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BENCHMARKS:
Ontological Considerations at Two Mojave Desert Petroglyph Labyrinths

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ABSTRACT

Benchmarks: Ontological Considerations at Two Mojave Desert Petroglyph Labyrinths

Chester R. Liwosz

Developments in archaeological practice facilitate the following innovative approaches to investigating ethnographically informed, multisensory phenomenologies of visual culture and landscape in the northern Mojave Desert. Synonymous with the hotly debated and widely publicized southwestern Great Basin, this region hosts a remarkably prolific rock art tradition that has featured prominently in discourses of archaeological methods, theories, and culture histories. While much of the debate derives data from the volcanic Coso Range, evidence available from neighboring mountain and valley systems often goes ignored. With project areas at both the foot of the Coso Range and in the vicinity of Death Valley, my research incorporates into this conversation new data and overlooked literature to provide new perspectives on important transitional areas between Precontact cultural zones.

My experimental and interdisciplinary approach demonstrates principles which promise to democratize archaeological practice while simultaneously harnessing the analytical potential of emerging methods now available in the digital age. These new, non-invasive methods exemplify culturally sensitive approaches to digital heritage management, as the archaeology discipline continues to cope with rising to meet its

legal and ethical obligations established in recent decades. Compelling evidence from integrating quantifiable visual, acoustical, and spatial data with multidisciplinary theoretical frameworks, and indigenous oral traditions provides remarkable new insights into population histories, religious practices, and Native American cosmologies. These insights establish grounds on which to improve methods and theoretical applications in archaeological approaches to landscape, visual culture, acoustics, and astronomy, and mark an important step towards multivocality. In expanding the knowledge of Numic iconography and verbal symbolism, and extending the boundaries of the petroglyphs discourse to important interregional intermediaries, this project is uniquely situated to address dynamic processes in linguistic and ideological systems among a immense, multicultural interaction sphere spanning from coastal California through the American Southwest, and into Mesoamerica.

ACKNOWLEDGEMENTS

The Mojave Desert slot canyons project has benefited greatly from the vested interests of other scholars, and the financial support of academic institutions. Both the Anthropology Department at the University of California, Santa Cruz, and the UCSC Archaeological Research Center (ARC) have perennially provided support for field research. Additional research funding came from the Fletcher Jones Grant.

I would like to thank Alan Garfinkel Gold for feedback on early renditions of this project at several conferences. His insights and ongoing dialog have been, and remain, helpful. Dr. Gold is a leader in community engagement, organizing public field trips, and developing strong ties with the Kawaiisu community.

Much thanks should go to L. Daniel Myers, who at Rutgers dedicated his doctoral research to pulling accounts of Numic creation and emergence in oral traditions out of academic obscurity. His dissertation provided useful insights into rich religious symbolism for peoples who scholars had (and sometimes continue to) primitivised as incapable of abstraction and metaphor (Myers 1987). Similarly, I would like to acknowledge Linda Reynolds and her doctoral research through the University of Nevada, Reno. Reynolds (1996) boldly engaged in a thorough examination of pinyon use through time – and its significance – in the Inyo-White Mountain Range, in a region where scholars largely fixated on projectile points, hunting, and men’s task. Reynold’s work fundamentally challenges assumptions that the ancestors of living indigenous peoples of the area arrived late in prehistory to leave little archaeological residuum. In attempting discover her more recent research, I was dismayed to learn of Dr. Reynolds' early passing.

I would also like to thank David Whitley for his insights and assistance in making this project come to fruition. At an early stage when the future of this project was uncertain, Dr. Whitley went out on a limb to ensure I would have at least one research location for the acoustics and photogrammetry study. His suggestions and insights have helped me move beyond my first crude concept of solely the acoustics of drum-like beating on the walls, towards the refined and thoughtful poetry of songs that has been an boon for the iconographic analysis.

It would go without saying that I am grateful to the faculty on my doctoral committee. Jon Daehnke, his research, and his perspectives have helped me mature as an archaeologist and as a scholar. Mark Allen has not only given me useful feedback and encouragement, but has been a champion of – and inspiration for – expanding the breath of archaeological considerations. My advisor, Judith Habicht-Mauche, should receive recognition for her patience, and allowing me to operate so independently. This project has not been very typical, and her uncanny flexibility has allowed both the research project, and myself as a scholar, to mature immensely. Additionally, I would like to that Professors Chelsea Blackmore, Danilyn Rutherford, and Carolyn Dean for their mentorship during my first few years of graduate school, and for helping me bring this project off the proverbial back-burner.

I also owe a great debt of gratitude to Emily Helmer. Without Emily's meticulous proof reading, suggestions, feedback, and encouragement, this document would not have been complete. Emily has been an inspiration for ethical approaches to archaeology, for scholastic achievement, and as a friend.

Although some of my field sessions were solo expeditions, other sessions benefited greatly from the assistance of others. Courtney Mackay, Deanna Stark, and park ranger Jay Snow assisted with photography, measurements, and climbing in 2010. R. J. Johnson provided valuable geological insights in 2014. Anastasia Hershey joined the project for multiple field seasons, and volunteered her time when this project was developing. Finally, Marino Di Franco also volunteered his valuable time, knowledge, and humor. I am grateful to all these fine people.

The research presented here represents a maturation of the first archaeological project I saw from the ground up - proposed, developed, organized, adjusted, and revisited – and it shows. At times, the methods were not so smoothly executed, the strategies somewhat disorganized, and the datasets sometimes flawed or incomplete. At the same time, however, I am warmed by a sense of accomplishment, having nurtured its development from seed to sapling to a sturdy study branching into diverse theories, practices, and disciplines. When the seed was sown during that celebratory birthday hike during my season as an archaeology technician with the National Park Service, I never expected it to grow into something so profound it would alter not only my career path, but also my personal worldview. Even when that seed germinated into one of the first field projects for which I was crew chief, I expected my connection with the Death Valley slot canyon - like my season with NPS - was soon to expire. As we exited the canyon at the end of that dreary gray October day, having documented 64 panels and mapped the canyon for the first time, I remarked to my companions on the small crew, “that place will be someone’s master’s thesis one day,” fully expecting some anonymous student of archaeology to stumble across our record some unknown number of years in the future. Little could I imagine how prophetic those words would be, how much of an underestimate a master’s thesis was, and most of all that said archaeology student would, in fact, be me.

It seems an oddly poetic reversal of causality that my relationship with these sites, and one of them quite particularly, began with a quest for a record, and now concludes with the revelations of songs. In a way, even the voices of the petroglyphs might be among the words on these pages. The prevalence of “pecking” begged the search for archaeoacoustics, which set up for music, and that was the game changer in all of this. So it is somewhat fitting that now this story concludes (or at the very least, these seven chapters within it conclude) with finding the first few notes, maybe even first few lyrics and allusions, of a new song of sorts. The song belongs to these places, it is not mine to own. Writing in an academic tradition, my expression here is not sung, although I chose to employ poetic prose when possible, without compromising meaningful conversation. Oddly, had that site record been more complete, if more of the documentation others *recorded* had made it to the requisite repositories, I would not writing about either of these otherworldly places today. At no point did I ever expect my life to become so entwined with that remote petroglyph canyon. But I have been glad each time that it seems to ask me back, and invite me in once again.

CHAPTER 1: INTRODUCTION

The Mojave Desert of southeastern California, ancestral homeland of the Numic peoples, fosters some of the most numerous and most hotly debated parietal art (literally "wall art") in the world. These carved and painted images on bedrock and boulders feature in prominently published debates over theory, archaeological practice, and even the philosophy of science (Whitley 1992a&b; Allen 2011:11-14). With the focus of much of this debate geographically centered on the volcanic Coso Range, my project's research areas box in this mountainous terrain on either side. By using digital approaches to space and sound that are still new to the archaeology discipline, my methods demonstrate new means by which to advance the discourse beyond the protracted intellectual differences. This project also demonstrates ways to pursue a socially responsible, multivocal archaeology, one which also dismantles economic barriers to productive scholastic study. My research nonetheless shows these new methods retain immense analytical value, providing data to make novel connections between ethnohistoric beliefs and practices, and long-enduring traditions from within, and extending well beyond, the regional bounds of this project.

Theoretical and methodological advances directed at enriching and democratizing the discipline run counter-currently to a history of disenfranchisement. At the outset of this project, it was not my intent to challenge the status quo of some of the dominant narratives. This Mojave Desert slot canyons petroglyph project began simply with the goals to understand the nature of rock art through empirical observation, and to solve challenges that these unique landscape features present to conventional archaeology recording methods. Observations, however, directly contradicted established timelines and classifications, thereby demanding adaptive methods to provide new insights and alternatives to the conventional approaches that could not otherwise accommodate these data. These changes further led me to adopt theoretical perspectives that were new to me. The title of this dissertation thus reflects the evolution my project has undergone over the last several years.

Some of my first motivating observations suggested the area's petroglyphs were connected with the perceptions of sound. At the same time, experiences in the field, and inspirational academic literature, have led me away from the conventions of studying archaeological deposits as stand-alone "sites," and instead to understand them in terms of their surroundings – geological, ecological, and cultural. In order to accommodate these phenomenological and landscape approaches, I have supplanted the nondescript term "sites" with the much more descriptive "labyrinths," the latter term at once carrying connotations of the studied landforms, and a phenomenological approach. My opening tagline speaks to advancements in theory, iconography, methods, and ethics. "Benchmarks" calls to mind new reporting standards for which I make the argument. It denotes a level of wholesale advancement and thus new standards in theoretical application, meeting Mark Allen's (2011:14) call to consider "religion, social identity, gender, and power" in interpretations for the region's rock art. The word also implies that I have proposed numerous new and alternative means of classifying, categorizing, and “reading” the visual culture; in fact, omitting the phrase “rock art” from the title is itself a conscious move away from projecting Western preferences for aesthetics onto the material symbolic expressions of non-Western societies. “Benchmarks” gives a nod to a few of the most impacting visual elements of one of this project’s research locations (e.g. Figure6. 28, Figure7. 15, Figure7. 24, and Figure7. 30), elements that would not have been discernible without the mentioned advancements in digital archaeology. Finally, “benchmarks” establishes that this study sets a standard for future work to remain accountable to the communities who hold a stake in its findings, for the ethical practice of archaeology, and for the incorporation of emic perspectives in multivocal interpretations.

