men figures were recorded at three of the 15 rock art sites within the district. At least three rock art styles portrayed in the district were recognized including the Great Basin Abstract, Great Basin Painted and Pahranagat Representational Styles, suggesting the imagery is varied enough to interpret prolonged use of the area over an extended period of time. Lee (2004:15) also noted that the "complex interplay of rock art, game drive features, and habitation sites indicates this [archaeological] District was used for a variety of purposes, and appears to have been a very important place for both utilitarian and ceremonial reasons."

Concerned with damage potentially caused by rock climbers, McLane (2006) inventoried 640 acres north, east, and south of Pahroc Spring. Twenty-eight archaeological resources were documented of which 14 sites contained petroglyph and/or pictograph depictions. Of the 14 rock art sites, two locations contain P-Men depictions, Starvation Rock being the most prominent. In general regards to Pahranagat Style elements, McLane offers that the unifying theme for the two anthropomorphic designs is based on the presence of water at or nearby their depiction. Under McLane‟s (2006:8-9; see also Fox 2000:172) assumption, the figures are either facing the direction in which water can be found or located directly above the panel, in the latter case most often in the form of a "poh" or *tinaja*. The two Pahranagat Style sites identified in this study fit McLane‟s postulation.

Referencing the P-Man and PBA petroglyphs as the "Dynamic Duo," Holmes and Carter (2009) presented analytical data obtained from the study of 294 elements at 20 petroglyph sites. Their first research goal was to determine which of the two figure types were more important. In order to categorize and quantify "importance" they considered several points of evaluation including size, positioning, adornment, and numbers. Of the four categories it was determined that intricacy of production (adornment) and the sheer number of depictions (3.5 PBA elements for every P-Man) were relevant to the style and concluded that the PBA figure is the most important figure of the two types. Holmes and Carter, in analysis of interior designs of the PBAs, then determined that just vertical lines and just horizontal line depictions rank highest out of nine motif categories; other motifs including just dots, lines with dots, line combinations, "rain pattern," checkerboard or net, other, and nothing. They further determined that the line combination is a design element that unifies the PBAs across their study area. At the same time they noted a pattern of design clustering spatially tying five complex sites (Mt. Irish, Petroglyph Village, the Gathering, Black Canyon, and Shooting Gallery) separately with smaller outlying peripheral petroglyph sites. They attribute this shared design affiliation between complex and peripheral sites as "clan markings." Finally, Holmes and Carter account for hunting and weapon implements depicted in association with many of the PBAs. They conclude that such trappings are most often represented at sites located on the south and west of the Pahranagat region and wonder if these areas were the front line of defense in protecting the resource rich area occupied by the Pahranagat culture.

Clabaugh and Clabaugh (2008) provide a different perspective on the subject in their thoroughly illustrated book. After comparing over 100 Pahranagat figures from 18 rock art sites the Clabaughs made two unexpected observations. First, they recognized slight differences in the depiction of attributes in relation to the rectangular and ovoid variants of the P-Man figures. They conclude that the two variants represent separate male and female genders. When occasionally depicted side by side on the same panel at a few sites, the Clabaughs refer to them as the "Pahranagat Man Family." They also note that there are a few P-Man figures which have varied internal designs, unlike the solid pecked body types. Their second observation was that other unique anthropomorphic images are often depicted on the same panel or in close proximity in possible symbiotic relationship. Referenced as "Family Friends," they include the ever present classic PBAs, the "Bird Figure," and the "Trickster." The Bird Figure is a standard stick-like anthropomorph with large digitated hands and feet, while the few Tricksters are similar to the PBAs in general form. Instead of varied internal designs, however, the Trickster body is solid pecked. The Clabaughs complete their illustrated book with examples of added anthropomorphic figures, representing diverse rock art traditions, as found at various locations in the region.

Finally, Far Western most recently conducted a 400-acre inventory, ethnographic study, limited X-Ray Florescence (XRF) dating, and thorough documentation of the rock art at Black Canyon for the U.S. Fish and Wildlife Service (Gilreath et al. 2011). Black Canyon was listed on the National Register of Historic Places in 1975 for its significance pertaining to the distinctive style of rock art. The survey resulted in the identification of 37 previously and newly documented cultural resource sites. Of the 37 sites, 12 contained rock art, collectively amounting to 148 panels and 404 different motifs. On-site consultations with the Southern Paiute determined that they regard Black Canyon culturally and spiritually significant, a place where one or more shaman conducted traditional activities and a location that helps the Paiute people maintain ties with their traditional culture. Some of the tribal participants recognized the solid-bodied P-Man anthropomorphs as "water babies," potentially dangerous spirits associated with water. Twenty-six rock art elements spread across five different locations received XRF analysis of desert varnish. With 10 readings rejected, 16 different designs provided a date range from 4,600 to 7,100 years B.P., the average being 6,013 years B.P., placing the Pahranagat Style on the boundary between the Early and Middle Archaic periods. Based on the depiction of bifurcated circles, thought to represent time-sensitive atlatls, held in the right hand of many of the PBAs, the relative time range is increased minimally from 1,500 to 8,000-9,000 years B.P. On the other hand, projectile point types, hydration rim values, and ceramic sherds located during the study also reflect an Early Ceramic to Late Archaic (within the last 750 to 1,500 years) use of their study area.

Far Western"s study concluded that the rock art panels averaged only four design elements per panel (Gilreath et al. 2011). Representational motifs account for 51% of the depicted designs, abstract equal 37% and the remainder characterized by indeterminate pecked, historic/modern, and painted designs. Human-forms account for 53% of the representational designs, and of that figure, P-Man was depicted 17 times compared with 86 portrayals of the more common PBA. Bifurcated circles were illustrated in association with 41 of the 86 PBAs and none of the P-Man figures. Sheep representations were identified in proximity with four P-Man figures and 12 of the PBAs, while 18 panels contained sheep with no associated anthropomorphs. It was found that dot arrays are prevalent PBA internal designs, depicted 29 times, and followed by vertical lines portrayed 27 times. Because of the high incidence of vertical-line combination patterns, it was suggested that there is some alignment with a rock art complex known as the Gathering northeast of Black Canyon, based on criteria offered by Holmes and Carter (2009). Far Western concedes that the Black Canyon "art work appears to be of one style judging from its scale, the manner of execution, the limited number of motifs, and panel composition; and it appears to date to a single period in the past based on the similar condition of most of the panels. It is not a mish-mash of different styles" (Gilreath et al. 2011:108).

PAHRANAGAT REPRESENTATIONAL STYLE: FORMAL ATTRIBUTES

In light of the more recent research outlined above a refined classification of the Pahranagat Representational Style of rock art can be offered. The following definitions are not to be considered an end in itself, but a platform from which additional research should and needs to be conducted based on principals of good science to verify, modify or otherwise refine the characterizations offered here. Schaafsma (1985) affirms that researchers have identified and defined specific rock art styles based on formal attributes of graphic imagery and that these styles have specific temporal, cultural and spatial definitions. Forge (1977:370) contends that style is comprised of "a consistent set of preferences for certain [design] forms and modes with a range of permissible variation." A petroglyph style is a shared visual graphic system comprised of a repertoire of element types whereby the type is a "specific form and characteristic mode of expression of any given element" (Schaafsma 1985:247). It is asserted here that a unique style of rock art exists in the Pahranagat Valley region and that style is based on two explicit anthropomorphic design elements that have temporal, cultural, and spatial definition. The two principal types of design elements that define the Pahranagat Representational Style include P-Man and associated PBA. It is also recognized that there are variants to the two primary types and that the style may contain other markers of style distinction. Design elements of the style are primarily pecked petroglyphs. Although extremely rare, some painted pictograph elements of the style do occur in the Pahranagat region.

Pahranagat Man

Commonly referred to as Pahranagat Man or P-Man, this image is one of two primary anthropomorphic design elements that define the rock art style. The principal attributes of the element include a single obvious spike protruding vertically from the head region, digitated hands at the end of straight or down-turned curving or elbowed arms, a solid or heavily stipple pecked body, and two circular unpecked eyes. Legs are represented in stick form extending downward from the body, with or without digitated feet. Digits are expressed in numbers of three, four, five, or a mix. Body width is generally half the length in proportion, though nearly square in uncommon instances. Body size ranges from 30 to 120 cm in height. Embellishments to the basic body design include the sporadic depiction of a male organ (see discussion below on gender), rare unpecked oval mouth and/or the erratic depiction of the protruding spike bent at its very top. The protruding spike has also been referred to as a topknot or feather. P-Man is illustrated front-facing, reflecting a static pose. Additionally, P-Man is <u>not</u> depicted with an attached bifurcated circle, interpreted to represent an atlatl, or other devices held in the hand or attached to the body. In relation to body shape, there are two primary variants, the Black Canyon and Mt. Irish types.

Black Canyon Variant

The Black Canyon variant was first recognized in publication by Heizer and Hester in 1974. Its body shape is characterized as rectangular with a flat horizontal top and bottom, while maintaining the defining attributes (Figure 2). Occasionally, this variant will be depicted with a slightly curved or semi-domed top, much like a modern Weber Smoker in profile. Alvin McLane often referred to the Black Canyon variant as *Casper the Ghost*, in reference to body shape.

Mt. Irish Variant

The distinguishing quality of the Mt. Irish variant is its elongated oval body shape, similar in appearance to a peanut or potato, while retaining all of the defining attributes of the type (Figure 3). Clabaugh and Clabaugh (2008) consider this curved version of the P-Man figure as expressive of the female gender (see below).

Figure 2. Black Canyon variant of Pahranagat Man.

Figure 3. Mt. Irish Pahranagat Man variant, eyes and top spike hidden by lichen growth.

Pahranagat Pattern Body Anthropomorphs

Collectively, the many varied and complex PBAs depicted in the Pahranagat region characterize the other central image of the representational rock art style (Figure 4). The PBAs are best characterized by the presence of a rectangular body outline framing an assortment of highly stylized internal geometric patterns. Two vertical lines define either side of the rectangular body, the lower extensions forming the legs, with or without digits. The two outside vertical lines often extend a short distance above the uppermost horizontal line and terminate infrequently with pecked knobs. Fringes are recurrently found dangling beneath the horizontal line between the legs. As Holmes and Carter (2009) have determined, PBA body cavities are filled with nine geometric design patterns, as outlined above. PBA body width is generally found to be one third of the height, and PBA height can range from as small as 13 cm to as high as 2 m, life size at the Emperor panel. PBAs are portrayed without arms or with short arms extending horizontally from the body. Some arms terminate with digitated hands, while those without hands and/or arms are frequently depicted with attached weapon or hunting implements, represented as lined bifurcated circles (atlatl), vertical lines (dart shafts or fending sticks), and connected circles (nets). These implements are mostly shown on the right side of the body. Like P-Man, PBAs are front-facing, reflecting a static pose. While Pahranagat‟s PBAs have an appearance similar to PBAs found in California‟s Coso region, they are distinctly different because they lack obvious decorative heads or headdress. Pahranagat‟s headless PBAs, because of the body shape and internal designs, have been referred to in the vernacular as "rug" or "Blanket People."

Associated Representational Elements

Other rock art elements are also present on panels where P-Men are depicted. The ubiquitous bighorn sheep, so common to rock art throughout the Great Basin, also has a recurrent association with the two anthropomorphic elements. The sheep are depicted in side profile and never in a head-on view such as found in the Coso Region of California. They are depicted with normal or exaggerated horns sweeping backward and rarely with the horns turned forward in a charging posture. Body shape can resemble a pickle, straight horizontal back with down curved belly or occasionally a fattened rectangle, all mounted on four stiff legs. Infrequently, sheep will have short ears depicted behind the horns, splayed hooves of ungulates and/or open mouths. Tails are short and extend straight back or slightly upturned. Clabaugh and Clabaugh (2008) also believe that their “Bird Figure” and “Trickster” anthropomorphic elements have a contextual association with the major P-Men elements. More study is needed to determine and verify the association of these representational elements as possible contributors to style.

Contextual Relationship

In general terms, P-Man, PBAs, and bighorn sheep petroglyph elements appear to have a symbiotic and contextual relationship. P-Man and PBA can be depicted together on any single petroglyph panel or can be portrayed independent of each other. Where the PBA is depicted there is usually multiple PBA elements, each with a different internal design. If P-Man is illustrated by itself on a single panel, PBAs will most often be illustrated on adjacent panels or nearby. Bighorn sheep representations are often shown with either P-Man or PBAs or in combination on the same panel. One large panel in the Mt. Irish district depicts several sheep progressing left to right across the rock face with three PBAs and a dog-like zoomorph present as well as a commanding P-Man overlooking the possible hunting scene. Another formal association panel is located at the Gathering (Figure 5). There, four sheep progressing left to right are “chased” by a dog or puma-like zoomorph at the rear of the herd while three PBAs are depicted at the bottom of the panel and one above; one lower PBA makes physical connection with one sheep by a held dart shaft or fending stick touching the sheep‟s leg. Interestingly, the P-Man is incorporated into the body of the dog/puma-like figure, the subject of much inference. For the most part, mountain sheep association is less formal with the depiction of just one or two on any panel. Spatially, the style petroglyphs are found at dependable water sources as well as associated with campsites or subsistence activity locales. Also, the elements are clearly visible to the viewer and not hidden from public discourse.

