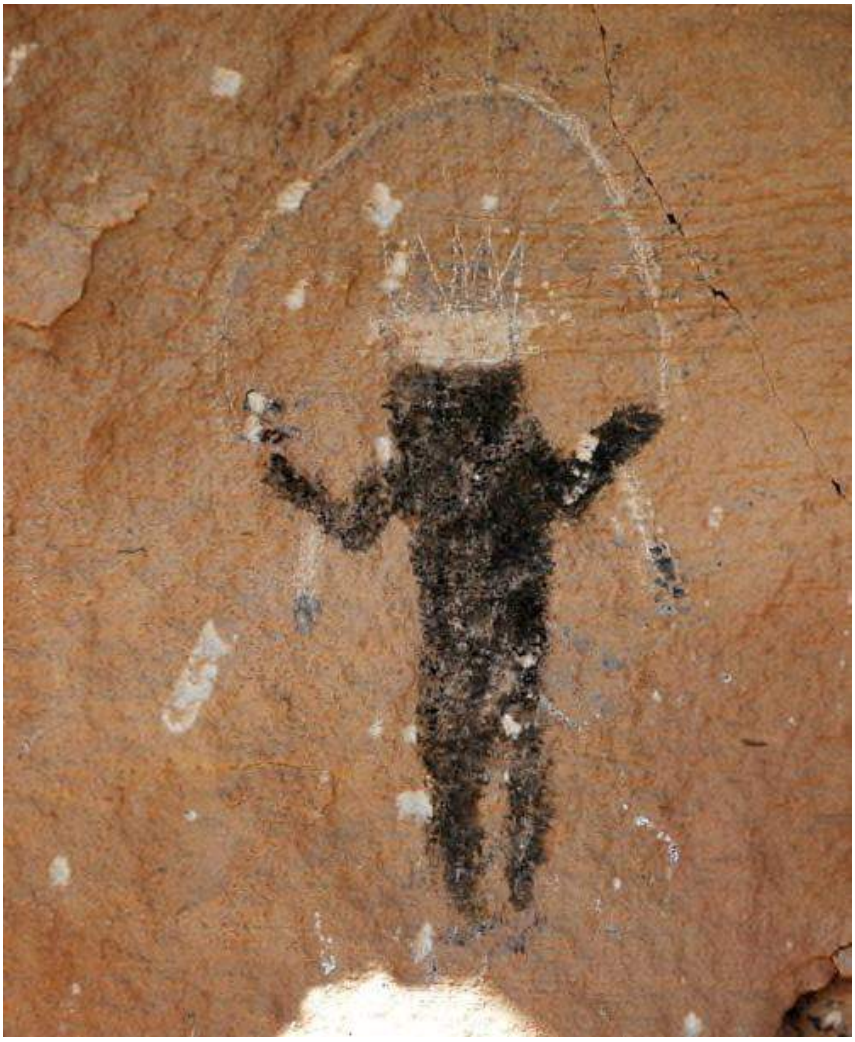
UTAH ROCK ART

VOLUME XXIV



Papers Presented at the Twenty-Fourth Annual Symposium of the Utah Rock Art Research Association
Kanab, Utah October 2004

Edited by Carol B. Patterson

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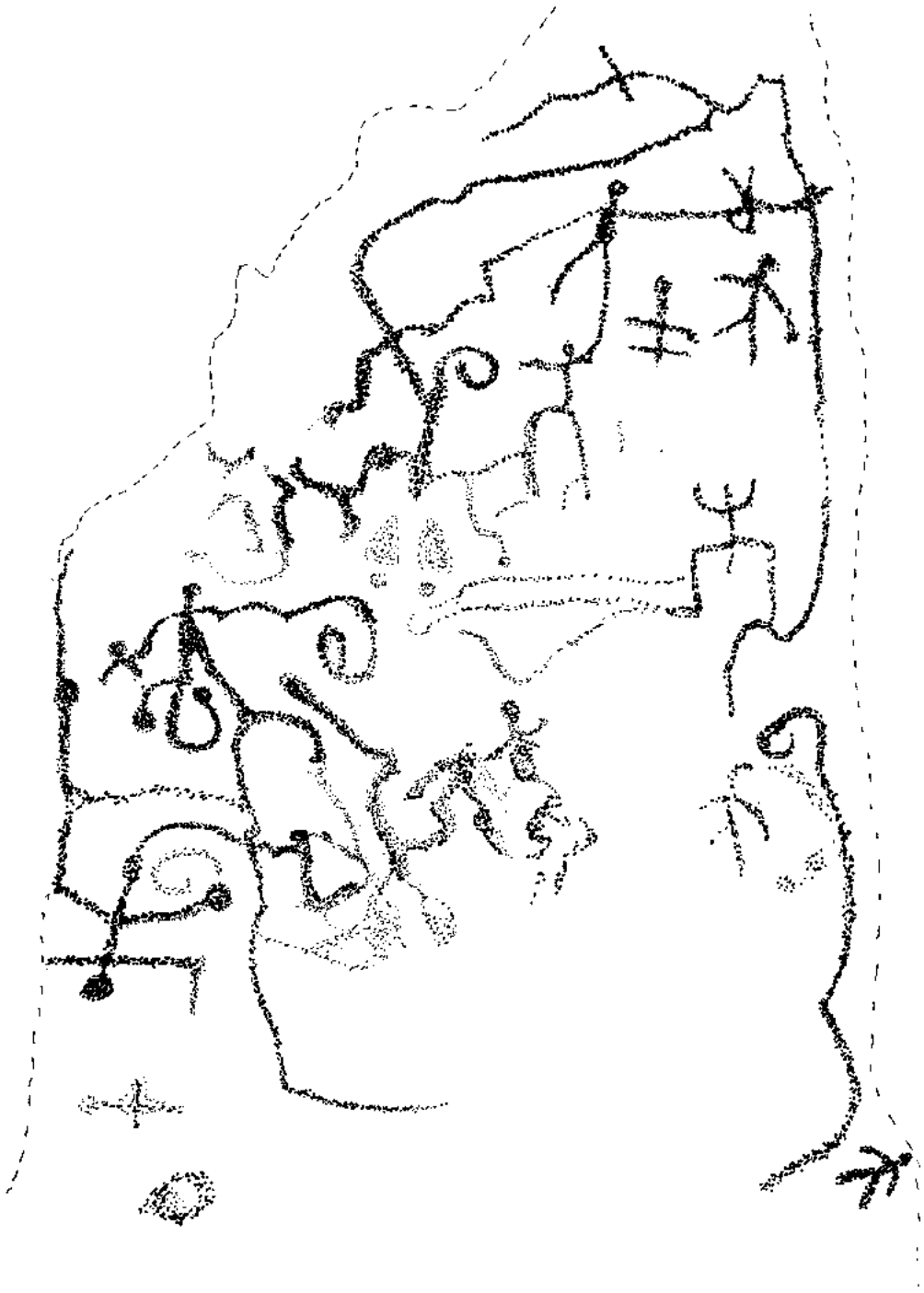

Cottonwood Site, Nucla, Colorado – Carol Patterson

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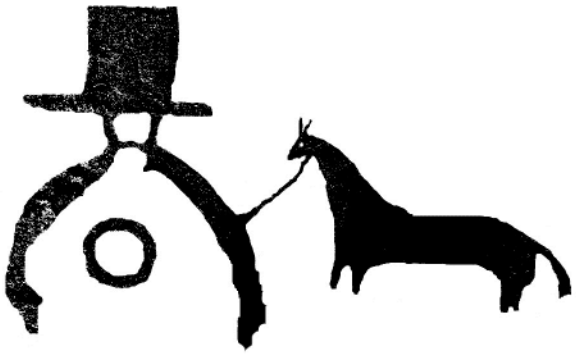


Harris Site – Carol Patterson

Alan Watchman, Carol Patterson and Ann McNichol

DATING BCS ROCK ART AT THE GREAT GALLERY, CANYONLANDS, UTAH

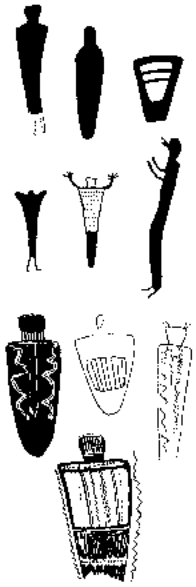
ABSTRACT

Dark red paint on a fallen block of sandstone at the Great Gallery site was sampled and dated. This test of the age of the Barrier Canyon Style of rock painting is part of a preliminary analysis of the antiquity of the style. Arising from this study are questions concerning the probable subcategories within the broad style because age estimates for various motifs range from Early Archaic to the Late Basketmaker periods. This paper describes the analysis of the paint and rock, and the steps necessary to remove contaminants prior to determining the age of the paint.

PURPOSE

The purpose of this study was to use AMS radiocarbon techniques to determine the age of the painting on a section of paint from a fallen rock at the Great Gallery panel of Barrier Canyon Style rock art in Horseshoe Canyon. The hope was to obtain a reliable date for the painting of this section of panel, using only small chips of paint and not the underlying sandstone.

Polly Schaafsma (1971) classified the Great Gallery paintings as belonging to the Barrier Canyon Style, circa 1000- 8000 BP. The dominant motifs at this site are large, life-size, tapering anthropomorphic forms lacking appendages and facial features, and all of upright orientation. The figures at the Great Gallery appear front or back-facing, but without eyes and noses, and are in static poses. They range in size from approximately 1.7m to 1.1 m in height with the exception being the "Holy Ghost" figure, which measures 2.13m. All figures were painted at least 2m above a rock platform which is much higher than the bottom of the canyon. The torsos of the large figures generally taper towards the ground whereas they are of uniform width in most of the smaller figures. This is consistent with the general variation of torso tapering seen in this style, which elsewhere ranges from long, thin tapers to broader triangular forms. None of the larger figures at the Great Gallery has arms or legs.



The figures vary considerably in decoration. Most figures are in solid red paint, the typical color of the style, but white and black are used for details. Intricate lines, stripes and zigzags are painted in the torsos, which are completely filled with red paint or divided into horizontal belts of vertical and horizontal red lines (broad belts), patterns or enclose other motifs (Figure 1).

Figure 1 *Various BCS figures.(drawings after P. Schaafsma 1971).*

Two dog-like animals have been painted on the chest of one figure above a series of red vertical lines and double zigzag lines (Figure 2).

***Figure 2**. Great Gallery anthropomorphic figures. (photo by C. Patterson)*

Another figure has two small, decorated anthropomorphic shapes within the central part of the torso (Figure 3). White dots, facial lines and linear markings are on some torsos. Vertical black bars have been painted on the chest of one of the larger figures. Incised zigzag lines are also observed in several of the large figures.

***Figure 3**. Close up on anthropomorph with smaller figures inside torso.(Photo by C. Patterson).*

In the general style the heads of the large figures vary considerably including round, rectangular, wedge-shape, elongate, and oval shapes. Facial features are usually restricted to round eyes, "bug-eyes" or "goggle-eyes", as in the largest figure of the "Holy Ghost" group of paintings. Heads are either plain or decorated. The decorations range from double line antenna-like projections at either side of the top of the head, straight lines either horizontal, vertical or a combination of both in red or white, or bichrome. Some heads have what appear to be crowns made up of rows of dots or horizontal bands.

Permission was not obtained to remove in situ pigments from any pictograph or pictograph mural. Samples for dating could only be taken from spall and mural fragments that through natural attrition have fallen away from murals and were not located on discrete artifacts. Therefore to investigate the age of the rock painting of the Barrier Canyon Style at the Great Gallery the paint on a fallen slab at the floor of the panel was selected (Figures 4 and 5). Small sections of painted rock were removed under permit (#CANY-2002-SCI-0025).

***Figure 4**. The probable original location of the fallen slab.(photo by C. Patterson).*

FIELD METHODS

The Great Gallery site was visited three times in order to obtain sufficient paint material for dating from a fallen slab of painted rock measuring 40 x 20 cm (Figure 5). The paint came from a figure, which was on a portion of the rock face with other paintings, but it had collapsed in a major rock fall. The shape and size of the figure is unknown, but given the size of the piece of painted rock the painting would have been large, possibly as large as the other large anthropomorphic figures on the same rock

face. The remnant painting clearly shows a band or belt of unpainted rock divided by thin red lines, and surrounded by red paint. The monochrome red painting is consistent with other figures nearby as other figures on the panel have broad bands of stripes, both vertical and horizontal. White paint does not seem to have been used to outline or highlight any part of the fallen section of painting.

Figure 5. *Photograph showing the painted surface of the fallen slab of rock, Great Gallery, Horseshoe Canyon (scale bar is 10cm long). (Photo by C. Patterson).*

The painted sections of rock were removed and wrapped in aluminum foil before laboratory examination and preparation for dating. Photographs were taken of the fallen block in the field and details were also noted of the nature of the paint and surface conditions of the paint on the fallen block and of the remaining paintings on the wall of the cliff.

ANALYTICAL METHODS

Mineralogical analyses were carried out on the paint sample to determine the inorganic composition of the paint. The non-destructive micro-analytical method chosen was the General Area Detector Diffraction System (GADDS), manufactured by Bruker AXS. Equipment used for this analysis is located at the Advanced Analytical Centre, James Cook University, Townsville, Australia.

The configuration of the equipment is an X-ray tube (copper target) and associated generator, a motorized specimen stage with movement in the XYZ directions mounted on a goniometer system, a Bruker-AXS HI-STAR^{TM} area detector and a laser alignment system. A spot size for the X-ray beam of 800 microns was set using a series of collimators. With guidance from the video system the laser beam is used to illuminate the exact spot on the specimen where the diffraction measurement was obtained. Data acquisition is approximately one minute. The diffracted X-rays are detected by a parabolic series of detectors and the electronic signal arising from the detection is corrected for intensity and spatial aberrations. Integration of the diffraction rings produces a conventional XRD pattern.

The paint sample and rock was mounted onto a backing plate that forms part of the specimen stage using Blu Tac^{TM}. The laser was used to align the specimen stage to analyze the desired part of the red paint. X-ray data were collected over 60 seconds at selected locations on the artifact. The corrected diffraction pattern was then automatically examined for identifying peaks and mineralogical identifications were undertaken using a computerized search-match routine.

The presence of hydrocarbons in the paint and rock were tested using combustion and gas chromatography. Carbon, hydrogen and nitrogen analyses were made using a Carlo Erba 1106 automatic analyzer. Gas chromatography - mass spectrometry was performed on a Hewlett Packard G1800A GCD series gas chromatograph with EI detector and controlled by an HP GC Top program installed on a Digital 5100 Pentium computer. An HP5 crosslinked phenylmethyl silicone of dimensions 30 m (L) x 0.25 mm (ID) x 25 µm film thickness was selected as the column. The carrier gas was high purity helium, travelling at an average linear velocity of 48 cms^{-1}. An injector temperature of 250˚C and detector temperature of 280˚C were

used. The column oven had the following temperature program: initial temperature of 50˚C (held 5 min), ramped at 5˚C/ min, final temperature of 200˚C (held 5 min). Injection volumes of 1.0 µL were used, with splitless injection.

Dichloromethane was fractionally distilled before use and stored in a sealed, dark brown glass bottle. Flash liquid chromatography was performed on silica gel using Merck Kieselgel 60 (230-400 mesh ASTM). Concentration of solutions was performed using a Buchi rotary evaporator under vacuum supplied by a water aspirator. GCMS solutions were concentrated and contained in Pierce 1 mL Reactivials, sealed with PTFE-faced septa. Vials were cleaned in Aqua Regia, rinsed with distilled water, dried in an oven, then rinsed with distilled dichloromethane before use.

GCMS data was obtained for dichloromethane solutions of the standards of Shell kerosene, Caltex regular unleaded petrol, Glendale mineral turpentine and commercial dodecane. Each solution had a solute concentration of 1.0 µL per mL.

Finely divided samples of paint and/or rock were prepared for analysis by the following general method. All glassware was thoroughly cleaned, rinsed with distilled water, dried in an oven at 135˚C, then rinsed with dichloromethane before use to minimize the possibility of introducing adventitious hydrocarbons. The sample (10 mg - 2 g) was weighed into a pear-shaped flask and covered with distilled dichloro-methane (5 - 10 mL, depending upon the mass of the sample). The suspension was mixed thoroughly by drawing up into and squirting back out of a glass Pasteur pipette for about 1 minute in order to extract alkanes. A short column (2 - 3 cm) of silica gel was prepared in a disposable Pasteur pipette, using a small wad of cotton wool to hold the stationary phase in place. The column was rinsed thoroughly with distilled dichloromethane prior to filtering the extract suspension down it, with the aid of further dichloromethane. The filtrate was reduced to 400 - 500 µL on the rotary evaporator in a pear-shaped flask, then transferred to a 1 mL Reactivial. The volume was reduced further on the rotary evaporator to approximately 20 µL by placing the vial inside a Quickfit test tube. Care was taken to avoid the use of grease on any of the ground glass joints close to the solution. The Reactivial was capped with a PTFE-faced septum (prewashed with dichloromethane) and 1 µL of this solution was injected into the GCMS instrument.

TESTING PROCESS

Radiocarbon analyses were carried out using the NOSAMS accelerator mass spectrometer (AMS) at Woods Hole Oceanographic Institute, Massachusetts, and at the Rafter Radiocarbon Laboratory, Lower Hutt, New Zealand. Analysis by AMS requires a sample that is orders of magnitude smaller than that for a conventional radiocarbon analysis (1 mg. vs 5 g). While this greatly increases the scope of radiocarbon studies, it also means that a much smaller amount of contaminant can ruin a sample.

The initial examination and radiocarbon analysis was made on a portion of the paint particles that were scraped from the rock and treated with 80% hydrofluoric acid to remove quartz grains and carbonate, and then 10% hydrochloric acid. The dry residue was hydrated and then 10% potassium hydroxide was added to neutralize the acidified sample. One small flake of cellular material (Figure 6), five short strands of reddish fiber and many small organic particles were observed in the resulting residue (Figure 7). Several short thin fibers, possibly fragments from the brush used to apply the paint to the rock, were observed while the components were in clear liquid suspension.

The test sample of a small portion of paint indicated that the quantity of carbon present in the paint was approximately 3.3 $\mu g/cm^2$ and so to obtain sufficient carbon for a radiocarbon

measurement a much larger surface area of painted rock was needed for dating. This piece, obtained by Dick Reed and Nancy Simon in collaboration with Gary Cox (NPS) measured approximately 100 cm^2 in surface area, with paint occupying about 55 cm^2. Almost the entire paint sample was scraped to ensure that a radiocarbon age determination and a stable carbon isotopic measurement could both be measured. About 1% of the paint was retained on the rock for organic analyses.

At the AMS laboratories the scraped paint powder was considered a small sample and therefore was registered in the 'small sample preparation schedule'. Samples containing between ~120 and 300 μg C are considered small samples, require special handling and are likely to have reduced precision depending on the amount of carbon and its ^{14}C content (or age).

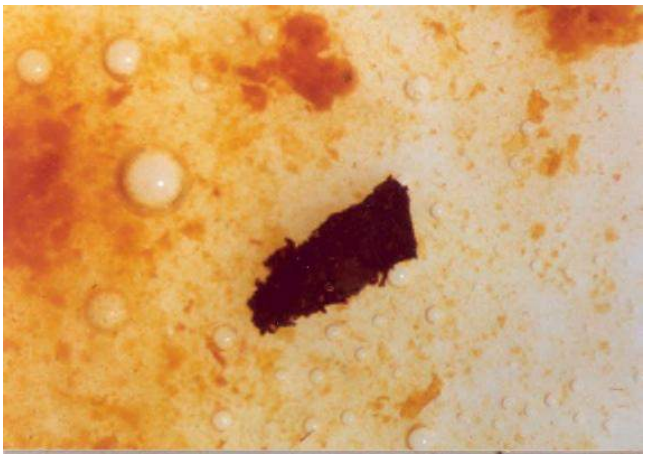


***Figure 6**. A photograph showing one of the relatively large fragments of cellulose-like plant material extracted from the paint on the fallen slab, Great Gallery, Horseshoe Canyon (70X magnified).*

The paint was regarded in a similar manner to the usual plant or wood samples and these undergo an *acid-base-acid* pretreatment procedure to remove any inorganic carbon and certain mobile humic materials before conversion to CO_2.

All materials (such as beakers, syringes, tweezers) used to pre-treat and combust organic carbon samples were rigorously cleaned. Apparatus was washed with Sparkleen soap, rinsed with organic-free distilled water (MilliQ H_2O), rinsed with 10% HCl then given five more rinses with the MilliQ H_2O. All apparatus that can be safely heated was baked in a muffle furnace at 550 degrees C for two hours to remove all traces of organic contamination. Gloves were used during all handling steps.

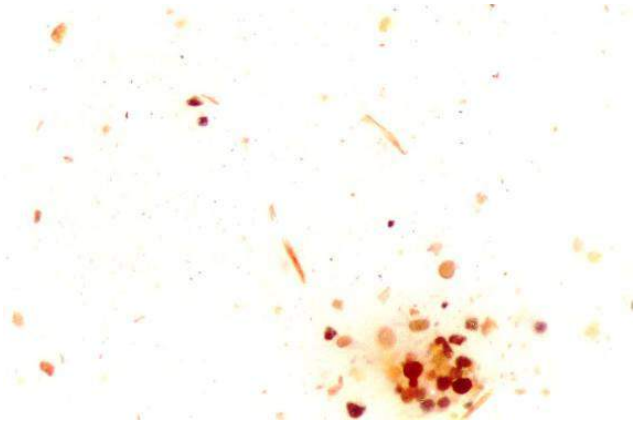


***Figure 7**. Three small fibrous strands presumably from the brush that was used for painting the rock face, Great Gallery, Horseshoe Canyon (90X magnified).*

The chemical pre-treatment to remove inorganic carbonate involved the following procedure and chemical reagents. Five milliliters of 10% organic free hydrochloric acid was added to the paint residue in a cleaned centrifuge tube. It was capped and placed in 60°C shaker-water bath for 3 hours. After centrifuging the acid was decanted using a disposable pipette. This was repeated three times using organic free water to rinse the sample well.

To remove humic substances and alkali soluble materials approximately 20 ml of 2% NaOH was added. The solution was covered and placed in the 60°C water bath for 1 hour. Any brown discoloration was removed by decanting from the base of the tube after centrifugation. The sample was rinsed at least 3 times with organic free water, centrifuged and decanted until the solution remained clear. Another 5-10 ml of 10% organic free hydrochloric acid was added. The tube was capped and placed in the 60°C

water bath for 1 hour. The sample was then poured onto a pre-baked quartz filter (Whatman 4.7 cm QM-A ultrahigh-purity SiO_2 microfiber filter) over a vacuum-pump filtration unit. The filter was rinsed three times with organic free water. The clean sample on the filter was removed from the apparatus with pre-baked tweezers and placed on cleaned aluminum foil. It was left in an oven at 60°C to dry.

Some preliminary work was necessary before combusting the sample. Two grams of cupric oxide was weighed into a quartz combustion tube (Vycor) and this was pre-baked at 850°C in pure oxygen for 5 hrs. The tube and contents were allowed to cool before 100mg of silver powder was added. The dry filter and sample was then rolled into a tube and placed within the prep-prepared combustion tube. The combustion tube was attached to a vacuum line and gently pumped down to a vacuum of less than 5mTorr. A flame was used to seal the Vycor tube containing the components about 2 cm from the vacuum fitting. The sealed tube was then placed in a muffle furnace and combustion was initiated at 850°C for 5 hours to generate the CO_2 (carbon dioxide) sample.

The automated process of converting CO_2 to graphite occurred overnight using a catalytic reduction method at high temperature. A precise and uniform amount of catalyst (Fe) was measured and loaded into a Pyrex graphitization tube. It is then placed on the graphite vacuum-line system and leak-checked. The carbon dioxide from the sample was transferred to the reactor tubes containing the catalyst, and hydrogen (the reducing agent) was added in a proportion of 2.5x the measured amount of CO_2, and an oven heated to 625°C was positioned over the tube.

In order to assess and assure sample quality and consistency, an automated computer program is used to control the operation of valves and the oven temperature, and to log a number of parameters such as temperature and pressure of each graphitization reaction over time into the NOSAMS relational database. Each graphitization process is numbered and tracked in the relational database with an OSG number. Once a sample has been reduced to pure carbon, the graphite-iron catalyst mixture is pressed mechanically to form a solid pellet, which in turn becomes the sputter target for the AMS ion source. The graphite is pressed into aluminum cartridges and mounted in a sample wheel or carousel. Samples are arranged on the carousel and analyzed in a pattern of 5 unknowns to 1 standard and there is at least one process blank included for each type of sample loaded. A similar process was used at the Rafter Laboratory to prepare graphite targets.

The graphite derived from the target of the paint sample was inserted into the cathode of the ion source of the mass spectrometer. After acceleration and removal of electrons, the emerging positive ions were separated and the C-12 and C-13 ions were measured in Faraday Cups where a ratio of their currents was recorded. Simultaneously the C-14 ions were counted in a gas ionization counter so that instantaneous ratios of C-14 to C-13 and C-12 were recorded. These raw signals are ultimately converted to a radiocarbon age.

Although one can simply measure old samples for long times, the targets are constantly being consumed by the ion source, so there are practical limits to the minimum sample activity that can be measured, depending on how much material is present in the target. The present limiting age is ten half-lives, or 55,700 years, set not only by the sample size but also by measurements of the blanks (no C-14). The blanks contain small but measurable amounts of C-14 from contamination introduced during chemical preparation or other handling techniques during sample collection. Organic materials, which require the most processing, are limited to younger ages by their corresponding blanks. Since it is always necessary to subtract the counts due to blanks from the counts due to samples and

standards, it becomes a statistical problem of measuring the differences between small numbers.

The fraction-modern is computed from the expression: Fm = (S - B) / (M - B)

In the equation, B, S and M represent the C-14/C-12 ratios of the blank, the sample and the modern reference, respectively. When the statistical error in the fraction-modern begins to exceed the fraction-modern value itself a limiting age is obtained. Standard practice is to limit reporting ages to fraction-modern, which are at least two standard deviations from the blank, or background levels.

Aside from the normal statistical errors intrinsic to the counting of C-14 events, there are additional statistical errors from the several corrections and adjustments that are necessary for us to arrive at a reportable result. The delta C-13 value is measured, both on the AMS machine and off-line on a stable isotope mass spectrometer for each sample. This is necessary to correct the result for natural fractionation to the customary value of -25 per mil. The correction, which varies between zero and 5%, has its own uncertainty of 0.1%. The added benefit of measuring the delta C-13 online during AMS C-14 measurements is that correction can be made for any machine fractionation effects. The overall AMS system stability contributes about 0.2% and the sample preparation contributes 0.25% to the error. As an example of a typical analysis, consider a case where the counting statistics is 0.35%.

The radiocarbon age is calculated by taking the natural log of the fraction modern (Fm):

Age = -8033 ln (Fm)

The error in the age is given by 8033 times the relative error in the Fm. Therefore a 1% error in fraction-modern leads to an 80-year error in the age. The reported error is the larger of the intrinsic counting statistics or the total error as measured by the standard deviation among the several measurements made on each sample.