Significance of Project

The research and discussion presented here are expressly developed to improve the state of archaeological practice and discourse, especially as related to studies of the visual culture of Great Basin peoples past and present. To that end, the project’s contributions cannot be disentangled from methods, the methodologies from which they developed, and the state of theoretical discourse regarding not just the images but the lifeways and affiliations of people to whom they are, or at times are not, ascribed. The findings made, therefore, must be presumed to directly impact local and indigenous communities connected with the study areas – much as the precedence of previous archaeological and anthropological research has done (see Blackhawk 1997; White 2003, 2008).

Starting the first fieldwork sessions some twenty years after the passage of NAGPRA, this project is mindful of the concerns over not just human remains, but the sensitive nature of certain material culture. By only employing zero-impact, non-invasive methods, the present study distinguishes itself as a model for both maintaining site integrity, and avoiding the sorts of appropriations which have in the past chilled relationships between colonial/settler institutions and indigenous communities. It also offers a starting block from which studies that might still later excavate and engage in materials analysis can reasonably establish site significance *a priori*. In that, the photogrammetry and acoustics offer a niche alongside now well accepted strategies such as scanning with ground penetrating radar.

In order to establish such significance, however, the study must situate the data in its proper context among regional Precontact religious structures. To place parietal visual culture in such a framework is a directed attempt to rise to the challenges set forth by Echo-Hawk (2000) for scholars to overcome academic institutional biases and to integrate the literal voices of the past as echoed in verbal traditions. As this study adopts recently developed recording methods, and the aforementioned interpretive framework, it necessarily adds to, and improves upon, a middle-range theory of Mojave Desert visual culture in, on, and of the landscape.

In remaining conscious of socio-political repercussions of the words recorded here, the methods developed and employed for the slot canyons project here are streamlined both in cost and reproducibility. As an aspect of the methodological advancements underlying this project, a concerted effort is made to democratize archaeology by increasing the accessibility of research practices. Field and data processing methods are therefore developed to be readily reproducible by those not so privileged as to be affiliated with a major research institution's resources. Field equipment costs were kept low (for example, choosing photogrammetry over laser scanning), and laboratory practices were kept cost-effective by utilizing free, open-source software whenever practical. In those instances for which paid commercial software was chosen, finalized data files were stored in formats readable to these open-source alternatives.[1]

To present this information, the project demonstrates digital archaeology's utility as a means of analysis, data storage, interpretation, and outreach. In an age of technological acceleration, the multimedia nature of the finalized visual, spatial, and auditory data sets operate to maintain the relevance of archaeology to publics ever more immersed in the computerized experience. The study at hand cannot fully explore the full potential of these multi-media data, and it is intended to inspire thoughtful approaches to virtualizing heritage management. I provide example interpretations using these digital data sets from my research locations to demonstrate how virtualized environments enrich analysis of iconography, spatial relationships, and sensory phenomena. These example interpretations have profound implications entangling Numic cosmologies with the histories of Native Californian and Uto-

1: Data beyond that included in this document is on file with the National Park Service, Bureau of Land Management, and/or the California Eastern Information Center.

Aztecan religions, including the multi-ethnic Flower World Complex, *Chinigchinich* cult, and the Historic Period Ghost Dance movements. Methodologically, my means of addressing these topics significantly advance spatial documentation and archaeoacoustics, and introduce a new archaeoastronomy paradigm to the region.

Finally, this project seeks to overcome the sometimes stalled theoretical discourse on Great Basin visual culture. The conclusion itself is a series of propositions for future research. It is my hope that by integrating indigenous ontology with emerging methods, this project fosters dialog between scholars and native communities, while ensuring relevance to publics at large. The suggested future directions are just some of a potentially broad spectrum of creative applications of theory and methods contained here within, the latter set potentially inspiring creative new inquiries.

Introduction to Research Areas

Two rock art landscapes were selected for this study, both because of their larger geographic context in an ongoing debate, and because of their potential for novel properties often not addressed in rock art studies. Specifically, debate continues over Numic origins, with a presumed heartland somewhat surrounding the Coso Rock Art Landmark – itself presumed by many to be not of Numic origin. The Death Valley landscape, is east and north of the Coso Landmark, and immersed in the heartland. Sites near Little Lake, by contrast, are adjacent to, and due west of Coso, and typically considered a manifestation of the same cultural phenomenon as the Coso area (e.g. Whitley, Simon, and Dorn 1999; Whitley and Dorn 2010). In Chapter 7, I discuss the complex relationship between ethnogenesis and ancestry, arguing there is room to reconcile the differences. The matter remains pertinent, however, on two accounts: one, because it contextualizes the relevance of ethnographic applications; two, because the attribution of rock art is among the cultural evidence which has been used in the U.S. legal system to deny land claims and even petitions for tribal recognition made by Native Americans, especially Numic Shoshone and Paiute (Blackhawk 1997; Whitley 2013b:83, 86; Liwosz 2017:178).

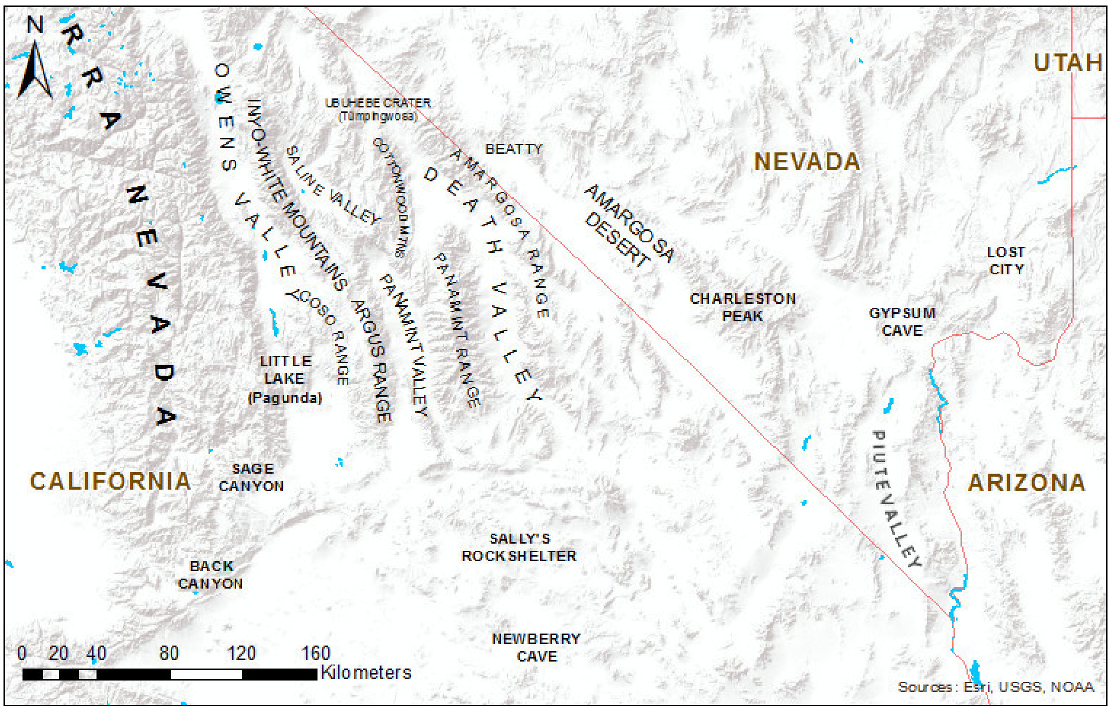

Figure1. 1: *Map of southwestern Great Basin/northern Mojave Desert, indicating important places named in, and directly relevant to, this study.*

The point of this study, however, is not to spill ink over rehashing the finer points of debates which have largely already played out. Instead, it seeks to explore the boundaries of studying non-western visual culture. Methods pushing boundaries beyond the visual are not unprecedented, but not yet widely adopted. As investigating these types of places is potentially highly culturally sensitive, on-site research stayed restricted to non-invasive, zero-impact strategies. Although doing so limits the ability to address some of those long standing questions, it also has been an opportunity to innovate on what kinds of questions can be asked, as well as how to construct data. With the conspicuous lack of indigenous voices, this study does not yet do enough for multivocality; it does, however, take into consideration not just ethnographic sources, but primary sources from people of Native American – and specifically Numic – heritage. Ideally, this will move the conversation forward, helping develop new questions of interest not just to scholars, but potentially related communities. Low-cost methods and open-source tools were consciously employed to keep costs down. The hope is to democratize data, and to reduce economic barriers for historically disadvantaged indigenous communities to entering into the conversation.

Fossil Falls Archaeological District and the Little Lake Landscape

Located at the southern terminus of Rose Valley, itself the most southerly lobe of Owens Valley, Little Lake is an appropriately named oasis abutting volcanic cliffs. The Cosos Range lava flows reach right up to the lake, forming tall basalt cliffs. To the north, the Red Hill cinder cone is a recognizable feature from miles away (Figure1. 2). Immediately to the west, the Eastern Sierras are memorialized as a scenic byway.

There are two major divisions in the Little Lake landscape. Marshy wetlands surround the lake itself, and are mostly privately held. Van Tilburg and others (2012) recently reported on the rock art there, and the archaeological record is extensive. Previous to their work, Harrington (1957) excavated habitation sites along the northern end of the lake, including CA-INY-182 and CA-INY-205. A larger, later period village, CA-INY-3826, was located on the western shore towards the southern end. This seems to have been inhabited continuously for the last 4,000 years, having the name *Pagunda* (and variants) when ethnographers visited. By that time, inhabitants were a mix of Paiute, Shoshone, and Kawaiisu, representing a tradition of cooperation in the area.

Figure1. 2: *Red Hill, a significant landmark in Rose Valley, just north of Little Lake, with the snow caps of the eastern Sierra Nevada in the background. View NW*

The second major area is atop the lava flows adjacent to the lake, an area I call the "tablelands." The cultural landscape is continuous, but the biotic environment of the lower lacustrine zone differs from scrubland steppe above. While the boundaries do not entirely conform to landforms, generally the lacustrine area is privately held, while the tablelands overlooking them are managed by the federal Bureau of Land Management (BLM). Numerous sites are found tightly packed on the tablelands, clustering towards the cliffs overlooking the lake. In 1980, the tablelands won recognition on the National Register of Historic Places, as the Fossil Falls Archaeological District. The name Fossil Falls, however, was ascribed by Harrington in what can only hope to have been intentional irony: there are no fossils in the igneous rock, and the waterfall by all indications ceased between 13,000 and 15,500 BP (Liu and Dorn 1996:189).[2]

The Fossil Falls landscape is a component of the Little Lake Rock Art Complex. Artifacts and features for the BLM-managed portion of Little Lake/Fossil Falls area are concentrated in a 160 acre area (Garfinkel 1980:41). An adjacent private parcel to the south is Little Lake Ranch, which covers 1,200 acres. Combined, the archaeological deposits across the Little Lake area are significant for their scale, density, location, and association with the adjacent Coso Range. In the terms of this study, the NRHP district and private ranch may be considered representative components of the Coso cultural system. Consequently, experimental research at the area's slot canyon – which begins at the village site CA-INY-1634 and descends into a dramatic gorge – can be combined with previous scholars' documentation of other sites at Little Lake, providing points of comparison with the INY-3074 slot canyon

2: Nonetheless, the quirky name has stuck, now adding to confusion in the general populace about whether or not archaeologists study fossils and its associated landscape in the Death Valley area. Land use patterns and visual culture thus can be cross-examined for consistency, and also can serve to contrast between the greater Death Valley Area, and the great Coso Range area.