OTHER CONSIDERATIONS OF THE PAHRANAGAT REPRESENTATIONAL STYLE

Range

As noted above, the style has a limited range of distribution, based on known sites (White 2005) (see Figure 1). A single Mt. Irish variant P-Man figure located in White Rock Narrows represents the northern known extent. The southern boundary is also represented by a single Mt. Irish variant P-Man element, well-digitated and with a bent spike, located in Bomber Wash. The complex “Gathering” site on the western margin and overlooking Delamar Lake playa, with many PBAs and both variants of P-Man, limits the eastern range. To the west, the Shaman Knob/Hill complex and numerous smaller surrounding sites at Mt. Irish mark the western limit where both variants of P-Man and many PBAs are identified. Likewise, the “Shooting Gallery”

Figure 4. Example of a PBA from Black Canyon holding numerous hunting/weapon implements.

Figure 5. Formal scene at the Gathering depicting P-Man (left), PBAs, and mountain sheep.

complex of sites in the Pahranagat Range is also a western boundary marker. Distance by straight line between the northern and southern expression is roughly 58 miles, while east-west distance is a narrow 24 miles. As such, sites known to contain the rock art style are found in 1,100 square miles of rugged landscape. Central to the style is the well-watered Pahranagat Valley, easy walking distance from east or west and along a principal north-south travel corridor of the ancient White River drainage. The southeast flank of Mt. Irish and west flank of the Pahranagat Range seem to be favored locations for style expression at large archaeological complexes while smaller individual sites are spread throughout the style range. The number of known sites varies from as low as 26 (identified by the author) to as high as 40 (determined by Alvin McLane). Additional research is needed to determine if the range of the style can be expanded such as Stoney"s (1991) Cedar City site.

Gender

When it comes to the discussion of the Pahranagat rock art style, there is no doubt gender prejudices. Aside from the long and over held assumption that rock art was created by men, the prejudice in the present case is based on observable absence or presence of external genital organs, either phallus or vulva depictions. PBAs, though assumed to be male figures, are indeed gender neutral, depicted without external genitals. On the other hand, P-Man figures are rightly so males, based on numerous depictions with phallic projections. So is there a Pahranagat Woman or P-Woman? Clabaugh and Clabaugh (2008) propose that the rounded Mt. Irish variant is the female of the two characters. While they make a good argument, they apply their criteria inconsistently when discussing rock art panels that they say represent the "Pahranagat Man Family," often portraying side by side oval-body figures they say represent man, woman, and in some cases, child. In their favor, however, is the "Red Hands" site, an apparent exception to the rule. At this site, which the Clabaughs consider a P-Man Family site, are depicted two oval body Mt. Irish variants that do not have solid or stipple pecked bodies. Rather, each figure appears to be stylized bisected ovals, the bodies themselves possibly representing female reproductive organs and are themselves unique and unlike any other glyph found in the style area (Figure 6). Far to the north of the Red Hands site in the White River Narrows and depicted on a panel containing numerous images of a different rock art tradition, not mentioned by the Clabaughs, are two P-Man-like images. While the two side by side figures have outlined bodies instead of solid pecking, they both have spiked heads, eyes on narrow faces, and digitated hands at the end of short arms. At the base of each body between the legs are obvious female genital depictions. Although we should not reject the existence of stylistic gender possibilities within the Pahranagat Style as suggested by the Clabaughs, additional research is needed in this area.

Age

Reliable dating is a major concern in rock art studies. Efforts have been made by researchers using traditional methods providing relative dates and, more recently, chronometric techniques have provided more absolute dates, although not without question. Heizer and Hester (1974) place the origin of the Pahranagat petroglyphs in a timeframe of between ~300 B.C. and A.D. 500, prior to the introduction of the bow-and-arrow in the Great Basin. This relative temporal range is based solely on the depiction of numerous atlatl-hunting devises shown in association with many of the PBAs. Use of XRF techniques recently on style petroglyphs at Black Canyon resulted in a broad range of dates from 4,600 to 7,100 years B.P. with an average of 6,013 years B.P., Early to Middle Archaic

Figure 6. Possible depiction of Pahranagat Women at Red Hands.

(Gilreath et al. 2011). While Gilreath et al. (2011:113-114) are critical and find the XRF dates suspect "along four unrelated lines" of argument, the researchers are comfortable with saying that the atlatl-holding PBAs are "more than 1,500 years old" and that representational petroglyphs are generally accorded a Middle Archaic timeframe. All the same, the author and Alvin McLane (personal communication, 2000) are confident that the pre-bow-and-arrow Pahranagat Representational Style will prove to be consistent with a Late Archaic timeframe, possibly equivalent with the aceramic Anasazi Basketmaker II period along the Virgin River drainage in southern Utah and Nevada.

Function

Co-occurring with subsistence activity and/or habitation debris and feature sites, rock surfaces upon which Pahranagat Style rock art is depicted are highly visible in prominent locations (White 2005). Open to public view, one colleague referred to such panel locations as "Billboards" (Dawna Ferris, personal communication, 1987). Because of the apparent association between settlement and/or subsistence activity and the rock art, it is likely that the rock art was a symbolic expression of identity mutually shared by members of the culture (Bernardini 2005) and not necessarily the purview of hunters" ritual magic (Heizer and Baumhoff 1962) or metaphors and altered-state experiences of the shaman as Whitely (1998) would have us accept. The highly visible panels would have been encountered by a broad cross-section of the society during the course of their seasonal rounds or on-site daily routines (Quinlan and Woody 2003). By replicating group identifying symbols distributed across a spatially limited social landscape the Pahranagat people transformed the natural wilderness into a culturally occupied territory (i.e., a place) through a process of mythologizing, physical marking, and mental mapping. At the larger rock art and habitation sites including Mt. Irish, Shooting Gallery, Crystal Wash, and the Gathering, the rock art most certainly would have provided a powerful symbolic resource that was incorporated into ritual performance as part of large communal gatherings. As Gilreath et al. (2011:113) astutely conclude, the "Pahranagat [Valley] is an ideal oasis where group identity/solidarity would materialize and manifest itself in symbolic behavior in the form of rock art," and "it seems most likely that the intended „audience‟ for this large-format public rock art was not outside groups, but rather the „message‟ being conveyed was made by and intended for local residents." Aside from social identify, boundary maintenance, and ritual activity as functional considerations, McLane (personal communication, 2000) offered an untested proposition that P-Man elements are depicted facing in the direction where the next source of water can be found, a practical function. Thorough knowledge of the landscape was paramount to individual and group survival in the Great Basin. Mutually understood rock art symbols may have also assisted in the practical application of day-to-day survival. In essence, the rock art likely served the society in numerous ways.

Origin

Without further detailed cultural resource studies on the local and regional scale for comparison, the origin of the culture that created the Pahranagat style of rock art will remain a subject of speculation. Some have offered that the style has its roots in the Coso region of California and spread eastward. Others believe the patterned body motif originates along the Colorado River drainage (southern and southwestern Utah) and moved west. Another school of thought is that the style was devised at and remained a local independent invention. While similar PBAs are found in the Coso region, the argument against a Coso origin can be made in the fact that Pahranagat PBA lack stylistic heads and headdresses. Additionally, Coso-style head-on view bighorn sheep depictions in the Pahranagat region, though present, are extremely rare and are not found in direct association with P-Men figures. The author has observed several instances of headless PBAs in the St. George, Utah area that are similar in depiction to those found in the Pahranagat region, though not as elaborate. Despite the commonality of PBAs in Coso and southern/southwest Utah, the one petroglyph element that argues for localized invention rather than style transfer or migration is the P-Man design. The P-Man element, whether depicted in the Mt. Irish or the Black Canyon variant, is unique to the Pahranagat Valley and the immediate vicinity and has not been observed in areas outside the cultural influence of the valley (while the Pahranagat culture may have been influenced by early appearance of the Virgin Anasazi, I feel confident that the style is a localized manifestation).

FUTURE DIRECTIONS

Understanding the archaeology of the Pahranagat Valley is paramount to understanding the rock art style presented above. We must ask ourselves: *who were the people who created the rock art and when?* While there is no obvious difference in the material culture of the region compared with the remainder of the Great Basin and/or the adjacent Anasazi and Fremont cultural areas, the fact remains that a style of iconography developed in a limited space and time that is unique specifically to Nevada and the Great Basin in general. As such, the archaeology and its associated rock art are prime candidates for study and remain to be thoroughly investigated through scientific, problem-oriented research, either by scholarly effort or land managing agency-based contracted studies. At the same time, it must said that avocational researchers also have data that contribute to our understanding of the subject matter and must not be overlooked.

Finally, the rock art of the Pahranagat region has become very popular in recent years. Style elements have shown up on T-shirts, reproduced on gourd and clay clothing adornments and refrigerator magnets, and even on the labels of home-crafted beer – Pahranagatman Pale Ale comes to mind. Finally, because the rock art style is unique only to Nevada, it would be appropriate that the State of Nevada adopt the Pahranagat Representational Style as a symbol expressive of the state‟s rock art heritage, similar in acceptance as the bighorn sheep (the state animal) and the Tule duck decoy (the state artifact). Much work remains to be done.

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Fecalphilia, or How Archaeologists Learned to Stop Ignoring and Start Loving Fecal Deposits

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This paper serves as a response to Smith's (2012) query on why historical archaeologists seem fixated on the privy. First, I argue that there is a wide range of questions and analyses that can be performed on privy deposits by historical archaeologists ranging from health and welfare, to social behavior, to food ways. Second, I examine the development of paleofecal analysis, paying specific attention to the discoveries of coprolites and boluses in the Great Basin. Lastly, I focus on bridging the discipline and connecting areas of common concern between both historic and prehistoric archaeologists.

In the 2012 volume of *Nevada Archaeologist*, editor Geoff Smith posed an interesting, if tongue in cheek question, commenting on historical archaeology: "…why the potty fixation?" (Smith 2012:iii). My response: it is not just historical archaeologists who have learned to utilize this (insert poo joke here) feature type, it is all archaeologists.

Historical archaeologists have had a long and illustrious love affair with privy deposits. We have examined the contents of privies, the social meaning behind leftovers (I-880 Cypress Freeway Replacement Project 2004), what happens to a privy once it is full (Geismar 1993; Roberts and Barrett 1984), examined diet and health (Faulkner et al. 2000; Fisher et al. 2007; Horne and Tuck 1996; Mann et al. 1991; Reinhard 1994; Warner and Genheimer 2008), and ideas of sanitation (Crane 2000; McCarthy and Ward 2000; Reinhard 1994). Privies are also secretive areas, places to do things unseen and unobserved (Crist 2005; Foster et al. 2005; Genheimer 2003). It is also within this personal and individual space that archaeologists can come face to face, literally, with individual behaviors and actions in the archaeological record.

Privies offer the opportunity to explore our changing perception of sanitation; what is clean and what is unclean. In 1981, a privy was excavated in the downtown Cincinnati neighborhood of Betts-Longworth and its contents analyzed. Beyond the standard faire of glass and ceramic this privy had excellent preservation of faunal remains. A total of 57 cats (*Felus catus*) were recovered and identified (Warner and Genheimer 2008). Due to the tight grouping of the remains – 97% located within two soil horizons or roughly two feet – one of the original interpretations was an episode of social deviant behavior (Warner and Genheimer 2008:8, 13). However, further research indicates that this type of animal dumping and disposition may be more closely related to sanitation efforts at the time. Historical archaeology, like *all* archaeology, can be prone to bouts of presentism and often we think of cats and kittens as loveable, heartwarming, and mischievous companions and devourers of vermin but in the past this may not be historically accurate. In Victorian England, cats were "the most frequently and energetically vilified domestic animal…" (Ritvo 1987:21-22). Cats were often seen as carriers of disease, possibly due to the connection between increases in vermin populations, increasing feline populations, and increasing visibility of diseases including cholera, diphtheria, dysentery, scarlet fever, typhoid, and plague (MacDonogh 1999:207; Warner and Genheimer 2008:21). The killing of these cats can be explained as a sanitation effort on the part of the owners of that privy. A *terminous post quem* for those layers can also be correlated with upswings in disease outbreaks in Cincinnati, lending more credence to the idea of sanitation as opposed to psychotic or sociopathic behavior (Warner and Genheimer 2008:21).

Under extreme conditions privies can offer excellent preservation as represented by Blanchard‟s (2010) excavations at several Washington Alaska Military Cable and Telegraph System (WAMCATS) stations across Alaska. The depth of the privies placed them within the tundra, essentially halting the decomposition process of fecal material. Being frozen, preservation of recoverable and legible newspapers was attained and helped to construct a cognitive landscape of the operators (Blanchard 2010:334). By examining what was written, where it was coming from, and who was reading it, Blanchard was able examine religion, political leanings, and identity – cognitive aspects of archaeology that are often difficult to explore.

Privies also offer the historical archaeologist insight into healthcare and women‟s roles. Women‟s roles in the past are different than they are today. I do not want to essentialize women as a fixed gender category and therefore homogeneous as an entity in the past, but rather wish to talk about a wider Victorian view of women and what women‟s roles were. There were very few opportunities for unwed, poor, or otherwise disenfranchised women. Prostitution was one of the roles available to these women. Excavations have taken place in many red-light districts as well as brothels that offer insight into the private lives of these women. In 1843, a "disorderly house" or brothel that operated in the basement of the 12 Orange Street tenement was ordered shut down. In 1993, the privy on the back lot behind 12 Orange Street was excavated exposing the neonate remains of two fetuses, possibly twins. This excavation exposes the difficult choices women had to make in the mid-nineteenth century (Crist 2005:20). It is unknown whether abortions were forced by the house madam or operator of the brothel or if the prostitute attempted to conceal her pregnancy to continue to work or if she had a miscarriage; however, the deposition of the neonates in the privy highlights the need, or want, to conceal the disposal of the remains. Historically, recovery of infant remains in New York led to pittance of the mothers, usually the poor or unwed, but attitudes were changing toward the criminalization of the act and generalized attitudes of revolt (Crist 2005:40-42). Foster and colleagues (2005) and Yamin (2005) both offer more complex examinations of the lives of prostitutes, full of trappings of gentility, children living in the brothel, and treatment of ailments. Yamin (2005:16-17) examines the manipulation of middle class symbols by these working women to promote a view of public gentility while privately struggling with degradation and exploitation.