RESULTS

Mineralogy

The X-ray diffraction analysis using the GADDS revealed a rock mineralogy consisting of quartz (SiO_2), mica ($KAl_3Si_3O_{10}(OH)_2$), rutile (TiO_2), diaspore ($AlO(OH)$), and ankerite ($Ca(Fe,Mg)(CO_3)_2$). The iron-rich carbonate mineral, ankerite, contains carbon and this is a possible contaminant in the rock which will affect the age of the surface paint unless removed. In addition, a thin calcite ($CaCO_3$) film covers the red painting providing another contaminating component. Both these carbonate minerals can be removed using acid.

The mineralogy of the red paint at the Great Gallery consists of quartz, potassium feldspar ($(K,Na)AlSi_3O_{8)}$, hematite (Fe_2O_3), gypsum ($CaSO_4.2H_2O$), kaolinite ($Al_2Si_2O_5(OH)_4$), and calcite. This analysis confirms the presence of carbonate contamination in the paint itself. The presence of quartz is not surprising considering that the painting was applied to the sandstone rock the primary component of which is quartz. Potassium feldspar may have been added to the paint as a colorless component. Kaolinite, gypsum and potassium feldspar could have been used as 'fillers' to increase the bulk of the paint without changing the color. Adding these components, while not affecting the color (they are colorless or white), increases the bulk of the paint material and therefore extends the area that the paint covers. The colorant is hematite, the only red mineral in the paint.

Calcite may also have been used as a 'filler' or an extender to enable the spreading of a small quantity of colorant across a large painted area, but carbonate was also observed as a matrix component in the rock and as a thin film over the painting. Whether a rock component or fill-

er, it has the disadvantage of providing carbon to the paint unless it is removed. The chemical pre-treatment of the sample using acid ensures that this form of contamination is eliminated prior to combustion of the paint.

Hydrocarbons

Chaffee et. al (1994) reported the presence of hydrocarbons in their samples of rock from this site, and they inferred that kerosene or some other chemical had been thrown over the paintings to improve the photogenic qualities of the paintings. It was therefore necessary to test the paint on the fallen slab for the presence of contaminating hydrocarbons. This was done using combustion and gas chromatography (Figure 8).

Kerosene

Paint - kerosene deliberately added

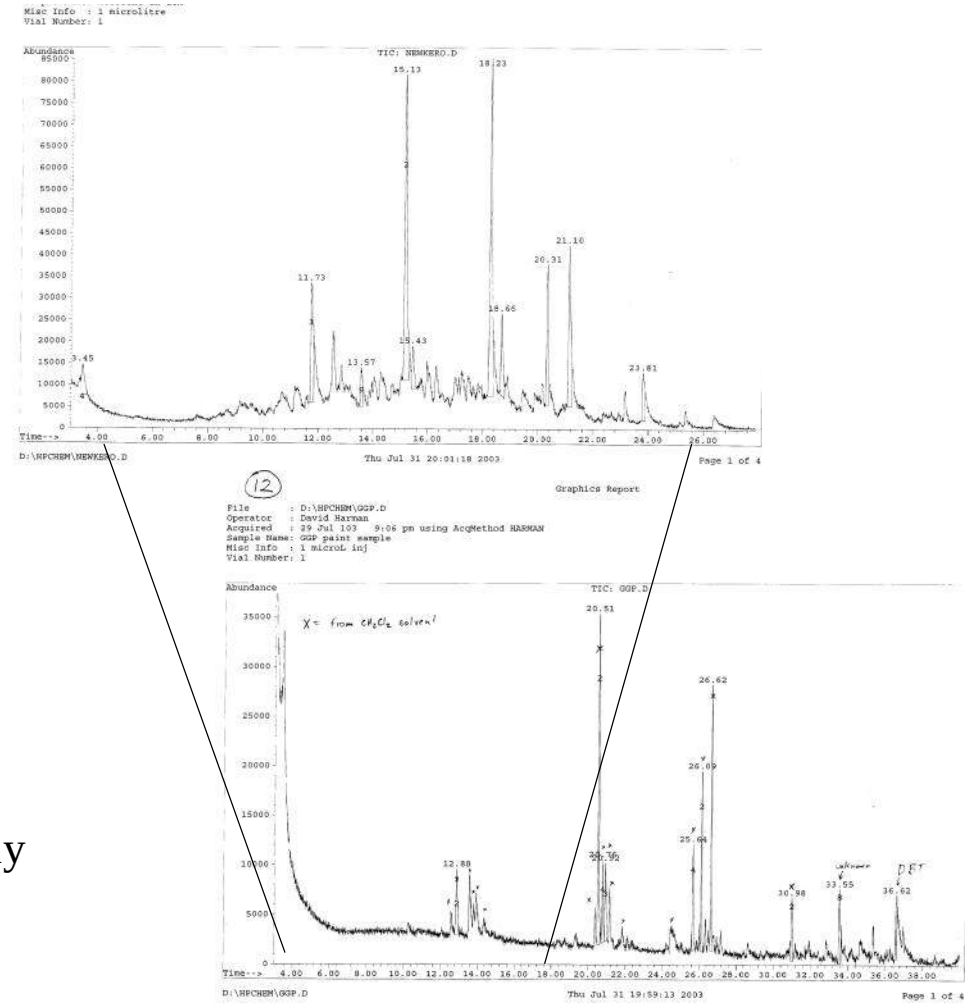


Figure 8 *Chromatograms from a sample of paint that had been deliberately contaminated with kerosene.*

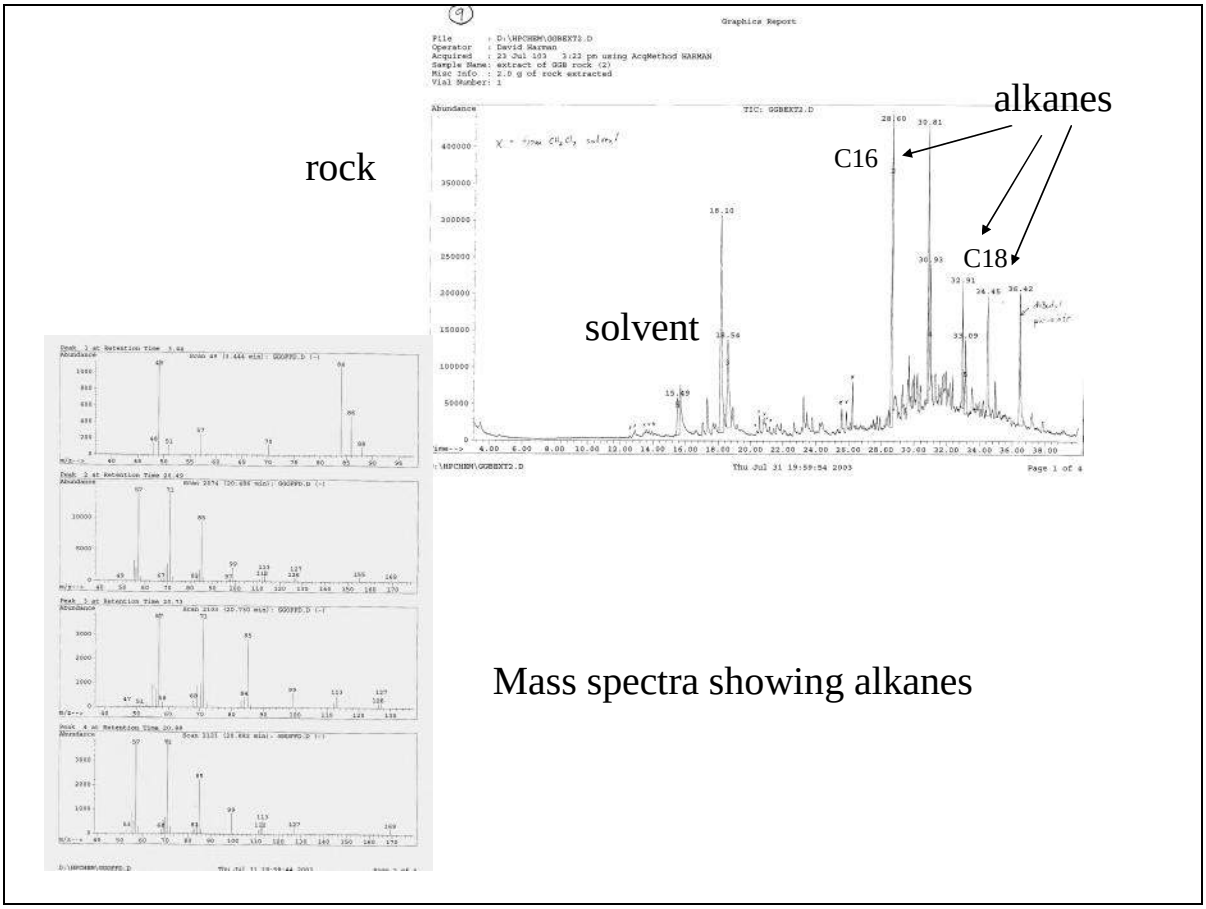


Figure 9 *Chromatograms and mass spectra showing the presence of trace levels of alkanes in the rock at the Great Gallery site.*

Generally, the total volume of alkanes in the paint/rock samples varied from 0.65 - 2 nL per gram of sample. In other words, if 0.1% of the sample mass was carbon from paint, then the mass of carbon present in the whole sample as hydrocarbon would be in the order of one millionth that of the carbon in the paint. Therefore, initial indications are that the amount of carbon present in the form of alkanes in the Great Gallery paint is insignificant in terms of affecting AMS ^{14}C age determinations (Figure 9).

While no alkanes were found in the Great Gallery red paint several unidentified non-alkane peaks were found. These are presumably traces of the original organic material present when the paint was originally prepared.

The AMS ^{14}C age determinations are listed in Table 1 below. Comparison is also made with published results obtained by Chaffee et al (1994) and with those reported by Dr Marvin Rowe to Nancy Coulam (unpublished letter 3 March 1993). The previous results indicated that the rock contained dateable carbon and that the paint they sampled was likely affected by hydrocarbons.

The rock sample under the paint contained carbonate and when this was dated using acid to generate carbon dioxide an age for the carbonate was 8160 ± 270 years BP (-26.0‰). When the rock was deliberately treated with hydrocarbons and reanalyzed an age was measured of 24,600 ± 280 years BP (OS-43387; -26.4‰).

An untreated (no acid used to remove carbonate) paint sample gave a misleading young age of 1040 ± 40 years BP (-9.10 ‰). The best approximation to the age of the Great Gallery paint sample was determined from the acid treatment of the paint, followed by combustion of the residue. The age of the carbonate (Fe-rich dolomite) filler in the paint obtained from acid hydrolysis was 8370 ± 190 years BP (-16.5‰). This chemical attack left residual paint, quartz and acid insoluble organic matter. When this carbonate-free residue was combusted in the two dating laboratories it provided age estimates of 8630 ± 310 years BP (-29.9‰ NOSAMS) and 8680 ± 110 years BP (-27.9‰ RAFTER).

These results indicate that the major carbon-bearing components in the paint, the dolomite filler and organic matter have approximately the same age of 8500 years ago. While their stable carbon isotopic ratios are different, -16.5‰ compared with -28‰ to -29‰ it indicates that they formed in different ways. The gas chromatographic analyses indicate that the non-alkane compounds in the paint are clearly of organic origin whereas the dolomite is of mixed origin (organic-inorganic). From these analyses it appears that the red paint components could have been derived from a single source, a shallow volume of water containing algal and other organic growths which presumably aided in the deposition of dolomite-rich red (hematite-bearing) mud, which was a naturally available pigment ideal for use as paint.

Sample identity	Painted area (cm^2)	AMS ^{14}C age (years BP)	Lab. Number	$\delta^{13}C$ ‰
GG3 untreated paint	55	1040 ± 40	NOSAMS-37581	- 9.10
GG3 acid treated rock	Carbonate age in rock	8160 ± 270	RAFTER	-26.0
GG3 acid treated paint	Carbonate age in the paint filler	8370 ± 190	NOSAMS	-16.5
GG3 acid residue combusted	Organic residue, no carbonate	8630 ± 310	NOSAMS	-27.9
GG3 acid residue combusted	Organic residue, no carbonate	8680 ± 110	RAFTER	-29.9
Chaffee et al. (1994) 42WN418-1a	6.21 g rock and paint	32 900 ± 900	AA-8747	-36.0
Rowe (1993) 42WN418-2a	6.08 g rock and no paint	3 400 ± 65	AA-8625	-26.1
42WN418-2d	5.84 g rock and no paint	4 010 ± 55	AA-9177	-25.7

Table 1*. Summary of the details of the samples and analyses in this project and previous studies of Barrier Canyon Style rock paintings at the Great Gallery, Horseshoe Canyon.*

CONCLUSIONS

The AMS ^{14}C age determination for the residual organic matter in the painted rock surface on the fallen slab at the Great Gallery is 8655 ± 210 radiocarbon years BP (calibrated interval 2σ 8286 BC – 7295 BC). This puts the painting of a presumable large, red monochrome Barrier Canyon Style figure in the Early Archaic period.

Is the new age determination reliable? As the fallen slab was lying with its painted side downwards there is little chance that modern grasses became incorporated in the paint, and therefore the carbon in the paint represents the original content. Modern contamination is therefore probably not very great because the age determination and the stable isotopic readings are consistent with each other. The critical issue regarding the age determination and its reliability is that chemical pretreatment of the paint is absolutely necessary before dating the residual carbon so that the carbonate contaminants are removed from the red colorant.

The stable carbon isotope value for the paint obtained in this study differs considerably from that obtained by Chaffee et al. (1994) for another painted rock sample from the same site. The more negative value obtained by those researchers for the paint is thought to indicate contamination of the paint by a fossil fuel derivative (Chaffee et al. 1994:166), possibly kerosene or some other straight-chain hydrocarbon. The conclusion from the age and the stable isotopic value is that the sample from the fallen block is not contaminated with fossil fuel derived products. Though the rock does contain naturally occurring alkanes and some paintings may have been sprayed with hydrocarbons to enhance their visual aesthetics the paint sampled from the fallen rock does not.

An age estimate has been obtained for the red paint on the fallen slab of painted rock at the Great Gallery location in Horseshoe Canyon. The painting, probably in the form of a large anthropomorphic figure in a style generally known as the Barrier Canyon Style, was painted in the Early Archaic period. Such large anthropomorphic figures typical of the early paintings in this style are reminiscent of similar monochrome forms at the Black Dragon site (8520 ± 970 years BP) and slightly younger polychrome motifs painted in rock shelters in Baja California, Mexico (Watchman et al. 2002). These large anthropomorphic figures are of a different style and age to the much younger polychrome figure in Salt Creek known as Paiyatiamo (dated to 925 ± 80 years BP), and to the Lower Pecos rock art.

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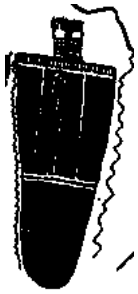

Carol Patterson

Rev. Galal Gough

THE TRAVERTINE POINT SUN SHRINE CAVE

It had been almost twenty years since I visited Travertine Point, which is located to the northwest of the Salton Sea in Imperial County just below the Riverside County line. All but the uppermost boulders were covered with several layers of marine deposits or tufa left by ancient Lake Cahuilla, created when the Colorado River flooded and overflowed on several occasions into the Imperial Coachella Valley. I had photographed petroglyphs in the tufa, and pictographs in a rock shelter, back in 1979.

So when I returned to Travertine Point (Figure 1) on the afternoon of New Year's Eve, December 31, 1999, with my oldest daughter and her husband and son, and my youngest daughter and her children, I was appalled by the terrible amount of vandalism and degradation Travertine Point had suffered in the past twenty years. Hardly any surface on the entire boulder complex was untouched by graffiti, and empty spray cans were lying in many places where they had been discarded.

Figure 1. *Travertine Point Scene*.

Petroglyphs I had photographed twenty years before had been so defaced by vandalism as to be unrecognizable (Figure 2). Fortunately, though there were the ashes of a fire in front of the pictograph shelter and some spray painting inside, the pictographs had not been disturbed.

Figure 2. *Graffiti on the petroglyph panel*.

Also, we found an excellent petroglyph panel west of the cave, the major portion of which had not been vandalized (Figure 3).

***Figure* 3.** *Petroglyph west of the cave.*

After leaving Travertine Point, I drove with the family farther south on the old highway to see the shoreline of Ancient Lake Cahuilla on the mountains. On our way back at about dusk,

hurrying home to Indio for a New Year's Eve Party and Service at the church where I am Interim Pastor, to bring in the Year 2000, we saw a dune buggy up by the pictograph shelter, with someone carrying wood up for a fire in front of the shelter.

About two weeks later I drove down to Desert Shores to call on a parishioner who was facing surgery. On the way back, I decided to drive up to the Travertine Point south flank. Right in front of the pictograph shelter there had been a huge fire, with wine bottles, beer cans and bottles, broken glass and burned out fireworks everywhere (Figure 4). There were the remains of other fires, with bottles and fireworks debris. But I was very concerned about the pictograph shelter, where the charcoal from burned out fireworks could be very destructive to the rock art.

Figure 4. *Broken bottles and ashes.*

The next Sunday I talked to my youth class, and two of the members who were Boy Scouts volunteered to go with me to clean up the site. One had wanted to go, because his art teacher had just mentioned Ancient Lake Cahuilla that week, with the rock art along the old shoreline. The other boy was a Life Scout, working on his Eagle badge, and wanted to help out as a possible project. So we went on January 29, 2000, to clean up the worst of the debris. We started with the ashes, bottles, broken glass and burned out fireworks in front of the pictograph shelter. Then we cleaned up another major "party" area. We filled the sacks and box I had brought, and stuffed them into the back end of my Pathfinder. It would take a major work party to clean up the whole Travertine Rocks area, but we felt we had cleaned up some of the more sensitive areas of harmful debris.

When we cleared the inside of the pictograph shelter of trash, I took pictures of the pictographs, and the somewhat faint parallel rows of red dots on an upper surface and the red sunburst on the lower surface were very clear on the developed photos. During my previous visit on December 31, 1999, a beam of light had shown across from an opening so brightly on surfaces facing the entrance to the shelter that the electronic eye on my print camera did not trigger the flash. Overlaying the two photos, I saw that even ten days after winter solstice, the point of the beam of light, extending down to the lower panel, still intersected a part of the sunburst. The upper squared end of the light beam abutted the lower row of red dots. So I was convinced I had the beginnings of a paper on "The Travertine Point Winter Solstice Site," and made plans to return to take time-lapse photos on the next winter solstice, December 21, 2000. But this discovery would never have taken place without our clean-up project.

WINTER SOLSTICE

When I arrived on December 21 at 10:45 a.m., I had expected an afternoon light dagger interaction, with the light beam coming from the west window of the cave, in keeping with my earlier visits. But upon crawling into the cave, I saw a beam of light from a small window on the east side, to the right of the entrance, which pointed down to the floor.

Inside the cave, I could stand, and looking toward the small window, I saw a faint red handprint with five fingers pointing down. Or it could also be a circular sun symbol with five downward rays. This pictograph was very old, and was located below and to the east of the opening. Then, as the sun moved on to be more

even with the cave entrance, the light beam from the small window moved toward the left wall of the cave, as I took slide and print pictures of the movement and made notes for each picture taken, with the crucial photographs and notes as follows:

11:45 a.m. Though part of the light beam is still on the floor of the cave, a portion is starting to reach up the east wall (Figure 5).

Figure 5. *Beam coming up the East side.*

11:55 a.m. The light dagger is broken, because of the rough cave surface, but the small point of light at the top now touches the tip of the red fingers (Figure 6).

Figure 6. *Point of light touches the fingerprints.*

12:05 p.m. Now the larger section of the light dagger touches the tip of the faint red fingers of the hand or sun symbol (Figure 7).

Figure 7. *Main beam touches the fingers.*

In the early afternoon a light dagger comes through the north side of the west window. Taking sequential picture and notes, I found that this dagger and point never intersected any pictographs. But then at approximately 2:30 p.m., another light dagger came in from the south or left side of the west window (Figure 8).

This dagger grew and cast a spot of light on the surface left of the sun symbol.

Figure 8. *Dagger from the west window.*

2:30 p.m. The first beam from the new light dagger from the west window created a small light spot on a surface about a foot left of the sun symbol to the right side of the Sun Shrine Cave (Figure 9).

Figure 9. *Light point from dagger*.

2:40 p.m. The light from the sun dagger begins to split, with the lower part of the beam growing larger and moving onto the same surface as the sunburst, while the upper part is on the above surface (Figure 10).

Figure 10 *Spot on symbol surface.*

2:50 p.m. The lower spot of light moves to the right about two inches closer to the sunburst, while the upper part of the beam grows larger and moves closer to the lower row of red pictograph dots (Figure 11).

Figure 11. *Beam closer to the symbol.*

3:00 p.m. While the lower light spot moves closer to the sunburst, the upper spot grows still larger and has moved up to the right until it is now about four inches from the lower row of red dots (Figure 12).

Figure 12. *Halfway to the sun symbol*.

3:10 p.m. Now the lower light spot contacts the lower left quarter of the sunburst circle, while the upper light spot is about three inches from the first dot in the lower row of dots (Figure 13).

Figure 13. *Light touches the sun symbol.*

3:13 p.m. The lower left quarter of the sunburst is now covered by the beam of light, which is blunt on the right side, but has developed a point on the left side (Figure 14).

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Figure 14. *Light quarters the sun symbol.*

3:20 p.m. Now the sun dagger has moved farther to the right along the horizontal sun beam line to halve the sunburst, with the pointed part of the beam touching the left side of the sun circle (Figure 15).

Figure 15. *Point of light on the left side.*

3:23 p.m. The left point of the lower sun dagger is now at the center of the sunburst, while the top of the upper light spot now hits the first dot in the lower row of dots on the surface above (Figure 16).

Figure 16. *Point of light at the center of sun symbol.*

3:25 p.m. The point of the sun dagger below reaches back to touch the right side of the sunburst, following the horizontal red pictograph ray; and the upper light moves along the lower row of red dots (Figure 17).

Figure 17. *Point of light at the right side.*

3:30 p.m. The upper light beam continues to move to the right along the lower row of dots, while the lower light pointer is already on the next rock surface (Figure 18).

Figure 18. *Light touches the dots.*

3:40 p.m. The upper light beam has moved midway along the bottom row of dots, pointing to the eighth dot, while the lower light spot is almost gone and the whole beam is concentrating on the upper surface (Figure 19).

Figure 19. *Light moves along the dots.*

3:45 p.m. Now, the upper beam of light starts to send a pointer up toward the midway dot above, while touching the halfway dot below (Figure 20).

Figure 20. *Point towards the upper dots***.**

3:55 p.m. Both rows of dots are now illuminated, with the fourteenth dot pointed to above, and the sixteenth dot cupped in the row below (Figure 21).

Figure 21. *Both rows are illuminated.*

4:00 p.m. The light dagger moves on to the right to the final dots, with the point on the dot above, and the lower dot cupped (Figure 22).

Figure 22. *Light moves toward final dots.*

At the moment the final dots were touched by the light dagger, I snapped a picture, but at that same moment the dagger disappeared and, looking through the west window, I saw that the sun had gone down below the mountains to the west.

SPRING AND FALL EQUINOX

Because of the dramatic sun dagger interactions on winter solstice, I decided to go back to Travertine Point on the spring equinox, March 20, to see if other pictographs might have equinox alignments. There were no involvements from the east window of the cave. But an afternoon dagger of light from the west window began moving across the cave floor, and up the side of the east side of the cave, with the following key descriptions and photos:

3:00 p.m. The light dagger has moved up the side wall to within about eight inches of the left red spot of the pair of spots, having the possible resemblance of winged birds, located below and on the same surface as the sun symbol (Figure 23).

Figure 23. *Equinox dagger moves upward.*

3:10 p.m. The finger of light is broken, because of the uneven surface, but the point now touches the tail of the faint red spot to the left. The left spot is about seven inches away from the other red spot to the right, which is directly under the vertical beam of the sun symbol above (Figure 24).

Figure 24. *Point of light touches the red spot.*

3:15 p.m. The equinox light dagger begins to broaden, with a finger of light on the right moving about an inch and a half toward the red spot on the right. (Also, the light on the surface above, where the two rows of dots are located has moved down past the upper row, which was outlined by light, and has intersected the lower row of dots (Figure 25).

Figure 25. *Equinox dagger broadens*

3:25 p.m. Now the light dagger has broadened further to touch, cradle and intersect both of the faint red spots below the sun symbol. (Finally the two red spots will be illumined by a narrow band of light, and a single red spot on a higher rock surface to the right will also be touched by light as the lower sun dagger and the light above come together on the right surface (Figure 26).

Figure 26. *Light beam cradles the spots*.

Going back to the cave on the fall equinox, September 22, I found that the interactions were virtually identical with those of the spring equinox. Then going back the next year on winter solstice, with my daughter Merrie, I found that I could tell her in advance exactly what the light dagger would do next. Because there were such exact solar interactions with pictographs in the cave, I sought to understand how the Cahuilla Indians could arrive at such precise calculations of key junctures of the solar calendar. Chief Francisco Patencio, in his *Stories and Legends of the Palm Springs Indians*,(Patencio 1943) as told to Margaret Boynton, describes how the movement of the sunrise along the horizon was marked by sticks to mark the movement of the through the seasons:

> "In this tribe there were some older people who put up signs to gauge how the sun shone. They found that they had to keep moving the stick to the right for a long time, and then to the left, and so by this means they discovered what times the birds had their nests, and what times the animals had their young, also what times the plants grew, and the times the seeds were ripe. This they did year after year as they studied the signs of the sun," (Patencio 1943:113).

Descriptions by Patencio, which could be related to another pictograph in the cave, might show why this Sun Shrine Cave may have had great significance for the Cahuilla.

SUMMER SOLSTICE

The pictographs involved in the winter solstice and the equinox alignments are faint and older than five features of more recent appearance. While no recorded efforts have been made to date the pigments, the apparent differences in age raise questions concerning the duration or time sequences of solar cave usage. Also to be explored is whether or not the more recent features have specific sun dagger interactions with junctures in the solar calendar. The less faded features include a hand print on the back

wall of the cave, and a sun symbol with flames around the inner circle on a slanted slab on the west side of the cave. Then behind the surfaces where the winter solstice and the equinox pictographs are located, there are three more features: the elongated perpendicular end of a rock slab is painted red, and higher up, there is a diamond in red with a black line in the center, and a winged figure with red and black dots radiating in lines up from the head.

Since the Summer solstice was the next major juncture in the solar calendar where I had not visited the cave, I went on June 21, 2001, to see what the light daggers would do. The beam of light which initiated an alignment was not from either the East or West windows, but from a small opening high up in the ceiling of the cave.
12:25 p.m. A narrow beam of light started down the surface above the red hand print on the rock slab at the back of the cave, and moved toward the black dots at the end of each finger (Figure 27).

Figure 27. *Beam of light above the hand print.*

12:35 p.m. The beam of light moves right across the top of the hand print, as though the one who watched the light had first placed a left hand there, and then had covered the palm and fingers with red paint to mark the passage of the light. (There appears to be an added sixth finger, which may have indicated special power.) See Figure 28.