Fieldwork for this project was constrained to a small area of the NRHP listed district, above and outside the private lands. A gorge carved by the long since dessicated eponymous waterfall contains petroglyphs. This was intentionally selected as a point of comparison with the other research location, INY-3074 (see below). The proper designation for the gorge, however, is ill-defined. It seems despite Harrington's obvious knowledge of the petroglyphs inside the gorge by being pictured inside one of the voids containing them (Harrington 1957:13 figure 8), his published works show no reference to the canyon panels. Similarly the site records prepared for the archaeological district do not entirely clarify the matter. No less than thirty site records ranging the full breadth of villages/camps, activity areas, rock art panels, rock shelters, and even trails exist. Detailed examination shows several references to positions in relation to the gorge, but it does not appear included in any of the inventories. Confusingly, at least three sites are named *after* the gorge and district toponym, but are in fact simply in proximity to the canyon. A geological reference (Liu and Dorn 1996) simply refers to the canyon as Owens River gorge. With no clear site number, I use the lowest Smithsonian trinomial within 30 m distance, which is CA-INY-1634. Continuous cultural deposits span all around the lake and the tablelands, and these appear to have all been a part of the same cultural landscape or “persistent place,” for some time. Results from this continuous landscape published by other scholars are examined in conjunction with data from my own fieldwork.

Death Valley Slot Canyon

Some ambiguity also exists with the Death Valley research location, CA-INY-3074, although at least a single trinomial is unambiguous. The canyon hosting the petroglyphs has a commonly used moniker among rock climbers and avocational petroglyph enthusiasts, but I omit that name here and elsewhere at the request of the overseeing federal agency, and interested tribal government. The first, last, and only official record of the location for thirty years has been the site record by D’Ascenzo and Deal, typed in 1987. Incomplete (they decided not to proceed further out of concern for safety), the record refers ambiguously to previous documentation by one or both of two researchers (Martin and/or Scolnik), sometime over a four decade long span; needless to say, this did not help narrow it down. My early involvement with this slot canyon was mostly an attempt to amend and update that record, beginning in 2010. Little did I know how consuming that effort would become.

The D’Ascenzo and Deal (1987) archaeological site record is just that: four pages of boiler-plate archaeological site forms, plus a location map and partial site sketch map. Their sketch map is the basis of the present locus naming scheme, although it only covers from the entrance to Chamber 2 (roughly half the canyon). No panels are distinguished, and no petroglyph sketches or photos are included. The pair seemed familiar with Numic conventional motifs, listing webs, snakes as diamond chains, and burden baskets among a small sample of terms to characterize the petroglyph motifs. The present petroglyph study can be seen as a scholarly sequel, addressing recommendations including "panels should be recorded in detail before any vandalism can occur," that the "site should be revisited [and] mapped in detail and the panels drawn," and to test suggestions such as "that 'Chamber #2' represents a calendar, designating horizon-specific astronomical events."

The short story of my history with the canyon neither begins, nor ends with that update. It is a series of open questions. Each visit to that canyon leaves some question unanswered. Each time I walk away confident I have finally collected enough data to understand, but that data as a representation of that place begs further questions. Certainly the questions have now expanded beyond the initial goal: to map the structure, and photograph all of the visual culture therein, providing a complimentary written record. Yet, expanding the methodological repertoire, and coming to know the place intimately, I am still drawn into asking again. Inexplicable complications always leave something un-measured. Data always provides something compelling, while leaving a gap where an answer seemed assured. In these last eight years now, I have repeatedly assured myself, leaving, that this was the last visit; I have come to terms with the knowledge that I may never guarantee this.

Methodological advancements

Methods used in the slot canyon acoustics study were developed under three guiding principles. The first principle is to democratize archaeological practice through minimizing equipment and software costs which might serve as barriers to interested communities' involvement. The second is to demonstrate the analytic value of new non-invasive data collections, providing useful alternatives for locations where destructive analysis is impractical, infeasible, or insensitive to cultural heritage concerns. Finally, data analysis is directed at providing quantitative datasets that still preserve aspects of the experience of place in digital format, showing just some of the potential in the emerging realm of digital heritage management.

Informed by past research of other scholars, and more recent groundbreaking work beyond California and the Great Basin, this study's influences are numerous and diverse. In adopting non-invasive methods, I do not intend any indictment of more traditional destructive analysis – after all, those strategies have provided the foundations upon which I can build inferences. This study is also not a rejection of quality equipment and paid software – merely a demonstration of certain alternatives, and formats common between commercial and open-source products.

Data reported in the Chapter 6 is the product of several fieldwork sessions in 2010, 2014, 2016, and 2017. Each excursion employed and improved upon the previous session's work, each time resulting in refined methods, and higher quality data. Throughout the fieldwork and data analysis processes, I also became aware of new methods used by others in related topics, and integrated them when possible (however, at times, changing the research design was not practical, and the original plan was followed instead). To that end, this is a creative endeavor, and like many prototypes, the results index a process-in-the-making, as opposed to a truly refined investigation.

As mentioned, one of the key goals is also cost control. Again, this is not an indictment of costly methods – many of which produce data not obtainable through other means. Instead, it is an effort to empower outreach such as community archaeology. By using equipment marketed to individual consumers (not institutions), and open-source or relatively lost cost proprietary software where and when it is feasible, this project's dataset may be read and checked for reproducibility by any range of interested communities. This is of particular importance for any study wishing to engage with indigenous archaeologists or historians, as economic inequality between research institutions and descendant communities can problematically (though not intentionally) exclude the latter from checking, refuting, or interpreting information. That said, this study is still not a solution, merely a proposed demonstration, of how such collaborations could proceed on relatively more equal footing.

Nevertheless, this is still a scientific study. Observations are intended to be grounded – when possible – in measurable and reproducible practices. For the sake of scientific rigor, this study also incorporates experiments which seek to critically engage the results of previous scholars' petroglyph studies. Furthermore, neither the accessibility nor amount of trace concerns allow us to ignore foundational archaeological and anthropological questions. Chronology remains a relevant topic to address, albeit challenging without destructive methods. Covariant with temporality, informed inferences of cultural origin are necessary in order to ground interpretations. Both culture and chronology, for the sake of this study, are addressed broadly, and should be considered as low-resolution approximations: exact sequences of events and population shifts are beyond the present scope does not appear included in any of the inventories. Confusingly, at least three sites are named *after* the gorge and district toponym, but are in fact simply in proximity to the canyon. A geological reference (Liu and Dorn 1996) simply refers to the canyon as Owens River gorge. With no clear site number, I use the lowest Smithsonian trinomial within 30 m distance, which is CA-INY-1634. Continuous cultural deposits span all around the lake and the tablelands, and these appear to have all been a part of the same cultural landscape or "persistent place," for some time.

Aforementioned approximations provide avenues through which we may begin to explore broader patterns of behavior, and symbolic systems, and their relationships with rock image bearing locations. While the analysis includes a search for design concordance, visual culture is in fact in dialog with – not isolated from – other cultural traits. Consequently, behaviors and concepts beyond the bounds of rock art are nonetheless inherently involved in petroglyph site formation processes. In

Chapter 2, archaeological evidence from subsistence practices, pottery, basketry, economic production, and settlement patterns has all been included because it can be presumed to have *some* impact on rock art context or iconography. Moreover, Chapter 4 enumerates upon several oral traditions which refer directly to persons (including other-than-human), places, and ideas understood somehow directly connected rock images. For the experiment phases, less obvious aspects of these lines of evidence have been used to formulate propositions directed at testing the consistency of current archaeological theories on the origins of parietal imagery. Further propositions consider testing the boundaries of current understanding, exploring possibly not-yet-recognized connections, and alternative explanations for the same patterns of data.

Summary of Theoretical Perspectives

Orientation to the project begins with the conversations from which it precipitated. The analysis of rock art is a notoriously challenging subject, and to grapple with these challenges scholars have developed numerous theoretical models in the last 125 or more years of North American rock art research. In order to develop the most robust interpretations of data from select research locations as possible, my approach takes into consideration several of the most influential frameworks. It should be no surprise early antiquarians paralleled rock art of the Great Basin with hieroglyphic writings of Mesoamerica, and the Nile's Nubia and Egypt (among the most notable traditions). Mallery, the first scholar to test this model in North America (continent wide, no less), also developed a counter-proposal that the images portray scenes from mythology. Perhaps the most influential model throughout much of the twentieth century, however, was ported from European Paleolithic cave studies, where large animal motifs were once assumed to be products of magical acts intended to improve hunting success. Ecological approaches have developed spin-offs oriented towards hunting behaviors, namely prestige and costly signaling, as well as magico-religious totemic moieties. Counter-proposals around the turn of the millennium have proposed that rock art marks territorial boundaries. As ethnographically informed approaches are increasingly accepted, area-specific evidence of periodic public festivals in the early American (Historic) Period is projected cautiously to similar ceremonialism in the past. By contrast to this regionally contextualized approach, global-scale cross-cultural research developed the neuropsychology model, which emphasizes images depict subjective experiences as subjects intentionally altered their perception in a ritualized context. Most recently, landscape archaeology has made inroads at developing a holistic approach that treats rock art's geographic and geomorphological contexts as integral to, and inextricable from, its significance.

Primer on Methods, Results, and Interpretations

My approach using zero impact methods resolves issues for both transit-based and geographic positioning system (GPS) technologies in mapping the complex, bedrock-shrouded interiors of these canyons, address petroglyph manufacture processes, and provide ethnographically founded acoustical information. Inspired by its successful use in mapping interiors of European Paleolithic Caves, I employed landscape-scale terrestrial photogrammetry to resolve these mapping issues, building virtual, true three-dimensional models of both slot canyons in this study using dedicated software to process over 4,500 digital photographs covering on the order of tens of thousands of square meters of surface area. The virtual models amount to an interactive environment in which to review the spatial relations of petroglyph elements, and provide micro-cartographic contexts for cultural and natural features at a resolution not typically otherwise documented. In more than one instance, reviewing these models facilitated identification of new petroglyph elements not noted in the field. Data produced from analyzing recordings of acoustical experiments also benefit from the virtual models, which together provide insights into the relationships between the voluminous shapes of natural space and culturally significant psychoacoustic phenomena.