Privies also make exceptional places for finding weird, absurd, and fragile pieces of material culture. If something is dropped down a privy, chances are no one is going to go in and fish it out. Thus, privies provide a soft landing for fragile items that are usually quickly covered, so that at least archeologically they are preserved. Just before privies were capped they often served as garbage repositories (I-880 Cypress Freeway Replacement Project 2004). During the 2010 excavation of Cornish Row, Virginia City, Nevada (26ST413), we found a small rectangular depression and when explored further found it to be an unlined single shaft privy with a depth greater than 1.5 m. The contents of the privy included large butchered and sawn cow (*Bos taurus*) bones, the remains of at least two boots, an ax head, gun parts, a crucifix from France, and copious quantities of macrobotanical remains (Holm and Taylor 2012). Finding leather in archaeological contexts on the Comstock is not rare; however, the excellent preservation of the boots was surprising. The deposition of these items was most likely due to the short term use of the privy and garbage dumping episode followed by a shifting and settling pattern once capped, although it is intriguing to speculate about the deposition of a religious icon in a privy.

The preceding paragraphs explain a little bit about historical archaeologists" "fascination" with the privy but the question asked by Smith begs an even larger explanation: the examination of fecal material is not limited to historical archaeologists and *our* fascination with the potty. Prehistoric archaeologists have also been asking similar questions (longer than historical archaeologist for that matter) about what can be inferred from fecal material, but like all good sciences and niches the vocabulary changes. No longer are we discussing privy deposits and nightsoils (Roberts and Barrett 1984) in a historical context but now we are talking about coprolites and boluses. The history of coprolite analysis has been written on extensively especially within the Great Basin (see Napton 1997; Reinhard and Bryant 1992) so no in-depth discussion is warranted – a small introduction should suffice.

Coprolite, as a term, was coined by Buckland (1829) and originally meant the fossilized excrement of extinct animals, but this term has gradually shifted to include desiccated human fecal material. Harshberger (1896) and Young (1910) were some of the first archaeologists to understand that desiccated human feces can offer evidence on diet, followed soon after by Loud and Harrington (1929) and Wakefield and Dellinger (1936). Wakefield and Dellinger are interesting in that they moved beyond identification and diet and moved into the realm of prehistoric health (Reinhard and Bryant 1992:246). In the 1950s, research into parasites in fecal material began to be explored, notably by Pizzi and Schenone (1954) and Taylor (1955), who discovered *Trichuris trichiura* (whipworm) eggs in an Incan mummy. The 1960s brought about another analytical technique: the application of palynology to fecal remains (Martin and Sharrock 1964). By analyzing pollen in fecal material, palynologists are able to understand the prehistoric ecology of the immediate area at the time of the last consumed meal (see Wigand 1997). The 1970s brought about another aspect to the examination of coprolites – that of phytoliths (Bryant 1974). Phytoliths are siliceous deposits in plant cells that preserve long after a plant has decayed. Phytoliths are interesting to archaeologists because they can survive human digestion and careful examination of coprolites can reveal these structures. Their study often produces different results than those of macrobotanical flotation, adding information to the breadth of pre/historic diets. The 1980s brought about refinement in technique and methodology including a standardization of fecal description and analysis that allows cross-site comparison (Gasser 1982; Reinhard 1990). Beginning in the mid to late 1980s, fecal remains began to be subjected to biological analysis, primarily in the form of DNA and aDNA analysis. DNA studies were not new, but their application to the understanding of the archaeological record was. Two studies, not from coprolites, showed the possibilities of human DNA still being viable in the archaeological record after thousands of years. Pääbo (1985, 1989) extracted DNA from Egyptian mummies and recreated or cloned several small sections of DNA. He also utilized this methodology to extract DNA from several extinct species proving the viability for DNA extraction from ancient samples. In 1994, DNA was successfully extracted for Ötzi the ice-man, a naturally mummified set of human remains found in the Italian Alps uncovered by receding glaciers (Spindler 1994). Techniques have gradually improved the analysis of DNA; no longer were fragments and portions interesting but whole sequences were could be reconstructed and recovered. Further, in 2008 the complete mtDNA sequence for Ötzi was published (Ermini et al. 2008) and in 2012, his entire genome was published (Keller et al. 2012). While neither of the last two examples have anything to do with coprolites and boluses, they exemplify a new trend in archaeology that is slowly beginning to gain traction: DNA analysis. This is pertinent to this discussion because DNA can be recovered from paleofecal material.

The Great Basin provides a fantastic study area for the examination of coprolites and boluses as dry caves and rock shelters provide an ideal environment for the preservation of these often delicate and fragile resources. As previously mentioned, one of the first coprolites to be studied came from Lovelock Cave (Loud and Harrigton). Other sites yielding coprolites include Hogup Cave (Fry 1970), Hidden Cave (Heizer 1967; Thomas et al. 1985), Spirit Cave (Dansie 1997; Napton 1997), Dirty Shame Rock Shelter (Hall 1977), Clyde‟s Cavern (Hall 1972), Danger Cave (Beck and Jones 1997; Fry 1977), Benchmark Cave (Callen and Martin 1969), Dryden Cave (Neumann et al. 1989), Last Supper Cave (Taylor and Hutson 2012), Bonneville Estates Rock Shelter (Albush 2010), Camels Back Cave (Schmitt and Madsen 2005), Jukebox Cave (Jennings 1957), and of course the Paisley Caves (Gilbert et al. 2008; Jenkins et al. 2012; McDonough et al. 2012). This list is not meant to be an all-inconclusive list of sites or scholarship but rather is meant to give a breadth of understanding to the numerous locales that contain coprolites in the Great Basin.

The Paisley Caves complex has yielded arguably what is the most famous of the Great Basin coprolite discoveries. In fact, it is a site that is defined largely through the recovery of paleofecal material. What Dennis Jenkins and his colleagues have done is: (1) define a site most famously through paleofecal material; and (2) attempt to rewrite the colonization of the New World from the "Clovis First" hypothesis to, at a minimum, a concurrent population event (Jenkins et al. 2012).

The Paisley Five Mile Point Caves, colloquially the Paisley Caves, is a complex of eight caves and rock shelters located in south-central Oregon originally explored in the 1930s by Luther Cressman (Cressman et al. 1940) and reopened in 2002 by Dennis Jenkins. Jenkins and University of Oregon crews actively worked at the sites for six field seasons (McDonough et al. 2012). Since that time thousands of artifacts, faunal remains, and coprolites have been recovered. The points, debitage, and megafauna remains recovered are interesting; however, here I focus on the coprolites.

The Paisley Cave coprolites have a fantastic archaeological history of their own due to their reported antiquity and containment of human DNA. There have been several critiques levied at the Paisley Caves coprolites due to their importance in understanding peopling of the Great Basin as well as the Americas. One of the first critiques of the coprolites from Paisley Caves was the identification of coprolites as anthropogenic when they could have been deposited by animals. The criteria used to determine the source of the individual deposits was morphological (Gilbert et al. 2008:787), which could potentially cause problems because humans and animals shared the same space over 10,000 years and may have consumed similar resources. In 2008, 14 samples were sent for testing of human mitochondrial DNA (mtDNA) and all came back positive for European single-nucleotide polymorphisms (SNPs). Six also tested positive for Native American founding mtDNA. Since the coprolites were not excavated under sterile conditions, the explanation provided was that excavators added small portions of their own DNA to the coprolites while excavating (Gilbert et al. 2008:787-788). Of those six that tested positive for Native American mtDNA, three were also contaminated with red fox (*Vulpes vulpes*), coyote (*Canis latrans*), or domestic dog or wolf

(*Canis familiaris* or *C. lupus*). These conceivably could have become contaminated by humans eating the above animals or animals urinating on exposed fecal materials (Gilbert et al. 2008, 787-8).

Radiocarbon (^{14}C) dating is a well-known process within archaeology and there has been little critique over the ages of the Paisley coprolites provided by that technique. Instead, the question that has been asked is whether or not the coprolites are human at all. While not to rehash the previous section, the question being asked now is the idea of urine leaching – that urine from animals and/or humans washed DNA down through the sediment, which ultimately leached into the buried coprolites. Jenkins et al. (2012) have addressed these critiques by examining anthropogenic coprolites, morphologically dissimilar coprolites, and sediment surrounding anthropogenic coprolites. They argue that if younger DNA leached downward from younger levels and contaminated older deposits, then DNA should also be present in non-human coprolites and surrounding sediment. They have found no evidence for such DNA contamination and tested nine coprolites for translocated DNA and found: (1) the fractions (water soluble carbon chemically removed from the macrofossil) and macrofossils were similar in age for seven of them; (2) in one specimen the fraction was older; and (3) in one specimen of camelid coprolite was found to be 810 ^{14}C years younger. While this test was not conclusive for the entire of the site, it suggests that DNA contamination is not likely to be an issue with those samples Jenkins et al. (2012:226-227) acknowledge that their findings cannot be used to determine that contamination is completely absent at the site.

While not specific to the Great Basin, violence and power dynamics between groups can be explored through the examination of coprolites. In the Southwest, a coprolite was tested that contained human remains (Reinhard 2006; Turner and Turner 1999). This coprolite, from Cowboy Wash Pueblo, had an interesting deposition: soon after consuming a meal containing human flesh, a person defecated on a hearth and the hearth preserved that act creating a coprolite. Human myoglobin was found in the coprolite (myoglobin is not found in fecal material) and conclusively shows that one human ate another (Reinhard 2006:256). Like most things archaeological, interpretations vary. For Turner and Turner, this coprolite is evidence of Pueblo people being terrorized by violent groups and cannibalism may have been an agent of terror (Turner and Turner 1999). Others view this coprolite as an isolated incident and other acts of "violence" in the Southwest, particularly Salmon Ruin, are actually evidence of complex mortuary practices (Reinhard 2006:261). Regardless of interpretation, this evidence from a coprolite shows direct evidence of cannibalism.

So why this long winded answer to Smith"s question "…why the potty fixation" (Smith 2012:iii-iv)? I have hoped to elucidate how this potty fixation is not a historical archaeologist"s fascination but rather a question of the discipline at large. Whether privy deposits or coprolites and boluses, fecal remains are one of the very few opportunities we are afforded to get an intimate view of the people we study; their health, diet, status, and secrets. To paraphrase and to add to both Smith (2006:480) and Rozin and Fallon (1981:45) with food: the mouth is the gateway to the body and therefore aspects of identity, conformity, and resistance; often all that is left for the archaeologist is what is processed (through the body) and discarded (by the body). Fecal remains allow us interact with the individual on a choice by choice basis. This is a level of fidelity that is very rare in archaeology: the remains of a single choice and single actions. We have the opportunity to exploit this type of resource as archaeologists by asking questions of our data and moving beyond samples taken for due diligence and stored for perpetuity in repositories. We have the responsibility to take these samples, new and old, and examine them for clues about our shared history.

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Rock and Gravel Row Mounds/Aggregate Harvesting Near Historic Railroads in the Desert and Basin Regions of California and Nevada

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In Volume 22 of the Nevada Archaeologist, Stearns and McLane (2007) make the case of historic railroad "ballast harvesting" finding a ca. 100-year-old shovel blade at 26CH2335, described as pebble mounds adjacent to linear rows of harvested pebbles along the Hazen Branch of the Southern Pacific Railroad. Lending further credence, virtually the same footprint of linear rows of mounded pebbles and gravel separated by and alternating with wider rows cleared of surface aggregate are also found along railroads in the Mojave Desert at the "Mystic Maze" (CA-SBr-219) and in Afton Canyon (CA-SBr-1910H). However, the purported prehistoric origin of the so-called "Maze" has been the subject of controversy for over 100 years, though the historic record, patterns of patination, contouring for erosion control, and the stylistic characteristics distinguishing nearby fragile prehistoric earthen art intaglios from the robust row mound alignments supports a historic origin associated with aggregate harvesting for railroad ballast and bridge caissons.

In 2010, the Archaeological Heritage Association preliminarily evaluated several types of evidence with regard to aggregate row mound structures: their associations, their morphology, the characteristics of the pavement immediately surrounding them, and the historic record including photographic and ethnographic evidence. The evidence was used to evaluate three hypotheses: (1) that the gravel rows were made in conjunction with prehistoric agricultural activity; (2) that they were made as geoglyphs or earthen art for prehistoric use in ceremony; and (3) that they were byproducts of a modern gravel procurement operation and erosion control in conjunction with the construction of the railroad and the need for ballast and caisson aggregate. The abstract for the report was submitted to the Society for California Archaeology in December of 2010, and the preliminary findings that the rows were likely made using mechanical scrapers (Figure 1) in vogue from 1883 to 1910 when the railroad and bridges were under construction were presented at the annual meeting in March of 2011 (Musser-Lopez 2011).

To date, parallel gravel row mounds have been recorded in three separate places in the Mojave Desert and Great Basin, each adjacent to historic railroads (Figure 2). The 100-year-old controversy over the age and origin of the 100-acre "Mystic Maze" or "Topock Maze" (CA-SBr-219) near Park Moabi, California, next to the historic railroad bridge crossing of the Colorado River at Topock, Arizona, has resulted in it being the best known of the sites. Site CA-SBr-219 is also an archaeological type-site icon of considerable importance, listed on the National Register of Historic Places as a significant prehistoric site.