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Figure 28. *The beam of light across finger tips.*

12:45 p.m. By holding my own hand over the red hand print, without touching it, I sought to show how the light which fell on the tips of my fingers would also have touched the tips of the fingers of the one who placed the red hand print on the wall; and then made the black spots where the light intersected (Figure 29).

*Figure **29.** Light on my finger tips*.

CROSS QUARTER

Four of the painted features still had not been related to a solar interaction. But, a very helpful little volume by Liz and Peter Welsh, *Rock Art of the Southwest*, 2000, noted that cross quarter points, including those on November 6 and February 4, were also "significant points in time for sun watching," (Welsh 2000:71).

So on November 6, 2001, I went back to the cave to see what the sun daggers might do. Then on February 4 I went again, and the resultant interactions were virtually identical. This time the light dagger came from the right side of the West cave window, and the following photos and notes among the many taken are sufficient to illustrate the interactions:
1:05 p.m. The light dagger goes through the red pictograph sun burst and fills the center opening of the sunburst design (Figure 30).

Figure 30. *Light dagger fills the sun symbol*.

1:20 p.m. Now, while the heel of the light dagger remains in the sun burst, the point starts over the edge of the West stone surface (Figure 31).

Figure 31. *Point of light starts over the edge*.

1:45 p.m. The sun dagger goes across to the other side of the cave, and starts upward on the East wall toward the vertical painted red end piece (Figure 32).

Figure 32. *Point of light goes up the east wall*.

2:45 p.m. The red painted vertical rectangular end piece has light all the way across and the light moves upward toward the diamond (Figure 33).

Figure 33. *Point of light moves upward*.

3:00 p.m. The painted end piece is now all in shadow, while the dagger moves toward the diamond (Figure 34).

Figure 34. *Light dagger moves toward diamond.*

3:45 p.m. The point of the sun dagger, while growing smaller, is only an inch from the point of the diamond (Figure 35).

Figure 35. *Point of light an inch away*.

4:00 p.m. The point is fading, as the sun sets over the mountain to the west, and disappears just as it touches the tip of the diamond (Figure 36).

Figure 36. *Point of light touches at sunset.*

HALF CROSS QUARTER

Now only one pictograph figure in the cave has not been involved in an interaction I had observed, but the painted red and black winged figure, with the red and black dots radiating up from the head, was located midway between the light daggers which had led up to the cross quarter and to the equinox interactions. Therefore, on February 26 and October 15, of 2002, I went back to the cave, and took pictures and made notes on the sun dagger movements. The dagger touched down just under the sunburst, and moved across the cave floor to the East side. The following selections are adequate to describe the interaction:

2:55 p.m. The light dagger has crossed over to touch the red rectangular end-piece (Figure 37).

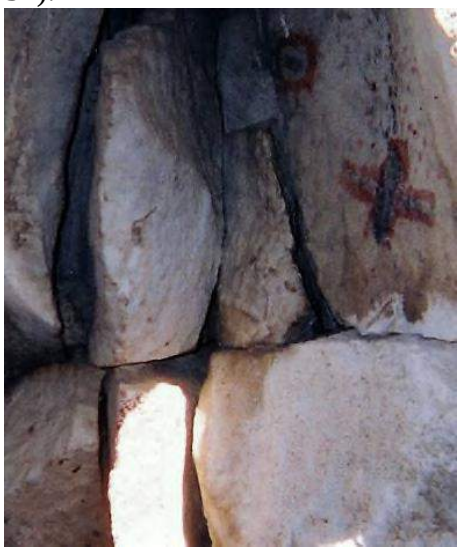

Figure 37. *Light touches the end-piece*.

3:15 p.m. The light moves from the red end-piece toward the winged figure, which is outlined in red with a black body (Figure 38).

Figure 38. *Light dagger moves toward wing tip.*

4:00 p.m. The light dagger is now only two inches from the wing tip of the figure with the

red and black ray spots over the head (Figure 39).

Figure 39. *Dagger is two inches from wing tip.*

4:15 p.m. The light dagger, which has grown smaller, touches the tip of the wing (Figure 40).

Figure 40. *Light touches the wing tip.*

4:25 p.m. The point of the sun dagger, growing still smaller, covers the entire tip of the wing (Figure 41).

Figure 41. *Light covers the wing tip*.

4:30 p.m. The sun dagger point has grown very small, within the very tip of the wing, and disappears a moment later as the sun sets over the mountain (Figure 42).

Figure 42. *Final spot of light on the wing.*

While trying to relate ethnographic data to a specific pictograph design cannot be done with any dependability by anyone except the maker of the design, one of the entries in Chief Francisco Patencio's recollections of *Stories and Legends of the Palm Springs Indians* relates to Travertine Point. Eagle Flower, a Cahuilla culture hero, had three sons:

> The youngest son took his mother and settled for a time at a point near where the Salton Sea now is. The people there had come from among his own people, so he stopped there and married among them. Then he went farther south with the people he had settled among, and one night while he was smoking, the pipe told him that his wife would have a child, and for him to go back to the point by the Salton Sea. He told his mother and his wife what had been told him by the pipe.
>
> Then they brought coals of fire and put them into an olla and started back. Before they reached the point his first child, a son, was born. He made a cave in the hill, and he, his wife and his mother lived there. (Patencio1943: 43)

RESEARCH AND RECOMMENDATIONS

One of the earlier printed references to petroglyphs at Travertine Point was published by Julian H. Steward in his *Petroglyphs of California and Adjoining States*,(1929). In it, he seeks to develop a survey of sites. While none of the sites are recorded in detail, he does provide several sketches of some of the more dominant petroglyphs on the northernmost surfaces at Travertine Point. While the panels are far more complex than his drawings indicate (Figures 43 and 44) his work shows an early concern for Native American rock art. Also, the petroglyphs Steward illustrates were overlaid with marine tufa.

One of the early attempts to date the Travertine Point petroglyphs was undertaken by Wilson G. Turner and Robert E. Reynolds (Smith and Turner 1975:25,27). They secured the permission of the owners to dissect a Travertine Point petroglyph, with the hope of obtaining a valid radio-carbon date. Their effort yielded an unreliable date of 9000 years B.P., because the petroglyphs had been carved into very old deposits of tufa. But the dating issue had been dramatized, and Daniel F. McCarthy was able to find pictures taken prior to 1917 showing that a large fracture had developed in the tufa and a section had fallen away. He concluded that "sometime after the fractured surface broke away, the petroglyphs were carved into the newly exposed, older deposits of tufa… the last high stand of Lake Cahuilla was about 500 years ago… Since the rock art predates the last high stand of Lake Cahuilla, it is probably between 500 and 1,000 years old rather than the previously suggested 9,000 years" (McCarthy 1981:107-117). Prior to receiving McCarthy's paper, I felt that the date of the petroglyphs with a layer of tufa having been deposited on them but not entirely obscuring them would have been at least 800 years ago since the last time Ancient Lake Cahuilla reached its maximum size was during the three hundred years ending in the Fifteenth Century A.D.

Naturally, while there has as yet been no chemical analysis of the pictograph pigments in the Sun Shrine Cave, the pictographs would have been made over the period of time between the last inundation of Ancient Lake Cahuilla and the present. If dateable vegetable or animal substances were used in preparing or applying the pigments, it might be possible to date the pictographs. Some of the pictographs appear old and faint, while others are obviously more recent. The one certain fact concerning the pictographs is that each of the sun dagger interactions illustrated in this paper will be repeated on a clear day, year after year, on the days and hours observed and reported. The oldest pictographs relate to the winter solstice and equinox interactions, as might be expected. If a scientific analysis and dating of the pigments is possible, the age of the pictographs and the time spans involved in sun dagger observations would contribute to the understanding of the role of the cave in Cahuilla tradition and ceremony.

The importance of Travertine Point in Cahuilla cultural heritage is underscored in a survey of important sites in *The Cahuilla Landscape: The Santa Rosa and San Jacinto Mountains* (Bean, Vane and Young 1991:96). The sojourn of Eagle Flower's son, his wife, baby son and his mother, in a cave at Travertine Point is reported in this source as well. The presence of potshards, another cave with pictographs, and cremation burials, along with the petroglyphs showing a long history of Cahuilla activity and sacred involvement, attest to the importance of Travertine Point as a place of tribal significance. A possible site for observing the sunrise and marking with sticks the movement of the sun along the eastern horizon from winter to summer solstice needs also to be tested (Figures 45 and 46).

Figure 43. *Petroglyphs Under Tufa.*

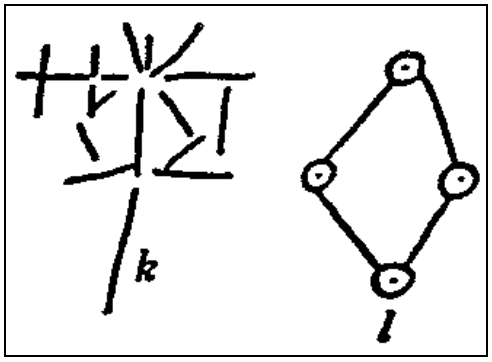

Figure 44. *Inset of Steward's Sketch*

Because of the cultural importance of Travertine Point, and the petroglyphs and Sun Shrine Cave, I have believed that the neglect of the site has been tragic. It belongs to a land holding company, and the lack of stewardship of the area has led to the terrible vandalism.

I made a presentation to the Native American Land Conservancy concerning purchase and preservation of Travertine Point, but realized in so doing, that the Conservancy had a large agenda of acquisition concerns. My recommended goals for Travertine Point include the following:

Goal I: Encourage the Archaeological Conservancy or Native American Preservation Entity to purchase the Travertine Point complex.

Goal II: Record all surviving petroglyphs and pictographs, and develop a plan for site restoration, preservation and management.

Goal III: Build an interpretive center and kiosk trail system with a dwelling unit for a full-time Native American site manager.

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Point for Sunrise Views

Figure 45. *Farthest hill south of Travertine.*

Figure 46. *Sunrise observations need to be made from the south hill.*

Carol Patterson

**Robert Ford, Dixon & Cody Spendlove,
David Maxwell, Gordon Hutchings**

WATERGLYPHS:
ANCIENT CARTOGRAPHY OF THE ARIZONA STRIP

In an area lying between the high elevations of Utah's Markagaunt Plateau, Paunsagaunt Plateau, and the abyss of the Grand Canyon is a remote area known as the Arizona Strip. It is a beautiful but inhospitable place, lacking one vital resource; permanent water. There are but few springs and water pockets in its canyons, plus small holes in the rim rock holding water for short periods after infrequent storms.

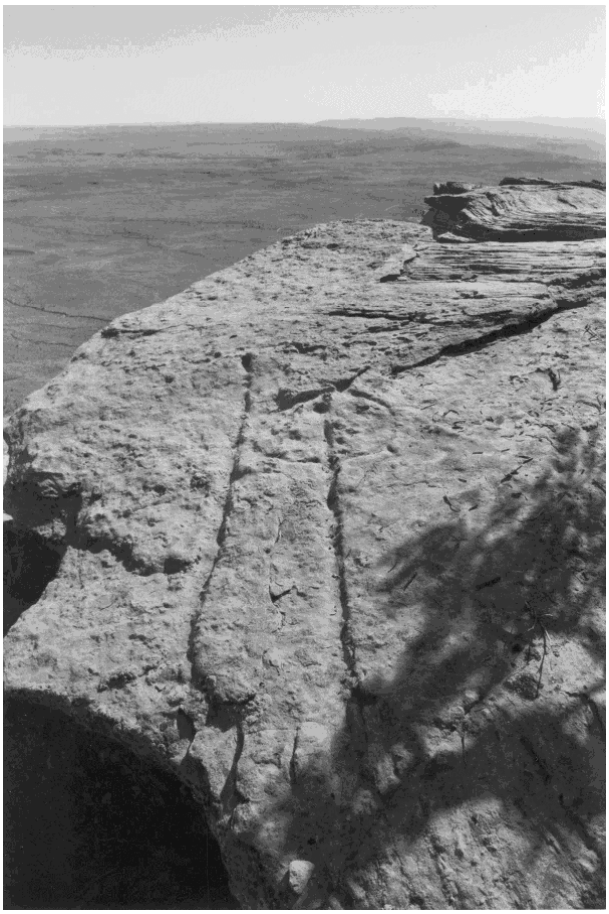

Figure 1. *Pair of waterglyphs, Washington County,Utah. Bob Ford Photo*

At the time that the United States founding fathers were signing the Declaration of Independence in Philadelphia, Spanish friars, Francisco Atanasio Dominguez and Silvestre Velez de Escalante, were preparing an expedition to explore a northern route from Santa Fe, New Mexico to Monterey, California.

On October 11, 1776, near present day Cedar City, Utah, the expedition, faced with worsening weather and dwindling supplies, decided to put their fate in the hands of God. By means of casting lots, the decision was made to return to Santa Fe by way of the Cosnina below the Colorado River.

The expedition turned south, entering through the lower Hurricane Valley, becoming the first known Europeans to traverse the Arizona Strip. Escalante's journal chronicled the barrier of the great canyon to the south and the many hardships they endured before finding a place to ford the river. On November 7th, 1776, Escalante noted in his journal:

"… about five o'clock in the afternoon they finished crossing the river, praising God our Lord and firing off a few muskets as a sign of the great joy which we all felt at having overcome so great a difficulty and which had cost us so much labor and delay, although the principal cause of our having suffered so much since we reached the Parusis was our lack of someone to guide us through such bad terrain. ***For through lack of an experienced guide*** *we went by a very roundabout route, spent many days in such a small area, and suffered hunger and thirst. And now,* ***after having suffered all this, we learned the best and most direct route where there were water holes adjusted to an ordinary day's travel****".*

Unknown to these Spanish explorers, an unknown culture, centuries before European occupation of the area, had already mapped and left guide marks for thirsty travelers beside these trails, using only minor modifications of basic petroglyphs, as in Figures 1 and 2.

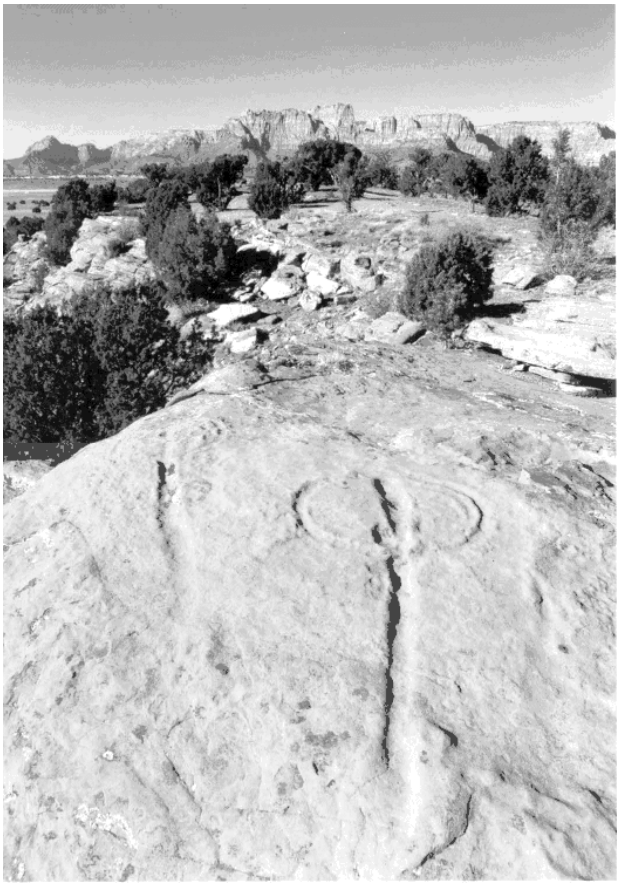

Figure 2. *Waterglyph in Mohave County, Arizona. Bob Ford Photo*

Eight years of research along these migration routes, trade routes and other thoroughfares has yielded more than 200 instances of this unique petroglyph known as the "waterglyph" scattered atop canyon rims and mesas, along this ancient trail system.

These waterglyphs are consistent in shape and size. Placement near the edges of cliffs that overlook a panoramic view can be shown, in a majority of instances to indicate the location of an existing spring, five to ten miles away… hence the name "water-glyphs".

Like many modern inscriptions, these glyphs may have additional secular or religious meanings. However, this article will focus on the only theory that has been consistently proven by the team, which is, they indicate distant sources of water.

BASIC GLYPH SHAPE

The waterglyph is cartographic information ground deep into horizontal sandstone and limestone surfaces offering a panoramic view of the surrounding landscape. Surfaces hosting them were not picked at random but rather carefully selected by the primitive cartographer. The location, aside from being chosen for its topocentric value, may have used natural features on the rock surface as a topographical representation of the field of view.

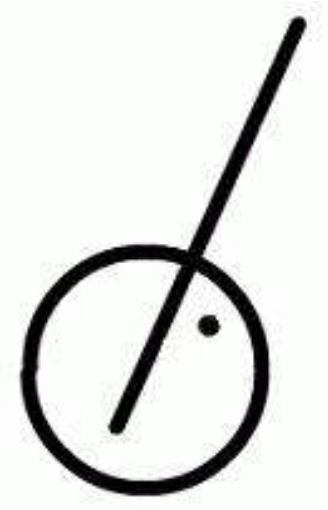

Figure 3. *Basic form of a waterglyph*

The common waterglyph has four simple components; an 18" to 24" diameter circle, a 36" to 48" line and two cupules. A cupule is ground into one end of the line; this line penetrates one side of the circle, bisecting the plane. The opposite end terminates either at the cliff edge, a crack or depression in the rock surface. The remaining, or floating, cupule is located, either within the plane of the circle, on the arc line, or outside the perimeter of the circle.

Variations include: additional circles or arcs, line with cupule termination area inside the circle plane, additional line cupules, additional floating cupules, and line angle change near cliff edge.

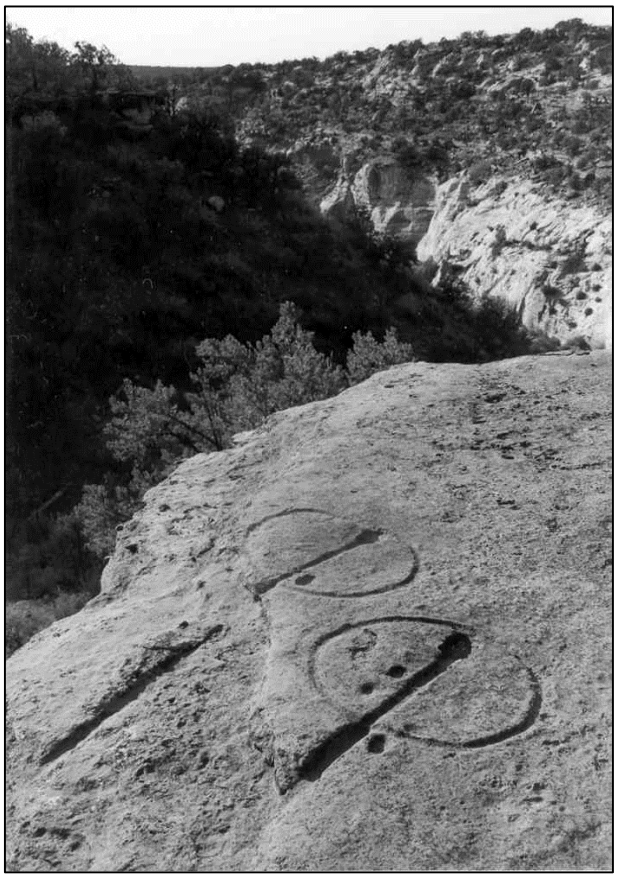

Figure 4. *Two waterglyphs from Kane County, Utah, Bob Ford Photo*

Currently, waterglyphs have been documented in Coconino and Mohave County, Arizona; Kane and Washington County, Utah; and Clark County, Nevada.

With more than 2.8 million acres and fewer than 100 permanent residents, this portion of the American Southwest remains remote and largely unknown.

The importance this petroglyph had to its makers, as well as with its users, is indicated by its extensive use, slight degree of variation, and depth of incision.

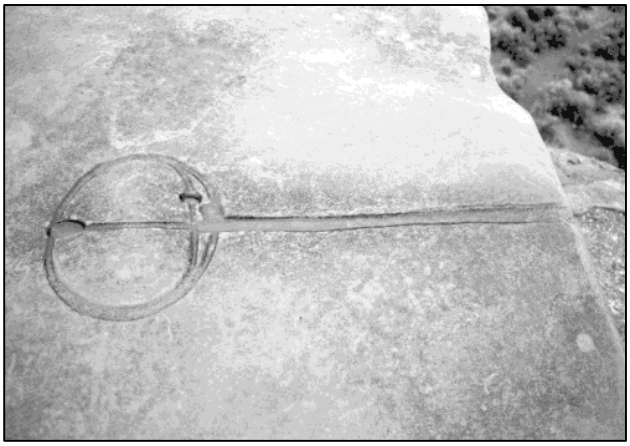

Figure 5. *Waterglyph from Mohave County, Arizona. Bob Ford Photo*

In order to prove this theory, twenty waterglyphs were chosen at three random locations and analyzed using ESRI's Geographical Information System (GIS), to verify the trail / spring correlations.

Figure 6. *Waterglyphs are found on the horizontal surface atop the cliff, not on the vertical cliff face.*

Of the 20, eight had fallen from the cliff face or been otherwise partially destroyed. Of the remaining 12, springs were found in the area indicated by the glyph in nine instances. Further analysis continues on the remaining waterglyphs.

PROJECT HISTORY

The existence of at least three of these unique glyphs has been known since the beginning of the modern historical record. Dixon Spendlove saw his first waterglyph as a boy in the late 1950's as part of a local Boy Scout outing, a tradition popular in local legend since 1914, when Freddy Crystal showed up in Kanab, Utah with tales of ritual sacrifice and a "map" of buried Aztec gold.

Bob Ford has known of several on the McDaniels brothers' farm since the early 1960's when, as a young man, he first began visiting Bruce McDaniels with his father.

However, it was not until 1996, while photographing some waterglyphs at sunset, that Bob remembered a passage from the journal of Major John Wesley Powell, in which he commented that their Native American guide would often leave the group around sunset, to walk nearby mesa tops. Then the guide would return and direct the group to a water source.

Powell mentions the incident only because he had to rebuke his men for making fun of their guide-- joking that their guide "went to pray to the rock gods". Powell pointed out that as long as he continued to find water, none of them should care what gods the man worshiped.

Sitting there, on the rim rock, staring down at one of these magnificent glyphs, in the setting sun, Bob's mind took a mental leap. What if the guide had not gone to the mesa to pray, but had gone instead to look for a message carved into the rim rock -- a message cut into the horizontal surface of the rock, like the singularly unique petroglyphs he was photographing?

Working on this hunch, Bob sought the aid of local resident Dixon Spendlove. By working together, pooling their knowledge and walking nearly two hundred miles of rim rock, they found 28 similar petroglyphs during the next two months.

Figure 7*. Fallen Waterglyph, Coconino County, Arizona. Bob Ford Photo*

Figure 8. *Close up of Fallen Waterglyph*

Documenting The Discovery

Convinced that Bob was on to something, Dixon contacted his son, Cody, who had just finished a class at Dixie College in HTML and web page construction.

In June 1997 Cody published a three page article on the Dixie College Udvar-Hazy School of Business website. [Subsequently, moved to the website: www.waterglyphs.org

In the article, Cody made the comment that the glyphs were "left by its first known inhabitants, the Anasazi Indians". This statement quickly drew criticism from several different groups.

Spanish Mine Marker Theory

Many telephone calls and emails were received from the Lost Spanish Treasure theorists, ex-

plaining that these glyphs were clearly made by early Spanish explorers to mark buried mine entrances.

This theory was put to rest in 1999 when Robert and Dixon discovered a "mini" waterglyph among other rock art drawings two miles northwest of Fredonia, AZ, Figure 9.

***Figure 9**. A "mini" waterglyph, among the other symbols at the "clam shell" site.*

This 4" miniature version does NOT seem to be a functional waterglyph, in that it does not point to any known water source. It appears, rather, to be some kind of teaching aid, similar to an illustration in a textbook. It is remarkably accurate, even in its placement, with the line extending to the edge of the rock upon which it is inscribed.

Whatever its function, it is clear that the author of the Clam Shell panel knew of the existence of these glyphs.

Because this panel has been dated to the Basketmaker period, or earlier (700 A.D.), the possibility of these glyphs having been created by early Spanish explorers was ruled out.

Solstice Marker Theory

Upon first sighting, the most common theory is their use as a solstice device. Perhaps this is because of the widely published accounts of "Sun Dagger" solstice makers at Chaco Canyon and Paint Rock in Central Texas.

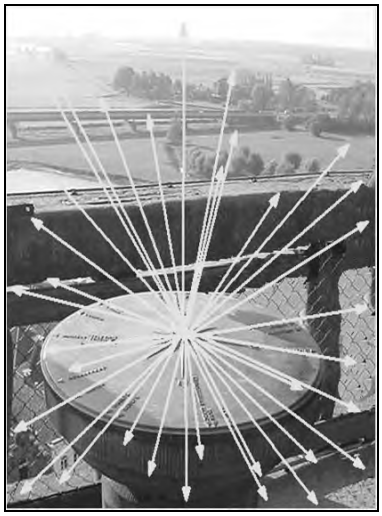

***Figure 10.** Compass azimuths*.

However, the 200+ glyphs found to date, *point to more than 90 different compass azimuths* ranging from 0° to 359° degrees (Figure 10). Additionally, their topocentric nature and occasional multiple placement raises serious questions about any possible solstice solution (Figure 11).

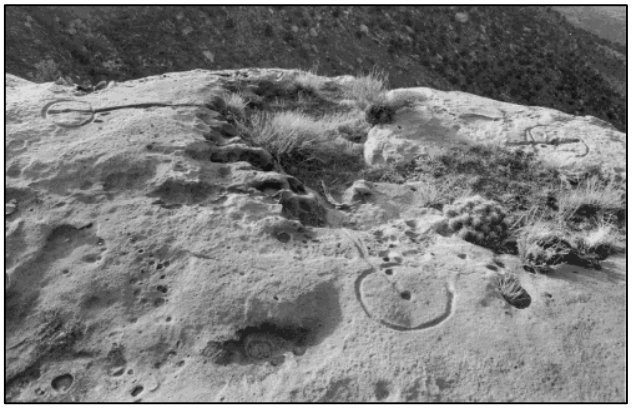

***Figure 11**. Triple grouping, Mohave County, Arizona Bob Ford*

Although some of these glyphs may have served a dual purpose as a solstice marker, azimuth readings of all known waterglyphs clearly indicate that their primary function was not astronomical.

GIS / GPS 101: AN INTRODUCTION

In the meantime, Cody had enlisted the aid of Dave Maxwell, director of the Geographic Information Systems (GIS) program at Southern Utah University in Cedar City, UT.

Using the Global Positioning System (GPS) of satellites to pinpoint each glyph's exact location, and compass azimuth readings taken at each glyph, allowed the team to draw directional vectors over GIS data. This facilitated preliminary research on the geographical data in that general direction before ground based reconnaissance work was initiated.