The approaches I use improve middle range theories for the identification, classification, and attribution of not just petroglyphs, but also related landscape phenomena functioning as *de facto* visual culture. In situating results of data processing in the contexts of established theoretical frameworks, I not only evaluate the consistency of data with predicted outcomes, but also identify shortcomings in these existing models. In the process of considering the implications these data have under several different theoretical frameworks, this project's interpretations construct an enriching and nuanced model of the role of rock art in mediating political economy, social structuration, and diachronic shifts in religious belief and expression.

By applying a neuropsychology reading of the ethnographic record to these multisensory, interactive data sets, this research demonstrates firm connections between historically known (and still practiced) Numic *Naraya* as a tradition of religiously significant and symbolically laden song, with deep Uto-Aztecan roots in a broad-reaching Flower World Complex of remarkable antiquity. Post-fieldwork analysis of data from key loci in the project areas provides unambiguous intentional interweaving of parallel themes known among both of these traditions, especially in song, chromatic symbolism, and archaeoastronomy. These connections are situated into the aforementioned political economy and belief systems of indigenous peoples.

The first few following chapters provide a summary of background research for the regions involved. The synthesis is cursory, and a substantial amount of information is omitted entirely. The intent is not to provide a comprehensive literature review so much as to situate the project into a history of theory, practice, and understandings. These discussions begin with a chapter on the geography and prevailing models for the cultural history of the geographic region. Following, Chapter 3 applies theoretical models to these, and highlights how various theories have been used to reach the conclusions on culture histories. In Chapter 4, ethnographic information is introduced, along with oral traditions from descendant and related communities that seems most relevant. Following, discussions proceed to the methods I used, the results achieved, and finally interpretive analysis. Concluding remarks include proposing future directions for outgrowths of this research.

CHAPTER 2: GEOGRAPHIC AND CULTURAL CONTEXT

Background

This study is situated in eastern California, at the convergence of two large North American deserts: the Great Basin and the Mojave Desert. Together, these cover more than one million square kilometers between the Eastern Sierra Nevada in the west and the Colorado Plateau in the east. Complex geologies and topographies foster a range of regional microbiomes, making a comprehensive synthesis of these regions too broad of a topic for this chapter to cover in its entirety. Instead, the following describes first general properties defining each desert, then the nature of the area in which they overlap, and subsequently specific landscapes within the region believed to represent the settings which gave rise to the most influential regional cultural processes over the last ten or more millennia. Descriptions are organized by physical geography, natural ecology, and archaeological evidence of human occupation and activities.

The human history of the Great Basin has often been oversimplified, remains contentious, and is frequently founded upon ambiguous evidence. This chapter covers the current state of consensus - and major disagreements - regarding human populations, their developments and movements, and material evidence used. Rock art at once substantiates, yet confounds many of the conclusions drawn, and therefore cannot be used as the sole line of evidence here; instead, other material and immaterial cultural indicators converge to clarify reasonable (yet sometimes conflicting) positions that researchers have taken regarding the subject matter. It is only in this holistic framework that rock art can be sufficiently contextualized to utilize it in addressing deeper anthropological questions. For later time periods, oral traditions are invaluable in informing us about social processes, lifeways, and systems of meaning through both desert regions in question. Projected into deeper time, anthropological data and oral traditions can yet be applied with a proportional degree of analogy to better clarify material patterns (Whitley 1992a; 2011).

Aforementioned additional (and to the discipline, traditional) lines of evidence include but are not limited to excavation collections, ceramics analysis, and especially lithic (flaked stone) analysis. Lithic projectile point typologies remain, in practice, one of the primary means of inferring age and chronology of archaeological sites within the region (Garfinkel et al. 2004; McGuire and Hildebrandt 2005; Gilreath and Hildebrandt 2008). Although attempts to better study and utilize groundstone data have been made (e.g. Hunt 1960; Reynolds 1996), it remains a relatively more poorly understood topic – likely resulting from implicit gender biases among scholars. The advent of radiocarbon dating greatly expanded our understanding of the antiquity of human occupation of the intermountain deserts (Whitley 2013a), although it is not the sole method of reaching such results. Ronald Dorn pioneered absolute dating methods for desert rock surfaces in geophysical studies. These methods, as applied to rock art corroborate carbon dates of the earliest human presence, and complicate long-held assumptions about rock art chronologies throughout the Basin (Dorn and Oberlander 1982; Liu and Dorn 1996; Whitley and Dorn 2010).

Chapter Structure

This chapter cursorily covers diachronic markers and changes in demographics as inferred through patterns of material culture and paleoenvironment. Additionally, it introduces bodies of (mostly middle-range) theory and research used to deduce such connections. At times, evidence or findings may appear contradictory. Said contradictions may not be resolved here, but some remain topics of discussion in later chapters. It is important to note that the Basin and the Mojave regions not only changed dramatically over time, but - as explained in the preceding chapter - vary substantially by elevation (among other variables). Consequently, the complicated climatic picture which emerges has confounded generations of researchers.

Reynolds' (1996:160) dissertation on shifting food processing habitation sites in response to changing treelines of the resource-critical pinyon pine highlights impacts of climate fluctuations on culture and cultural landscapes within the region. Admittedly, however, localized microclimates may rival larger scale climate shifts. As Mehringer (1977) asserts of the Basin:

> "...the instability of the last 10,000 years is no more dramatic than the ecological variation encountered by Great Basin inhabitants within a single year. Variability itself may have been most important in shaping cultural or technological adaptations." (Mehringer 1977:68 in Reynolds 1996:49).

It is precisely because of this variability that the regional trends become somewhat complicated. With seasonal contrasts between low elevation and high elevation temperature and precipitation extremes, adaptation-oriented arguments may rapidly devolve into overly simplistic caricatures that too broadly apply parallels between sites of similar microclimate settings to describe trends over the diverse region. This is precisely the trap of Jennings' (1957) later retracted "Desert Culture" hypothesis–. It should be noted, however, that the intent of this hypothesis was to generate discussion, a goal in which it succeeded resoundingly (Jennings 1973; Reynolds 1996:44-45).

Given the variables and complications above, it is necessary divide this chapter not only by time period and theories, but additionally by locality on the landscape and sub-regional scales. These divisions should not be read as attempts at isolation. Throughout seasonal, annual, and longer-period cycles, availability of food, water, other resources shift both by latitude and more so by elevation and exposure. Human presence in, exploitation of, and modifications to the landscape occurred in a complicated relationship with both opportunities and hardships magnified by these cycles. It is thus necessary to include a sampling of literature addressing variations between and among prominent and relevant landscapes to this study, in addition to measures of change through time, and bodies of theory to recognize the significance of certain cultural traces.

Landscape and Environment

Great Basin

Various definitions exist for the Great Basin as a geographic unit, each delineating a somewhat different perimeter for the hydrological, topographical, geological, ecological, or cultural Basin. Generally speaking, all of these variable definitions cover eastern California, the bulk of Nevada, and parts of southern Idaho, southeastern Oregon, and western Utah. To be accurate, the hydrological Great Basin is not a singular, but rather a series of large, internally draining basins with no oceanic outlets (Kelly 1997:1-4). Much of this region is in one or more mountainous rain shadows, beginning prominently with the Owens Valley on the leeward side of the Sierra Nevada. Boundary references are the Colorado River drainage to the south and east, the Columbia Plateau to the north and west, and the Sierra Nevada to the west. Consequently, population movements and cultural transmission occurred between the Great Basin and these surrounding regions throughout Precontact times. Quite likely, cultural transmission spanned even more broadly.

Mountain ranges and their aforementioned rain shadows in the valleys east of each range account for a major factor on the topographical definition of the Great Basin. Despite the name, the Great Basin is actually a series of dozens of often interconnected interior drainage basins. Tectonic processes generated and continue to shape this massive “washboard” topology, through crustal thinning and spreading. This process has fractured the crust into block faults which tilt so that lateral pressure is relieved, creating the washboard-like system of ranges and valleys. Despite general aridity, water is the primary erosion driver. Debris and sediments washed from higher erosions tend to channel into canyons, before being expelled out into valleys. With mostly only sparse vegetation insufficient to obscure them, large alluvial fans radiate out from these discharge points as decreased slope and an end to flow restriction causes the laden waters to lose energy and deposit sediments they carry. In many areas, alluvial fans from adjacent outlets converge, forming vast sloping aprons called *bajada*. Where seasonal floodwaters sometimes inundate valley floors, fine sediments form usually nearly level *playas*.

Flora thus defining the region differ across elevation and latitudes (Kelly 1997:1-4). In valleys, common plants are sand grass (*Oruzopsis membranacea*), sagebrush (*Artemesia nova* and *A. tridentata*), creosote bush (*Larrea tridentata*), and varieties of mesquite (typically *Prosopis pubescens* and/or *Prosopis juliflora*). In higher elevations, brush lands give way to forests of piñon (or commonly pinyon) pine (*Pinus monophylla*), and juniper (*Juniperus osteosperma*) . Pinyon-juniper woodland (Figure 2.1) and forests varied in density by slope, exposure, and precipitation. These woodlands often fostered underbrush, including *Artemesia sp.*, bitter bush (*Purshia tridentata and P. glandulosa*), varieties of ephedra (*Ephedra viridis* and *Ephedra nevadensis,* also commonly called joint pine, “Indian tea,” or “Mormon tea”). Neighboring areas to the woodlands curly rabbit brush (*Chrysothammus viscidiflorus*), desert berries (*Lycium andersonii*), beavertail cactus (*Opuntia *basilarius*, a variety of prickly pear), cottontop cactus (*Echinocactus poylcephalus*, also known as devil's pin-cushion), and primrose (*Enothera brevipes*). Riparian areas include reeds (*Phragmites vulgaris*, a source of sugars), willow (*Salix lasiandra* and/or *Chilopsis linearis.*), and unicorn plant (*Martynia proboscidea*), in addition to shrubland plants(Coville 1892; Reynolds 1996:15; Kelly 1997:4; Bettinger 2015:64, 91-93). See also Figure7. 3, Figure7. 5, and Figure7. 13 for examples of local flora.