Though the site area had been explored first during the 1853-1854 Whipple Expedition, dur-

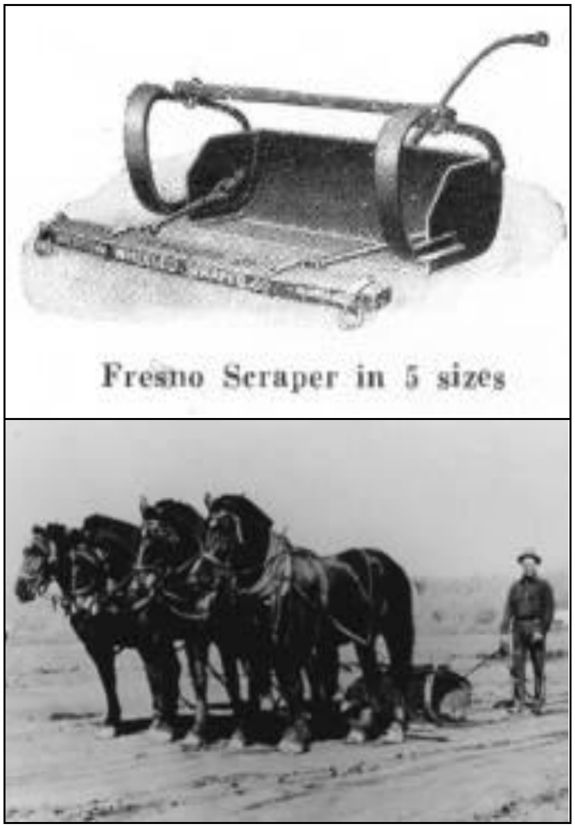

Figure 1. Horse drawn mechanical scrapers in vogue during the period of 1883 to 1910 were likely used to harvest railroad ballast. Top image courtesy of *Road and Street Catalog and Data Book* (Gillette 1930).

ing which detailed diaries were kept in an effort to find a 35th parallel route for the railroad, then by engineers, contractors, and railroad personnel building the railroad in the 1880s, no mention was ever made of gravel row alignments or a gigantic prehistoric labyrinth until it was first photographed and described in the literature as a "stone maze" by Edward S. Curtis in 1908. Curtis was contracted by the railroad to produce imagery and promotional material to attract tourism to the West for the purpose of visiting remains of a "vanishing race" of Native Americans.

Described as an "ethnographic adventurist," Curtis was known to manipulate imagery and/or enhance the facts. Curtis (1908:55) asserted that the site was used by "Mohave Indians…as a maze into which to lure and escape spirits… bewilder the spirits… and thus elude them", allegedly basing his information upon one person‟s memory received by Curtis second-hand.

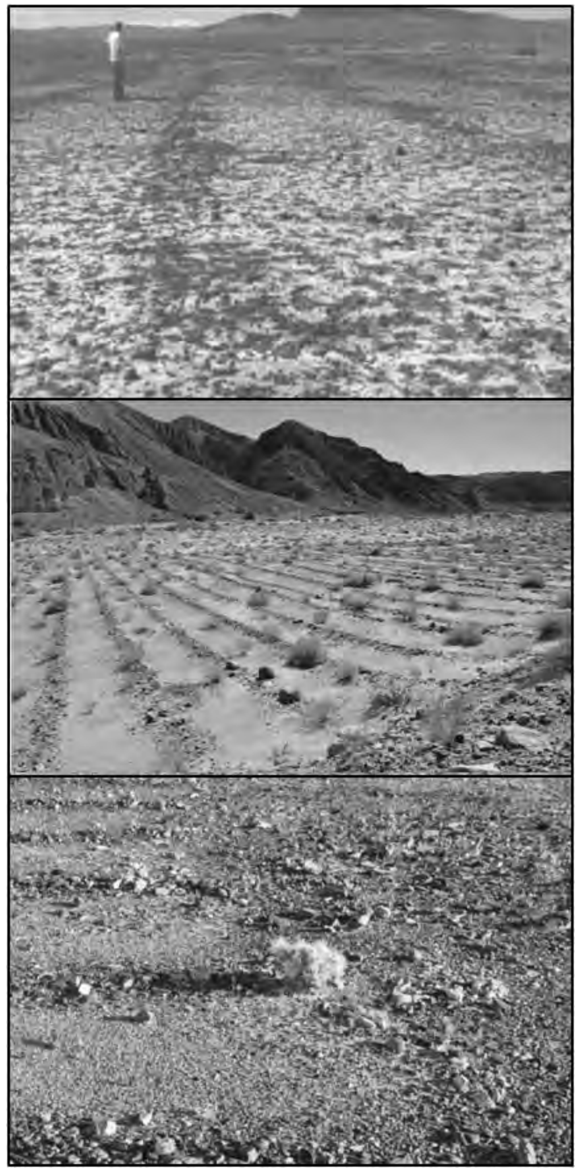

Figure 2. Aggregate row mound footprint at three archaeological sites, top to bottom: (1) 26CH2335, Hazen; (2) CA-SBr-1910H, Afton; and (3) CA-SBr-219, Topock.

The giant maze imagery took root in the corporate mind of the local culture that sold everything from a fantastically sketched maze with the words “Mystic Maze” on postcards at Harvey Houses to jars of honey based upon the ever morphing legend. By 1929, the local Needles High School yearbook had been named *The Mystic Maze* and the volume included an editorial about the many life paths students can choose from, much like the paths in the Mystic Maze (*The Mystic Maze* 1929).

It should be noted that Schroeder (1952) reported an interview with a Mrs. B. B. Brown of Parker, Arizona, who claimed to have spoken with an elder Mojave Indian by the name of Chuck Wood, who testified to Mojaves using the maze to find the way out without crossing the gravel, thus to “leave the devil behind them.” It is unknown if she used an interpreter; however, the date of the purported conversation was said to be in 1910, postdating the Curtis publication. Interviews with Mojaves who actually lived in the Mohave Valley/Topock area contradict this statement (see below).

Perpetuating the idea of its prehistoric origin, the gravel row was then recorded as a prehistoric archaeological feature of “Site M-78” by Malcolm J. Rogers in 1939, and thereafter the site record was updated repeatedly, rerecorded as a California prehistoric site (CA-SBr-219), an Arizona prehistoric site (AZ L:7:14) (Urban 1976), and as a National Register of Historic Places prehistoric site by well-meaning archaeologists who based their assessment of a prehistoric origin on Rogers (1939), Schroeder (1952), and their own visual observations of patina without any further empirical testing, ignorant of or ignoring the historic record and strong evidence of historic surface gravel mining operations in the area. Rogers (1939:9), to his credit, did predicate his description of the site as prehistoric with this precaution:

> “In the vicinity of roads, railroads and modern settlements, the mesa surfaces have often been dragged with scrapers to procure gravel for road ballast or concrete work. That work has produced wholly fortuitous figures of a geometric nature which are difficult to distinguish from the prehistoric figures; they have to be carefully studied before a decision regarding their origin can be made.”

It was not until 2005 that another 100-acre site with row mounds was recorded – 26CH2335 in Churchill County, Nevada (Stearns and McLane 2007). Similarly, it was also located adjacent to a historic railroad, and like the so-called maze at Topock, it too was initially identified as a “geoglyph” or earthen art. Shortly after Musser-Lopez‟s (2011) assertion that the Topock “maze” was the remains of gravel harvesting with mechanical scrapers, rock and gravel row mounds with a virtually identical footprint were reported in Afton Canyon near Barstow, California. In 2011, Fred Lange updated the site record for CA-SBr-1910H, the historic Afton settlement, reporting the presence of the rows mounds constituting the most recent known recording of this site type. In his report, Lange (2011:2) states:

> …The scrapes are consistent with the footprint of a Fresno scraper. The scrapes lead to the rail line and the (sic) show that the adjacent material was used to build the rail grade. The age of the railroad is consistent with when the Fresno Scraper was in operation.

Typically, “rock and gravel row mounds” can be described as patterned relief, low-lying, linear rows of mounded gravel, pebbles, or aggregate separated by wider rows of cleared swaths. Aggregates are comprised of rounded pebbles to subangular gravel averaging 2 to 7 cm in size along with infrequent larger rocks. Though typically about 100 to 150 cm wide, inter-site and intra-site cleared rows are not consistent widths; this variation is explained by the fact that Fresnos were being produced in multiple sizes as demonstrated in the 1930 *Road and Street Catalog and Data Book* (Gillette 1930, see Figure 1). The contrast of color between the cleared swaths and gravel row mounds is dependent upon local variations in patination and geomorphology of the original undisturbed surface gravels and the underlying soils prior to human modification. Site size ranges from near 10 to 100 acres with hundreds of rows present. Generally, gravel row mound sites have the following characteristics:

- Location is on easily accessible relic river terraces or in basins or washes with abundant gravel and cobbles averaging 2 to 7 cm in size along with infrequent larger rocks;
- An historic railroad is found within a few miles or less;
- Site contains artificially formed, regularly spaced, parallel gravel row mounds, each roughly10-30 cm high and 20-60 cm wide, and typically spaced about 120 cm apart, separated by swaths of cleared surface gravels exposing underlying soil;
- Rows are open ended, do not make abrupt turns and do not feature obstructions or turnarounds characteristic of a puzzle, labyrinth, or maze;
- Rows can be physically associated with raked pebble mounds;
- Rows can be physically associated with totally harvested, cleared areas;
- Sites are typically devoid of historic artifacts and features except access roads;
- If prehistoric trails are present in the site, they are truncated by the alignments;
- If prehistoric artifacts are present in the site, typically they are isolates; for example, a single potsherd or lithic flake isolated in a row mound, or found gathered in a pile;
- Undisturbed lithic reduction stations or pot drops are not found in or on row mounds;
- Rows are often gently curved to conform to contour of slopes; and
- Tests for prehistoric aboriginal crop pollen are negative.

Estimated ages of gravel row mounds vary from historic times to over 8,000+ years ago. Without verifiable evidence, the earlier date is likely assigned by those wishing to link the mounds to the age of Paleoindian occupation of presently dry Pleistocene/early Holocene lake shorelines, perhaps attempting to make it fit into Bedwell"s (1973) Western Pluvial Lake Tradition or another similar concept. The historic date is based upon the historic record associated with the Topock site CA-SBr-219 (see below) but it has also been speculated by their presence near or leading up to historic railroads at the three known sites and the reported 2005 discovery of a 100-year-old shovel blade at 26CH2335 (Stearns and McLane 2007). Otherwise, there have been relatively few historic or prehistoric artifacts associated with aggregate row mounds.

AGGREGATE ROW MOUND FUNCTON

Stearns and McLane (2007) provide an excellent summary of the contributions to the current theory regarding the function of circular mounds of aggregate or pebbles and extend that theory to row mounds based upon the association of pebble mounds adjacent to linear rows of pebbles and gravel along the Hazen Branch of the Southern Pacific Railroad. They suggest that rakes, shovels, and wagons were used to harvest gravel at 26CH2335. Gravel was raked into neat rows and wagons moved conveniently between the row mounds along the wide, cleared swath between them while gravel was pitched onto the wagon from the mounds.

In 2011, Musser-Lopez demonstrated the likelihood that CA-SBR-219 is also an aggregate borrowing area, citing S. M. Rowe (1891). In 1891, Rowe published an article entitled the "Red Rock Cantilever Bridge" in the *Transactions of the American Society of Civil Engineers* documenting profit-driven gravel harvesting by railroad construction contractors who hired "Indian laborers" to procure aggregate material used in the caisson work at Topock by raking up gravel from mesa terraces near the bridge to be transported by wagon, loaded up on railcar and moved to locations where needed:

> "…The broken stone was at first supplied from the debris of the Chino Quarry and from the volcanic rock found in the vicinity of the bridge, but it was found that broken volcanic rock with which the "mesas" were strewn, could be collected at less cost, and being of the same character, was substituted in the caisson work at a saving of nearly $1 per cubic yard. The process of gathering was to rake these fragments of stone into windrows and haul them by wagon to a pile where convenient to load into a car when needed. An inclined screen was erected to separate the dust from the stone while conveying it to the car. Indian labor was used very successfully for this as well as for labor about the caisson" (Rowe 1891:692-693).

In a personal communication, Everett Bassett, Transcom Environmental, suggested that instead of or in addition to the Fresno Scraper, the employment of the Buck Scraper, with a characteristic of pushing soil or gravel to the side, should be considered as a possible way in which the gravel rows were roughed out. The Buck Scraper"s historic successor, the Fresno Scraper, with its controllable scraper bucket, was used extensively by the railroad as the first "bulldozer" for construction, along with teams of draft horses. The distance between the rows seems to be designed for the 3.5-foot-wide blade, a perfect fit for collection of gravel. The use of horse-drawn scrapers in the area between 1883 and 1910, when thousands of them were produced, is supported by both local testimony and archival documentation. In 1941, Charles Puck (1941:2), in a letter to the *Desert Magazine* editor, cited an article on page 32 of the January 1933 *Touring Topics Magazine* (predecessor of *Westways*) stating:

> "… the ridges of rock is [sic] the work of the contractor who built the Santa Fe bridge at that point. He used a scraper to line up the rocks so they could be shoveled into wagons. He claims to have saved $1 per cubic yard by getting his material in this manner."

Desert Magazine editor Randall Henderson further expounded upon the article, saying that H. W. Dennis, a Los Angeles engineer who answered the question of origin, wrote it. Henderson (1956:46) recounted the Dennis article:

> "Actually, the mysterious maze

> was a by-product in the construction of the Topock Bridge across the Colorado by the Santa Fe railroad in the early 1880s. The construction men needed great quantities of broken rock for the concrete caissons. They found it was cheaper to scrape up and screen the coarse gravel on the nearby mesa than to operate a rock-crusher. They used a Fresno scraper for the operation, and this explains the tiny parallel windrows of gravel which extend across many acres of the mesa‟s surface."