However, because the U.S. military was still the primary user of the GPS system in 1999, the satellite signal was randomly scrambled, and commercial over-the-counter grade GPS units were only accurate to 200+/- meters on any given day. For obvious reasons, professional grade Trimble GPS units had to be used that allowed the data collected to be post processed in the GIS lab against known land based survey markers (Figure 12).

Figure 12*. Trimble GPS system and survey markers.*

After post processing, this gave the team an exact location for each glyph with less than one meter accuracy.

BI-DIRECTIONAL THEORY

Maxwell was also the first team member to suggest that the glyphs should be read in both directions. As a professional cartographer, Dave pointed out to Cody on their first visit to collect data with the Trimble GPS units that any mapping system, in order to be functional must work "coming" and "going".

This concept helped explain a mysterious glyph discovered earlier by the team. Over time, this waterglyph had fallen off the edge of the cliff, and been re-cut by its creator.

Figure 13*. Waterglyph from Kane County, Utah. Gordon Hutchings Photo*

Although there were several feet of good flat surface farther along the cliff edge, this glyph had been carefully re-created in as near to the exact location of the original as possible, even to the extent of wrapping part of the circle around the edge of the cliff (Figure 13).

Maxwell's bi-directional cartographic model seemed to explain the exact placement of each glyph, because while a line can be geometrically drawn between any two points on the planet, a third point between the two, must be in an exact location to keep the line straight. The question was, what were they trying to keep aligned?

DECIPHERING MEANING I

Collecting GPS data points in such remote locations required at least two people to verify each reading. In order to expedite data collection a fifth team member was brought into the project.

As an amateur photographer, GIS student from Southern Utah University and long time friend of both Cody and Dave Spendlove, Gordon Hutching was a natural choice.

Gordon's contribution to the project was immediate. On his very first outing with the group, he dropped midway down a cliff and snapped a photo, (Figure 14), sighting directly down the line.

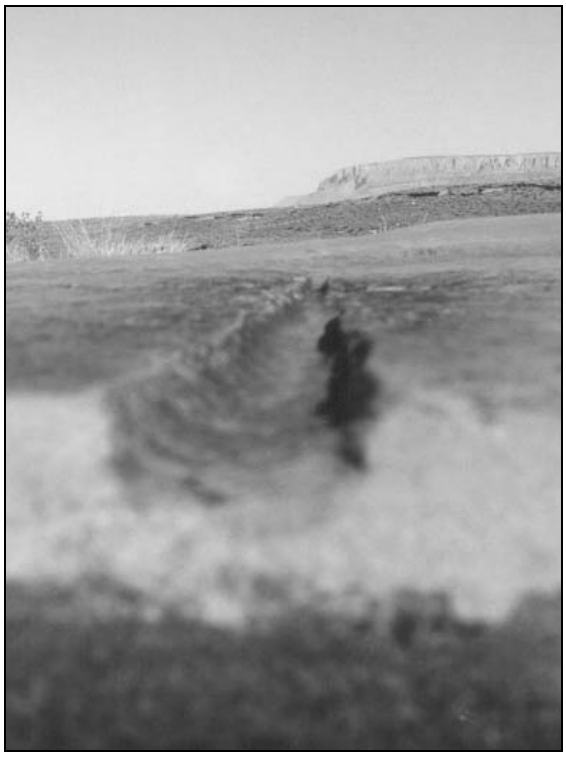

Figure 14. *Sighting directly down the line. Mohave County, Arizona. Gordon Hutchings Photo*

Although the image was not seen by Cody until the film was developed, it haunted him. The line clearly pointed directly at an obvious landmark. Could it really be that easy?

Cody began combing through the hundreds of other glyph photos the team had collected. There was an obvious pattern. The line in the glyph was not trying to indicate the direction to another glyph as previously suspected. Rather, it was pointing to an obvious landmark to use as a reference while traveling in much the same way that Boy Scouts or military personnel are taught to use a compass by selecting a prominent landmark in the direction of their bearing to use as a guide to avoid wandering off the path. (Figure 15).

Figure 15. Examples of line / landmark alignments

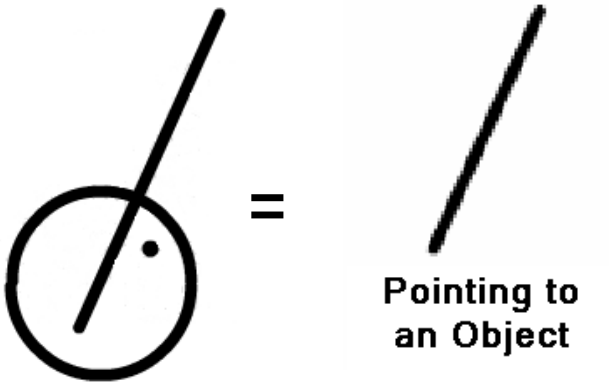

Figure 16 *– Line indicates object on the horizon*

Return trips to known waterglyphs, with careful attention to objects on the horizon now made easier by GPS coordinates, proved this theory to be accurate in nearly every case (Figure 16).

DECIPHERING MEANING II

The next major breakthrough came with the realization that the circle(s) somehow indicated the distance to be traveled.

Although the basic glyph was pretty universal in shape, there were often modifications as to how the circle(s) were drawn. The most common variations include: double front, double concentric, and double circles along the azimuth (Figures 17, 18, 19).

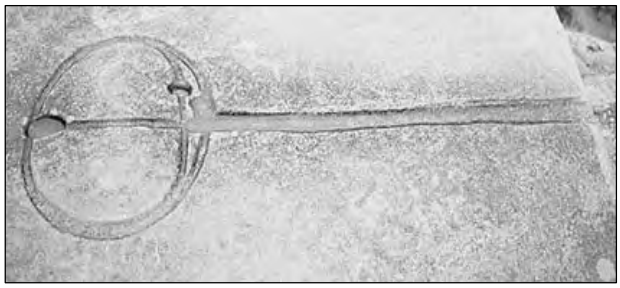

Figure 17. *Double front.*

Figure 18*. Double concentric.*

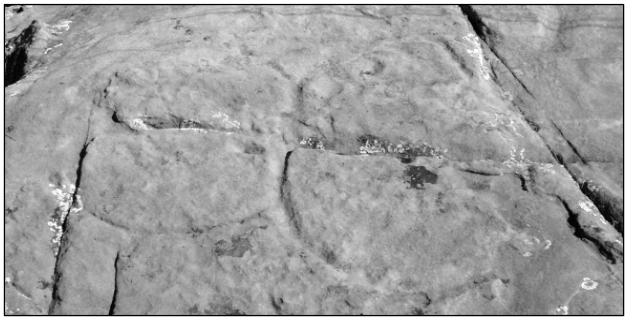

Figure 19. *Double circles along the azimuth.*

Clearly such variations were intended to convey meaning. Following a hunch, the team began looking for topographical correlations between the glyphs and the field of vision from that point.

Eventually the team found this glyph (Figure 20),

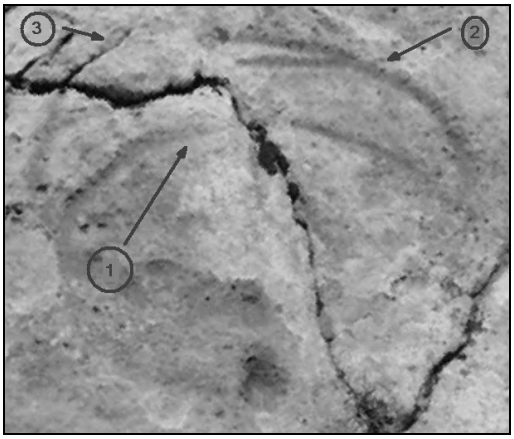

Figure 20. *Triple field of view***.**

with this field of view (Figure 21).

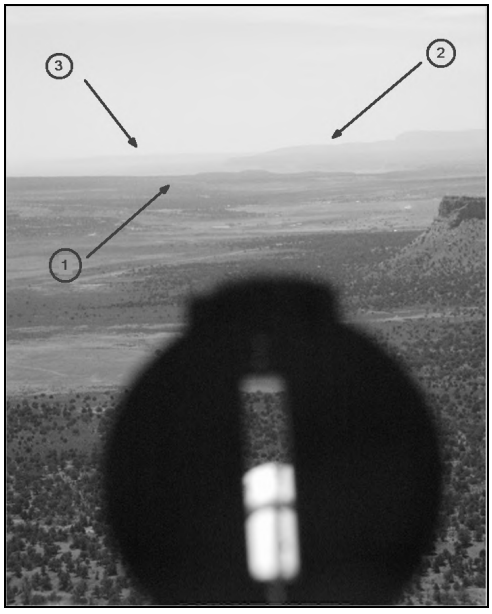

Figure 21*. Triple horizons***.**

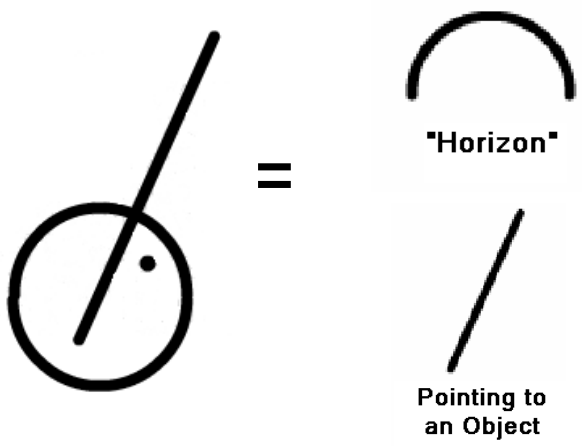

Figure 22. *Circle(s) represent Horizon(s)*

DECIPHERING MEANING III

With a working understanding of at least part of the glyph's meaning, knowing the intended direction of travel and the approximate distance, the team set about finding out what the "dot" indicated (Figures 22, 23 and 24).

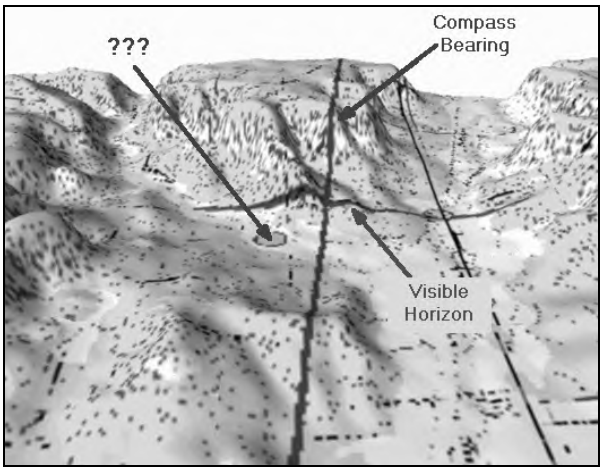

Figure 23. *Unknown target.*

It did not take a great deal of thought to realize that a ground reconnaissance for each glyph, looking for an unknown target near or beyond the visible horizon, 5 – 15 miles out, would take a least a lifetime, with no guarantee of success.

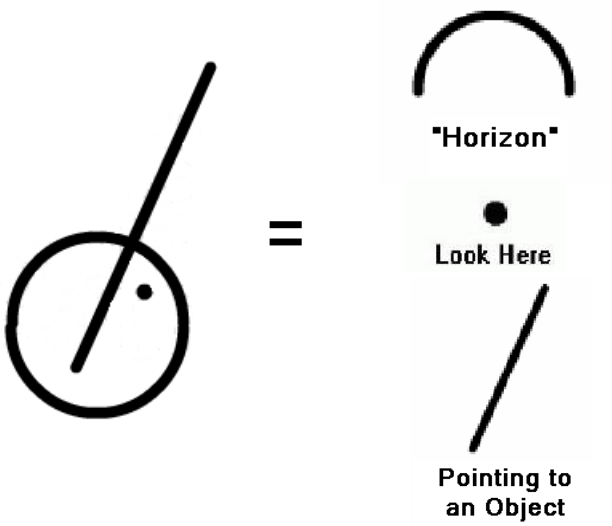

Figure 24. *Cupule indicates target.*

So, after many months in the field collecting data, the team turned indoors to the Southern Utah University (SUU) Geographic Information Systems (GIS) lab and some high tech computer help.

GIS 201: UNDERSTANDING LAYERS

The power of a GIS system comes from its ability to separate the different layers of information normally contained on a traditional paper map.

Separate data layers (also known as "sets"), such as roads data, stream and river data, topographic data and vegetation data, allow researchers to ask the computer questions looking for correlations between the layers (Figure 25).

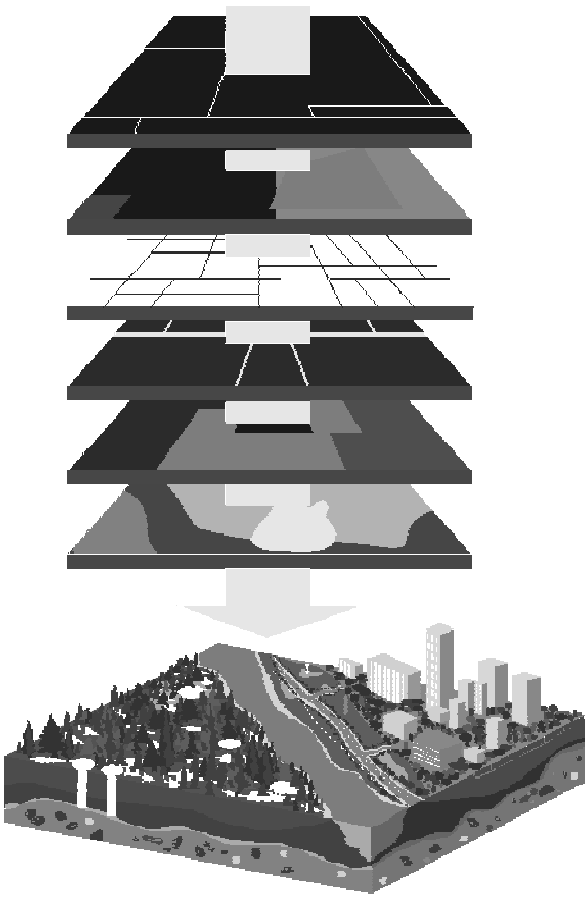

***Figure 25**. Layers of a GIS map*

For example, "show me all the instances where the water layer crosses the road data". In the case of the waterglyphs, all modern data, such as roads, towns or state boundaries were eliminated.

Additionally, a special layer had to be constructed that would allow the computer to look with a defined field of view in the direction of the line and search the general area of the cupules associated with each waterglyph.

Gathering Layers

GIS works well when the data layers are seamless. However, GIS data sets are primarily created by government agencies that tend to create data sets that terminate along state, county or national park boundaries. This creates logistical nightmares for researchers with projects that straddle state or county boundaries (Figure 26).

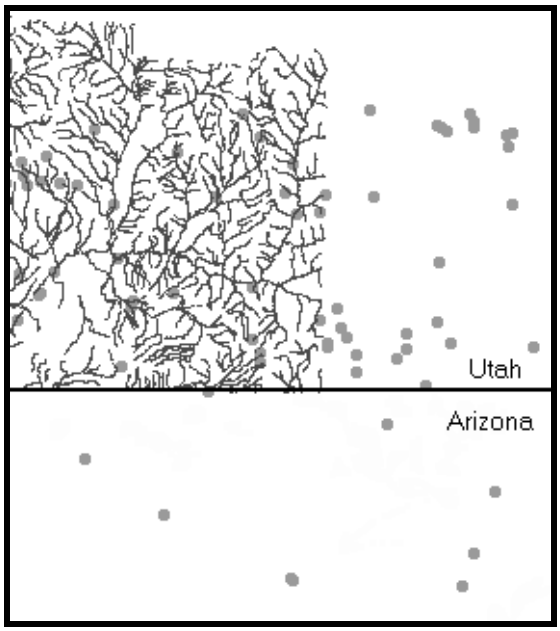

***Figure 26**. Stream & river data layer has been "clipped" along county boundary. Springs are missing from Arizona data set.*

Accurate data (view from 25,000 ft) was readily available from the Utah Automated Geographic Reference Center (AGRC) website, but Arizona data was less accurate (view from 100,000 ft). Many of the springs on the Arizona side of the border were simply left off the data set.

However in 2002, after a couple of frustrating years attempting to locate the necessary data sets, Gordon Hutchings, now a senior at SUU, agreed to work full time on the problem during his last two semesters as part of his GIS capstone project.

One of Gordon's first tasks was to find and combine data sets from different government agencies into single seamless layers for the project area, most notably:

- Streams, rivers & springs
- Digital elevation models (DEMs)
- Satellite images

Digital Elevation Models (DEMs)

In much the same way that lines on a topographical map indicate elevation change, a DEM uses information encoded into the pixels of an image to represent elevation. However, unlike a topo map, this information can be used to create a 3D Model of the real world (Figure 27).

Figure 27. *Example of a DEM data set.*

This "virtual" model is then overlaid with other GIS data layers such as satellite images and spring locations. The net result is something that saves hundreds of hours of field work.

After two semesters, and many frustrations, Gordon eventually completed the task and the team was able to begin lab analysis of their field observations.

Note: The United States Geological Survey (USGS) has since created a website: http://seamless.usgs.gov, which automatically creates seamless data sets, including the National Elevation Dataset (NED).

The "Bowtie" Layer

In order to create this special layer, Dave Maxwell and Gordon Hutchings had to construct a wire frame drawing in AutoCad that would represent the field of view from each glyph.

The wire frame was divided every 5 degrees, in both the forward and backward facing view (Figure 28).

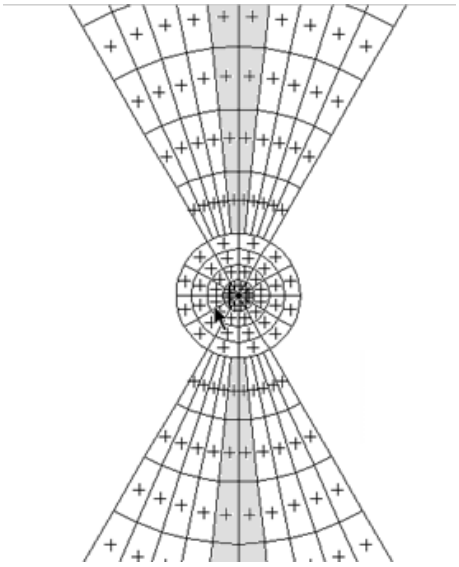

Figure 28. *Wire frame AutoCad "bow tie" .*

Additionally, each five degrees of view had to be subdivided into segments of 5, 10, 15 and 20 miles of distance from the glyph.

After constructing this basic "bow tie" template, a separate GIS layer had to be created for each individual glyph, rotating the template to match the compass azimuth of the glyph (Figure 29).

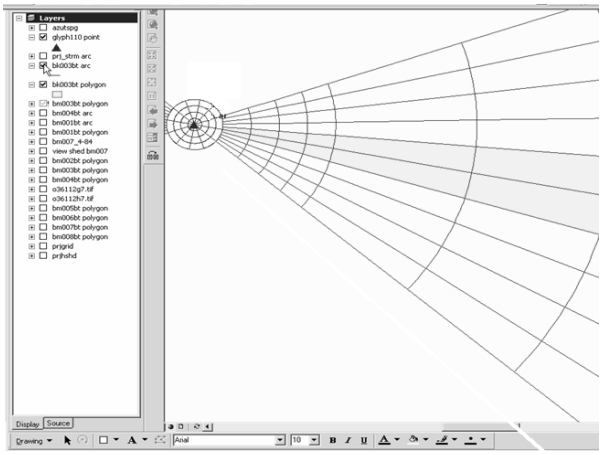

Figure 29. *Rotating the wire frame to the compass azimuth.*

A sample group of 20 glyphs (10% of known glyphs) from three sites were then selected as a test pilot of the system. Of the twenty, eight were broken, had fallen from the cliff or were otherwise unreadable.

The team then used the DEM data in conjunction with this bow tie layer to create a view

shed, or field of vision, for the remaining 12 glyphs.

This established a virtual horizon for a person standing at that exact point. It also gave the GIS system an exact area to focus its analysis on, to the left or right of the centerline, and before or beyond the horizon, depending on the location of the "dot" in the actual glyph (Figure 30).

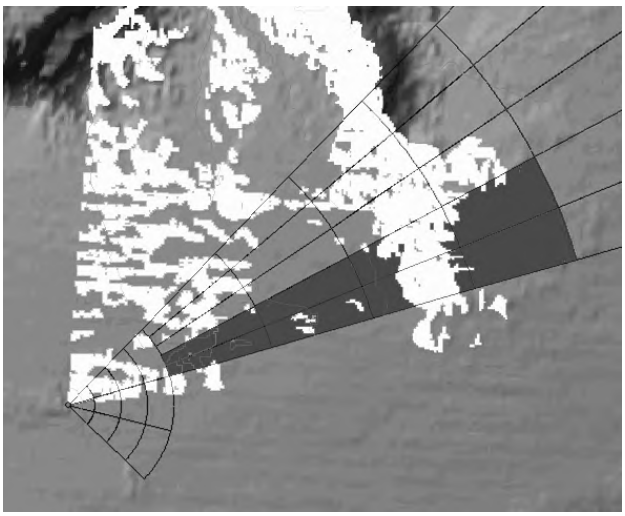

Figure 30. *Wire frame, DEM and viewshed show field of view (white areas) from each waterglyph.*

After running the analysis, nine of the twelve did in fact have a known water spring in the appropriate polygon.

Two additional glyphs had modern water tanks or cattle watering troughs in the area indicated, which could have originally been springs that were converted, and one glyph appeared to point at nothing.

Even without the other two questionable glyphs, *nine of twelve gave an amazing 75% accuracy rate* to the "waterglyph" or "hydroglyph" theory.

DECIPHERING MEANING IV

The final translation of the glyphs then is: As Far as You Can See "Horizon"; Look Here; Pointing to a Prominent Landmark; Water (Figure 31).

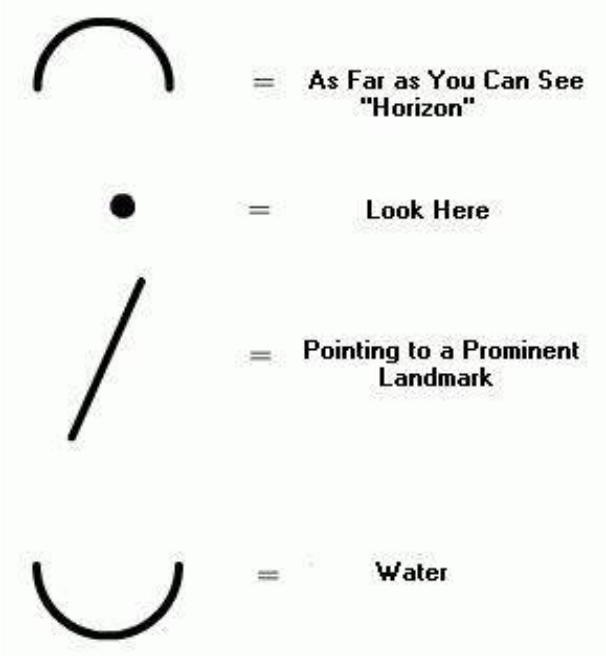

Figure 31, *As Far as You Can See "Horizon"; Look Here; Pointing to a Prominent Landmark; Water*

… Or .. Figure 32

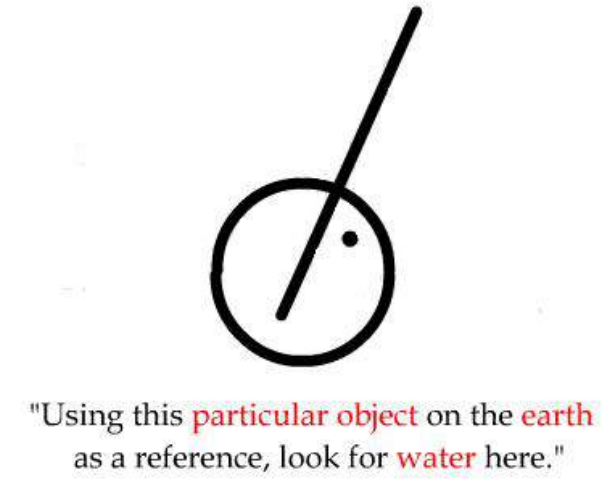

Figure 32. *Another Interpretation.*

Of course, the team reserves the right to alter this interpretation as new data comes to light, but at the time of this presentation to the URARA members, the "waterglyph" theory remains the most accurate model to date, for explaining the function of these unique glyphs.

CONCLUSIONS

The fundamental conclusions drawn from this project are that:

1. There is a predictable pattern of waterglyph locations; namely that they are found near the edge of a cliff with a prominent field of view.
2. That waterglyphs retain a fundamental shape and size; 24" circle with a 48" line and dot(s). The line will always run to the edge of the cliff or a crack in the rock.
3. That the line usually aligns with a prominent landmark on the horizon that can be used to navigate a hike of 5 to 10 miles.
4. That the circle(s) represent the visible horizon from that geographic point and functions as a general indication of distance to the "dot".
5. That GIS analysis has shown that in approximately 75% of the cases, the "dot" indicates a known spring of fresh water.

That these glyphs could have also served additional functional or religious functions is not questioned.

In fact, given the almost universal human tendency to reuse symbols, such as the "all seeing eye" on the U.S. dollar, which means little to the average citizen, quite a lot to a Master Mason, and something entirely different to an ancient Egyptian, it would seem fairly preposterous if they did NOT have additional meanings.

However, it remains the focus of this article, to give credit to Robert Ford, who somehow made the mental connections between an obscure comment from Powell's journal and the reality of the "waterglyph" before him…

NOTES

1. The content of this article in no way reflects the complete research behind the waterglyph project, but is limited only to the ideas shared during the half hour presentation at the 2004 fall URARA conference held in Kanab, Utah.

2. The research server that hosted the team's initial publication was originally located in the Udvar-Hazy Business building at Dixie College, http://144.38.20.128/cody/bobby.html. This server was removed in 1999 and the project website was relocated to its current domain: www.waterglyphs.org.

3. The reader is cautioned that the obvious antiquity of these waterglyphs in no way implies that they are not still in use by Native American tribes. As always, a healthy dose of cultural sensitivity is suggested while researching this particular petroglyph.

4. Team members are frequently asked why they have not previously shared this data with universities, state/federal government agencies or national science publications. The simple answer is that during the last eight years the local BLM, National Geographic and Discover magazines were all approached; none of them were interested.

ADDITIONAL CONTRIBUTORS

The contributions of Marty Heaton, linguistics; Kathy Webb, Meso-American research; Dr. Gary Schaffer, Navajo and Hopi cultural liaison & Dr. Tom Charles, North Carolina state archeologist to this project are here noted. However, because of the time constraints of the URARA presentation, their contributions were only briefly mentioned and will not be covered in this article.