Figure 2.1*: Pinyon-juniper woodland, characteristic of high elevations throughout the Great Basin [credit: author 2010]*

The Great Basin hosts a breadth of fauna adapted to desert climates, including many mammals, reptiles, and arthropods. Heizer and Baumhoff (1962), Grant and others (1968) observe the bighorn sheep, or mountain sheep (*Ovis canadensis*) appears to be one of the most commonly depicted petroglyph motifs. In addition to *O. canadensis*, other artiodactyls (even toed ungulates) include pronghorn antelope (*Antilocapra americana*), and mule deer (*Odocoileus hemionus*) (Reynolds 1996:16;

Brosman 2012:11). Other notable mammals include coyotes (*Canis latrans*), kangaroo rats (*Dipodomys sp.*), woodrats (*Neotoma sp.*), cottontail (*Sylvilagus audubonii*), and jackrabbit (*Lepus californicus*).

Mojave Desert

Covering a smaller area, the Mojave Desert not only borders, but partially overlaps the Great Basin (see below). The Mojave also exhibits basin-and-range topography, but a much great share of its enclosed area is low-elevation flatland. In some of these flatlands, pluvial lake beds form dry playas. Entirely dry most of the year, some of these playas may flood or form marshy alkali flats during late winter and early spring, especially in wetter years, fed by highland run-off and snow melt. The Mojave sits between the damper Southern California Coast and mountains, the cooler Great Basin to the north, the lower elevation Colorado Desert, and the Sonora Desert to the south and the east (note: the Colorado Desert is a subregion of the Sonora, where the Colorado River and lower valleys cut through in the latter's west).

Figure 2.2: *Joshua Tree, characteristic of the Mojave Desert [credit: author 2016]*

Joshua Tree (*Yucca brevifolia*) is the botanical hallmark of the Mojave Desert (Figure 2.2). The Joshua Tree's distribution accounts for the majority of the outer extent of this desert, spanning west to the foot of the Tehachapi Mountains, into the southern end of the Eastern Sierra Nevada, northeast into Death Valley, and east to the Colorado River and present-day Las Vegas. Other plant life in lower areas and valley floors commonly consist of salt grass (*Districhlis stricta*), Indian Rice Grass (*Oryzopsis hymenoide*), salt bush (*Atriplex*), *L. tridentata,* and *P. pubescens* (Kelly 1997:4; Brosman 2012:9).

In middle elevations, Mormon tea (*Ephedra sp.*) and *L. tridentata* commonly grows alongside *Y. brevifolia* (Kelly 1997:4; Brosman 2012:9). *Y. brevifolia* often colonizes large expanses along flats, alluvial fans, and bajada, leading to the common use of the term "Joshua Tree forest" to describe this biome. Joshua Tree forests are found (among other places) in the southern Sierra Nevada, the northern end of Death Valley, and the southern reaches of the Mojave Desert, where they give Joshua Tree National Park its name. In addition to much of the same fauna as the rest of the Great Basin, the Mojave Desert is also home to the desert kitfox (*Vulpes macrotis*).

Convergence Area

Approximately half of the Mojave Desert's northern reaches overlap the larger Great Basin's defining basin-and-range topography in the latter's southwestern most extent (Figure 2.3). Boundaries for this area are particularly ill defined, but some principles of both still hold. In this convergence zone, the basin-and-range topology still dominates, although valleys are somewhat wider on average. The Mojave's *Yucca brevifolia* is commonly found in middle elevations, especially around 1200 meters (roughly 4000 feet) in elevation. Hotter temperatures push pinyon-juniper forest to higher elevations. In lower elevations, both the Basin and Mojave frequently contain stable sand dune formations on pluvial lakebeds. The Mojave is considered by some as a subregion of the Great Basin; by this standard the map in Figure 2.3 indicates extent of basin-and-range topography south of the maximum range of *Yucca brevifolia*.

Expansive pluvial lake systems in the southwestern Basin left not only indelible impressions on the landscape and resources in recent (Late Holocene) times, but defined much of the available resource distributions since prior to their desiccation in Early Holocene. Presently – and in fact, since the boundary of the Early and Middle

Holocene – many of these former lake beds have dessicated into what are now expansive inland alkali playas. Especially during years of heavy rain, lakebed playas may still periodically flood, producing temporary shallow lakes or seasonal wetlands.

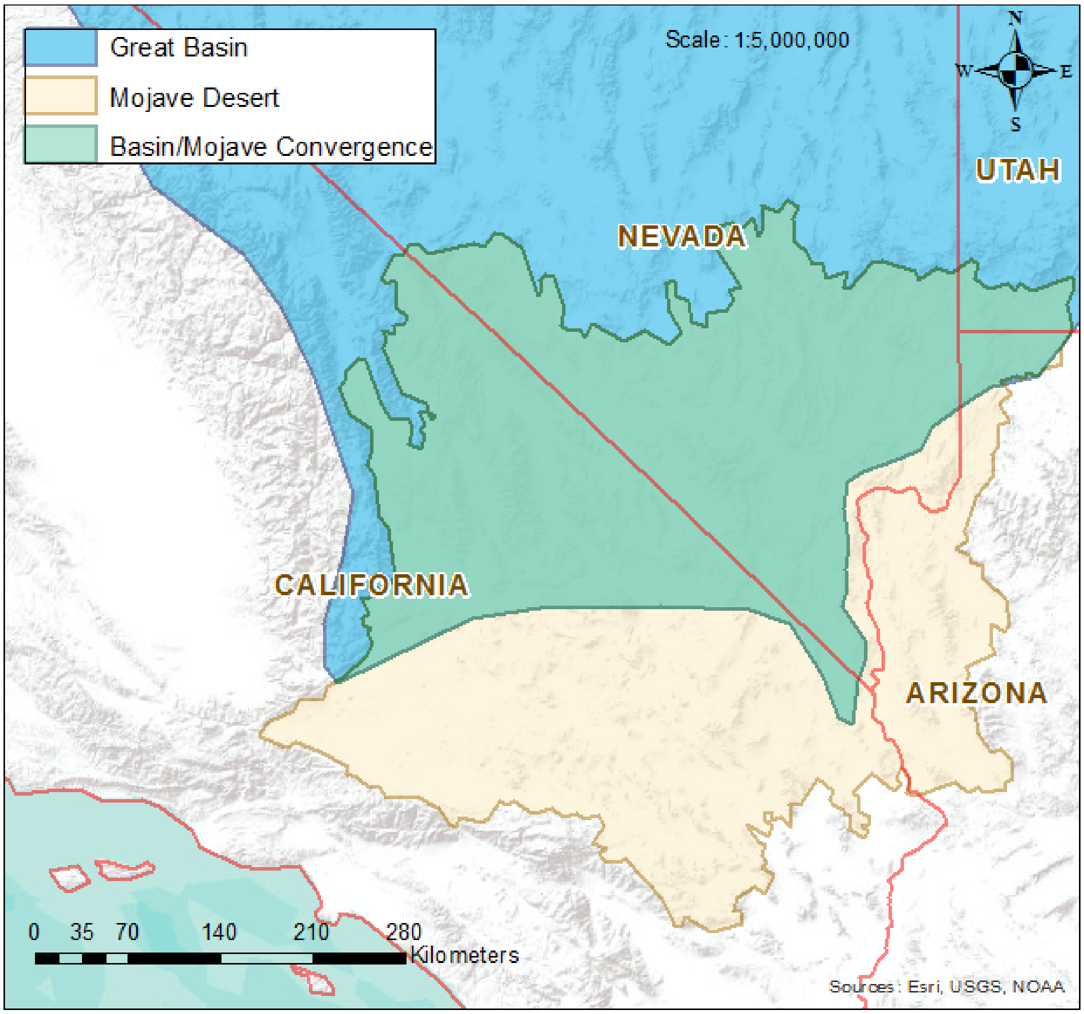

Figure 2.3: *Regional map of Great Basin and Mojave Desert convergence zone. originally published by (Liwosz 2017:177 figure 1), reproduced with permission by author.*

Chronological divisions

Numerous previous studies by notable researchers propose a variety of chronological sequences for the relevant and surrounding regions. Both differing and complementary opinions create a complicated discourse around appropriately dividing time and space throughout the intermountain deserts in a way that meaningfully communicates broad trends in material culture. While the below discussion seeks to cogently communicate a somewhat simplified consensus, it does not wholly account for the relevant nuances raised by other researchers.

Table 2.2 charts the culture history sequences proposed by prominent authors. In the following discussion, lead headings denote an approximate overarching category from Table 2.1 for culture history trends within and outside of this study's focus area, while subheadings account for the closest corresponding localized period – for example, in the Great Basin (generally), and in the Mojave Desert (specifically). This chapter does not seek to delve too deeply into critiques of the culture history concept as a whole, of which there are many valid ones to be made. Both temporal and geographic boundaries, should be considered somewhat "fuzzy." Individual events, deposits, or other traces should be understood to occur in a somewhat more stochastic nature, further complicated by marginal non-linearity in adoption of new cultural practices and material traces related to them. Prior to delving into the nuances of each established period, this chapter provides an outline of some of the themes and discussions which dominate the literature of a given era.

Some scholars (e.g. Allen, Sutton) consider the Mojave a subregion of the Great Basin. While this nested hierarchical arrangement of regions is not inaccurate, the present study diverges from said approach to highlight complications in the literature and material record. Namely, proto-historic and ethnographic period ethno-linguistic groups in the northern reaches of the Mojave Desert spanning into basin-and-range topography diverged from those in the southern reaches along the Sonora's Colorado Desert subregion to the south, and Colorado river riparian zones south of Grand Canyon to the east. It is in this basin-and-range topographical area within the Mojave Desert that archaeological findings from the northern and especially central Great Basin (namely present day Nevada) have been misapplied by other scholars to unfortunately perpetually alienate Numic peoples from the cultural heritage of Proto-Numic ancestors. For a different approach, consider the interaction patterns described by Sutton, Allen, and other Mojave Desert scholars (e.g. Sutton et al. 2007; Sutton 2017).

Paleoecology

During the Pleistocene, aforementioned extensive perennial lake systems covered much of the lower lying areas of both the Great Basin and the Mojave. Higher elevation mountains hosted glaciers, feeding lakes with melt water. By approximately 9,400 BP, expansive Pleistocene lakes receded, leaving behind more numerous small lakes and wetlands that persisted to about 7,500 BP (Brosman

2012:13). Aridity and high temperatures reached extremes the following three millennia (Antevs 1948, 1955), although localized timing and intensity is a matter of debate (see *Altithermal Hypothesis* below). Historic climate patterns began to set in circa. 4,500 BP. During these major shifts, and shorter period events, treelines and habitats shifted, with woodlands at their lowest elevations around the Pleistocene/Early Holocene transition (Reynolds 1996).