Oral testimony also supports that aggregates were raked and shoveled into wagons by Mojave laborers. Perhaps as technology evolved, scrapers were introduced and combined with hand raking and shoveling. In her 2011 paper, Musser-Lopez also cited the 1957 statement made by J. M. Asbill who conducted an investigation with regard to the maze for the Division of Highways, California Department of Public Works. Asbill (1978:52) reported on an interview with Mr. Hiram McCord who was eight at the time of the bridge construction:

> "Mr. McCord‟s uncle, Jorando Gates relates the story that the so-called "maze" was made by Indians employed by the railroad company to rake rocks which were to be used in the construction of the Red Rock River Bridge by the Atlantic and Pacific Railroad.... Mr. McCord was informed that many reports on the origin of the "maze" was [sic] to the effect that the maze was constructed by the Indians for the purpose of walking through it and in some unknown manner being able to elude pursuing evil spirits. Mr. McCord states that to his knowledge there is nothing in the folklore of his tribe that would place any credence at all upon such reports."

Asbill (1978:52) reported that Mr. McCord acted as interpreter during an interview conducted with Mr. Charlie Hamilton, then an elder of the tribe and wrote:

> "Mr. Charlie Hamilton, age 75, states that he personally saw the rocks which forms this „maze‟ being raked by eight Indians, and that he actually rode on the wagons which hauled the rocks to the bridge site during the construction of the railroad bridge."

It should be noted that members of the McCord family have traditionally served in leadership roles in the Fort Mojave Indian Tribe including in the tribal judicial and legislative bodies. Although Haenszel (1974) sought to debunk the testimony by Hamilton, whom she referred to as "illiterate," the State Department believed the evidence supplied by Hamilton, Gates, and McCord is an important contribution to the understanding of the origin of the "maze" and we are fortunate to have Asbill‟s record noted by Haenszel (1978). When the facts became known as a result of Asbill‟s investigation, a highway sign posted along Route 66 stating "Prehistoric Indian Maze," was revised to "The Rock Maze" (Henderson 1956), reflecting a more neutral position; today, there is no highway sign at all.

OTHER EVIDENCE OF AGE AND FUNCTION

Site CA-SBr-219 (Park Moabi/Topock): The Type Site for Aggregate Row Mounds

Site CA-SBr-219 is a type site icon that meets all of the criteria described above for a typical "Gravel Row Mound" site, but what should be recognized first and foremost is that it is not a maze. The roughly 100-acre large earthen construct is located about 20 km south of Needles, California, at the Park Moabi turn off of I-40 in San Bernardino County. It includes an extensive series of 200+ surviving, open-ended, artificially-formed, parallel, alternating row mounds of darkly colored gravel, many over 1,000 feet long, alternating with wider rows of what appears to have been scraped or raked swaths revealing the lightly colored soils underlying the gravel (Figure 3). The striped rows, easily viewed from satellite and at ground level, are located on a connected series of low, naturally formed relic Pleistocene river terraces naturally dissected by intermittent washes. Adjacent relatively undisturbed terraces to the west and north are consistently covered with darkly patinated desert pavement.

A Lack of Patina on Cleared Surfaces and Disturbed Patinated Surfaces without Repatination

What distinguishes and is confusing about CA-SBr-219 are the characteristic contrasting dark and light rows (Figure 4). The original darkly patinated surface gravels are scooped up into rows, leaving exposed the underlying light colored subsurface. That contrast is visually striking and can be viewed while passing by via train, automobile, horseback, or on foot even today, leaving the visual effect that has resulted in the site being a roadside attraction for well over 100 years while the other two aggregate row mound sites have gone virtually unnoticed by the media.

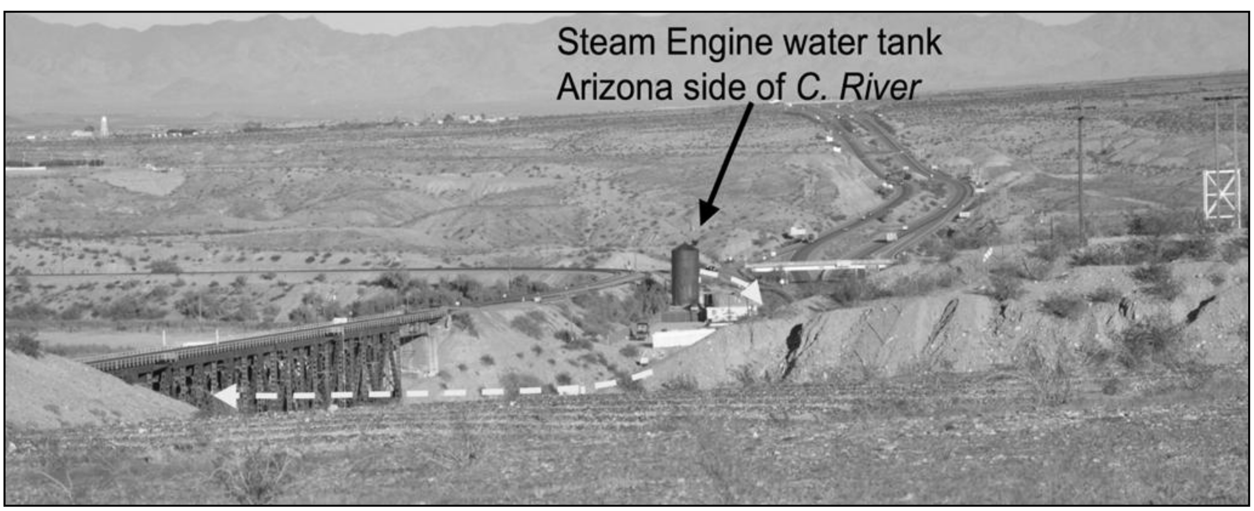

Figure 3. Aggregate harvest area above row mounds following the natural contour of the slope above original steam engine track (white dashed arrow) present prior to realignment for new bridge indicates ballast harvesting with erosion control in mind in the area adjacent to old bridge over the lower Colorado River at CA-SBr-219 (Topock, AZ/CA).

Figure 4. Gentle curvilinear sweeps of the aggregate row mounds following the natural contour of the slope is evidence of ballast harvesting taking into consideration erosion control in area adjacent to the railroad grade at CA-SBr-219 (Topock).

Unfortunately, many people, including some professional archaeologists, have misinterpreted the patina on the mound row aggregate as indicating an ancient prehistoric age rather than focusing on the obvious lack of patina accumulation on the cleared surfaces between. Within the row mounds themselves, the surface patina is not consistent and one can visually detect that some of the originally patinated surfaces are turned down while the reddish soil stained side is turned up. This evidence of a recent age is discussed by Musser-Lopez (2011) along with several other points summarized below.

Isolating relict Loci A, B, and C of the site is a historic transportation corridor through the central portion of the acreage and includes Interstate 40 and the historic grade of the Atlantic and Pacific (A&P) Railroad, later to become the Atchison, Topeka, and Santa Fe (AT&SF) Railroad, and now the Burlington Northern and Santa Fe (BNSF) Railroad. Located adjacent to the historic railroad bridge on the west side of the Lower Colorado River entering Arizona at the southern end of Mohave Valley and bounded by the Chemehuevi Mountains and the Topock Gorge to the south, the site is in a transition zone of the Mojave, Colorado, and Sonoran deserts.

The Style of Delivery Distinguishes Aggregate Row Alignments from Prehistoric Art

Based upon ethnographic evidence and oral history, Musser-Lopez (2011) reported that prior to the railroad, there existed prehistoric rancherias and villages in the Topock/Park Moabi area with trails connecting them one to another. This being a sacred area to the Mojaves, significant prehistoric earthen art still exists where it was not destroyed by modern constructs. Still present today are four giant anthropomorphic ground figures in three distinctly separate locations within this area. These figures, which Park Moabi residents endearingly refer to as the "Moabi Stick Men," are similar to the famous anthropomorphs found in Blythe, California: the "Blythe Intaglios."

These intaglios are very different in construction style than the nearby gravel mound alignments at the maze. The Moabi Stick Men are earthen representational art work constructed utilizing a type of art form referred to as “intaglio” while the gravel aligned rows are a form of “relief” (for images, see Musser-Lopez 2011). Steve Miller, archaeologist with the Lake Havasu Bureau of Land Management, suggests that the anthropomorphs were produced by removing dark tiny gravel fragments by hand, actually lifting individual pieces of gravel out of a central configuration. While the anthropomorphs are fragile and can be easily damaged, the aggregate row mounds at Topock are a robust “relief” produced by scraping and piling up gravel.

A representational figure photographed in 1926 by Rogers (1939) was found in the midst of the row alignments; Rogers described the image as being that of a “phallus.” Haenszel (1978) described the figure more delicately as having the appearance of a hook in the “hook and eye” for fastening clothing. A lot of to do was made about this figure, its placement, and landscape orientation which was considered to be evidence of a prehistoric origin for the so-called "maze", though logic would suggest that it could have been constructed during the historic period simply by making a small, almost effortless alteration in the gravel rows.

The figure in the photograph can simply be described as two rock rings (roughly 2 feet in diameter) added to and slightly altering two gravel row scrapings so that the opposite end of the rows are connected. The alteration gives the appearance of two eyes and a large nose, resonant of the popular World War II "KILROY WAS HERE" imagery. Since the figure was photographed in 1926, it predates World War II; coincidentally, however, very similar imagery existed and was popularized in World War I as "FOO WAS HERE," FOO (Forward Observation Officer) being a precursor to Kilroy. An innocent prank? To illustrate that the explanation is within the realm of possibilities, until about the 1980s, a renowned railroad employee living in Needles, California, left his name in prominent places around the desert – many remember seeing the words "T. More was here" or just "T. More" at the end of a trail or on a mountain top boulder.

Superimposition of Aggregate Row Mounds over Prehistoric Sites

A historic, well-documented local public outcry summarized by Haenzel (1978) transpired in the Topock area when an important prehistoric anthropomorphic earthen art figure, similar in description to the Moabi Stick Men, was destroyed during the realignment of the railroad on the west side of the bridge at the turn of the twentieth century. This figure was said to be adjacent to the row mound alignments but separated from them by a ditch constructed around it.

Musser-Lopez (2011) asserted that the smoking gun of the historic origin of the gravel rows is the fact of a public outcry bringing government officials out from the Coast, which only arose as a consequence of the prehistoric anthropomorph intaglio being destroyed. This alarm begs the question: why was there not an outcry when the railroad was aligned through the middle of the adjacent prehistoric "sacred maze?" The lack of concern strongly implies that the parallel gravel row mounds at the time of the railroad"s realignment were not considered to be an antiquity of cultural importance. It should be noted that the railroad was constructed in the 1880s, the bridge realignment took place in the 1890s, and the first written record or suggestion using the words "prehistoric", "Indian", and "stone maze" was not until the 1908 Curtis report.

The confusion with regard to the origin of the row mounds at CA-SBr-219 is due in part to the original prehistoric use of the area, evidence of which is laced through the historic site. That ballast harvesting of surface gravels took place in areas of previous prehistoric use in the Topock/Moabi area is also evidence by isolated artifacts in and trails truncated by the aggregate row mounds. A reported pile of flakes and sherds is reminiscent of those left by unpermitted collectors at many prehistoric sites throughout the desert.

Curvilinear vs. Straight Rows: Contouring for Erosion Control

In 1979, Robert F. Heizer and C. William Clewlow took soil samples from the site for analysis to the University of California, Berkeley, which came back negative for aboriginal pollen (Musser-Lopez 2011). Other observations by Musser-Lopez (2011) do not support an agrarian site function. Lange et al. (2013) wrote "Rows of pebbles on cleared desert surfaces (mazes) were created by Native American peoples" and "rejected" "recent assertions that Afton Canyon mechanical scraper scars might be utilized to challenge the Native American origin of the Topock Maze…", maintaining that the curvilinear nature of the rows at CA-SBr-219 is evidence of its prehistoric origin. On the contrary, however, we observe that with the exception of "FOO" (the "eyes/nose" figure, or Roger‟s "phallic symbol") all of the row mounds could have been easily negotiated using historic scrapers and draft animals or could have been made using historic hand rakes. The presence of gentle row mound sweeps around hillsides following the curvature of the natural slope contours argues for erosion control near the railroad grade (see Figures 3 and 4), not prehistoric origin (see Musser-Lopez 2011).

Aggregate Row Mound Construction

Musser-Lopez (2011) also advanced the idea that while surface gravel harvesting may have started out as hand rake and shovel operations, the footprint of the row mound alignments alternating with cleared swaths at CA-SBr-219 indicate that mechanical scrapers such as the Fresno or Buck type scrapers pulled by teams of horses or mules may have been used. She pointed out that mechanical scrapers were in vogue during the 1880s to the turn of the twentieth century when the railroad and bridge were being constructed and realigned near and/or adjacent to the site and that once harvesting of gravels began, raking and shoveling by hand likely evolved with the technology – she postulated that mechanical scrapers typically used for leveling roads and railroad grades were adapted for use in gravel harvesting supplemented by hand raking and shoveling (Musser-Lopez 2011).

CA-SBr-1910H fits well within the framework of the typical gravel row mound site with a virtually identical footprint as 26CH2335 and CA-SBr-219. The recorder for LSA Associates describes the historic origin of the rows at Afton as "…made during the construction of the railroad. The engineer used locally available material to construct the rail grade" and states that the rows were made by a mechanical scraper, a Fresno (Lange 2011). CA-SBr-1910H further challenges the prehistoric origin of the so-called maze and lends further credence to a historic origin of all three sites.