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2004 http://seamless.usgs.gov United States Geological Survey (USGS)

Steven J. Waller

ARCHAEOACOUSTICS: A KEY ROLE OF ECHOES AT UTAH ROCK ART SITES

Archaeoacoustics is an emerging field of study investigating sound in relation to the past. The intent of this paper is to convey appreciation for the echoes at Utah rock art sites, by recognizing the importance of their influence both on the ancient artists, and on modern scientific studies. The title of this paper is thus intentionally worded such that it could be understood in two different but interrelated ways. One, the study of sound indicates that echoes were an important factor relative to rock art in Utah. Two, the echoes found to be associated with Utah rock art sites have been particularly helpful in developing theories relating sound to past cultural activities and ideologies. This paper describes in a roughly chronological order the events and studies that have led to Utah featuring prominently in the development of archaeoacoustics.

More than three dozen rock art sites in Utah, as well as hundreds of others around the world, have been documented as possessing remarkable echoes or other acoustic phenomena. The first systematic analysis of a rock art site for the localization of sound reflection consisted of acoustic data collected throughout Horseshoe Canyon. The results showed that the five art sites correlate exactly with the five locations within the canyon possessing the strongest echoing. The cultural significance of this is that many ancient cultures are known to have had supernatural explanations for echoes, as they are described in echo myths from around the world. It is theorized that echoing locations such as caves and canyons were considered sacred, and were decorated with images evoked upon hearing the echoes. For example, echoes of percussion noises such as clapping can mimic the sound of hoof beats, and hoofed animals are a frequent rock art theme. Voices appear to emanate from rock surfaces where beings are depicted, as if the images are speaking. Myths attribute echoes to sheep, humans, lizards, snakes and other figures that are major rock art themes. Echo-rich Fremont Indian State Park even has a panel that has been interpreted as showing the mythological Echo Twin. The study, appreciation, and preservation of rock art acoustics in Utah are encouraged.

INITIAL STUDIES OUTSIDE UTAH

A conceptual connection between sound and rock art originally occurred to me when visiting European Palaeolithic caves in 1987. A fortuitous shout at the mouth of a cave resulted in a startling echo. I immediately remembered the Greek myth in which echoes were attributed to the answering calls of a nymph turned to stone (Ovid). This belief in a conscious supernatural being who is responsible for natural phenomena is a form of animism. I theorized that echoes attributed to spirits would have been a powerful motivational factor for the production of rock art in sound reflecting places such as caves and canyons (Waller 1993a).

At about the same period in time, several other researchers noticed sound in relation to rock art (Hedges 1993, Reznikoff and Dauvois 1988, Steinbring 1992).

Thus began my investigations of sound and rock art. At first, I simply noted the echoes I heard. Progressing from subjective descriptions of echoes to objective measurements, I later made recordings at a number of caves and open air sites in France. These recorded echoes were analyzed with a sound level meter. The resulting data served to objectively document the

presence of strong sound reflections at rock art sites (Waller 1993b).

I also tested a variety of rock art sites in Queensland, Australia and found echoes associated with the art there, too (Waller 2005).

ACOUSTIC RESULTS IN UTAH

Three Kings

To analyze recordings of sound reflections more efficiently and in more detail than in the studies I had conducted in France, I purchased a computer program that displays sounds graphically as a function of time. The first rock art site that I analyzed with this new program was the Three Kings panel near Vernal, in northeastern Utah. Like the other petroglyph panels elsewhere at Dry Fork Creek, I found excellent sound reflection. The Three Kings panel is located very high up on a cliff. What I found was that the echo appears to emanate from the exact spot high on the cliff face where the artists chose to decorate. For the documentation process of the echo, I recorded the ambient background sound, then made a percussion sound similar to clapping, using a spring-loaded device that gives reproducible results. The primary sound, as well as any reflected sounds occurring afterwards, were captured on tape for later analysis. These recordings were digitized on a Macintosh personal computer using a commercially available program called SoundEdit Pro (version 1.0). The results are shown in Figure 1, clearly showing the existence of an echo. The reflected sound is 30 dB above background, and is separated from the primary sound by 0.1 sec, a delay which is distinguishable by the human ear. These results were presented at the International Rock Art Congress held in Flagstaff in May of 1994 (Waller, in press).

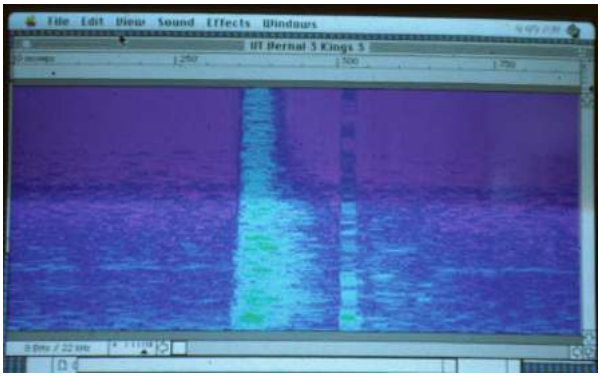

Figure 1. *Echogram of sound at Three Kings near Vernal, Utah. Frequency is on the Y-axis, time in seconds is on the X-axis, and sound pressure (loudness) is indicated by a color scale. An impulse made at time = 0 seconds is followed by reflected sound (echoing) at greater than 0.1 seconds.*

Horseshoe Canyon Systematic Study

In conjunction with the IRAC'94 congress, I participated in a four-day rock art tour of the Colorado Plateau. This tour included many wonderful rock art sites, but the main reason I wanted to go was to see "The Holy Ghost" (Figure 2). This captivating image is part of the Great Gallery, found in Horseshoe Canyon (formerly called Barrier Canyon), located in Utah's Canyonlands National Park. The Great Gallery is considered one of the premier rock art sites in the world, and represents a major category of rock art called the Barrier Canyon

Style. These images painted in reddish brown are estimated to be thousands of years old.

Figure 2*. Detail of the Holy Ghost figure from the Great Gallery in Horseshoe Canyon, Utah.*

The art is characterized by enigmatic, ghostly looking anthropomorphic (human-shaped) and zoomorphic (animal-shaped) figures (Figure 3).

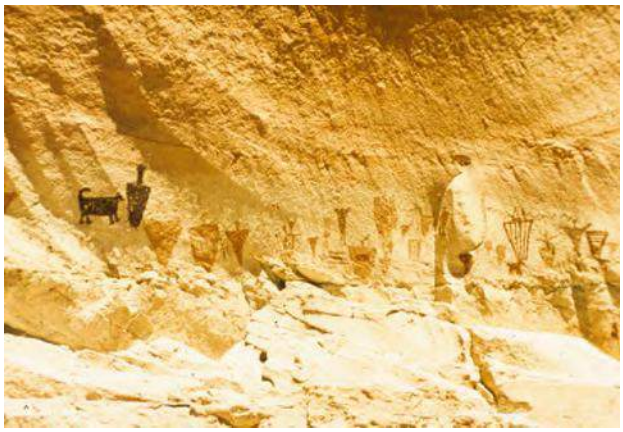

Figure 3. *Barrier Canyon Style anthropomorphs and zoomorphs from the Shelter panel in Horseshoe Canyon, Utah.*

Hiking into the canyon, our group came first to a cluster of figures painted high up on the canyon wall, called appropriately enough the High Gallery. I could distinctly hear the voice of a tour guide bounce from high off the wall exactly where the art occurs, as if the painted beings themselves were speaking. Next we came to a group of paintings called the Shelter site, and further along, a huge cave called the Alcove site with more paintings. Visually, there appeared to be no obvious reason any of these sites would have been selected for decoration, as there are plenty of similar rock surfaces suitable for decoration all along the canyon. My sense of hearing, however, revealed that each of these art sites occurs at places with exceptionally clear echoes, in striking contrast to the undecorated portions of the canyon.

Although the group stopped to rest and eat in the shade of the Alcove, I could not wait to see the magnificent Great Gallery. I pressed on alone in my pilgrimage through the canyon, until finally the moment I had been anticipating arrived, and I stood face to face with the Holy Ghost. It was an awesome sight, seeing this ethereal being surrounded by many other ghostly figures. Unfortunately, a whole class of art students was there, and it was taking an incredibly long time for their teacher to basically say we know hardly anything about this art. Impatient to listen for acoustical effects, I walked around and discretely made some clapping noises. This drew a few curious stares, but the echoes were worth it. Eventually the class packed up and left. Just when their conversation started to die down and I thought I could start some recording, my own group arrived and began chattering excitedly at the sight of all the rock art. Sighing, I sat down and ate my lunch while contemplating the Holy Ghost. Then I joined in with the others snapping photos left and right. I gave a demonstration of the acoustics to the group, showing that the Holy Ghost will speak back to you if you address him from about twenty yards away.

When the group finally left down canyon for the return hike, with the permission of the group leader, I actually continued further up the canyon. I had spontaneously decided this would be an ideal location to systematically test the acoustics all along the canyon. My aim was to objectively verify the impression I gained on the way in: that the art is located at the places with the best echoes. Beginning at a point well beyond the Great Gallery and out of sight of art, I made the return hike while making recordings at regular intervals. That was quite a hike, and one I am sure I will never forget: miles of rugged trail under the hot Utah sun in June, and since I was stopping so often (eighty times total) to set up my equipment, take measurements, then pack up the equipment, I jogged in between each stop so that I would not keep the group waiting too long for me at the end. As a result, I had to hold my panting breath for each measurement (done in triplicate at each stop) to avoid interfering with the recording!

Even with my computer program, it took me over two years to complete the analysis of all the data (my baby daughter Julia arrived in the meantime). The results of these quantitative measurements, depicted in Figure 4, show that all four rock art clusters in Horseshoe Canyon are situated exactly at locations with echoes louder than the surrounding non-decorated por-

tions of the canyon. Furthermore, while testing in the canyon I had noticed an additional location with good echoing near a bend in the canyon about half-way between the Alcove and the

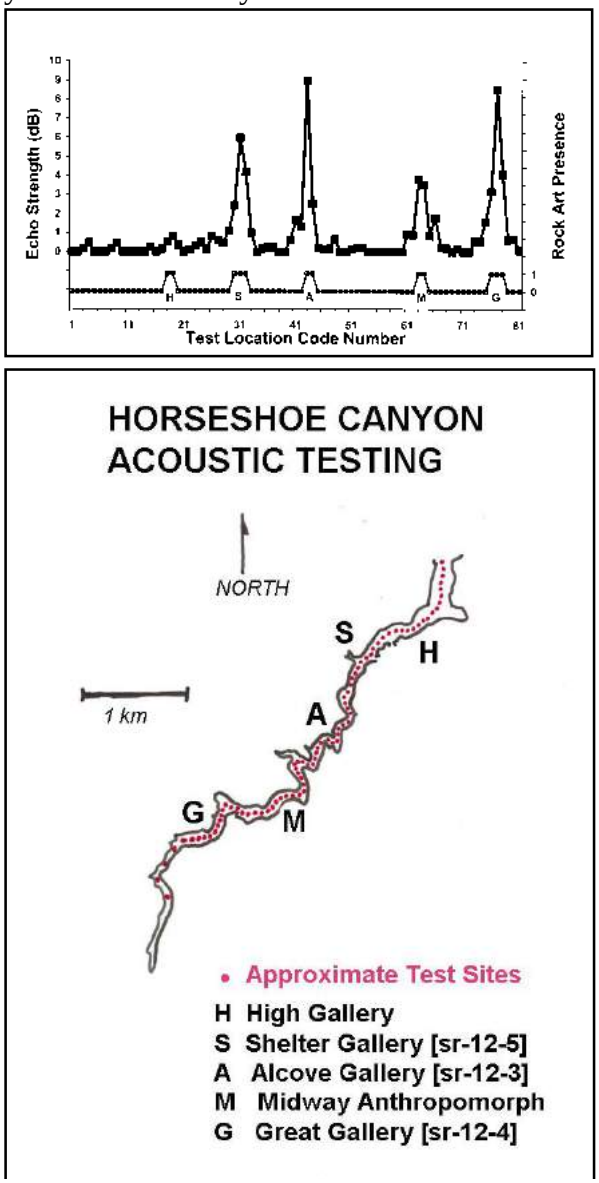

Figure 4. *Measurements of sound reflection throughout Horseshoe Canyon, Utah. Sound pressure (loudness) of the echoing is shown on the Y-axis, and test location number as an indication of position is shown on the X-axis along with abbreviations for the rock art panels at certain of the test locations: H = High, S = Shelter, A = Alcove, M = mid-way anthropomorph, and G = Great Gallery.*

Great Gallery, and this stands out distinctly in the graphics of the results (designated as test location #63 in Figure 4). I called the Canyonlands National Park Archeologist who had accompanied our group to ask whether any traces of art had been found anywhere else in the canyon besides the four major clusters.

Indeed, she replied that "there is a single small anthropomorphic [human-shaped] figure painted near a bend about midway between the Alcove and the Great Gallery" (Nancy Coulam, personal communication 1996). I immediately faxed her my graph showing the presence of a strong echo where she had described. This exciting and dramatic example of anticipating the presence of art at a location with strong echoing relative to its surroundings (together with the many examples of anticipating echoes at art locations) demonstrates that the theory of acoustic motivation for rock art has predictive ability, one of the hallmarks of a valid theory. Thus the five rock art sites within Horseshoe Canyon -- the High panel, the Shelter, the Alcove, the mid-way anthropomorph, and the Great Gallery -- all have the strongest echoes within the canyon. A statistical analysis of the data showed that out of eighty tests the probability of the five art sites occurring by random chance at the locations with the strongest echoes is less than one in ten thousand (Waller 2000).

Acoustics At Other Utah Rock Art Sites

I have visited and tested a variety of other rock art sites in Utah, and found echoes at each one of them:

Fremont Indian State Park -- echoes from cliffs and canyons.
Willow Springs -- echoes from large boulders.
Butler Wash: Wolf Man/Yucca and Procession panels -- echo from each cliff face.
Sand Island -- echo from cliff.
River House ruins -- echo from shelter in cliff.
San Juan River: Kachina panels -- echo from cliff.
Hog Springs -- echo and reverberation in large cave.
Capitol Reef -- echo from cliff.
Wire Pass -- echo from cliff.

Zion southgate -- echo from cliff and facing slope
Clamshell -- echo from cave and facing rocks.

In addition, a number of people have informed me, via personal communications over the years, of acoustical phenomena at other Utah rock art sites:

Hell Roaring or Hey Joe Canyon (William Biesele);
Sego Canyon (William Biesele);
"Black Dragon" site (Dana J. von Kraut);
Newspaper Rock near Moab (Dana J. von Kraut);
Courthouse Mesa (Dana J. von Kraut);
Wild Horse Canyon (Pam Baker);
Mouth of McDonald Creek (Pam Baker);
Turkey Pen Ruin, Split Level Ruin and Perfect Kiva in Grand Gulch Primitive Area (Susan Villalobos-Boehm);
Titus Creek (Jesse Warner);
Nine-Mile Canyon (Layne Miller);
Bird Site in Canyonlands (Larry Larason)
Head of Sinbad and Temple Mountain Wash (Cathleen McGowan);
Five Faces (Margaret Berrier);
Indian Canyon (Margaret Berrier);
Kane Creek (Margaret Berrier);
Wild Horse Canyon (Margaret Berrier);
Three Fingers (Margaret Berrier);
Rochester Creek (Margaret Berrier);
Pleasant Creek (W. Tapp, H. Mulder) Southfork Indian Canyon (L. Koss).
Music Temple in Glen Canyon [now flooded] (Joan M. Bennett)

Rock art researchers are encouraged to clap or call out upon approaching rock art sites, and also while standing at rock art sites, and listen to determine if the echoing is better there than in the surrounding terrain that does not include rock art. (Please contact me at wallersj@yahoo.com with results.)

ILLUSION OF DEPTH

The following observation captures perfectly the perception of depth that can occur as the result of an auditory illusion. “I first noticed the acoustics of rock art when I heard a car ‘drive’ out of the Buckhorn panel” (William Biesele, personal communication 1997). Echoes seem to originate from behind sound-reflecting rock surfaces, in a manner analogous to images reflected in a mirror (Waller 2001). In my view, spirits making the sounds were probably thought to dwell within those rocks. Consequently, the rock surface would have been a permeable boundary between the spirits and the listener. Studies of indigenous people in South Africa describe the belief in the spirit world within the rock and its relevance to rock art images that decorate the rock surface. Evidence is shown by Lewis-Williams and Dowson, that San people’s rock art relates to the belief in a spirit world beyond the "veil" of the rock surface. The rock art incorporates examples of painted images emerging from cracks or holes within the rocks. (Lewis-Williams and Dowson 1990).

In North America myths have been recorded that describe the belief in a spirit world within the rock, and which feature sound as an important aspect: a magical rock wall appearing like a transparent window when viewed from within as if the rock paintings hung in the air; sounds of voices heard around these paintings; and spirit beings inside the rock producing many sounds such as heartbeat drumming and songs echoing across the lake (Conway 1993:149-157). The experience of depth due to auditory illusion can be experienced at many of Utah's echoing rock art sites.

ECHO MYTHS OF UTAH & VICINITY

The following are short synopses of several echo myths from tribes living in or near Utah. Like the Greek myth about the nymph Echo, these myths explain sound reflection as spirit voices (Waller 1999).

Origin of the Echo [Ute, Paiute]

Teugai (a witch) came near a village one night and called to a little girl, "Bring me my child." The girl thought it was her mother, so she obeyed. *Teugai* had a basket on her back, and she put both the baby and the girl in it and carried them away, scampering through the woods. When the mother missed her children, there was a great search through the village for them. The people all believed that a *Teugai* had taken them off.

Early the next morning, they followed the old hag and found her asleep, wearied from her flight. The people quickly rescued the children.

When *Teugai* awoke and found they had taken the children from her, she went to her grandfather *Togoav* (Rattlesnake), taking all her own family with her. She begged him to take care of them, for she feared the people of the village would come to kill them and her also. Not knowing what to do, he swallowed them all. It made him very sick, and he asked them to crawl out again. This the children did, but the old *Teugai* was stuck fast.

Then *Togoav* crawled out of his own skin, leaving *Teugai* in it. She shouted, "Let me out, let me out!"
"Stay where you are; be still!" said *Togoav*.

Still she screamed, "Let me out, let me out!" But *Togoav* refused to help her and went away.

Then *Teugai* wriggled with the skin into a crevice in the rocks and made her home there. When the people of the village came in search of her, she repeated their words in mockery; and though they heard her voice, they could not find her.

Since that time, all *Teugai* live in snakeskins, and the echoes which are heard in the rocks are their spiteful mockings (Powell 1881).

In another version of this story, the witch first hides with the baby in "a skin that had been stripped from a huge mountain-sheep" (Skinner 1903)

Night Chant: Divinity Echoing Stone [Navajo]

The Navajo Night Chant (*Yeibichai*) includes offering of prayers to the divinity Echoing Stone on the first day of purification (Highwater 1984).

Palöngawhoya, the Echo Twin [Hopi]

Spider Woman then said to the twin on her left, "You are *Palongawhoya* and you are to help keep this world in order when life is put upon it. This is your duty now: go about all the world and send out sound so that it may be heard throughout all the land. When this is heard you will also be known as 'Echo', for all sound echoes the Creator."
...*Palongawhoya*, traveling throughout the earth, sounded out his call as he was bidden. All the vibratory centers along the earth's axis from pole to pole resounded to his call; the whole earth trembled; the universe quivered in tune. Thus he made the whole world an instrument of sound, and sound an instrument for carrying messages, resounding praise to the Creator of all (Waters 1963).

TWIN MOTIF INTERPRETATION

Fremont Indian State Park in Utah has a panel that has been interpreted by LaVan Martineau as showing the mythological Spider Woman and her Twins (Patterson-Rudolph 1997:57-58, Plate 16 and Figure 32); see Figure 5. Since the younger Twin is called "Echo" (see myths section above), a depiction of him would be tantamount to depicting an echo.
Interpretations of rock art have been controversial, because it has been pointed out that one cannot scientifically prove specific meanings beyond any doubt. Nevertheless, acoustic testing could serve to help substantiate interpretations that are related to echo mythology. In this

detail of a rock art panel in echo-rich Fremont Indian State Park, redrawn from Patterson-Rudolph (1997, Figure 32). As interpreted by LaVan Martineau, the Twins are the two circles connected to the larger figure. The younger Twin is known as "Echo".

case, while I was not aware of the specific interpretation of that particular panel at the time of my visit, I have documented echoes throughout Fremont Indian State Park. The presence of echoes in the vicinity of this panel helps lend credence to the interpretation of the rock art imagery of this panel as containing the Echo Twin.

ACOUSTIC CONSERVATION

Unfortunately, Fremont Indian State Park is a prime example of a rock art site that has had its acoustics compromised somewhat. The visitors' center was constructed so near some of the rock art, that it interferes with hearing the echoing. The building not only blocks the propagation of natural sound reflection from some of the rock art panels, but adds its own artifactual echoes.

The recognition of the importance of echoes to rock art studies immediately implies the need for conserving the natural acoustics of rock art environments (Waller 2003).

CONCLUSIONS

Echoes have been documented at over three dozen echoing rock art sites in Utah, more than any other state except for California (since that is where I happen to live). The first systematic analysis of a rock art site for the localization of sound reflection was performed in Horseshoe Canyon, and showed that the five art sites correlate exactly with the five locations within the canyon possessing the strongest echoing. Echoes have great cultural significance, as contained in echo myths from around the world, including many from Utah and vicinity. It is theorized that echoing locations such as caves and canyons were considered sacred, and were decorated with images evoked upon hearing the echoes. For example, echo-rich Fremont Indian State Park has a panel that has been interpreted as showing the mythological Echo Twin. The study, appreciation, and preservation of rock art acoustics in Utah are encouraged.

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Laurel Casjens

VIRGIN ANASAZI DESIGN: ROCK ART AND CERAMICS

STYLE AND CULTURE

Style, whether on rock art or pottery or other artifacts, has long been used to identify cultural identity—e.g. Virgin Anasazi—and to identify time periods as styles change through time. This ability to identify small slices of time is especially refined in pottery. Indeed, pottery sherds are often used as time markers.

The Museum of Peoples and Cultures is exhibiting artifacts from a site located near Kanab[1]. The site is located on private land, and was excavated by the owner. Because we have very little information about the provenience, or exact location from which the artifacts were taken, it was not possible to undertake many scientific or contextual archaeological studies. However, we realized that one possibility was to study the designs on the pottery. I thought it would be interesting to compare the style of the designs on the pottery to those found on rock art in the general vicinity.

By style, I am referring to the techniques of producing designs, the design elements, and the composition or arrangement of the elements. Obviously, the surface on which the designs were placed is totally different in ceramics as compared to rock art. And, techniques of placing the design have differences in scale and procedure. Therefore in this study, I am concentrating on the elements and their arrangement.

Variation in style has interested researchers for a long time. In 1985, James Hill discussed causes of variability, combining two theories, the "social interaction theory" and the "information exchange theory" into a more encompassing "evolutionary framework". The "social interaction theory" states that style serves no function in maintenance of societal, interpersonal, or intergroup relations. Aspects of style are simply taught or communicated. Styles diffuse from people and groups to people and groups; the closer and more interaction, the more diffusion will take place and the more similar styles will be. Information exchange theory suggests style is functional and adaptive since it conveys information that fosters group identity, integration and boundary maintenance, social integration and differentiation. The evolutionary framework combines the two theories to make a more comprehensive explanation of stylistic variability and change. Style changes in a process similar to biological evolutionary theory. All aspects of style should be accounted for within an ecological/adaptive framework. (Hill, 1985:362-385). Hegman (1994:4) suggests that style can fill many roles and convey various meanings. She feels that style is mainly a means of marking social identities and expressing social differences.

COMPARISON OF ROCK ART AND CERAMICS

While pottery design and rock art were both important artistic endeavors to the prehistoric inhabitants of this area, they have several inherent differences. Pottery is movable: individual vessels can be traded long distances. The design on the pottery is determined and created by the maker, wherever she may be. The importance of the design to the person to whom it was traded may have been moot if the pot passed through many hands or was brought to its final

owner by traders or other travelers. However, in the locality in which it was made, painted pottery could be manipulated to actively "negotiate the meanings of relationships among individuals, families (kin groups), households (economic groups) and communities (residence groups)." Pottery is portable and can have ritual as well as household contexts, especially in the circumstance of intercommunity feasting. (Webster and Hays 1994:323) Most ceramics in this study are made locally (at least to the general area).

Rock art is non-movable, and rock art sites must have been chosen for specific reasons. Rock art can serve to mark a place as having been the site of intense human experience or can intensify human experience, serving as a point of orientation (Smith, 2001) Rock art is part of a sacred and social landscape (Hays-Gilpin 2004:147). Rock art at the same site may have been made by different people at different times. (Smith 2001). Rock art works at the scale of several communities (Crumley, Carole and William H. Marquardt1987) but may have public and private functions.

Determining the meaning of either rock art or pottery design has intrigued people for a long time. (cf. Martineau 1973, Patterson 1992, Cunkle1993). Unfortunately, meaning is usually not testable, and different sites or panels may have been made for different reasons. Rock art is often correlated with ceremonial practice, including trance, ritual, hunting magic, healing, initiations, and myths. (Hays-Gilpin 2004:165, 177). However, other panels may be simply histories telling a story of what happened. Other glyphs may be locational markers for water or travel routes.

A few studies comparing rock art and ceramics have been undertaken in the Southwest.

Most commonly, these studies involve representational elements rather than geometric elements. Among them, Fewkes (1898:691-2) identified similarities between feather designs on Sikyaki pottery and in petroglyphs. Separate papers by Schaafsma and Hays-Gilpin in one volume (Schaafsma 2000) analyze rock art and ceramics (respectively) with depictions of kachinas. Hays-Gilpin illustrates dichotomous decorative styles in Basketmaker portable items (pottery, baskets and woven items) and rock art from the four corners area (Hays-Gilpin 2004:103-104). Stewart, Matousek, and Kelley(1990:307-8) compare rock art and ceramic art in the Jornada Mogollon region, finding some complex geometric designs, specifically meander lines and circle and dot designs that occur both in rock art and on ceramics. None of these studies look at the Virgin area in what is now Southwest Utah.

Southwestern Utah

The rock art Southwest Utah is mostly representational, being largely composed of anthropomorphs and zoomorphs. Purely geometric images are less common. However, many representational images include or are decorated by geometric elements. These elements were included in this study. Petroglyphs are more common than painted pictographs, so color is only occasionally present.

Decorated ceramics from the Talbot site have only geometric designs. The collection contains no vessels with representational elements. Decorated ceramics are mainly black on white, with a significant number of black on red.

Many ceramics from the site show three design types (singly or together) that are missing from, or rare, in the rock art panels.

Design Elements

Many vessels show negative or reserve designs: i.e. the design that catches the eye is actually the area left unpainted (in this case, the white or red). Negative elements are rarely used in the rock art of the area (Figure 1, 2, 3).