Table 2.1: *Paleoclimate Periods (based on Brosman 2012:14)*

Climate Period	**Time frame**
Terminal Pleistocene	Before 10,000 BP
Early Holocene	10,000 to 7,500 BP
Middle Holocene	7,500 to 4,500 BP
Late Holocene	4,500 to present

More detailed chronological divisions are a matter of location, author, and source. Conventions exist for both the Great Basin and the Mojave, as well as more localized time tables for various sub-regions therein. Many factors have gone into constructing each chronology, although projectile points remain one of the most widely applied distinguishing markers. Other considerations include subsistence strategies, adoption of pottery, and arrival of the bow-and-arrow. Although archaeological cultures are often defined along these lines, it would be prudent to note that changes occur with punctuated, even stochastic timing, and that timing itself is offset by centuries or even more for neighboring valley systems. In the following graphic, dominant and relevant culture-historic chronologies are listed.

Table 2.2: *Culture-history diagram for the Great Basin and Mojave Desert, including Death Valley chronologies.*

cal. years BP	Bettinger and Baumhoff 1982	Kelly 1997 (Great Basin)	Bettinger and Taylor 1974	Schneider et al. 2000	Gilreath and Hildebrandt 2008	Warren and Crabtree 1986	Davis 1970	Hunt 1960 (Death Valley)	Wallace 1977 (Death Valley)	Norwood et al. 1980	Sutton 1996 (Mojave Desert)	Sutton et al. 2007 (Mojave Desert)
100 300 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 6000 7000 8000 9000 >10,000	Numic Spread (600BP +/- 100) Numic Languages emerge (post 2k BP) Pre-numic/Archaic (6k - 1k BP)	Eastern Numa (post-600) Desert Series (1k - 600 BP) Owens Valley Rosegate Terminal Archaic (2k - 1500 BP) Middle Archaic (4k - 2k BP) Early Archaic (5500 – 4000 BP) occupation hiatus (central Great Basin) Paleoindian (before 7k BP)	Marana (post-750 BP) Haiwee (1350 – 750 BP) Newberry (3.5k - 1350 BP) Little Lake (6k – 3500BP)	Marana Period (post-750 BP) Saratoga (1350 – 750 BP) Newberry (3.5k - 1350 BP) occupation hiatus Pinto (6k – 4.5k BP) Lake Mojave (before 6k BP)	Marana (post-650 BP) Haiwee (1350 - 350 BP) Newberry (4k - 1350 BP) Little Lake (7k - 4k BP) Mohave (10k - 7k BP)	Shoshonean (post-750 BP) Saratoga Springs (1500 – 750 BP) Gypsum Tradition (4k – 1500 BP) Pinto Tradition (7k – 4k BP) Lake Mojave (12k – 7k BP)	Post-Contact Archaic Pottery Archaic (3k – 500 BP) Milling Archaic (4.5k – 1k BP) Early Milling, Archaic Transition (6k – 3k BP) Terminal Paleoindian (8k – 6k BP) Western lithic co-tradition (up to 8k BP) Fluted point co-tradition (up to 8k BP)	Death Valley IV Death Valley III (2k – 1k BP) Death Valley II (4.5k – 2k BP) Death Valley I (8.5k – 4.5k BP)	Death Valley IV / Panamint / Shoshone Death Valley III / Saratoga Springs / Amargosa II (2000-1000BP) Death Valley II / Mesquite Flat / Amargosa I / Pinto Basin occupation hiatus Death Valley I / Lake Mohave / Nevares Spring (7k-5k BP)	Ethnography Ceramic Horizon (1k – 100 BP) Milling Horizon (4k – 1k BP) Projectile Point Horizon (10k – 4k BP) Chopper/ Scraper Horizon (before 10k BP)	Late Prehistoric (Takic, Yuman, Numic) post-1k BP Rose Spring (1500 - 1k BP) Gypsum (4k - 1500 BP) Pinto (7k - 4k BP) Lake Mojave (10k - 7k BP)	(Historic) Late Prehistoric (850 BP – contact) Rose Spring Complex (1800 – 850 BP) Gypsum Complex (4000 – 1750 BP) Occupation hiatus? Deadman Lake Complex (7.5k – 5.2k BP) Pinto Complex (9k – 5k BP) Lake Mojave Complex (10k-6kBP) PaleoIndian (>10k BP) Pre-Clovis? (>12k BP) Late Holocene Middle Holocene Early Holocene

Human Ethology

Oasis Concept

Like other deserts, the Great Basin hosts landscapes that span the full spectrum of of productive to inhospitable, with riparian and lacustrian microclimates consolidated resources amidst otherwise broadly sparse regions. For decades, researchers have implicitly and explicitly recognized the utility of these resource concentrations – with the pluvial Owens Lake a particularly productive enduring environment due to low salinity (Antevs 1955). More recently, theoretical advancements have lead archaeologists to recognize the social implications of oases as places to aggregate (Conkey 1980). Emphasizing the sociality of aggregating at oases, Van Tilburg and team (2012) link Little Lake to Numic ceremonialism (see Chapter 3 and Chapter 7). During Middle Holocene scarcity, these oases may have hosted the last holdouts of populations which otherwise migrated out of the Great Basin (see Table 2.2 for proposed occupational hiatuses) into California or the Colorado Plateau (Kelly 1997:9).

It is not unreasonable to postulate cultural and linguistic differences in later periods emerged out of geographically separated (but not isolated) communities that aggregated around lakes, rivers, and marshlands during protracted drought. For the eastern Great Basin, former *Lake Bonneville* retreated to become the current Great Salt Lake (which would later be home to the Fremont). In the eastern Great Basin, the Washoe homeland is around the Lahontan Trough's lakes (Carson, Humboldt, Pyramid, and Walker) and rivers (Humboldt, Carson, Truckee, and Walker), including Carson Sink wetlands (Kelly 1997:4). For the Numic heartland, pluvial Owens Lake, China Lake, and Lake Manly (Death Valley) once shared a hydrological network, and their associated playas host plants like mesquite known to hold both cultural and dietary significance. Both research sites, INY-1634 and INY-3074, are thus linked with persistent major oases on far ends of the same expansive hydrological system.

Terminal Pleistocene and Paleoindian

Initial occupation of the Great Basin was once tentatively projected be be little older than the Middle Holocene – ca. 6,000 – 7,000 BP (e.g. Jennings 1957; Heizer and Baumhoff 1962). Subsequent adoption of absolute dating techniques has led scholars to revise this figure to conservatively double, with the general consensus that sparse populations inhabited more productive parts of the region at least 12,000, and perhaps 14,000 or more years ago (e.g. Dorn and Whitley 1984; Giambastiani and Bullard 2010; Whitley 2013a; Shillito et al. 2018). As this represents a dramatic difference in the timing of the earliest human arrivals, climatic differences must be considered in regard not only to subsistence and adaptation, but preservation and erosion processes, and even cognition in conceptualizations of the landscape.

Kelly (1997:8) indicates by at least 11,000 BP, sparse populations lived with mobility along the margins of pluvial lake shores. Paleoecological data were instrumental in initially making these determinations (Sutton 1996; Kelly 1997). A number of subsequent dating studies (e.g. Giambastiani and Bullard 2010; Whitley

2013a) demonstrate this pattern of behavior even earlier, conservatively around 12,000 BP and likely as early as 14,000 BP. Exemplary studies of early Paleoindian ecologies include ongoing research at Paisley Cave, Oregon, a northern Great Basin site along the marhsy shores of the pluvial precursor to present-day Summer Lake. Analysis of faunal remains (Hocket et al. 2017) and coprolites (Cromwell et al. 2018; Shillito et al. 2018) indicate highly variable diets that included a suite of animal from insets including crickets, to small mammals and birds like jackrabbits and sage grouse, and large game artiodactyls. The large sample analyzed provides a wealth of environmental information including seasonal pollens and volcanic eruptions in addition to the data on dietary variability, for periods spanning from 6,790 ± 15 BP, through 12,320 ± 35 BP, with the oldest coprolite dated to 14,233 ± 85 BP.

Associations of dated deposits with lithic tools have made the Paleoindian toolkits of the area instrumental in dating. The hallmark of Late Pleistocene occupation of North America, the fluted point traditions, collectively represent a continent-wide distribution of the earliest identified widespread human occupations. Fluted points - including the Clovis and Folsom - generally date between 11,000 and 9,000 BP, with some more extreme dates possible as early as 13,500 BP (Giambastiani and Bullard 2010). Sutton, Basgall, Gardner, and Allen (2007) assign a range between 12,000 BP and 10,000 BP in designating the Clovis Paleoindian Complex, qualifying their findings by mentioning uncertainty regarding later fluted traditions and similar tool morphologies.

Clovis Fluted Tradition

Fluted points are present in some valleys of the Great Basin (Kelly 1997) and the Mojave Desert (Sutton 1996) where glacial melt-water formed massive pluvial lake systems. In the Basin, the most prominent pluvial lakes were Lake Lahontan in western Nevada, and Lake Bonneville in northern Utah. In the Mojave Desert, a northern lake-and-river system connected Lake Manly in Death Valley to Owens and China Lakes, while the central portion contained Lake Mohave where present-day (dry) Soda Lake is located. Fluted point finds dot the shores of all of these locations (see also Reynolds 1996:25; Brosman 2012:15).

Lake Mojave Complex

The Mojave Desert additionally has its own Paleoindian lithic tool tradition, distinctive from fluted technology. Several names exist for this highly diagnostic toolkit, including the Playa Complex, the San Dieguito Complex, the Western Lithic Tradition, and the Western Stemmed Tradition (Wallace 1977:240). The most commonly used designation, however, is the Lake Mojave Tradition (or simply Mohave Tradition).[3] Projectile points from the Lake Mojave Complex featured long basal stems for hafting, in contrast to the Clovis style basal flutes (Reynolds 1996:24; Brosman 2012:15). Additionally, crescent-shaped lithics are also diagnostic of the Lake Mojave Complex. Usually 3.8 – 4.8 cm (1.5 – 1.9 in) long and 2 cm (0.8 in) wide, these small concave bifaces are subdivided into analytic categories that include

3: As a matter of clarity, “Mohave” and “Mojave” have both been used to describe the period and its associated technological industry. Here, I have adopted the standard set by Sutton, Basgall, Gardner, and Allen (2007).