CONCLUSIONS AND RECOMMENDATIONS

As a type site listed on the National Register of Historic Places and available for public inspection, CA-SBr-219 provides an important outdoor laboratory setting for learning about and comparing other aggregate row mound sites. Further, given its unique stature as a historic roadside attraction, it is important that all of the currently available tools for exhaustive, rigorous, empirical archaeological analysis be utilized to form an objective foundation for management and interpretive recommendations. Currently, a worn and barely legible interpretive sign, installed at the site by the United States Fish and Wildlife Service, includes imagery of the maze superimposed with Mojave pottery suggesting that the gravel alignments are prehistoric in origin. Though the findings presented here are considered to be preliminary pending the Department of Interior‟s (DOI) approval of the Archaeological Heritage Association‟s proposal to complete empirical testing and analysis at CA-SBr-219, sufficient evidence has been provided to challenge the DOI‟s assumptions regarding the age and origin of the Topock Maze.

Further, the site is located adjacent to and west of the Pacific Gas and Electric‟s (PG&E‟s) gas compressor station and Bat Cave Wash, the recent dumping ground of PG&E‟s hexavalent chromium ("Chrome 6") hydroxide sludge. The potential threat of lethal Chrome 6 contaminated groundwater migrating into the Colorado River could pale in comparison to the groundwater contamination made famous in Hinkley, California, by the 2000 film *Erin Brockovich*. The new ponds associated with the California Department of Toxic Control‟s Groundwater Remediation Project at the PG&E Topock Compressor Station (see Pacific Gas & Electric 2011 for more information) were built on the opposite side of CA-SBr-219 so that now the publicly accessible area of the Topock Maze is bound by PG&E, its pipeline, toxic dumping ground, and present Superfund-level cleanup activity. Though CA-SBr-219 was rerecorded in conjunction with the ongoing interim measures (McDougall 2005), many empirical methods are available to determine age and origin but such studies have yet to be accomplished.

If archaeologists are to continue to assert that CA-SBr-219 is truly a prehistoric maze or earthen art, then there is an important obligation to protect what could be the largest canvas on Earth. The credibility of the archaeological community is at stake. We must not rely on assumptions and we cannot afford to dismiss the tools of research available to us in order to make a determination on a site of this magnitude of importance. Suggested studies may include but not be limited to detailed morphological examination and controlled study of the surrounding pavement as methods for distinguishing such features from the traces of modern commercial gravel collection (as recommended by Bendímez and others [1986] at Macahui), as well as replication, luminescence dating, further pollen analysis, testing for presence or absence of reformed patina, clast comparisons and other innovative minimally destructive tests, and counts of disturbed patinated rocks in the alignments recommended by Musser-Lopez (2011).

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"Good Luck in Making Unexpected and Fortunate Discoveries[i]": Teaching and Learning at Serendipity Shelter

Dedicated to the memory of Garth Portillo (1952-2007)

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Serendipity Shelter, lying within the borders of the Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area, offers a unique context for the exploration of many anthropological issues, ranging from the identification of lithic production systems to the interpretation of ideological frameworks. But it also provides an opportunity for critically important lessons in site stewardship, public education, and student training. Here, we examine the history of investigations at Serendipity Shelter and its continuing role in public archaeology.

After a long day of archaeological survey we were bone tired and thirsty, seeking respite in any patch of shade available on Grassy Rock, a huge sloping butte in northwestern Nevada"s remote High Rock Canyon country (Figure 1).

It was 1982 and Garth, Karen, Mike, and Melinda[ii] were conducting inventory for the Bureau of Land Management (BLM) Surprise (Valley) Resource Area Office, headquartered in Cedarville, California. We had begun at the north end of the monolith, traversing its slopes and crests, noting chert outcrops, springs, and lithic reduction stations (Figure 2). We rounded the southern nose of Grassy Rock and made our way up the slope. Above us, we noted a strong shadow capped by a vertical face of rock. It was a rockshelter with a broad opening, and enough horizontal depth to have hosted cattle, horses, owls, and packrats for some time. We became increasingly intrigued as we noticed scatters of stone tools, flakes of multicolored chert, chalcedony, basalt, and obsidian, fragments of grinding stones, and small bits of animal bone. By the time we had completed a systematic scan of the shelter"s surface deposits we had recorded additional scatters of fire-cracked rock, abraders and hammerstones, projectile points, an ochre-stained metate fragment, a broken shell bead, and, much to our surprise, several brownware ceramic sherds (relatively rare finds in this part of northwestern Nevada).

Our excitement soon was tempered; however, by the signs of recent, substantial human disturbance: beer can pop tops, bits of aluminum foil, rusted metal, crudely dug potholes, and a swath of cheat grass leading up slope to the shelter, demarcating a well-used footpath. Indeed, the site must have been known by recreational users of the area for some time and had suffered badly for it. Still, the hastily dug holes revealed significant cultural depth. We estimated that there might be at least 2 feet of cultural deposit remaining in those interior areas that had thus far escaped the attention of collectors and looters.

The final, unexpected discovery came as our

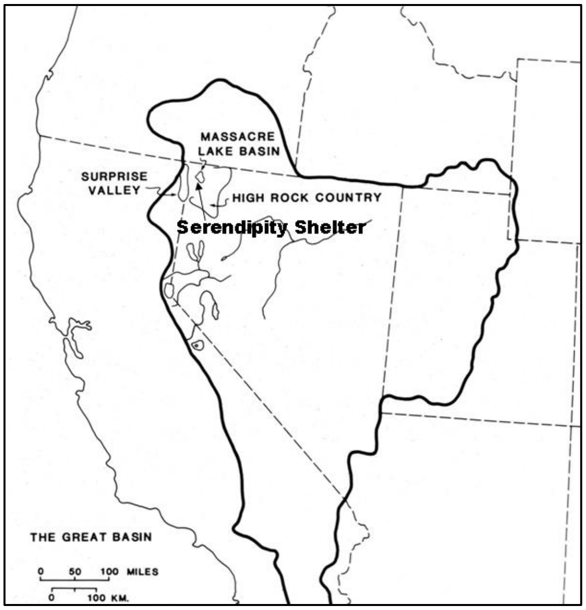

Figure 1. Map of the Great Basin showing the location of the High Rock country, Serendipity Shelter, and other locales mentioned in the text.

Figure 2. Grassy Rock. Serendipity Shelter lies at the southern terminus, far right (Photo by Alison Harvey).

eyes adjusted to the dim light of the shelter. We began to scan the rear rock wall. Since Melinda‟s childhood rockshelter explorations in west Texas, where ancient Mogollon peoples and more recent Mescalero Apaches painted fantastical images on cave walls, she has never been able to pass by a rock face without lingering to search for symbols, figures, or patterned pecking. There in the shadow we could just make out faded splashes of color, some echoing the rust-red of the pulverized ochre we had seen on the metate fragment, pale swatches of yellow, white, and black. These were panels of pictographs (painted designs) that are quite rare in this part of the Great Basin (see Ricks [1996] for Warner Valley, Oregon occurrences to the north).

As Karen made a preliminary sketch of these images (along with a small pecked petroglyph), we talked about the significance of this extraordinary place. Melinda reflected on the coincidence and irony of the shelter‟s life history. This remarkable landform was visible for miles around to ancient people moving seasonally across the landscape from rocky upland root-gathering fields, grasslands and waterfowl-rich lake margins in the northwest, to big game hunting rims in canyons to the south. Some ancient travelers might have been surprised by the first glimpse of Grassy Rock rising up out of this sloping valley. This would have been a welcome stopping place: elevated with good visibility, nearby water, excellent raw material for flintknapping and, of course, shelter indeed, a serendipitous opportunity for rest in a summer storm or in the midst of a long journey. We, ourselves, had come upon the shelter unexpectedly, surprised by its rich and ancient evidence of occupation. Serendipity Shelter, then emerged as a fitting name, and Melinda entered it at the top of the official site record that we completed that day. The irony lay in the fact that Serendipity Shelter, in its prominent position on Grassy Rock had also been highly visible to modern visitors, some of whom had vandalized it. The shelter‟s visibility and strategic location were both its premier value over the millennia and its greatest vulnerability in modern times.

The shelter‟s on-going exposure to vandalism was of great concern to Garth as a BLM Cultural Resource Specialist, and to all of us as students of the past[iii]. We discussed some possibilities for protecting Serendipity Shelter and its remaining cultural deposits. Should the BLM place patrols in the area? Should the shelter be sealed off altogether? After some deliberation, we decided that a concerted program of monitoring should be undertaken and that the site should be nominated by the BLM for inclusion on the U.S.D.I. National Park Service (USDI-NPS) National Register of Historic Places[iv]. Both the prehistoric record and the ethnographic cultural setting of this remarkable place warranted further exploration.

THE CULTURAL SETTING

Through our study of valuable ethnographic sources and regional archaic occupation patterns, here is what we can say about those who came to stay awhile at Serendipity Shelter.

At the time of Euroamerican contact, the High Rock country was exploited by seasonally-mobile foraging bands of Numic-speaking Northern Paiute that ranged over a vast area of the northern and western Great Basin (Fowler and Liljeblad 1986). Rich details of remembered Northern Paiute lifeways were collected by ethnographers in the 1930s. Isabel Kelly‛s (1932) work among the related Surprise Valley Paiute offers especially vivid details about historic period culture and adaptations in the region to the west of Serendipity Shelter.

It is unclear which historically-identified bands might have considered Serendipity Shelter within their territory. The territories of the *Kidütökadö* (the "groundhog eaters") based in Surprise and Warner Valleys (southern Oregon), the *Kamödökadö* (the "jack-rabbit eaters") to the southwest, and/or the *Aga'ipañinadökadö* (the "trout eaters") of the Summit Lake region to the east might have converged at their margins in the vicinity of Grassy Rock, but ethnographic distribution maps give no strong suggestion of this (Fowler and Liljeblad 1986: Figure 1; Kelly 1932; Stewart 1939: Map 1 and 1966). It is probable that none of these groups would have exploited the Grassy Rock and Serendipity Shelter area in any intensive manner, as it was a long way from their central base camps. Still, Serendipity Shelter would have been an excellent short-term way-station in an annual foraging round.

Northwestern Great Basin foragers exploited this region extensively, subsisting on a wide variety of wild plants and animals. Some of the once-prolific native grasses, especially Ricegrass (*Oryzopsis hymenoides*) and Great Basin wild rye (*Elymus cinereus*), provided critically important storable seeds. A variety of other seed plants, berries, and root crops were also significant subsistence staples (Fowler 1986). Roots (for example, bitterroot [*Lewisia rediviva*], biscuitroot [*Lomatium* spp.], and yampah [*Perideridia spp*.]) gathered from the stony, shallow soils of low sage plant communities and from moister areas (for example, camas [*Camassia quamash*]) were especially important in this region (see Coutour et al. 1986). Important prey species that would have been available within the foraging range of Serendipity Shelter include mule deer (*Odocoileus hemionus*), antelope (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), sage grouse (*Centrocercus urophasianus*), and a variety of small mammals[v]. Waterfowl (migratory geese and ducks) also would have been available at the Massacre Lakes to the northwest.

Looking deeper in time, perhaps as long ago as 10,000 years or more, people occupied the region and quickly established a broad-spectrum Paleoarchaic/Archaic economy[vi]. There were important local variations, however, especially around the wetlands and marshes of Surprise and

Warner Valleys (O‟Connell 1975; Weide 1968, respectively) and the Massacre Lakes (Leach 1988). And there were undoubtedly short- and long-term changes in this lifestyle in response to critical resource distribution and availability, as well as shifts in population and climate (see Elston 1982; Jones et al. 2003; Leach 1988). Complex trade arrangements and social interactions existed with peoples elsewhere in the Great Basin and Columbia Plateau region, further complicating the archaeological record.

SERENDIPITY SHELTER: AN OPPORTUNITY FOR TEACHING, LEARNING, AND PUBLIC ARCHAEOLOGY

In the years following our first recording of Serendipity Shelter, scarce federal resources allowed infrequent monitoring and no measures for physical protection of Serendipity Shelter. Sadly, the looting continued unabated. But concern for preservation of Serendipity Shelter was still very real. By 1997, destruction of the site was advancing precipitously and Hugh Bunten, then Garth Portillo‟s successor as Surprise Resource Area Archaeologist, was equally concerned about the shelter‟s preservation. Bunten began to make plans for limited testing to see what deposits might yet remain undisturbed and to assess their information potential. Other archaeologists had also become interested in the potential value and interpretation of this place, especially its rock art[vii].

While the BLM was obligated to protect valuable cultural resources from further destruction, it (along with other federal agencies) was also responding to larger federal mandates to develop programs in public archaeology (education, outreach, and public participation in archaeological projects, and partnerships with other institutions [*sensu* Smardz Frost 2004])[viii]. Public archaeology was recognized as an important component of federal projects as it enhanced public relations, built public awareness and helped establish community support for future work (Merriman 2004:4). Today, public archaeology is seen as a significant aid in site stewardship and preservation (NSHPO 2010; SAA 2010, 2013; USDI-NPS 2013).

Serendipitous Phases in the Exploration of the Shelter

Serendipity Shelter was poised to enter a new phase of exploration and inquiry as a training ground for students in field and laboratory techniques, along with public archaeology involving community members in the field. In the summer of 1998, Bunten began to assemble a limited testing crew of BLM archaeologists from several field offices. From the University of North Dakota (UND), Melinda contacted Bunten to offer her volunteer services and those of then UND student, Janie Franz[ix], as they were going to be in the area on a general planning trip for a potential public archaeology project elsewhere. Melinda also suggested that UND would volunteer the facility and personnel for the cataloguing and analysis of lithic materials from the test excavations.