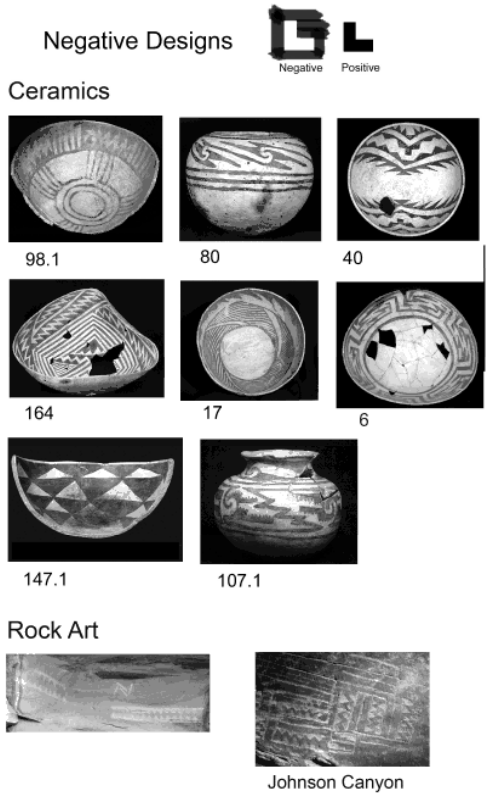

Figure 1. *Negative Designs*.

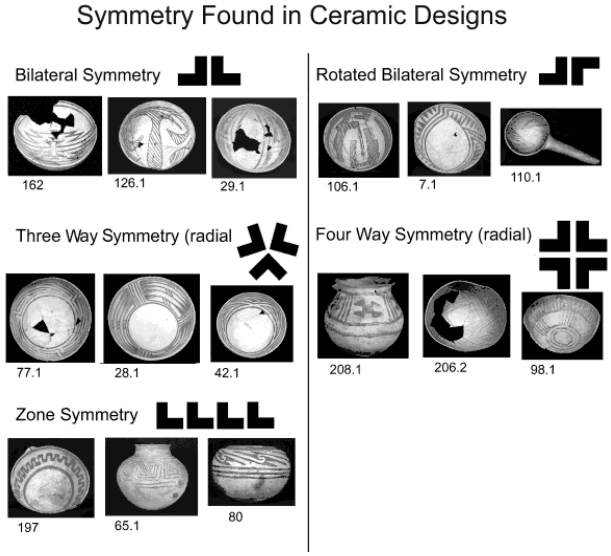

Figure 2. *Symmetry Found in Ceramic Designs.*

Most pottery designs show symmetry: glide, bilateral, or rotational. Some vessels are not quite symmetrical, but give the overall impression of symmetry, even though elements aren't placed exactly in the right place or aren't exactly the right size. Rock art shows essentially no symmetry except the bilateral symmetry shown in the (face-on) anthropomorphic subjects (humans are by nature bilateral). The geometrics in the rock art rarely show symmetry (Figure 2).

Many vessels show bounding lines above and or below the geometric decorations (Figure 3).

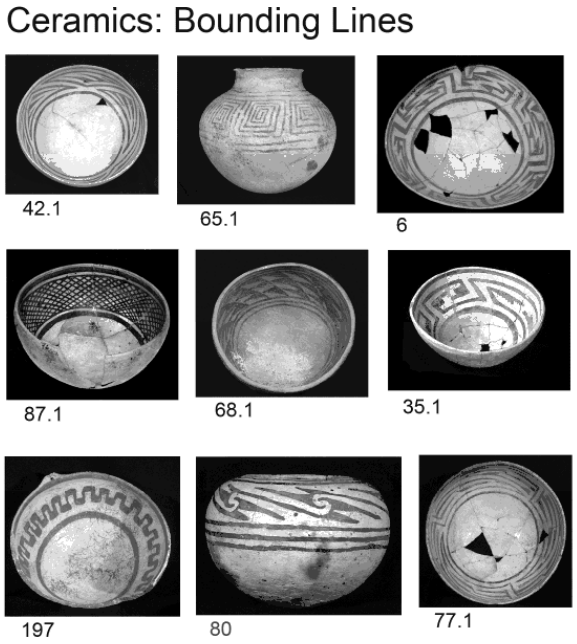

Figure 3. *Ceramics: Bounding Lines*

GEOMETRIC ELEMENTS

Many geometric design elements are found both in rock art and in the ceramic decorations. A close look at the shared elements, however, shows that they are generally used differently.

Triangles

Ceramics:

Triangles are very important in both bowls and jars: most vessels' decorations include triangles; some designs are totally composed of triangles. Most triangles are pendant from a line, some are stepped, and some are free floating. Triangles come in all shapes: equilateral, isosceles, and scalene (Figure 4).

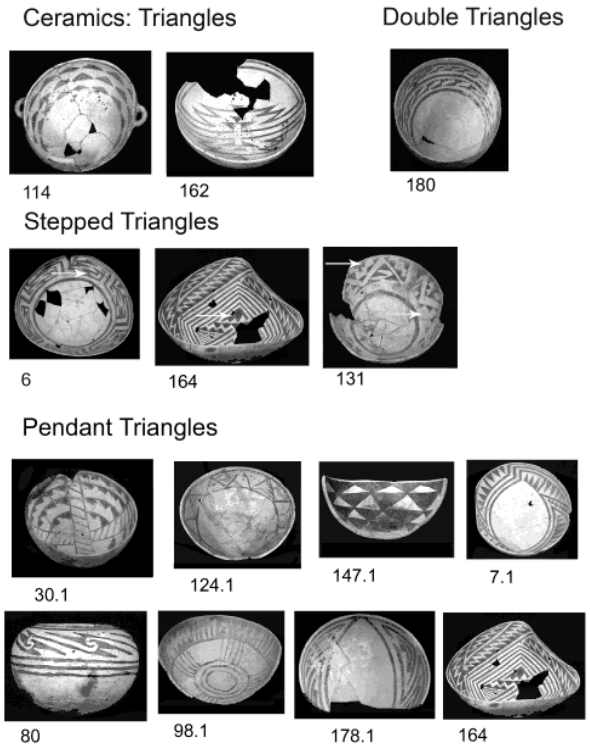

***Figure** 4. Triangles*

Rock Art

The panels contain only occasional triangles: several sets of appended triangles, and two sets of triangle decorations between lines occurred in this sample. There is one example of concentric triangles (Figure 5).

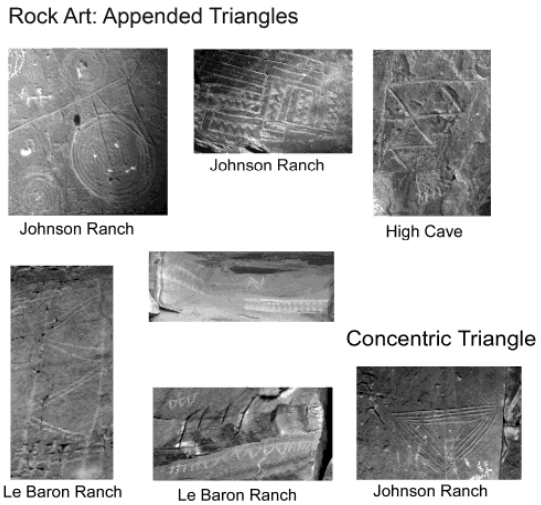

Figure 5**. Geometric Decorations.**

Geometric or Curvilinear Designs with Internal Hatching and Cross Hatching

Ceramics

This design element is very important in ceramics; many bowls and jars have this type of decoration. Cross-hatching only occurs on two vessels; in both cases it occurs as a simple band. The designs that are hatched may be complex curvilinear or rectangular geometric with hatching set off from the undecorated (plain) sections. In some vessels, the hatching occupies about half of the surface (Figure 6).

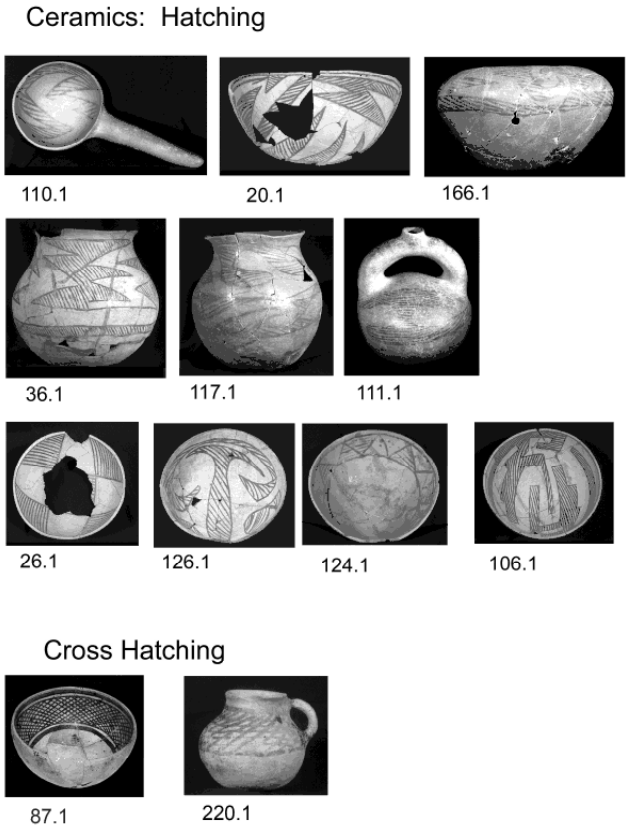

***Figure 6**. Cross Hatching*

Rock Art

In rock art we find rare, sparse cross-hatching between vertical lines; hatching is used only in one panel to fill in representational images (Figure 7).

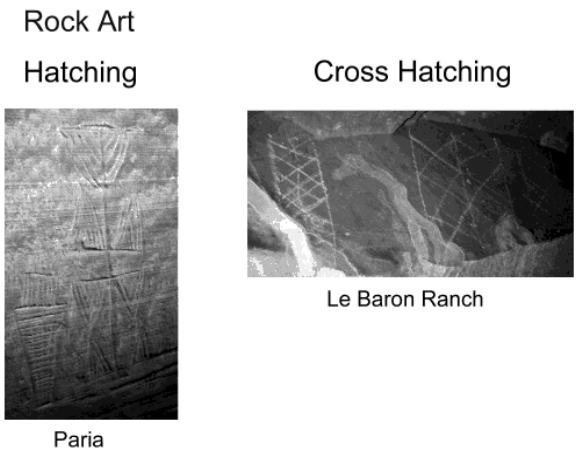

Figure 7. *Hatching and Cross Hatching*.

Spirals

Ceramics

A round spiral occurs on only one bowl. There are several triangular or square spirals on other vessels (Figure 8).

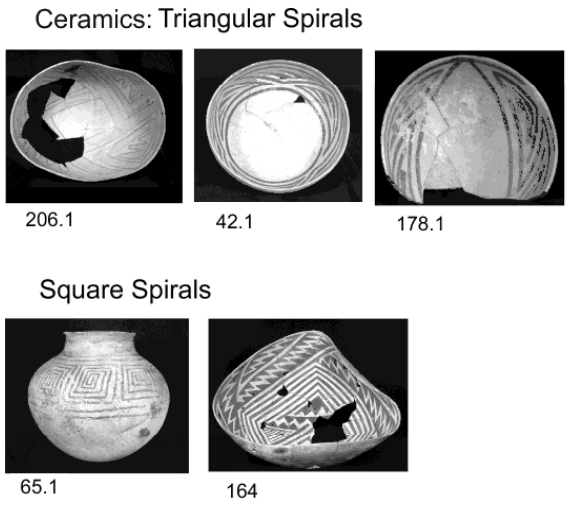

Figure 8. *Triangular Spirals.*

Rock Art

Round spirals are very common. They often occur in groups, with several near each other. Some groups of spirals are connected by a line. The spirals often resolve into something: a snake head, a person, or just an amorphous pecked area; sometimes spirals are bisected by a line. There are two examples of square spirals: one set is arms and legs of an anthropomorph (Figure 9).

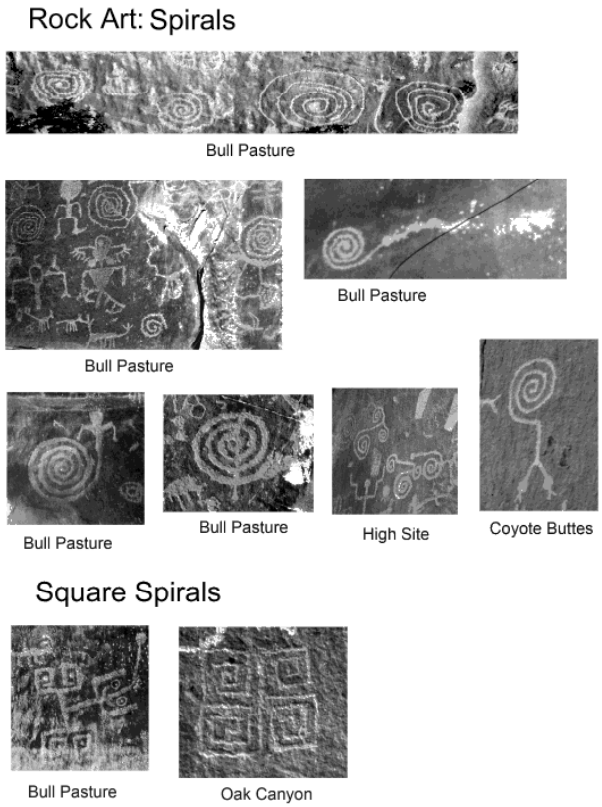

Figure 9. *Rock Art Spirals*.

Circles and Concentric Circles

Ceramics

Few bowls have a decoration that is mostly or all concentric circles. A larger number have several bounding lines that technically are concentric (these bounding lines also occur on jars, but the impact is that of parallel lines, not concentric circles). One bowl has concentric circles in its center. This element is very easy to fit in spherical structure of bowls: however, it is quite rare (Figure 10).

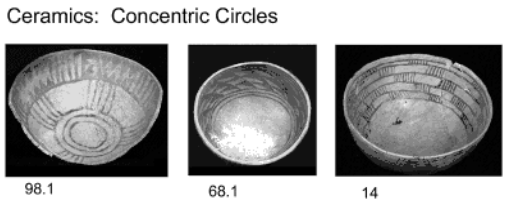

Figure 10. *Concentric Circles*.

Rock Art

Concentric circles are an important element found at several sites. Sometimes several are scattered in the same panel; they are comprised of varying numbers of circles. Sometimes there is a dot in the middle, sometimes not (Figure 11).

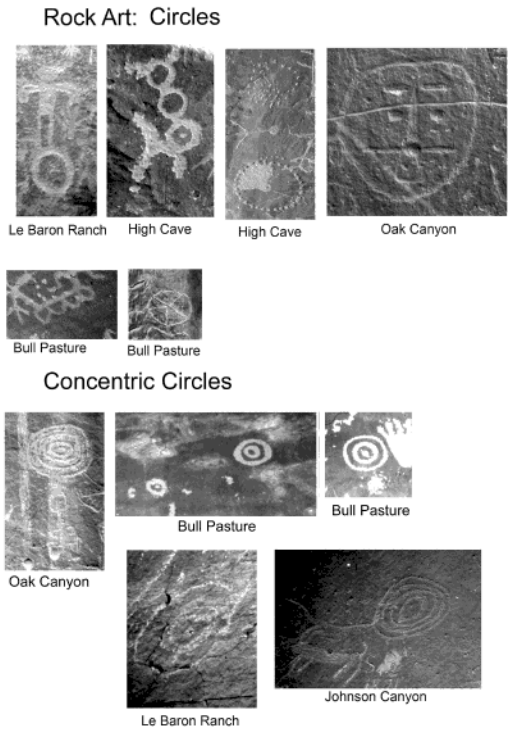

Figure 11. *Rock Art in Concentric Circles*

Zigzag or Wavy lines

Ceramics

Zigzag lines are used occasionally in a variety of ways: around the rim, forming the pattern, bounding triangles, and negative zigzags formed by parallel lines of pendant triangles (Figure 12).

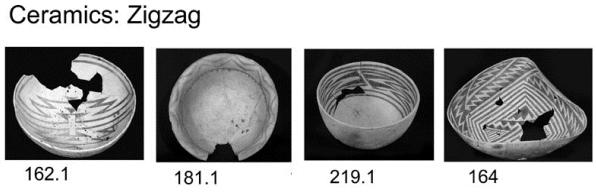

Figure 12. *Ceramics: Zigzag Lines.*

Rock Art

Zigzag lines, some deteriorating to merely irregular wavy lines, are very common in rock art panels. They vary from purely geometric to making up parts of representational images; sometimes there are several roughly parallel zigzag lines; some zigzag lines are vertical, some horizontal, and some are at an angle (Figure 13).

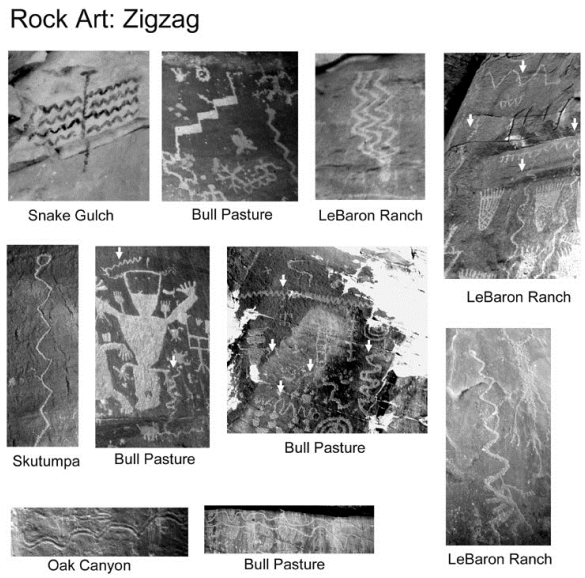

Figure 13. *Rock Art: Zigzag Lines*.

Other Lines

Ceramics

Bounding lines, horizontal lines above and/or below the zone of decorations, are very common. They may be single or multiple, thick or thin, and are found on both bowls and jars. Lines on a few pots form interlocking designs. Bands of parallel lines form part of the design on several pots (Figure 14).

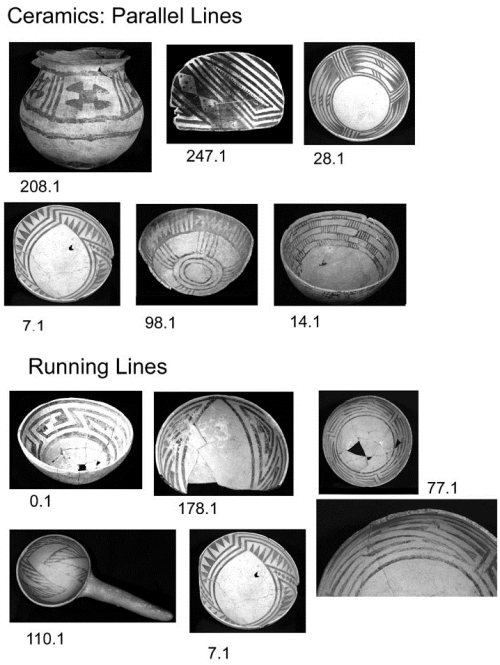

Figure 14*. Ceramics: Parallel Lines*.

Rock Art

Geometric patterns formed from lines include two "mazes" or "basketry designs" and one "net" shaped design (Figure 15).

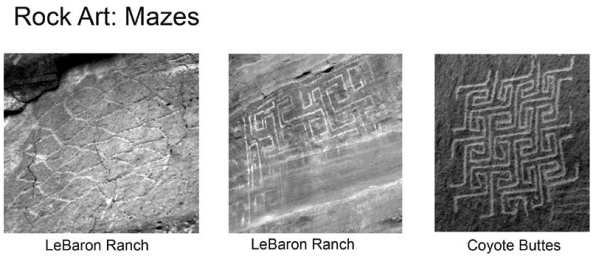

Figure 15*. Rock Art: Mazes*.

Dots

Ceramics

Dots are found in the centers of squares and within rhomboids; in one case a line of dots parallels one edge of a large triangle (Figure 16).

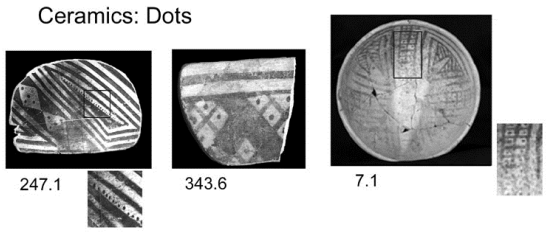

Figure 16. *Ceramics: Dots*.

Rock Art

Dots are used both to form figures and to decorate the insides of representational images. They are also found at the center of some concentric circles (Figure 17). In one element, dots form eyes and a nose.

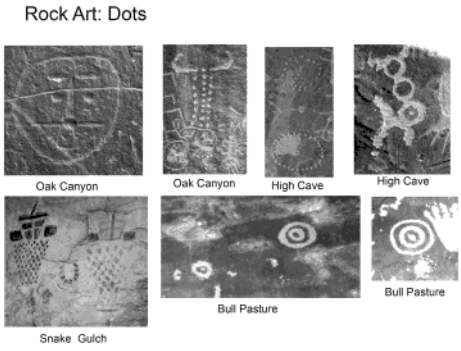

Figure 17. *Rock Art: Dots, Pendant Dots and Short Lines (on one side of a line) and Ticks (protruding on both sides of a line).*

Ceramics

Pendant dots are found on a few vessels; ticked lines occur rarely (Figure 18).

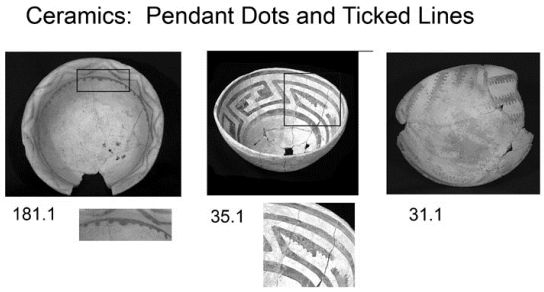

Figure 18*. Ceramics. Pendant Dots and Ticked Lines.*

Rock Art

Ticked lines (and some pedant dots or lines) occur in several rock art sites. Some are purely

geometric; others form parts of representational figures (Figure 19).

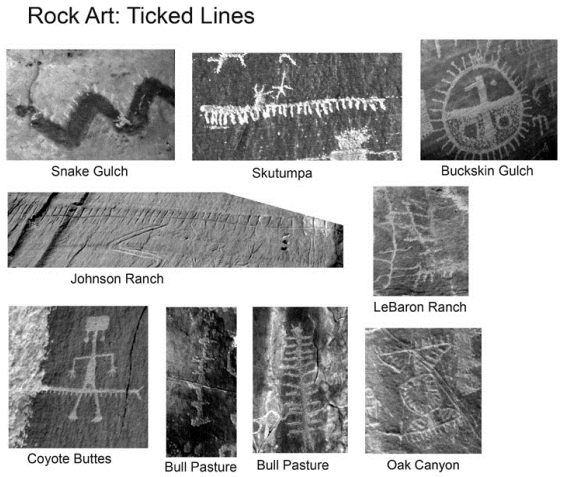

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Figure 19*. Rock Art: Ticked Lines***.**

Squares, Rectangles And Rhomboids

Ceramics

These elements are relatively uncommon; they vary from small to large, and may be negative or positive. They are often combined with other elements (Figure 20).

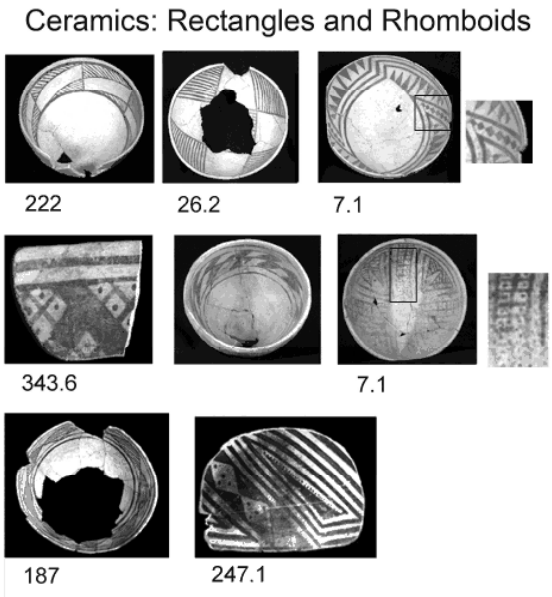

Figure 20*. Ceramics: Rectangles and Rhomboids.*

Rock Art

These elements are relatively uncommon; they are used as internal decoration or stair-stepped together (Figure 21).

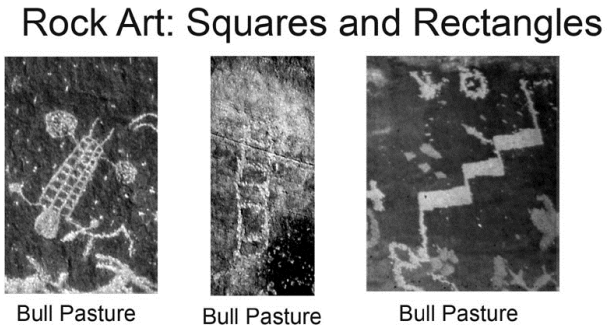

Figure 21*. Rock Art: Squared and Rectangles***.**

CONCLUSIONS

While various geometric elements are used both in ceramics and rock art, there is very little overlap in the arrangements or styles in which the elements are used. Negative elements, bounding lines and symmetrical arrangements are largely confined to ceramics. The question then arises as to why there should be such a difference in art styles in these two media.

Technique does not seem to be a limiting factor. The rock art designs painted and pecked into the walls could easily be painted on the pottery, even with the constraints of the curved limited surface, and pottery designs could easily be painted or pecked on the rock faces as well.

Several, sometimes non-exclusive, reasons can be postulated. The difficulty we face is determining which is correct. The most obvious reasons that come to mind are that both rock art and ceramics were decorated by different groups of people, or that they were made for different purposes that required different styles.

Rock Art And Ceramics Were Decorated By Different Groups Of People

Because the rock art and ceramics principally are of the same age and from the same general

location, and based on previous archaeological work, we can confidently say that they were made by the same culture. Thus, different groups within the culture would have been responsible for the designs.

Who made rock art? Scholars have generally assumed men made it. Hays-Gilpin (2004: 85) reports that ethnographically both men and women are reported to have made it. Rock art is often attributed to shamans: again, both men and women are shamans (88-89). Rock art is produced by young women at their puberty rites in California (91). In general, there are very few eyewitness accounts of making rock art; some of the few are of females. (92). Robins and Hays-Gilpin report that contemporary Hopi men identify rock art as a masculine production; their research has also shown that worldwide men make more rock art. (2000: 231-232)

Who made pottery? Scholars have generally assumed making pottery was women's work. Robins and Hays-Gilpin report that women make most pots and baskets in cultures where such trades are not carried out by full time practitioners (2000: 231-232).

In her search to determine the importance of gender in rock art creation, Hays suggests,

> If we assume two dominant gender categories corresponding to our concepts of "men" and "women" in past societies, we can search for binary patterning in content, style or both. If we find dualistic patterns, we can then hypothesize that gender has something to do with them. (Hays-Gilpin 2004).

Following this line of reasoning, if women made most pottery and men made most rock art: we can expect them to show different styles. The dichotomous styles found in the two technologies, fits the pattern Hays-Gilpin has proposed as one that would indicate gender differences.