“lunate,” “butterfly,” and “bow-tie” descriptors (Giambastiani and Bullard 2010:55). The Lake Mojave/San Diguito industry was initially purported to have lasted from 10,000 to 7,000 BP (Wallace 1977:240), or 10,000 to 8,000 BP (Sutton et al. 2007, table 15.4), somewhat later on average than the fluted point traditions. A revised chronology that includes somewhat earlier dates of 11,000 to 7,500 BP with outliers up to 12,000 BP has also gained acceptance in recent years (Giambastiani and Bullard 2010:51). While more or less contemporaneous with fluted points (especially in the regions at the focus of this study), the mean age of the Lake Mojave Complex is still slightly more recent, although a comparison of dates in the region makes the difference difficult to discern.

Early Holocene

The Early Holocene, spanning from roughly 10,000 to 7,500 BP, was marked by climate shifts, lakes drying, and megafauna extinctions. Many of the pluvial lakes of the Pleistocene dessicated by 9,400 BP, although shallow or marshy remnants lingered in key portions of the Great Basin (Harvey et al. 1989; McDonald et al. 2003; Brosman 2012:13). Despite the megafauna extinction, the big game that is still found today remained, including mule deer, pronghorn antelope, and bighorn sheep. Settlement patterns are believed to have consisted of small semi-mobile groups largely inhabiting valley floor wetlands, with occasional forays into upland coniferous forests (Reynolds 1996:24). The Lake Mojave Complex – including such nomenclature as Western Pluvial Lakes Tradition, Western Lithic Co-tradition, Western Stemmed Tradition, Playa Complex, San Dieguito Complex, Lake Mohave Complex, Early Archaic, Death Valley I, and Period I – is the only industry associated with the Early Holocene Mojave Desert (Sutton et al. 2007, table 15.4).

Middle Holocene

Shifts towards warmer and more arid conditions throughout the Great Basin culminated in the Middle Holocene, which ranged from approximately 7,500 to 4,500 BP. These conditions changed the distribution of flora and fauna throughout the region, as treelines receded to higher altitudes and many oases are presumed to have dried (Reynolds 1996). The magnitude of temperature and ecological change led Ernst Antevs (1948) to propose the Altithermal Abandonment Hypothesis. As described below, the Altithermal Hypothesis remains a commonly cited – albeit crude – depiction of the Great Basin during the Middle Holocene. While research in subsequent decades has complicated the timing of heat and aridity, Antevs remains mostly correct in the assertion that this period was distinct from the Early and Late Holocene because of these factors.

Altithermal Hypothesis

Prior to the writings of Ernst Antevs, scholars understood little of both climatic and cultural changes in the Great Basin. Data sets were biased by superior preservation in cave deposits, and largely Great Depression-era cultural inventories undertaken by Driver (1937), Kelley (1938), Steward (1927, 1941), and others. Jesse Jennings initially proposed what would come to be known as the Desert Culture

Hypothesis, despite publishing little on it formally. Summarily, Jennings (1957) and colleague Edward Norbeck proposed in the Desert Culture Hypothesis that a singular adaptive pattern of cultural practices and material culture characterized Great Basin peoples for the last roughly 9,000 years. The Desert Culture Hypothesis assumed that climate remained relatively stable over the last nine to ten millennia, and that differences in language, religion, and visual culture were essentially epiphenomenal.

Although published a few years earlier than Jennings' hypothesis, Antev's Altithermal Abandonment hypothesis directly contradicted many of the formers' assumptions. Antevs' (1948) climate data based on geologic studies became the foundation for the4 later (1955) inferences regarding animal and human habitation of the Basin during the Middle Holocene. According to Antevs, warming between 7,000 and 4,500 BP made the Basin inhospitably arid to humans. Citing evidence including bats abandoning Lovelock Cave (Lahontan Trough, northwest Nevada; see Figure 2.4) between 6,000 and 4,500 BP, Antevs (1955:329) concluded that the Basin was abandoned and not repopulated until cooler and moister weather returned around 3,500 BP (Kelly 1997:9). During this time - and more specifically, between 7,500 and 4,000 BP - Antevs coined the term "Long Drought" to denote period during which he presumed a continent-wide drought occurred.

Even with millennia-long margins for error, the combination of cultural and climatic data likely indicates a discontinuity between the *central* Great Basin's earliest ("Paleoindian") inhabitants and later ethnographic groups. In light of such evidence, the Desert Culture hypothesis was largely abandoned. Even Jennings (1973) later admitted in the aptly named essay *The Short Useful Life of a Simple Hypothesis* that the Desert Culture concept was intended to generate debate – a goal which Reynolds (1996:44-45) deems successful.

Antevs' (1948, 1955) findings led to the conclusion that as the Basin climate fluctuated, human adaptations must have undergone dramatic changes not accounted for by Jenning's Desert Culture model. Reynolds (1996:25) describes these shifts as "*the* major adaptive shift in the western Great Basin," (emphasis in original). These so-called adaptive shifts, in Antevs' view, amounted to humans abandoning the region, much as did bats at Lovelock Cave. Many subsequent studies refer to Middle Holocene depopulation as a hiatus, as indicated in Table 2.2.

Not all of the intermountain west was equally impacted by the Antevs' Long Drought. Although central Great Basin wetlands and lakes appear to have vanished altogether between 6000 and 5500 BP, evidence from recent decades, however, indicates impacts of the Middle Holocene warm period varied throughout different segments of the region (Kelly 1997:9). The very warming processes that increased overall aridity may also have paradoxically fostered an expansion of productive prairie and marshland in certain basins (*ibid*). For instance, although Lake Bonneville retreated to become the Great Salt Lake circa 8500 BP, both Salt Lake and Owens Lake (California) likely never fully evaporated[4] (Antevs 1955:330). Instead, wetlands

4: at least, not until the Historic/American Period "Water Wars" for the latter.

along its margin expanded by encroaching on the lake between 7000 and 6000 BP, and again in the later Newberry Period ca. 3500 BP and 2000 BP (Kelly 1997:9). While the central area was severely impacted, there are indications that other parts of the Basin (and the Mojave Desert) maintained some (albeit low) human populations.[5] Compared with the central Great Basin, the Basin's northern margins' aridity increased less, later, as was less severe (Antevs 1955).

5: Peak Middle Holocene aridity and heat offset between localities, with some entering drought millennia later than elsewhere, as other localities began to emerge from it.

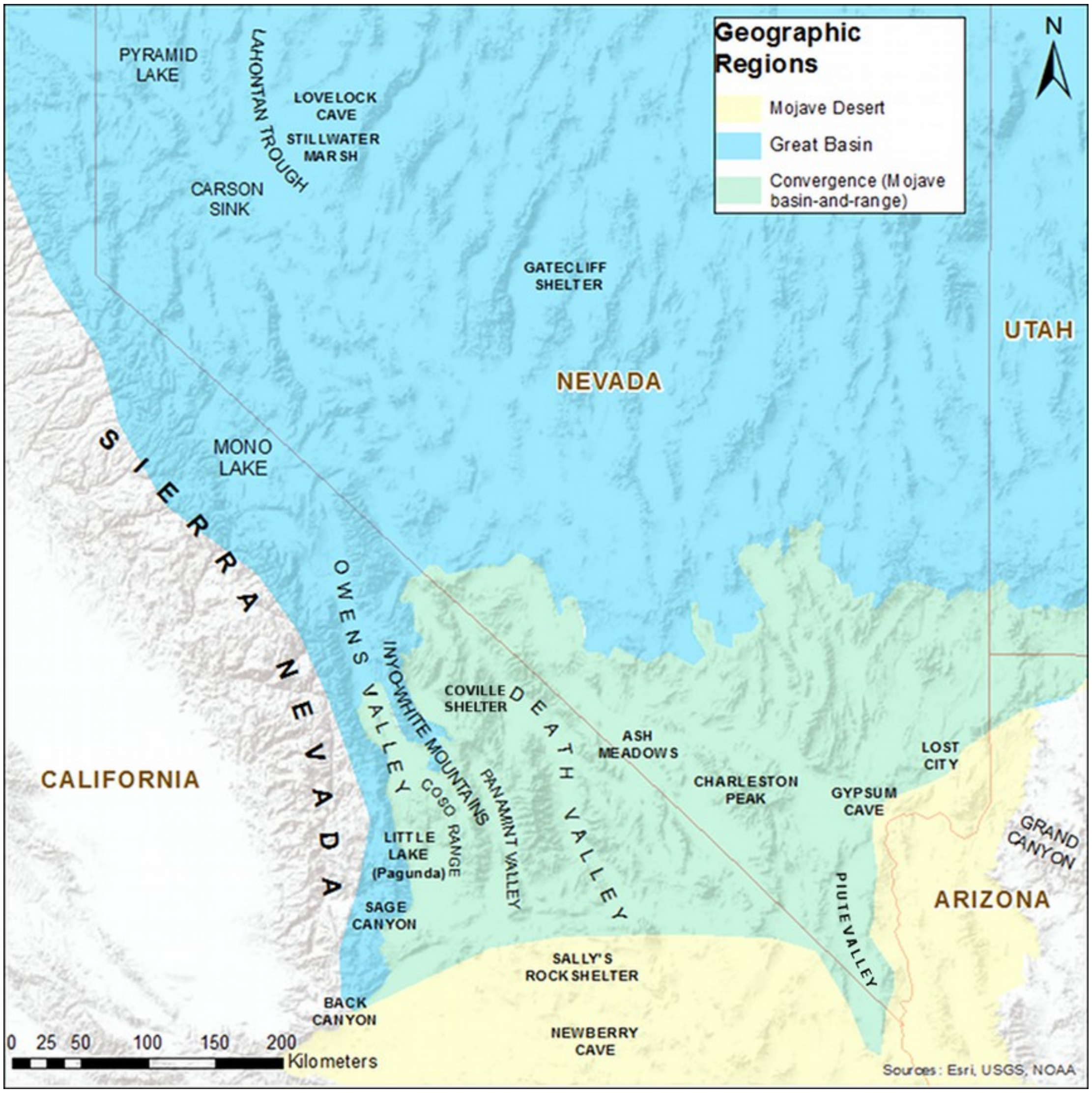

Figure 2.4: *Map of central and southwest Great Basin, with places mentioned in text labeled.*

Desert Archaic

The primary cultural moniker most often used for archaeological materials of the Middle Holocene is the Archaic, or more specifically, the Desert Archaic. Once believed the begin around 6,000 BP (e.g. Bettinger and Baumhoff 1982), more advanced dating techniques have pushed dates for Archaic patterns of material culture about a millennium earlier. Despite unequivocal evidence of widespread drought, a number of locations throughout the Basin exhibit Archaic Period habitation, especially along the Basin margins. The Basin/Mojave interface at the heart of this study is one such margin, including Owens Valley, Death Valley, and China Lake, along with the drainages of the Mojave and Colorado Rivers (Figures 2.3 and 2.4). 4Elsewhere, the Basin's northwest margin's material record is somewhat different (from the convergence zone), and centers around the Lahontan Trough. The flatter, eastern margin of the Basin includes the Great Salt Lake, with inhabitants there also spreading through the Uinta Mountains (Kelly 1997). In the Great Basin, the early Archaic is conventionally referred to by some (e.g. Bettinger and Taylor 1974; Gilreath and and Hildebrandt 2008) as the Little Lake Period. In the Mojave Desert, the conventional name for the same window of time is the Pinto Period (e.g. Warren and Crabtree 1986; Sutton 1996). Recent works have adjusted the window for a Pinto Complex beginning and ending somewhat earlier, with early dates following the Lake Mojave Complex, and terminating ca. 5000 BP (Sutton et al. 2007).