Sadly, save for the very able Lynn Nardella (then Surprise Resource Area Archaeological Technician), the rest of Bunten‟s crew did not materialize due to scheduling constraints. While Melinda and Janie volunteered to carry out the limited test excavations with Lynn‟s help and logistical assistance from the BLM, it was clear that a volunteer crew of three was inadequate to explore even a small portion of the deposits on the apron of the shelter. This labor shortfall offered an unforeseen opportunity. Volunteers from the community and other agencies came forward and saved the day (Figure 3).

Figure 3. Volunteers screening excavated matrix at Serendipity Shelter, 1998.

BLM and Bureau of Indian Affairs fire crew members, temporarily in the area awaiting fire duty, were able to join us for a day, serving as talented screeners, baggers, and auger samplers. Several volunteers from the Cedarville community helped set up and excavate units, screen matrix, sort artifacts, and sample looters‟ backdirt piles (Figure 4).

Figure 4. Janie Franz, Melinda Leach, and Cole Green excavating the apron of Serendipity Shelter, 1998 (Photo by Tim Green).

In addition to the fire-fighters, this motley crew included a six-year-old child, a father, an uncle, a grandfather, three mothers, two teachers, a writer, and a couple of high school and college students. Now, in addition to partnering with UND, the BLM had an opportunity to highlight the importance of Serendipity Shelter and its preservation in the eyes of children, youth (including members of the Fort Bidwell Northern Paiute Community), seniors, and other members of the Surprise Valley community.

This was public archaeology in action! Melinda and Janie were able to teach some rudimentary archaeological techniques and to hit hard on the lesson of site preservation and respect for cultural heritage (Leach and Franz 1998), while volunteers offered their labor and remarkable insights into the meaning of our finds. Even then six-year-old Cole was able to spot artifacts that the looters had missed, recovering three projectile points and a pot sherd from their hastily discarded backdirt pile (Figure 5)!

Figure 5. Cole and his granddad screening looters' backdirt at Serendipity Shelter, 1998.

In less than a week, we were able to complete surface reconnaissance and mapping, the testing of two units, two controlled shovel and auger probes, and a sampling of the looter‟s substantial backdirt pile on the apron of the shelter (Leach 2013). The excavated matrix was sifted through $^{1}/_{8}$"-mesh shaker screens cleverly crafted by Lynn, and the sieved materials (including copious quantities of natural gravel) were bagged, labeled, and prepared for shipping to UND where they would be cleaned, catalogued, analyzed, and curated.

Impressively, this relatively small volume of excavated material (less than $^3/_4$ of a cubic meter) yielded over 10,000 artifacts and ecofacts: small and large animal bone, shell, seeds, wood, more than 500 formed chipped and ground stone tools, bone and shell ornaments, ceramic sherds, historic and/or modern Euroamerican objects, and thousands of pieces of chipped stone flaking debris.

The post-field lab work and student training was given critical financial support in 2001, when Penni Borghi, by now the new Surprise Field Office Archaeologist, designed a BLM Cooperative Agreement that would help with cataloguing and some analysis of the lithic material and faunal remains.

A Shift in Management and Protection

In the previous year, 2000, the Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area Act had been passed by Congress to specially recognize and preserve the unique historic, prehistoric and wilderness values of this region of northwest Nevada. Grassy Rock fell within the boundaries of the new conservation area, to be jointly managed by the BLM Winnemucca and Surprise Field Offices (USDI-BLM 2007). Now, the sites associated with this unique monolithic feature were to be regularly monitored. They would no longer be accessible by wheeled recreational vehicles and, presumably, site vandalism would be curtailed. With David Valentine, then chief archaeologist for the conservation area at the cultural resources helm, new possibilities opened up for the further exploration of Serendipity Shelter and collaboration with UND.

In 2007, Valentine authorized a BLM Challenge-Cost Share grant with UND to revisit Grassy Rock with several students and volunteers. Students William Swearson, Amber Summers (later Summers-Graham), and Katie Amundson (later Graham), Pierre de Tudert (a French high school exchange student living in Surprise Valley for the summer), Matthew Graham (Amber"s good friend and later husband), and Valentine rounded out our field crew (Figure 6). Our goals during the brief trip included exploration of stone sources (both cherts and obsidian) in the vicinity of Grassy Rock in order to identify potential prehistoric quarry locales, and reconnaissance of other sites on Grassy Rock to determine broader prehistoric use of the geologic feature. The grant also supported further lab work and analysis of the chipped stone materials from Serendipity Shelter.

Figure 6. Dave Valentine with the 2007 Serendipity Shelter crew.

William, Amber, and Katie had been working with Melinda in the lab for a number of years and she was eager to show them Serendipity Shelter, the source of the thousands of artifacts that they had helped catalogue. Only a visit to the shelter could make the place come alive for her students. Handling all those artifacts as rather lifeless objects in an archaeological lab gave them no real context for understanding. While Melinda showed slides and maps and talked about Serendipity Shelter, even laying out theoretical questions to be explored by the students‟ analyses, the artifacts‟ meaning was limited. Melinda was merely providing the sort of "expert construction" of knowledge (*sensu* Copeland 2004:135) that ultimately has limited impact on students‟ real understanding. The place itself remained unreal to the students. Where had these artifacts come from? How were they made in a living, behavioral context? Who had used them and why? None of these questions had any particular relevance because the students had no frame of reference, no prior experience from which to create real knowledge of the place. What the students needed was an individual experience with Serendipity Shelter, to enable them to richly construct its past, give it meaning, and transform the sterile evidence they had seen in the lab (Figure 7).

Figure 7. The 2007 Serendipity Shelter field crew (Pierre de Tudert, William Swearson, Melinda Leach, Katie Amundson [Graham], Matthew Graham, and Amber Summers [Graham]).

The 2007 field visit, then, was an important experience for both Melinda and her students. During our stay, we met with skilled rock art professionals from the Nevada Rock Art Foundation, who had come to formally record and assess the condition of the pictograph panels that we had first identified in 1982 (Barker 2007). Melinda got to rediscover the shelter again some 25 years after her first visit, and to watch the students take in every detail, to discover and learn, and to redefine Serendipity in their own terms. Here is what they had to say.

The Serendipity Experience, by William Swearson

I worked for nearly four years in the UND archaeology lab on the lithic artifacts of Serendipity Shelter. Many others had donated their time and energy to this project for over nine years. I spent most of my time in the cozy 100 year-old lab space, looking through 40+ bags of stone flakes. It was my job to separate the debitage into multiple categories of obsidian and chert. Occasionally, I would find a piece of bone or charcoal that had escaped the preliminary scans of previous workers. I would even sporadically, and excitedly, find bits of rubber eraser that had fallen into the screens from pencils during excavation. Although these ecofacts and modern artifacts were nothing special, they would bring me back to a moment of sanity during the tedium of sorting. Still, I liked what I was doing.

As a kid I had always imagined doing this reconstructing past cultures by looking at what they had left behind as trash. It was like working on a four-dimensional puzzle that would lead to more questions and more puzzles. So for years I spent hundreds of hours in the lab, a great deal of the time in good friends‟ company, separating white opaque chert from red speckled chert, basalt from obsidian, and so on. *After a while I began to feel a connection to these small arti-*

facts as though I had become a permanent part of the site itself, working my way underneath its skin and making a home. The possibility even crossed my mind that given more time, I myself might eventually be cataloged and stored with the artifacts.

The thought of actually going to Serendipity Shelter had never occurred to me. It was a trip that I knew I would not be able to afford on a college student‟s budget. It seemed as though the difficult logistics of getting there from North Dakota would require a supernatural act. So when I was offered the opportunity to help Dr. Leach with a small survey project at Serendipity Shelter, I was thrilled.

In summer 2007, after a field school in Arizona, I made my way across the Southwest and into the Great Basin. I discovered for the first time the vast isolation of the Nevada desert. After meeting up with the rest of the crew, we made our way over dusty jeep trails to remote Steven‟s Camp, at the edge of the High Rock country, in northwestern Nevada.

The next morning, we hiked to Serendipity Shelter for the first time, the site we had all so diligently worked on. We had left our vehicles, as required, at the boundary of the conservation area. As we walked over the rough terrain in the valley below Grassy Rock, I was so excited about the things I was seeing that I very rarely looked up. On the ground lay thousands of obsidian cobbles (a rare economy in the northern Plains, where my home is), hundreds of pieces of flaked obsidian, and chert artifacts. After staring at countless pieces of debitage in the lab for over three years this was a great thrill for me. Before I knew it, we were hiking up the southern end of a large rocky outcrop in the middle of nowhere. Still slightly disoriented I asked Amber where we were. She said that this was it, this was Serendipity Shelter! Flabbergasted, I looked up, finally connecting everything I had seen in the lab to this one spot. I could see miles around me in every direction, undisturbed by buildings, power lines, or highways. It was almost a moment of nirvana.

After the feelings subsided I explored the area. Things began to make sense, things I had often wondered about in the lab, such as the puzzling variety of material types. In the lab occasionally I would come across pieces of chert that seemed to blend together two different material types. Each material had a named category but sometimes you would come across a “maybe” (it could have easily gone into either category). I had wondered how these stone materials would look in the wild. Out here they flowed into one another, or appeared intermittently in certain areas. Though this would seem small to most people, it was astounding to me. By the end of the day, after I had finally come off my adrenaline high, I had a great sense of understanding of what I was working on. I also felt great appreciation for all the work that everyone had put into this project and for the many hours my friends and I had spent in that lab with all that G4 and G5[x] material!

Serendipity Shelter Thoughts, by Katie T. Amundson

The impact that I experienced when I visited Serendipity Shelter in July of 2007 was an enormous one. Working in the lab at UND, sorting debris was just the tip of the iceberg for me. I felt as though I had learned a lot about the area just by being in the controlled environment of the lab, but what I learned by having the privilege of going to the site was much more profound. Working with the materials previously was a great introduction to the area and what to look for, but it did not give me any real idea of what to expect. Working with Dr. Leach and examining the contents of the site created a whole new understanding and respect for Serendipity Shelter and the people who had lived there.

The excitement that loomed as we were first entering the area was intense. What we had worked so hard for in the lab was now paying off ten-fold. We entered the area from two different directions on two different days and each was an experience of its own. The first day was a bit more physical as we hiked some hills to get to the rockshelter. Day one was intriguing because it was our first look at Serendipity Shelter. It was breathtaking to see the many pictographs that were present, a potential hearth, and the knowledge that thousands of years ago people were here who left a story for us to decode. All of that was put into perspective as we started doing a survey where we found stone tools, arrowheads, and chipping debris scattered in the area, and many artifacts that had eroded from the shelter down the hillslope (Figure 8).

Figure 8. The 2007 Serendipity Shelter crew surveys the apron of the shelter (Photo by Amber Summers).

Day two included a larger survey of the north end of Grassy Rock. There was a large quarry area filled with boulders and cobbles of many different shapes and sizes; several in various stages of reduction. Here, I found the biggest connection between Serendipity Shelter and my lab work back at UND. In this huge rock bed, we found that pieces of debris that we had segregated in the lab actually could have come from the same core.

It was amazing to walk along and find piece after piece screaming out "here I am, find me, connect the dots and understand!" We found stage 3 and 4 bifaces[xi], complete arrowheads, and large obsidian cores. We had identified seven different color varieties of obsidian in the lab and we found the source for two of those varieties here! On the ledge above the shelter we found at least two sources and qualities of chert: grainy nodules and large, well-used veins of glassy material.

In just the small amount of time that we spent there I learned so much, and grew as an archaeologist. There is nothing like actually being on site. I was able to put my education to use and tie together what I had learned from working in the lab. Field research is so important for students. *As anthropologists we have the privilege of having the ability to do things hands-on in the lab, but in the field we see and also touch history, making connections along the way.* Experiences like these become your life; you are connected to that past in ways that others might not understand because they have not had the experience.

Surveying Serendipity Shelter, by Amber Summers

During the course of my college education in anthropology at UND, some of my most significant experiences were in Dr. Leach"s archaeology lab. In my four years of experience with her, I had the opportunity to work on an archaeological project spanning several different phases, from initial artifact sorting and cataloging to the final analyses. Throughout my years in the lab, we worked with materials brought back from test units excavated by Dr. Leach and another UND student in 1998. After the initial sorting of all excavated materials, the majority of my work involved the lithic artifacts.

The fact that people at this site had been producing and maintaining lithic tools is evident from the abundance of lithic material in our collection. There are many research questions that can be asked and answered from the data gathered from our lithic collection. We sorted the chipped stone flaking debris by material type and possible core association so that we might learn more about where these people were procuring their raw materials. The sorting of debitage showed us that tools were being made from different types of obsidian, many varieties of chert, as well as chalcedony and other types of silicates.

When I had the opportunity to join Dr. Leach and some of my fellow students on a field survey in and around Serendipity Shelter, I was thrilled. I am convinced that fieldwork is a necessity during the course of an anthropological education. While the lab work was fascinating and an invaluable learning experience, the bigger picture didn‟t come together for me until we were out in the field.

On our very first day as we were hiking up to the shelter, we started seeing lithic scatters. As we approached the shelter, the artifacts became more and more numerous until I felt as if I didn‟t know where to put my next step for fear of crushing something. I realized that while the weights and counts in our catalogues should have given me an idea of how rich the site was, I really had no idea that there would be so many lithic artifacts. People had been here for a long time, and had worked many, many tools. *Instead of the theoretical idea of prehistoric life, I finally had a sense that someone had actually been here!*

Over the next few days we surveyed the areas surrounding the shelter and found the quarries from which they were gathering many of the raw material types we had classified in the lab. It was interesting to see how most of the materials were localized near the shelter. On top of the shelter there were large, worked veins of an opaque orange chert running through the rhyolite massif. This high quality material was heavily represented in the artifacts back at the lab. I really didn‟t know what prehistoric quarries would look like. There were thick veins of chert running through the ceiling of the shelter, cobble upon cobble of raw obsidian baked into the earth, and fields of small chert boulders. It was quickly becoming obvious to me why this had been a place to which people had returned for thousands of years. I was seeing that the debitage and tools I had classified in the lab as having come from two different source cores were actually swirled together in one large parent rock.