However, other factors could cause dualistic patterns as well. Shamans or ritual practitioners could be another group of people who made rock art but did not decorate pottery. In most cultures, shamans can be either men or women. They might be especially associated with panels that involve curing, hunting magic or myths.
Or, dualistic patterns could result from other divisions. For instance, it is documented ethnographically that some sites are important in the initiation of young girls or boys.

Ceramics And Rock Art Were Made For Different Purposes That Required Different Styles.

No one would argue that rock art and ceramic media have different meanings or purposes. Rock art is often postulated to have ritual meaning (at least in some cases); this may involve shamans, puberty ceremonies, hunting magic, myths, or other symbolic meanings. Rock art may be telling a story of something that happened or may be a way-finding aid. Rock art may be clan symbols. Rock art has important ties to the location where is it situated.

The purpose or meaning of ceramic design is rarely discussed, especially when the design is geometric rather than representational. While most archaeologists that study design feel it has a social or functional role, they are not able to break down the design to determine the meaning. While books claiming to offer keys to reading the designs are available (cf. James Cunkle for pottery and Alex Patterson or LeVan Martineau for rock art), these mainly refer to representational images, and, in any case are not universal, since many elements have multiple meanings.

This study points out significant differences between the pottery from a site near Kanab, Utah and rock art from several sites nearby. Several possible reasons for such differences are postulated, however, determining the cause of these differences will require much more research.

NOTES

1. Lanny Talbot, Kanab, has graciously loaned this collection of ceramics to the Museum of Peoples and Cultures.

2. Staff, students and student aides at the Museum of Peoples and Cultures, BYU took the pictures of the ceramics.

3. Nina and Craig Bowen, members of URARA, have a huge collection of rock art photos from this area. They graciously let me choose relevant photographs from their collection, both for this study and for the exhibit at the Museum of Peoples and Cultures. Photographs of some 35 panels of rock art panels from 11 sites were chosen from the hundreds of photographs because they contained geometric elements. Panels that did not include geometric elements were not included in this study. The sites are scattered, but all are within a few tens of miles from the Talbot site. All but two of the rock art photographs were taken by the Bowens.

4. Bob Ford kindly provided a photograph of a negative design (left photo in Figure 1), and I took the other (right) negative design photograph.

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Carol Patterson

Jesse E. Warner

ROTATIONS: A SLANTED LOOK AT ROCK ART

This presentation is about a different type of information than you have probably ever considered before. Because of that, there will be a number of people who may have a problem accepting some of this information as a viable possibility. So, with that in mind, let me also state that I do not want any of you to take what is being presented here seriously. By suggesting that you are not obliged to believe anything I say, you will probably learn more than if you really set out to take it seriously and were closed minded to this information.

The concepts presented here have been growing in my mind for a considerable amount of time. Each little discovery I made led me to believe there was something going on that related to this theme. But I did not have enough examples to support any theory; I only had a vague comprehension that an *intentional ambiguity* was present. It seemed that different images were hiding within other images, but they could be revealed if viewed from a different orientation. This in certain respects is reminiscent of some of Beverly Doolittle's paintings. In these, she hides images within her landscapes. During the very beginning of my research, over 40 years ago, I created files of images which seemed to fit within certain conceptual ideas or categories of symbolism. I did not have a file pertaining to these kinds of images until much later. Many of these images lay in a miscellaneous file.

During the time that I taught on the Navajo Reservation I had access to two individuals who taught me a tremendous amount about symbolism. From these teachings I learned that reversed images do not necessarily represent death. For example, Figure 1a, b, c, is an image that contains more than is immediately obvious. Put your hand over the bottom two images (b. c). in Figure 1 and look just at 1a. What is it? Why do we usually assume that there is only one way to orient an image on the rocks, and that it is its real orientation? How do you interpret it? If you cannot see anything in Figure 1a, drop your hand down, still covering the bottom image and see *one* rotation of it. What do you see now? When the second image (1b) is rotated a *second* time, it becomes familiar to most people. Figure 1c, is rotated a *third* time. What do you see now? If you still do not see anything, don't feel bad, it's not an IQ test, it's all about how well you can see hidden images as a part of pattern recognition.

Visualize the vertical placement of this image representing the thin line between life and death. In other words, perhaps it represents the belief that "when we are alive, we are dead and even in death we are alive". This statement depends on your belief in the proposition "we can die."

Figure 1. *Death.*

There are others who believe that it is only the body which dies. When visualized properly this image contains both concepts of life and death. How intellectual is that? Was it done for the glory of being intellectual alone, rather than art for arts sake? Or was it being intellectualized for intellectual's sake? Or was there a deeper meaning in its purpose?

Figure 2 a-h, illustrates that the rotation of an image is not just a phenomenon that Native Americans played with. Here are a few interesting images with other hidden images redrawn from Newell (1964). Look at them and then turn the page upside down and look at them again. Even though these may seem amus

ing there is a hidden meaning, every face has two sides.

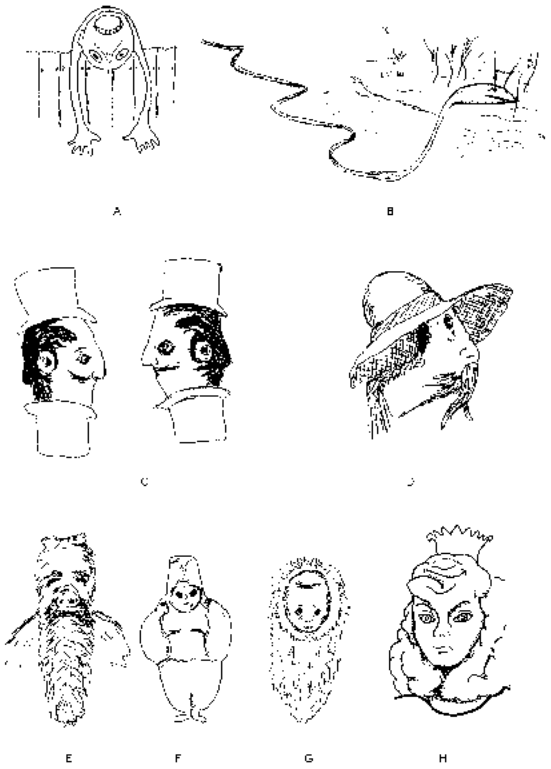

***Figure 2**. Redrawn from Newell. (1964)*

Salvador Dali used this trick in several of his paintings. In one he used the nose and mustache of Hitler to create a serene scene. Figure 3a is the portrait of Hitler with a portion enlarged in 3b. When rotated it becomes a boat, and a mast appear and a serene seascape (Descharnes and Neret 2002:508-9). Even though Dali was considered a genius by himself and others (ibid:11,558) his work had a dark and morbid side. We only know this from our understanding of the political climate during the time of the surrealist movement.

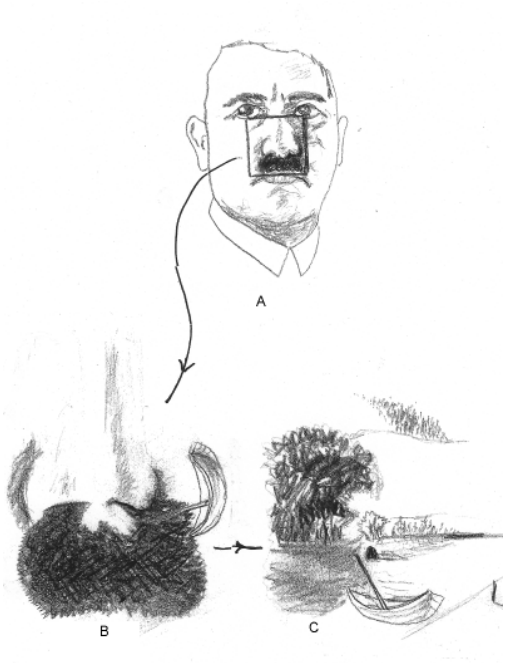

***Figure 3. P**ortrait of Hitler's Nose and Serene River*.

We are fortunate to know that the rotation was purposeful and inspired by a portrait of Hitler. So, with rock art, how do we know if the image was meant to be reversed or that sideways images may always represent death? Could they also represent concepts that have an affinity with an image that we associate with death?

MYSTICAL SYMBOLISM

In this category, Figure 4, the images are placed upside down. There is a subcategory called *Reversed Images that* is just one category out of 30 representing concepts of *Mystical Symbolism*. Other aspects of *Reversed Images*, according to many Native American consultants, are attributed to altered states of consciousness. Many of the examples in Figure 4 seem to represent concepts of death. Notice that other little nuances of symbolism are combined that exclude the simplistic interpretation of death as the only possibility. For example, a dead man, as such, wouldn't be shooting sheep, 4B. Notice that all of the other types of symbolism they include also exude a sense of the mystical.

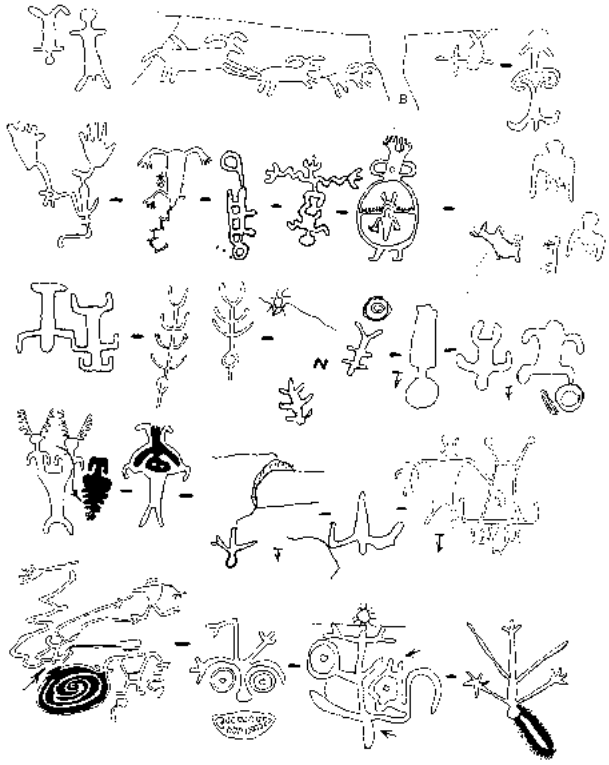

Figure 4. *Reversed Images*.

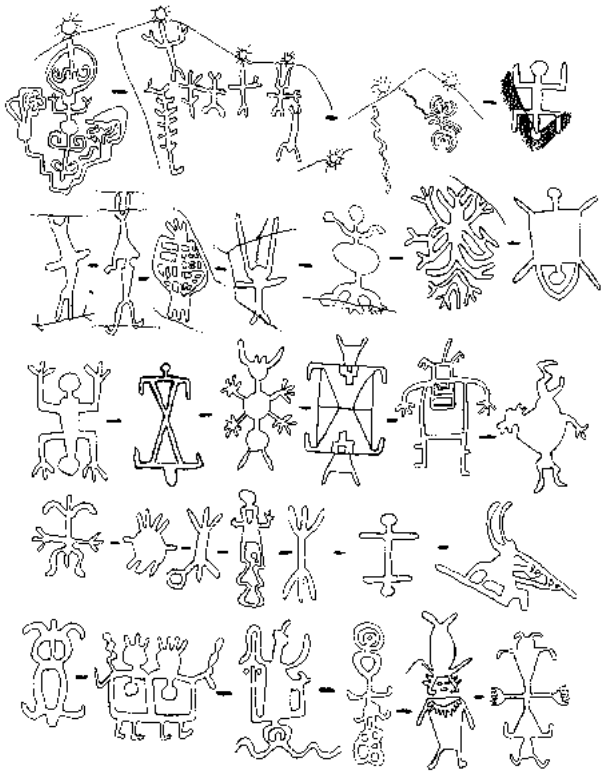

Figure 5. *Reversible Images.*

In 1987 I presented two papers on *Double Entities* (Warner 1990, 1994), another aspect of *Mystical Symbolism* that seemed to deal with human forms with more than the appropriate number of body parts. The concept associated with these forms seems to suggest the emergence of the spirit from the body. One subcategory of *Double Entities*, is "*Reversible Images*." These images, much like those on face cards, have two manners of doing this. In one instance, the top half mirrors the bottom half. In the other instance one half is a different image but when the figure is reversed they change places. In both situations they are just as understandable right-side-up as they are up-side-down. Study, and then reverse Figure 5 and you can see what I mean. By creating such an image, it seems that they are no doubt playing with higher levels of metaphysical symbolism beyond what some simply call "death."

Horizontal Images

Horizontal Images, are another category of *Mystical Symbolism* (Figure 6). How, many of them may simply be a statement of "death"? They may also express certain degrees of mysticism. Do dead men speak with light (6A)? Ok, now I'm going to throw you a curve ball (a pun for a rotated object). For those of you who have really seen 6B from Nine Mile Canyon or just a reproduction of it, *is it horizontal*? Again this is a trick question. Think about what I'm doing. For those of you who are not familiar with it, the real image has a vertical orientation. Does that help any?

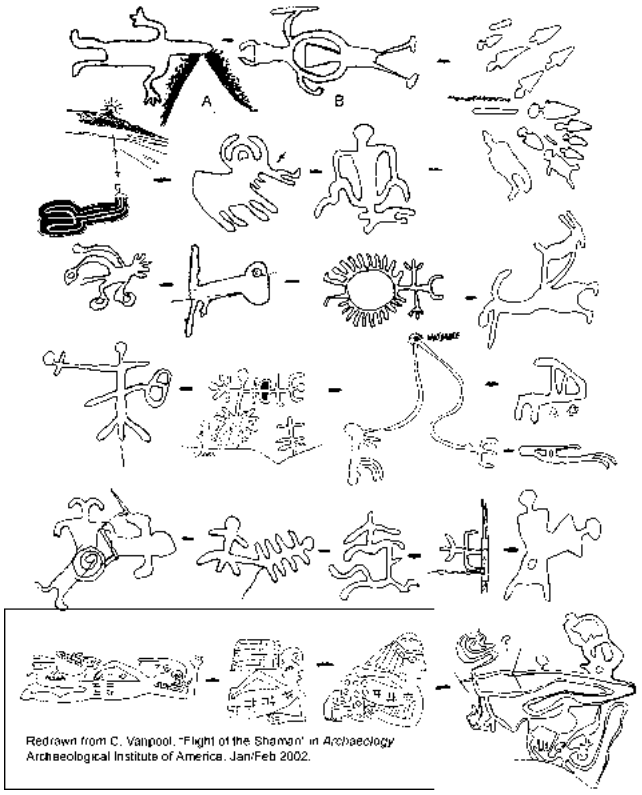

Figure 6. *Horizontal Images.*

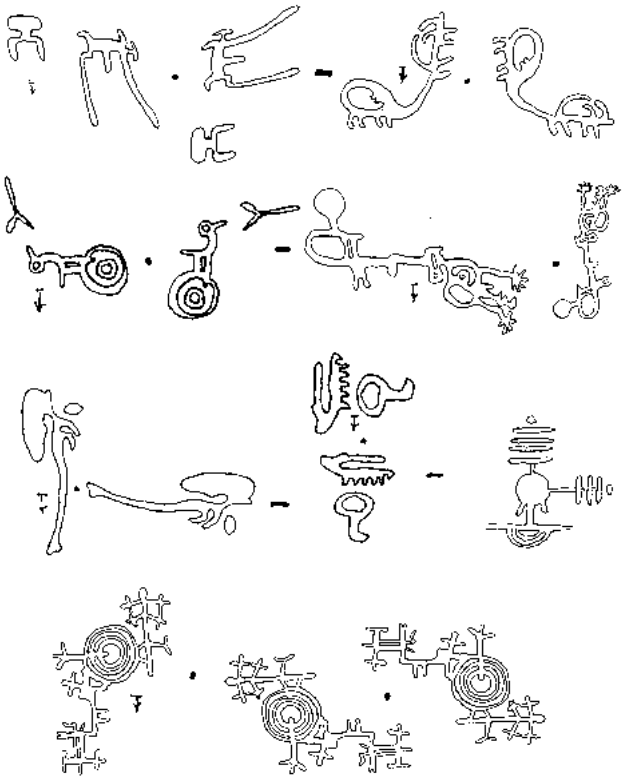

Figure 7. *More or Less Obvious.*

Now, given that information, I will ask again, "Is this image horizontal?" I know what you're thinking, and many of you are missing at least some of the point. If I was an instructor in an Epoptic school of mysticism, and I walked into the class and turned this figure on its side and told you that you couldn't leave the classroom until you learned the lesson for that day, how many of you, (like the Zen student who simply nodded to his teacher in understanding) would understand what the lesson was in a rose from the Master that day? The epoptic way of teaching is without instruction. Students simply meditated on the object until they understand it. I honestly believe that a lot of rock art represents this type of situation.

It was obvious that there were other possible orientations, Figure 7. For example the "little arrow" is for orientation and indicates how the image is oriented on the rocks. In these illustrations the arrows all point down.

Socrates said "all I know is that I know nothing" in other words, the more that you learn, the more you realize how much you don't know. Here's what's nice about admitting that. If we really admit that we don't know anything, our mind is cleared of any preconceived notions (biases) that such-and-such a thing has to be either a this or a that. Why not a *this* and a *that* at the same time or even something totally different?

I illustrate this concept in an upcoming volume on Moab Rock Art. (in press). For example, I'm a man, a father, a brother, a son, a husband, an artist, painter, and I'd like to think I'm a rock art researcher, a student, and a teacher. As a soldier, my main occupation was a radio operator (Morse Code, encryption and decipherment), but I was cross trained in demolitions and weapons and was a paratrooper.

I'd also like to think I can help you to have several paradigm shifts to get you out of your pre-

sent mode of thinking about rock art. A study of rock art images is similar to quantum mechanics, when it begins to consider 'string' theories. It stops being science and starts becoming philosophy. If that is the case then we just have to get philosophical.

The art work of Caravaggio contained paradox after paradox. He loved to break every art canon he could. One of his critics stated that he came to destroy traditional art. He was a rebel. I love his work because he was, in my estimation, a mystical artist. I see many things going on in his art that I see in "rock art." He painted dead people as if they were alive, and living people as if they were dead. This has an application here. Some of what he did was very anti establishment, both of the Catholic Church as well as the art canons of the Western tradition of fine art.

A study of Caravaggio's work (Bersani and Dutoit 1998) reveals that his representations of people do not measure up to their models (nothing has a face value), but that the non-obvious is just as important as the obvious (ibid:8). I believe that what we identify as obvious in rock art images leads us away from the real purpose, the least obvious, often has more to do with what was really intended (nothing has a face value). Any unveiling of Caravaggio's secrets has to result in a new knowledge of one's self (ibid:66-7). True understanding or knowing - *Gnosis*, was not for the common people, but for the elite (who could understand it) and was not a form of rational knowledge. *Gnosis* could be translated as *insight*. It was an intuitive process of knowing oneself (Martin 1987:132).

A major theme in my Volume 1 of the Moab series (in press) states that before anyone can ever fully understand enigmatic images, one really has to have a better understanding of oneself. I tried to design that volume to help the reader with two discovery processes. First, the reader needed to assess what he or she is bringing to this subject, because that will influence how much they will understand and consequently learn. Second, to learn more they will have to discover why they are that way, so they can learn about what remains hidden to them. This is a major lesson of Zen philosophy.

Caravaggio's secrets are both being offered and yet withheld (ibid:66). Like rock art, his art becomes the site where the world reappears, and appears for the 1st time - as the 'correspondence' of that design, and fail to design, the always mobile unity of phenomena (ibid:110). Much of what we see in these images can be understood at a higher level if we can open up ourselves to them.

The weightlessness of objects in Caravaggio's compositions reveals the horror of a solid form, the fear of the weight of material objects (ibid:58). That is no different from words used by those who have had to return to their bodies after an out of body experience. His work is an experiment with rationality (ibid: 15, 40), using symbolism that can't be metabolized (ibid:39-40), which resist being read (ibid:43) (nothing has a face value). He was just as articulate in portraying the invisible as he was the visible (ibid:51). That alone was a major part of most ancient world symbolism from art to architecture. The design of their creators was to make the invisible accessible to those who can only see the visible.

Caravaggio forced us to provide a verdict (ibid:47) after we have had to participate in his work (ibid:52). His art has its own grammar (ibid:53) just like "rock art." Those very same things could be said about the mystical artists who created rock art, especially when it concerns subjects such as life and death. It is hard to be objective and scientific when interpreting rock art. Science cannot deal with areas of abstract and metaphoric expression, an area that is not objective and quantifiable.

So, the exercise with Figures 5 –7 is to not take them too seriously. Instead, look at them without thinking about them. Let yourself *feel* them. Participate *in* them. Remember that there is no greater ignorance than contempt before any familiarity. And do we really have to decide? Not really. Why not? Because if we

have to decide, then we have to label them. That puts limits on what other possibilities and levels of symbolism are present.

They are just what they are, a *this* and a *that*, it seems. I present you with these illustrations as a rose. Learn from them what you will. If nothing more, you will be given the opportunity to get to know yourself just a little better and this exercise was worth the effort. This exercise will allow you to participate in the process of meaning. You will never look at rock art quite the same again. This exercise is an attempt to tap into your subconscious or creative mind that will provide you with your real truth. Here are some examples:

Rotation: Man - Animal

Figures 8 to 10 deal with the proposition that abstract elements may deal with the human form. Figure 8 contains a few abstractions that when rotated, hide a human form. Figure 9 when rotated, has forms that suggest a man-to-man relationship. These forms are upright images that contain a human-ness. When they are rotated they become other forms of human-ness.

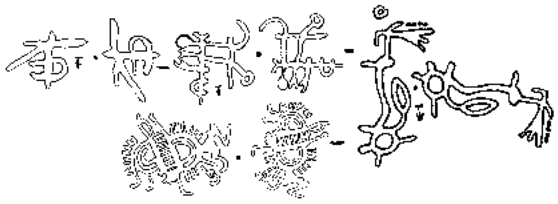

Figure 8. *Abstract – Man.*

The images on the left with the orientation arrow are the upright forms. The images on the right are the rotated forms.

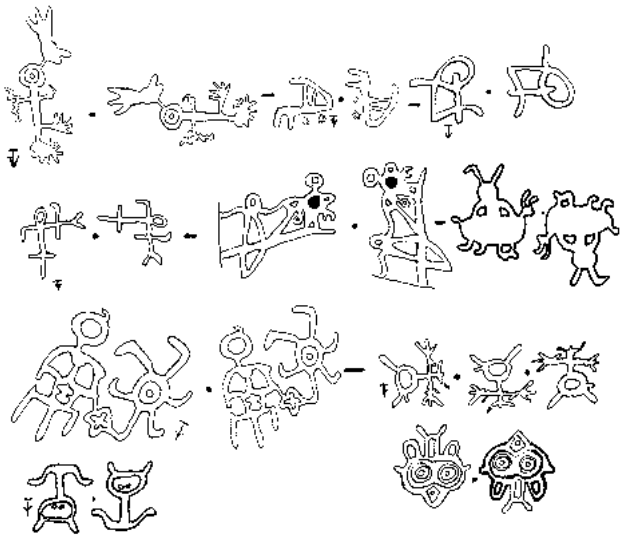

Figure 9. *Man-to-Man Relationship.*

Figure 10A illustrates upright images that are rotated in 10B. These human like images conceal a possible animal-ness when rotated. Many of these may represent one aspect of a symbol while another image appears when rotated. This exercise allows one to see another aspect of the image that was not obvious before. There is a clue there.

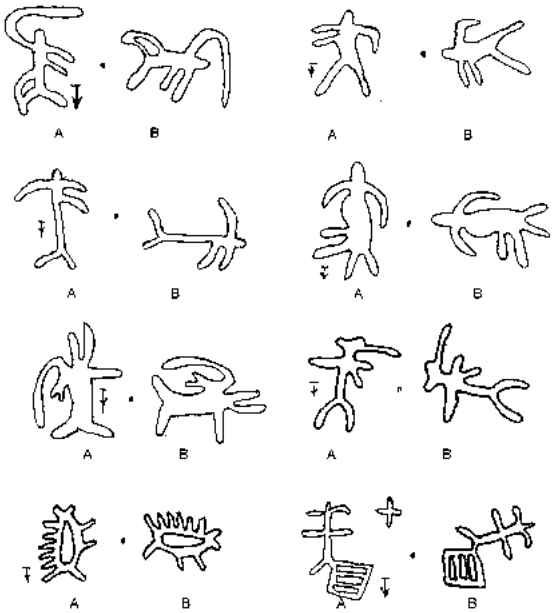

Figure 10. *Man – Animal*. A is the original position and B is the same image rotated clockwise 90 degrees

Abstract – Animal

Figure 11-1 and 11-2 contains many abstract images as they appear on the rocks, but when rotated seem to have an animal likeness. The rotated images are often abstract, but still contain additional symbolism that is not as obvious from its original "upright" position.

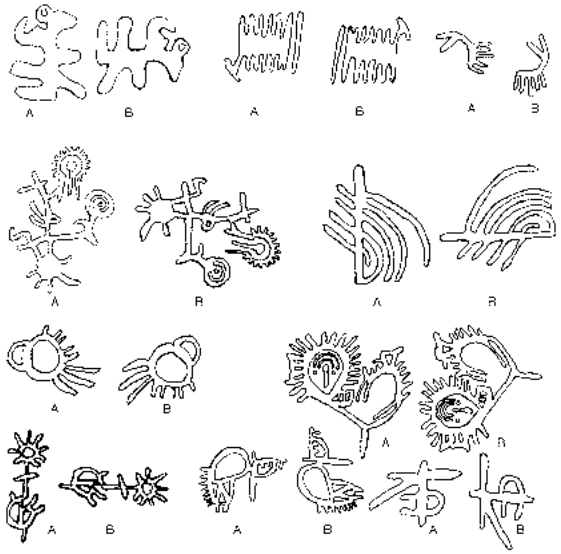

Figure 11-1. *Man and Animal.*

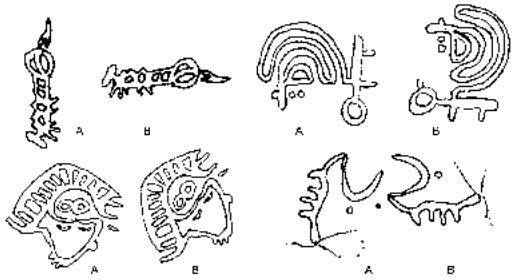

Figure 11-2. *Abstract Animal.*

Animal – Animal

Figure 12 depicts animal-like images that are more animal-like when rotated.

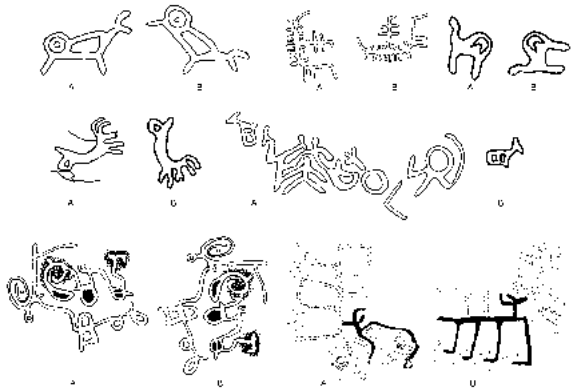

Figure 12. *Animal – Animal.*

Animal – Human

Figure 13 contains animal-like images that when rotated create a human-like image.

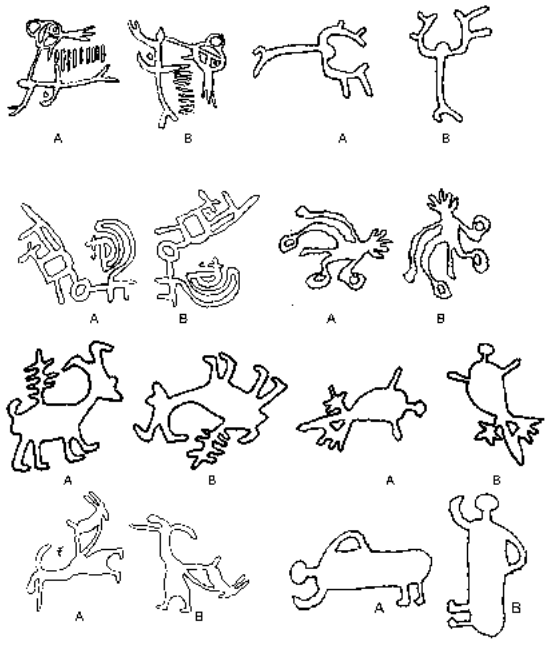

Figure 13. *Animal – Human.*

Figure 14 illustrates a more complicated concept by adding three or four different orientations.

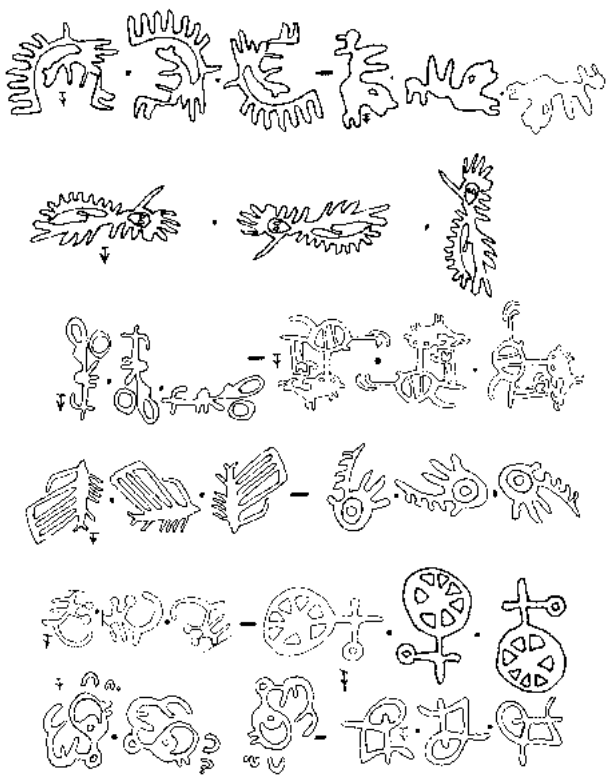

Figure 14. *Images in Three Directions.*

According to Vastokas and Vastokas, (2001) a human form in petroglyphs found with legs spread out horizontally, sideways, or curved upwards, might represent a floating sensation, and, also represent the belief that the spirit is floating in that out-of-body experience or ecstatic state.

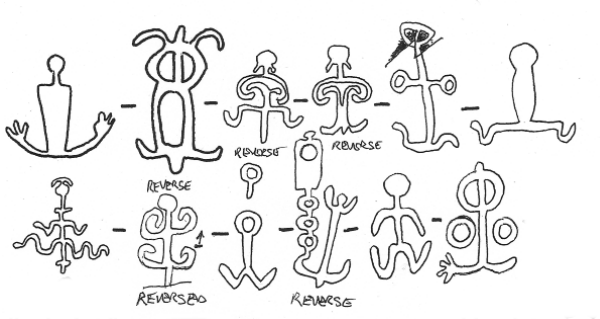

Figure 15. *Images with Legs Spread Out of Curved Upwards.*

CULTURAL FILTERS

In Navajo ceremonial language many words describing movement use an aquatic metaphor. Embedded in these metaphors are concepts of "horizontal". The name of the town at the mouth of Canyon de Chelly, is Chinle. In Navajo it is Ch'inili. In Navajo the third person singular pronoun includes three beings, he, she, and it. Ch'inili means "the water (it) is flowing out" (of the canyon, understood with a horizontalness implied). So if I said, ch'inili (the exact same word) in a ceremony, it could refer to any person (he or she) as "flowing our of" a hogan. The horizontal is implied, but not observed as such. Another example is the word for river, tooh nilini that translates as horizontally flowing water.

MULTIPLE MEANINGS

Snakes are prime examples of a symbol with multiple concepts associated with them, two of which are wisdom and horizontal movement. A snake is a sacred image in mystical symbology. Flowing or floating on water is another metaphor of these sacred images for the mystical experience. In American Indian sign language, the word "river" is signed by a horizontal movement of the hand with slight wave-like fashion extending outward as if flowing. Note without the horizontal aspects in all of these examples, the ideas they portray would not be understandable.

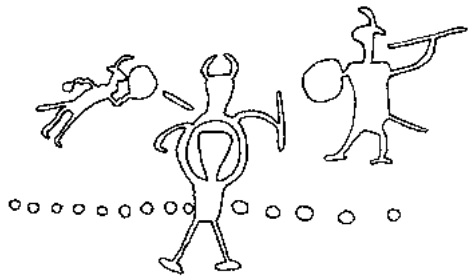

Figure 15. *Figure 6b rotated counterclockwise.*

Rotate 6b counter clockwise and you get the top figure in Figure 15. Even if upright, is he still horizontal if he is in a metaphysical state of being? Notice that his arms are up around his head to create the "emerging being" that is doing the fighting for him. Can you feel that he is not in a normal frame of reference? What his exact state of being really is isn't necessary to

know if we just understand that it is not normal. If that is so, it isn't important whether he is having an out-of-body experience or just an altered state of consciousness. Or is he just one of those mystical warriors who have more abilities than a normal warrior. Could this image then be translated as both horizontal and in an out-of-body experience/visionary, or whatever word they used to describe such a state in their language? Yes, he is horizontal if horizontal simple refers us to the idea of his being in a state of metaphysical awareness. One of the contenders seems to throw a projectile at him. They seem to be up in the air, up above his ground line and around the emerging aspect's head. The one on our left is off kilter, at a 45 degree angle, more or less horizontal. Is he then a mystical warrior as well? Look at all of these other illustrations in that light. They are al mystical to various degrees.

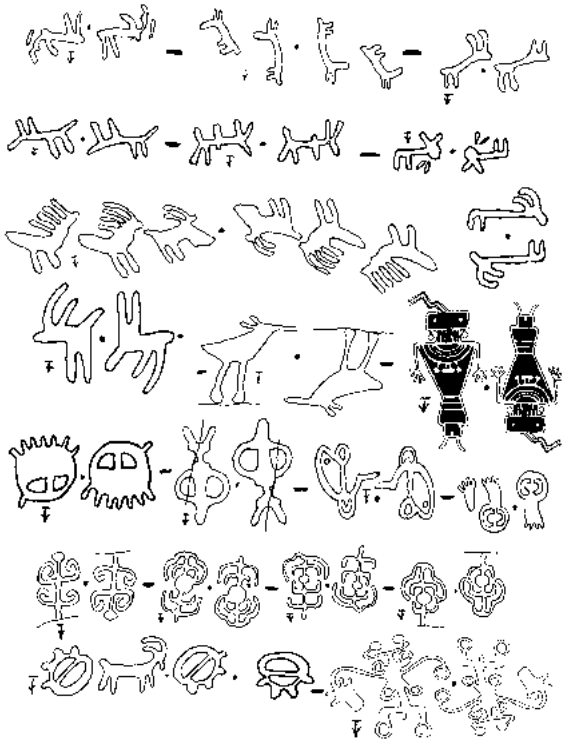

Figure 16. *Rotated 180 Degrees.*

DEGREES

After having fun playing with these images, I decided to go back to other images I would not have thought to look at as rotatable in 180 degrees. Figure 16 illustrates examples of two legged animals which when rotated are almost, for the most part, identical as if they were "upright." Remember that the image without the orientation arrow is the reversed image. The middle set in the 4th row illustrates that there are some which just do not belong or that just do not work. They are what I refer to as beyond the limits of the variation of this two legged, two eared/horned, theme.

Figure 17 starts you out with one that is very obviously a candidate in the reversible category, but the rest are not all that obvious unless you are more of an abstract thinker.

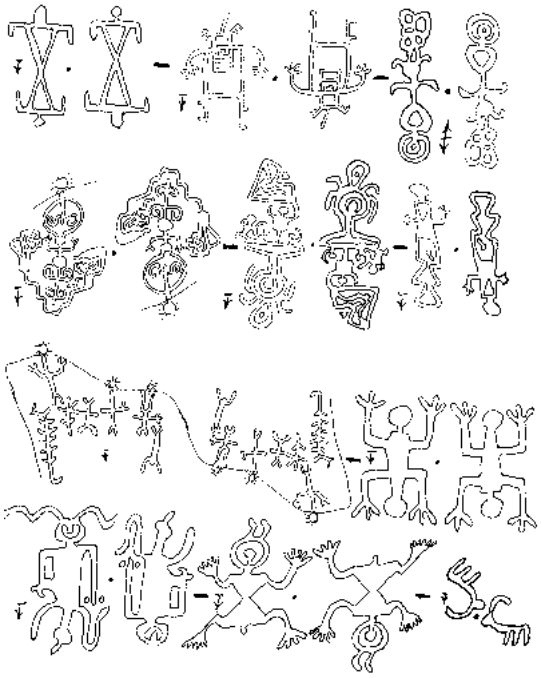

Figure 17. *More Rotated 180 Degrees.*

Remember, in the words of Bersani and Dutoit (1998:72) about Caravaggio's secrets, that "truth" is just the appearance of being. It is his illuminated rationality; there is nothing to know. The only thing we need be consciousness of is the movement or moment in which we participate.

REVIEW

This paper has challenged how you determine the truth. Your truth is what you understand from what you see. What you see depends on the personal filters you have and ultimately your understanding. You only see what you want to see. That is your reality. It may be just an illusion, as it is in the realm of mysticism and quantum physics.

For an even better understanding after you have read this, let it sit for a while and then come back and go through these illustrations, and without thinking just let your eyes take them in without any judgment as to what this or that may or may not be. But just let your imagination play with them. Then give up the idea that they have to be anything at all, but might just have the possibility to be more than what we can possibly imagine.

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Carol Patterson

DINÓE' (NAVAJO) CEREMONIAL PAINTINGS IN WESTERN COLORADO

The Uncompahgre Plateau and Gunnison Valley contain Uncompahgre, Fremont, proto-Ute and Historic Ute style petroglyphs. There are older Archaic, and possible Paleo-Indian sites. The Gunnision Basin and the Uncompahgre Plateau are unusual places to find *Dine'* (Navajo) ceremonial paintings and engravings depicting *Ye'i* figures, a class of supernatural beings referred to as "gods".

PRELIMINARY INVESTIGATIONS

Navajo Archaeology

Archaeological sites of Navajo occupation are found in north-western New Mexico, as far north as the San Juan River dating between circa A.D.1500 and 1700. They are attributed to proto-historic Navajo, but questions have arises as to whether they are Ute rather than Apache-Navajo. Early Spanish accounts report these sites to be Ute stating that the Navajo did not live west of the Continental Divide until after A.D. 1669. Husher and Husher (1939) recorded what they claimed to be "hogans" that were circular stone houses at thirty-five locations that amounted to over two hundred buildings. The 'houses' had curved walls of dry-laid masonry and were characteristically found on high elevations, hilltops, mesa rims or the slopes of steep-sided bluffs. Arrowheads found nearby suggested their use as fortification from enemy attacks. The lack of log roof beam remains has cast doubt upon Husher's claim of Navajo origin. Without collaborating evidence of Navajo occupation on the Uncompahgre Plateau or Gunnison Basin, it is unclear if the Navajo occupied regions far north and east of their traditional homeland.

The Navajo call themselves the *Diné* "the People," or "the Earth Surface People," which refers to their god's emergence from the previous world below, to the present world, where they created the Diné people (Crum 1996).

Although the Navajo migrated south from Canada around A.D. 1100 as part of the Athabaskan language group that included Apaches. Their traditional homeland (Dinétah) is roughly defined by the Continental Divide to the east, Chaco Canyon to the south, the Animas River to the west and north to the Colorado, New Mexico border.

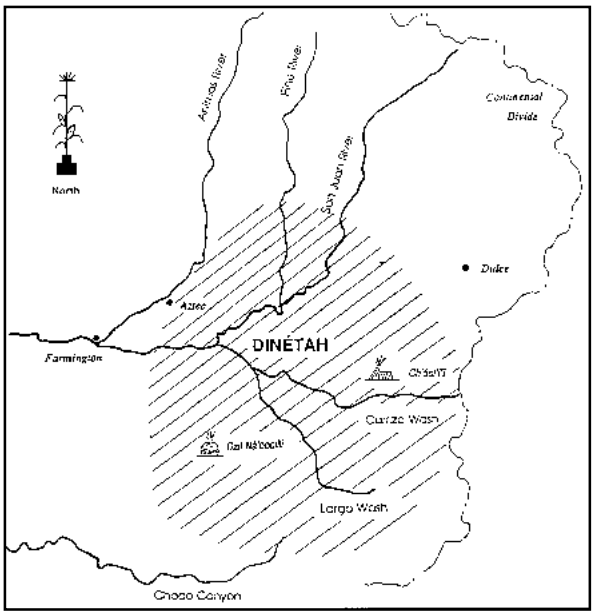

***Figure 1**. Location and major drainages of the Dinétah. (from Copeland and Rogers 1996).*

The two holy mountains, Ch'óol'í'í' (Gobernador Knob) and Dzil Ná'oodilli (Huerfano Mesa) are

sacred because of their role in the creation stories involving Changing Woman, Monster Slayer and Born-for-Water.

The Navajos learned to grow corn from the Pueblo neighbors. When the Spanish arrived, the Navajos adopted sheep and goat herding and Spanish clothing. The Navajo became good horsemen and drove their herds to higher altitudes during the summers that included the foothills of the San Juan Mountains. They became wealthy through raids of Pawnees and Utes for women and children traded to the Spanish as slaves. The Utes also raided Navajos for captives to trade for horses and by A.D. 1775 had pushed all the Navajos from southwestern Colorado. It is estimated that there were three to six thousand Indian slaves in Spanish homes in New Mexico in the 1800's and three out of four were Navajos (Crum 1996). They helped with the ranches and built the towns and in turn were educated in Spanish schools.

Almont Site, Gunnison Basin, Colorado

A site called "Indian Caves" (5GN477), was recorded by O.D. Hand , CDOH in 1990.

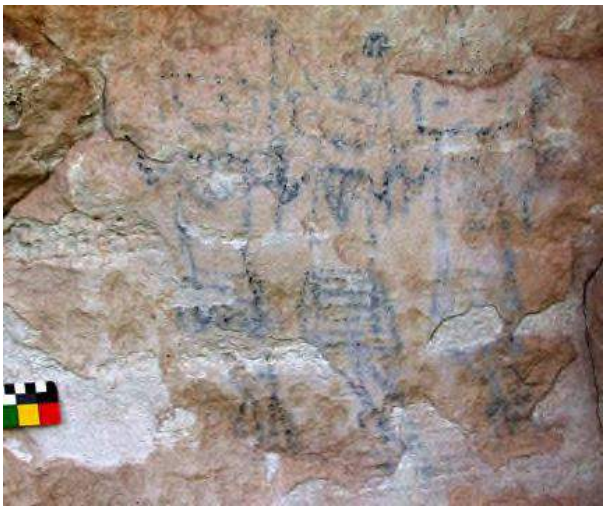

Figure 1*. Three Yei'i figures with kilts, holding chokecherry branches.*

The recordings of each rock art panel are drawings without photographs. A re-evaluation of this site was recorded by C. Patterson (Patterson 2004). The panel is a charcoal drawing of what has been identified as three 'Ye'i gods', (Figure1).

There are also Navajo engravings at this site characteristic of angular lines. The square faces identifies the rider as a Ye'i figure riding on horseback (Figure 2).

Figure 2*. A square headed 'Yei'i' on horse back.*

Another panel depicting a Ye'i horseman appears under a ledge. The horseman is drawn with charcoal and has three feathers with painted red tips, (Figure 3).

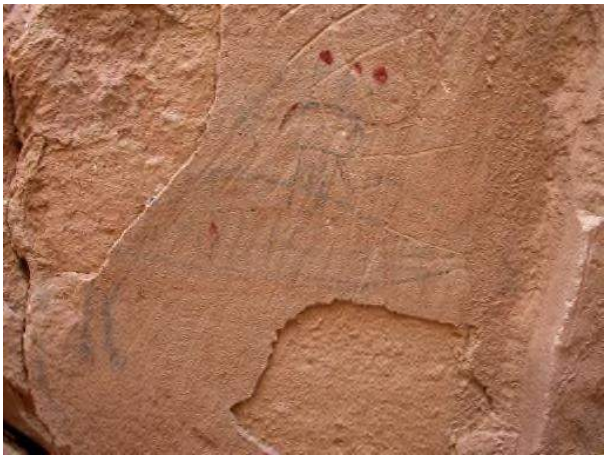

Figure 3. *Square faced Ye'i figure on horseback with red tipped feathers.*

Horsefly Creek, Uncompahgre Plateau

On a low overhanging rock face above Horsefly Creek is a red painted figure that resembles the Navajo God *Ghaan'ask'idii*. This deity carries a pack of seeds on his back and a feathered staff. He also wears a feathered headdress, (Figure 4).

***Figure 4**. Red Painted figure at Horsefly Creek (Cole 1987).*

Cole (1987) notes that this site is far north of the traditional Navajo homeland and modern reservation, but is within an area where Navajo people have historically worked and traded. She believes if it is not Navajo in origin, but that it may have been made by a Ute Indian living in the area prior to A.D. 1880, who was familiar with the art and myths of the Navajo.

I disagree with Cole with regard to religious iconography. It is far too dangerous (fatal in fact) to paint a picture, wear the mask, or create a sand painting of a religious deity, if one is not an initiated member of that culture.

Shavano Valley, Uncompahgre Plateau

The north end of the Shavano Valley, 5 miles west of Montrose, Colorado has another group of Navajo paintings. They are under a rock shelter that in previous decades had a circular rock wall surrounding the cave floor. It may also have had juniper logs placed in front of the cave, braced against the rock wall and the back of the cave (Squint Moore, p.c.). Figure 5 is the paint at the back of the shelter.

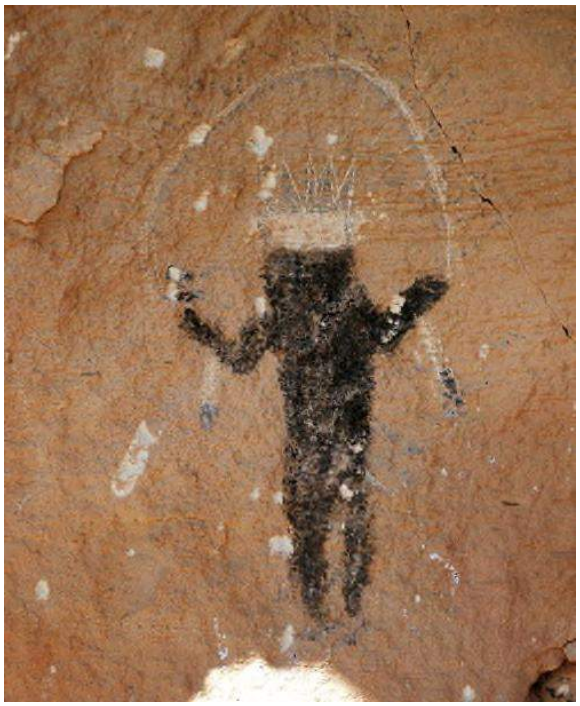

Figure 5**. Ye'i from the Mountain Way Ceremony**.

This painting is black with blue and white painted motifs. The figure has a white face with a crown of blue feathers. From the upper arms hang white feathers with blue tips. The body is black charcoal with blue feet or 'lightning' coming out of them. Over the head arcs a blue and white rainbow. To my knowledge there are no reports of these paintings in the literature.

Ethno History

The recorded histories of Colorado and the Spanish journals do not mention Navajos living on the Western Slope, in the Gunnison Valley, or the Uncompahgre Valley. Perhaps a discussion about the Mountain Way Ceremony would shed some light on the origin of these paintings.

Mountainway Ceremony

The imagery of the square faced deities is represented in sand paintings of the Navajo Mountain Way Ceremony. The characteristic of the

People of Mountain-way are: white painted or masked faces; tall feather headdresses or the bison headdresses worn by dancers and Whirling Rainbow People; an otter or beaver skin collar with attached whistle; beaded and embroidered clothing; red "fire" dance kilts; "wings" or symbolic indications of them (feathers) on the upper arms; charcoal blackened forearms and lower legs with white lightning marks on them; and chokecherries carried in the hands. The Ye'i' figures in the Mountain-way sand paintings have square heads with black and yellow as male colors and blue and white as female in some designs. In other paintings black and blue are male, while white and yellow are female (Wyman 1975, 120).

A formal study of Navajo rock art began in 1959 as part of the Navajo Reservoir Project by Polly Schaafsma. She published a report in 1963 with revisions in 1975, 1980 and 1992. She established a chronology and stylistic analysis defining the Gobernador Representational Style depicting Navajo ceremonial themes. Studies of these paintings led to the conclusion that:

> "The function of the Navajo petroglyphs and pictographs is that of ceremony. They are not simple depictions of Holy People, objects and events, but instead have a deeper theological meaning not yet understood. For that reason we avoid further use of the term "rock art." (Schaafsma in Copeland and Rogers 1996).

Figure 6 is from her study of the Navajo Reservoir Project in northern New Mexico.

Figure 6*. Ye'i figure with square white face from New Mexico, Navajo Reservoir Project. (Copeland and Rogers 1996).*

Shaafsma observed that many of these sites included the techniques of smoothing the surface before paint was applied and pecking or engraving within the painting.

Figure 7*. Gobernador style Ye'i paintings from Canyon del Muerto, Arizona. thought to represent 'Black God' and Mountainway Yei'i.*

Figure 7 is a Feathered Ye'i rock painting is located at Blue Bull Cave in Canyon del Muerto, Arizona. It has been suggested that the adjoining solid colored figure is a depiction of "Dark" or "Black God". The square faced figure is one of the Mountainway People.
(http://my.execpc.com/~jcampbel/sites9.html).

The square faced Ye'i figures with feathered headdresses and feathers from their upper arms are pictured in the sand painting of the 'People of the Myth' from the Mountainway Ceremony in figure 8.

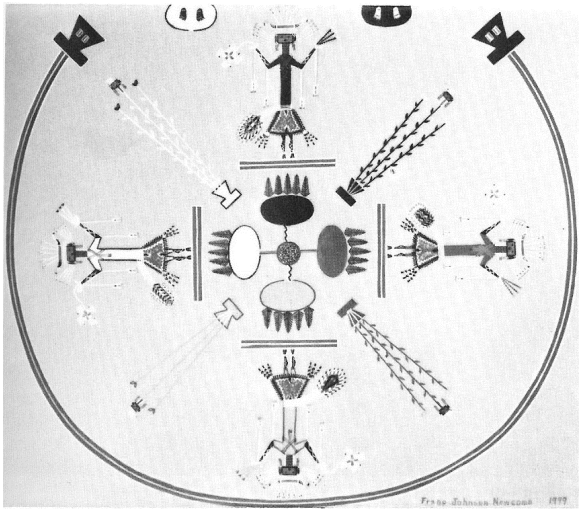

Figure 8. *Radial Ye'i figures depicted in the Mountain Way Ceremony It is entitled 'People of the Myth' (from Newcomb, 1929).*

Mythology of the Captive Navajos

The Mountain Way Chants includes extensive narratives about the escape of Navajo captives of the Utes who were active in the slave trade during the late 1600s into the 1800s when slave trade was finally outlawed.

There are five myths in the Mountainway ceremony that tell of the adventures and miraculous escapes of the Navajos. They are listed here:

1. Two brothers were being taught hunting magic by their father and the elder brother was captured by the Utes because of paternal injunctions disobeyed.
2. A grandson of Older Sister was taken while he was guarding his family's hogans.
3. A Young Man's story.
4. A story of Older Sister and her escape.
5. Two Sisters given to the Utes by their father with ulterior motives.

These captivity escape myths are sung and retold as part of the Mountainway Ceremony.

The Mythic Motifs included within these Ute Captivity narrations include: A Hero's life saved by an old man; Old man and woman guards a Navajo captive, tied with a cord to them so he could not escape; Utes were put to sleep by a Whippoorwill, that flew into the tepee through the smoke vent and over the heads of the Utes, putting them to sleep; Captive released by supernatural, Talking God and Calling God released the prisoner and sent him on his way. The captive followed the hoot of an owl, came to a canyon, and was helped down into it by Talking God, who then sheltered him in his home there; Flight from the Utes protected by supernaturals, the Navajo captive was hidden, by various supernaturals, Talking God hid the hero in his home or cave in a cliff; Otter or Beaver hid a Navajo in his home under the water; A Navajo girl was put out of reach of the Utes on a growing rock point like the Sky-reaching-rock of other chant myths, and Talking God used a hill which grew into a mountain to baffle the Utes; Hidden by Wood Rat, a Navajo is invited into Rat's home, the Utes poke around in the nest with a stick but can not find their victim; Hidden under a bush, a Navajo uprooted a greasewood bush, blew on the hole to enlarge it and replaced the bush, thus hiding himself.

After escaping or evading the Utes, the Navajos had to purify themselves and embark on a journey visiting various supernaturals who demonstrated ceremonial procedures and ceremonial protocol. This may be the explanation for the locations of these paintings.

Before the returning hero was allowed to enter his family's hogan he was shampooed and bathed to

remove all the alien substances and influences acquired during his captivity. Then he was allowed to join his people (Wyman 1975,145-148).

The Geography of the Moutainway

The Ute Captivity narratives begin in the Southern Ute country of southwestern Colorado. The action in the Captive myths takes place in the Four Corners region. The Older Sister's Flight from a Bear takes place in the country immediately to the north and south of the San Juan River in Colorado and New Mexico (Wyman 1975, 157).

CONCLUSION

The observations of Navajo paintings and engravings as far north as Almont, in the Gunnison Basin, and the Shavano Valley north of Montrose, raise questions concerning Navajo visitations being either for ceremonial pilgrimages or from forced captivity. One theory is that they were created to call upon the Holy People for deliverance from the Ute captors. A second theory is that some of these painted sites are part of a Navajo sacred geography that extended into the Gunnison Basin and Uncompahgre Plateau. The Navajo traditions include visiting sacred sites that were part of the Holy People's sacred landscape that may have extended beyond the historically recorded boundaries. What ever the reason for creating these paintings, their identification as part of the Mountainway ceremony is certain and it is important that these sites be protected and regarded as sacred to the Diné people.

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