Throughout the field days, new research questions began to pop into my head along with ideas for new analyses of the data we had back in the lab. With additional research we can gain a better understanding of stone tool technologies, as well as trade, migration and settlement patterns. In the future, I truly hope for the opportunity to continue to return to the shelter and be involved in further research.

Once Again to Serendipity Shelter

Again, in 2010, we were given the opportunity to return and complete the testing of the apron and interior deposits of the shelter (Figures 9 and 10). Dr. Kathryn Ataman, archaeologist for the Black Rock Field Office in charge of cultural resource projects in the conservation area, generously increased our cooperative agreement to allow a final phase of limited excavation, the field support of a UND geoarchaeologist (Dr. Richard Josephs), collection and transport of materials back to the UND archaeology lab, additional obsidian hydration dating and sourcing, and preparation of the collection for final curation.

This final phase of test excavations allowed us, once again, to expand our mission of teaching and learning, with both students and the community, at Serendipity. With our largest crew yet, and the excellent labor, humor and wisdom provided by 14 Surprise Valley community volunteers, students, staff and interns from a number of agencies[xii], we were able to complete three more test units, train students in basic field techniques, collect some geomorphological data, and provide another community presence for public archaeology in the High Rock and Surprise Valley regions of northwestern Nevada.

Figure 9. 2010 Volunteers Alison Harvey and David Loera from the Nevada Site Stewardship Program, now under the helm of the Nevada State Historic Preservation Office.

Figure 10. Exhausted volunteers rest in the cool of the shelter, before packing out collections and equipment to the distant trucks (Photo by Alison Harvey).

That this final phase of work was again completed in the context of a long-term research program in the High Rock country, with a mandate to explore the effects of previously unrestricted access to an unprotected rockshelter, made the public education aspect all the more important. All of our volunteers, students and interns are deeply committed to preservation, and many of them plan careers in education. I have no doubt that having worked on an endangered archaeological site will someday impact both their own teaching and the learning of their students as they relate from their own rich experience the critical importance of archaeological site stewardship.

WHAT WE HAVE LEARNED... AND HAVE YET TO LEARN

Over more than a decade, the archaeological work at Serendipity Shelter provided for the training of well over 150 students and community members (from six states and three countries) in archaeological field and laboratory methods. These amateur archaeologists were able to put into practice analytical methods for prehistoric chipped and ground stone tools, ceramics, shell ornaments, and faunal remains. And they were able to observe meaningful context and significant symbolic rock art in a place of antiquity. My students were asked to analyze, write, and think critically, and to move from projectile points to people as they attempted to answer big questions about ancient foraging strategies, technological traditions, chronological and typological problems, and long-term social interactions in the High Rock country.

Sadly, the floor of the shelter has now been scoured almost clean by looters. Still, if excavation can continue on the apron and the slope leading up to the shelter, much remains to be learned at this remarkable place. Despite the vandalism of this once-pristine rockshelter, some important details of the Archaic lifeway have been illuminated by its study.

While we have no radiocarbon dates from these disturbed deposits, our time markers suggest repeated occupations, however brief, spanning some 6,000-7,000 years. Projectile points at Serendipity Shelter were both transported and produced here throughout the entire Archaic period (6,500-100 years BP), and possibly even from the Paleoarchaic (prior to 6,500 BP)[xiii]. And several possible Shoshone Brownware ceramic sherds suggest more recent occupation during ethnographic times.

Most organic remains in the shelter‟s apron deposits have long-since decayed, but there is a plethora of animal bone that preserves culinary, dietary, ecological, paleoenvironmental, and taphonomic information. Those who lingered at Serendipity Shelter left behind a rich record of their food processing and focused dietary preferences. Dense clusters of seed grinding equipment, pottery, flake tools, and burned animal bone suggest that occupants prepared and consumed food on-site. Thousands of whole and fragmentary small mammal bones were recovered here, many of which reveal evidence of having been charred or intensely burned during roasting (Hamlin 2008:3). Identified taxa include various species of ground squirrel, cottontail, jackrabbit, marmot[xiv], kangaroo rat, chipmunk, pocket mouse, pocket gopher, vole, woodrat, mouse, weasel, badger, and skunk species that would have been trapped and/or netted in the immediate environs of the shelter, suggesting short-term visits, rather than intensive residential stays. Larger mammals are quite rare in the faunal assemblage, and include bobcat, cougar, coyote, fox, and elk (the latter mammal known from ethnographic ranges in Oregon (Fowler 1986:80), but not from northwest Nevada [Hamlin 2008:64-67, 72]). The processing and consumption of high-ranked deer, antelope, and bighorn sheep, while available within a very few kilometers, surprisingly does not show up in this faunal record and must have taken place elsewhere or at occupation times not represented at the shelter.

The abundant scatters of chipped stone flaking debris, cores and bifaces indicate both early and late stage reduction of raw material, intensive tool manufacturing, and rejuvenation. The abundance of raw materials suitable for the production of stone tools near the shelter would have been a significant draw to mobile foragers. The copious quantities of lithic debitage, cores and flake tools testify to the perceived value of these nearby toolstone sources (particularly the easily-accessible obsidian cobble fields and chert veins)[xv]. Geochemical sourcing profiles of some flake tools, bifaces, and projectile points from these deposits suggest preferential selection of these local materials for flake tools and bifaces, while projectile points show a greater range of more distant sources (Leach 2008, 2011).

Grassy Rock served as a critical focal point along travel and trade routes, and those who stopped here left clues about prehistoric regional economic and social interactions and affiliations. Energy dispersive x-ray fluorescence analysis of 20 obsidian projectile points conducted by Richard Hughes (2006)[xvi] revealed obsidian source origins as far as eastern California and southern Oregon. Rare shell beads (implying trade with California coastal populations), ceramic vessels (revealing possible ethnic ascription and/or affiliation with traditions elsewhere in the Great Basin), and pictograph motifs (reflecting stylistic/ethnic affinity with rock art in other regions) are particularly informative. These and other finds require more nuanced humanistic interpretations. Recovered beads of shell, bone and ground stone might have been the personal effects of people who displayed individual style, or were engaged in age or status-related ceremony. The rare pictographic symbols offer an opportunity to examine ideological context and meaning. Was this a place of ceremonial social aggregation, a place of shamanic activity, a place of power and critical social identity, or something else (Leach and Barker 2010)? Although it will be difficult to temporally assign the rock art to particular occupations or activities, we can explore multiple meanings of the art.

In the last several decades, exciting perspectives have emerged in rock art research that look holistically and contextually at prehistoric images (e.g., Cannon and Woody 1996; Quinlan and Woody 2003; Ricks 1999; Ritter 1994; Whitley 1998; Woody 1997). Such studies look beyond traditional explanations to consider other meanings and contexts: ritual and social significance, chronological variation, functional variation, complex spatial distribution, residential associations, and landscape patterning. When considered in a regional and theoretical framework, the Serendipity Shelter rock art might inform us in ways that the material record cannot.

Rock art researchers in the Great Basin have demonstrated that rock art frequently co-occurs with gender-related milling assemblages and important root crop habitats (Cannon and Woody 1996; Quinlan and Woody 2003; Ricks 1996:58, 1999). This important observation places Serendipity Shelter, with its abundant ground stone tools and art, in a position potentially to yield information about the connection between women"s activities in the adjacent root-rich stony flats and ritual behavior, among its many other functions. Flake tools and pointed drills in the assemblage might have been used for other gendered processing tasks involving hides, textiles, or woodworking. Indeed, the variable geochemical profiles of flake tools (*if* produced more often by women) and projectiles (*if* produced more often by men) might reveal gendered decision-making, selection, and use of raw materials on a daily basis (Leach 2008).

Thus, the significance of Serendipity Shelter can be measured both in terms of its research potential and its unique heritage and cultural values. The site represents only one element in a much larger cultural system, and as such, requires consideration in a regional context of related settlements, resource zones, landscapes and contemporary populations. A number of important research questions relating to mobility, gender roles in lithic and art production, technology, site function, culture history, social organization and networks of interactions, chronology, subsistence, paleoenvironments, and cosmology potentially can be addressed by further study at Serendipity Shelter.

Finally, a critical component of any future work will certainly involve more public archaeology, as we join with the BLM to raise awareness about cultural resource preservation and site stewardship in the conservation area. Still, this will be a two-way street, a multi-faceted learning experience and conversation between archaeology and the community of learners participating together to write the story of Serendipity Shelter. Serendipity Shelter continues to offer unexpected discoveries. There are richer rock-shelters – deeper, more complex, and perhaps even more significant. But this place has been so central to our learning that we have a notion we will be pursuing questions here for a long time.

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NOTES

[i] Serendity, Serendipitous: defined as "good luck in making unexpected and fortunate discoveries" (Thinkmap Visual Thesaurus, Inc. 2013).

[ii] Garth Portillo, then Bureau of Land Management Surprise Resource Area Archaeologist, Karen Lange and Michael Rourke, then BLM archaeological interns, and Melinda Leach, then a BLM Temporary Archaeologist and UCLA doctoral student. Portillo went on to become Utah State Office Deputy Preservation Officer. Lange is now a journalist who has published a children‟s book on the archaeology of Jamestown and has worked as a staff writer at *National Geographic Magazine* and the Humane Society of the US. Leach is a professor of anthropology at the University of North Dakota.

[iii] By the 1980s, looting was a critical concern nationwide, with over 50 percent of all public and private sites showing signs of vandalism (Jameson 2004:39).

[iv] The National Register of Historic Places is the official federal list of cultural resources deemed worthy of protection and preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources (USDI-NPS 2011).

[v] For example, black-tailed jackrabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus nuttallii*), marmot (*Marmota flaviventris*), Great Basin pocket mouse (*Perognathus parvus*), golden-mantled ground squirrel (*Spermophilus lateralis*), Belding‟s ground squirrel (*Spermophilus beldingi*), Townsend‟s ground squirrel (*Spermophilus townsendii*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Eutamias minimus*), and sagebrush vole (*Lagurus curtatus*), among others (Fowler 1986).

[vi] Surveys and excavations in the Black Rock/High Rock Country to the east (e.g., Jones et. al 2003; Layton 1972; Smith 2010; Smith and Kielhofer 2011) and the Massacre Lakes area to the northwest (Leach 1988; Raven 1981; Ritter 1966) have produced time markers and obsidian hydration records that span the entire occupation sequence known for the northwestern Great Basin, beginning in the terminal Pleistocene and early Holocene.

[vii] Eric Ritter (2002) conducted a 1995 field study and petroglyph recording visit, Mary Ricks (1998) included a stop at the shelter during a larger rock art reconnaissance of the Massacre Lake Basin and environs, and the Nevada Rock Art Foundation later documented the panels in 2007.

[viii] See, for example, the National Historic Preservation Act of 1971, the Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979.

[ix] Franz is now a novelist, poet and free-lance journalist in New Mexico.

[x] All excavated material was size graded through graduated mesh screens ranging from Grade 1 (G1) 25.0 mm mesh to Grade 5 (G5) 1.2 mm mesh. G4 and G5 artifacts are very small, indeed!

[xi] In the lab, all bifaces were categorized according to five potential reduction stages, from blank through primary and secondary thinning to finished product (*sensu* Callahan 1979).

[xii] Including UND and UC Berkeley, the BLM-Black Rock Field Office, the BLM-Surprise Field Office, the British Trust for Conservation, the Chicago Botanic Garden, the Nevada State Historic Preservation Office Site Stewardship Program, the Nevada Outdoor School, and the Great Basin Institute.

[xiii] Based on chronological sequences for the region reported in Leach (2007:3), projectile points recovered from shelter deposits can be attributed to the Early Archaic (6,500-3,000 years BP; Large Side-notched and Gatecliff series projectile points); the Middle Archaic (3,000-1,500 years BP; Elko series and Humboldt series projectile points); and the Late Archaic (1,500-100 years BP; Desert and Rosegate series projectile points). The retrieval of several possible Great Basin Stemmed points might extend the chronological reach of the shelter into Paleoarchaic times.

[xiv] These four species comprise over 76 percent of the total faunal assemblage (Hamlin 2008:64).

[xv] Chalcedonies and basalts are available in the Grassy Rock vicinity and the region at large, while various cryptocrystalline silicates can be found to the east

in Little High Rock Canyon and, more distantly, (over 60 km) to the southwest in the Tuledad Creek region (Lynn Nardella, personal communication 2001).

[xvi] Director, Geochemical Research Laboratory.

Call for Papers: Volume 27 of the Nevada Archaeologist

The Nevada Archaeological Association is currently soliciting manuscripts for Volume 27 (2014) of the *Nevada Archaeologist*. The *Nevada Archaeologist* is an ideal, peer-reviewed venue through which professional and avocational archaeologists and students can present the results of their work. The deadline for submissions is **July 31st, 2014** and submissions must adhere to the following guidelines:

1. Papers should be ~6,000 words or less, excluding references cited and figure/table text;

2. Papers must focus on archaeological research in Nevada and/or neighboring parts of the Great Basin;

   and

3. Papers must adhere to the Society for American Archaeology‟s (SAA) Style Guide, which can be downloaded for free at www.saa.org/ publications/StyleGuide/styFrame.html.

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