Great Basin: Little Lake Period (7,000 to 4,000 BP)

Materially distinct from contemporaneous Mojave Desert and Bonneville Basin assemblages, the Lahontan Trough in the northwest portion of the Great Basin (see 4) presents a unique perspective on Middle Holocene (Basin) populations. Valleys in the Lahontan Trough are typically 300 meters to 900 meters lower than those of the central Basin. Low valleys typically contribute to higher inflow of water, and are consequently believed to have assisted this area's Middle Holocene population while valley systems further east depopulated (Kelly 1997:4). Adjacent to the Lahontan Trough area, Lake Tahoe to the west, and Pyramid Lake to the north are believed to have retained perennial water during the much of the Altithermal (Antevs 1955:330). Seasonally mobile populations of the period evidently used valley marshes as population hubs (Kelly 1997:15).

Leonard Rock Shelter looks out over one such marshy valley of the Lahontan Trough. This multi-component site features several horizons of use and occupation, spanning from the onset of the Early Holocene to the Late Precontact/Marana Period (explained later in this chapter). Leonard Rock Shelter is particularly relevant for two reasons: first, it exhibits occupation/use during the presumed Altithermal; second, it features Great Basin style petroglyphs. Middle Holocene material culture at this site shows use around 5950 BP, and a later component from 3950 BP (Heizer and Baumhoff 1962:231-232). The latter components parallel both Northern Paiute and Lovelock Cave attributes (see 4). Great Basin Abstract style petroglyphs on an associated cliff wall (see illus. Heizer and Baumhoff 1962:174) are located within reach of the late component surface, but 20ft (6 meters) above earlier cultural deposits. Consequently, Heizer and Baumhoff (1962:232) interpreted these petroglyphs to belong either to the Lovelock "culture" or to the later Northern Paiute. Petroglyph dating by such associations is, however, speculative, founded upon certain assumptions like a lack of climbing equipment (e.g. ropes or ladders).

Why Little Lake?

The namesake of the period, Little Lake is one of the aforementioned lacustrian oases, host to one of the study canyons, and location of Middle Holocene human occupation. Radiocarbon dates from CA-INY-182 and CA-INY-205 (the “Stahl Site” and “Stahl Cave,” adjacent) indicate the area between the Owens River gorge and Little Lake’s (present-day) north shore active from 10,000 BP through 5,000 BP – right through the height of the supposed Altithermal (Van Tilburg et al. 2012:21, 26). These deposits included lithic tools from the Lake Mojave industry. Obsidian rim hydration dates from the same sites – obtained through optical microscopic petrography of water from the environment infiltrating the fabric of the volcanic glass – show another component beginning 6,500 BP, and tapering off until 2,000 BP or as late as 1,500 BP (Gold 2005:205; Van Tilburg et al. 20112:21). Although during this period Little Lake may have been more marsh and prairie rather than lake, the data indicates the location remained in use, if not continually occupied in the strictest sense, throughout the period. Located in Rose Valley (itself a lobe of the southern end of Owens Valley), Little Lake’s position along the former Owens River linking Owens Lake with China Lake makes it reasonable to consider other such Middle Holocene use throughout the former Owens-China-Manly Lakes system.

On the Great Basin’s eastern margin, pluvial Lake Bonneville – now the Great Salt Lake – presents another compelling example of Middle Holocene occupation. Despite Early Holocene retreat, parts the Bonneville Basin likely never fully evaporated (Antevs 1955:330). Instead, Bonneville flats fostered wetlands which expanded between 7,000 and 6,000 BP, and again later in the Newberry Period ca. 3,500 BP (Kelly 1997:9). These wetlands furnished resources for human populations, whose pithouse residences and interments have been dated to this period as a result of salvage archaeology efforts (Kelly 1997:15-16). Pit-house domiciles are consistent with ancient Fremont who later defined the Bonneville area, and the closely related modern Washoe (see mtDNA studies by Kaestle and Smith in Table 2.3).

Towards the close of the Little Lake Period, the central Great Basin began to repopulate. A new tool kit including a potentially multi-purpose corner-notched projectile point and hand blade combination appeared at this time (Kelly 1997:12). Type sites for this include point Hidden Cave, and Gatecliff Shelter, which both feature examples from about 3800 BP. Earlier examples from Lovelock and Humboldt Caves, however, demonstrate the advent of this toolkit to be around 4,500 BP (Kelly 1997:10-11). Corresponding paleobotanical evidence suggests that the central Basin began to moisten circa 5,000 to 4,500 BP.

Mojave Desert: Pinto Complex (9,000 to 5,000 BP)

Brosman (2012:15) attributes certain cultural shifts during the Middle Holocene to the lacustrine desiccation. Overall, these shifts saw decreased reliance on big game, and more reliance on plant-based subsistence – especially increased seed use as indicated by more frequent milling slicks and groundstone. For the Mojave Desert, such shifts indicate the Pinto Complex’s commencement. Radiometric dates on hearths and human remains from Kern County and Ludlow Cave (respectively) demonstrate their use at least as of 7,000 BP (Sutton 1996:231), and as early as 9080 ± 85 cal BP at INY-182 on the north shore of Little Lake (Sutton et al. 2007, Table 15.3). Unlike the Great Basin, and contrary to some arguments (e.g. Wallace 1962), the Mojave may not have abandoned during the Pinto Period (Sutton 1996:224; Kelly 1997).[6] Recent scholarship (e.g. Sutton et al. 2007), however, indicates very sparse population densities in the Mojave Desert during the millennium spanning from 5,000 to 4,000 BP. Productive land likely existed in the vicinity of pluvial Lake Mohave – the same name (Giambastiani and Bullard 2010). While Lake Mojave itself – now a dry playa called Soda Lake – probably desiccated ca. 7,500 - 7,000 BP (Antevs 1995), its hydrological system including the Mojave River continued to provide an inflow of water. Other areas of the Mojave, however, may have become largely abandoned (Sutton et al. 2007).

Elsewhere in the Mojave, occupation also continued in the vicinities of Owens and Death Valleys. Antevs (1955) observed unusually low salinity for the period at Owens Lake, suggesting not only wetlands but standing water persisted there. Owens Lake was the longest holdout of a once interconnected Pleistocene lake system - as described in the preceding chapter. Unlike its counterparts, Owens Lake did not vanish until twentieth century irrigation projects redirected eastern Sierra Nevada outflow. During the Middle Holocene, other members of the Owens Lake-China Lake-Lake Manly system likely ceased perennially holding standing water, but may

6: Tangentially, Harrington (1957:73), in a volume on Little Lake excavations, noted the irony of the name Pinto, as its meaning of "spotted horse" is not appropriate for a culture which preceded the introduction of the horse to North America by several millennium.

have continued as marshy wetlands and seasonally filled during climate fluctuations (Sutton 1996). In the Inyo-White Mountain Range (see Figure 2.4), Pinto Complex projective points are found in what is now brushland, but was, at the time, pinyon woodland. Additionally, locations such as the Coso Range reveal evidence for the exploitation of lagomorphs while others show evidence of artiodactyl hunting (Hildebrandt and McGuire 2002).

Mojave Desert: Deadman Lake Complex? (7,500 to 5,200 BP)

In 2007, Sutton, Basgall, Gardner, and Allen proposed a new co-tradition to the Pinto Complex. When originally proposed, the Deadman Lake toolkit had only been identified at Twentynine Palms in the southern Mojave Desert. These lithics include "lozenge-shaped" or contracting stem projectile points, battered cobble and core tools, bifaces and flake tools, and milling equipment. *Olivella* shells appear to have traveled both from the Pacific, and the Sea of Cortez. The tools seem to suggest intensive vegetation processing, which wound refute long standing beliefs that plant intensification began much later.

Late Holocene

After around 4,500 BP, climate trends in western North America shifted again, with the intermountain regions experiencing somewhat lower temperatures and more precipitation than during the Middle Holocene or "Altithermal." Environmental changes created the opportunity for populations throughout the Great Basin and

Mojave Desert to increase steadily. Concurrently, settlement patterns gradually shifted towards more sedentary patterns (or "limnosedentary," as Bettinger and Baumhoff 1982 describe it). Both deserts rapidly accrued regional cultural diversity during this time. In the Great Basin, these patterns are characteristic of the Newberry Period (Gilreath and Hildebrandt 2008:10, 18-19), and the the Mojave Desert of the Gypsum Period (Warren and Crabtree 1986; Sutton 1996:232-234) or Gypsum Complex (Sutton et al. 2007).

Temporal types of diagnostic artifacts of this period are Gatecliff projectile points dating between 3,800 and 3,000 BP (Kelly 1997:11, 17), and Elko and Humboldt points from 1,860 to 1,220 BP (Gilreath and Hildebrandt 2008:19). Sutton (1996), and others (e.g. Kelly 1997) note that distinctions between Gatecliff and later Haiwee period Rose Spring points are questionable. Radiometric dates on Elko points from Newberry Cave push their appearance to correspond with the 3,800 to 3,000 BP dates of the Gatecliff series (Sutton 1996:234), making this potentially the best diagnostic lithic artifact type for the Newberry/Gypsum Period. Portable ritual artifacts such as split-twig figurines and ceremonial attire were also recovered at this and other sheltered sites throughout both regions (Sutton 1996; Hildebrandt and McGuire 2002:243).

Great Basin: Newberry Period (4,000 to 1,350 BP)

As exemplified by sites like Stillwater at Lake Abert in Oregon, northern reaches of the Newberry Period Great Basin saw lake margin use increase in intensity (Kelly

1997:17). Northern Basin adoption of pit-houses occurred gradually beginning circa 4,000 to 3,800 BP at locations including Stillwater, Oregon, Pyramid Lake, Nevada, and Great Salt Lake, Utah. Increased popularity of pit-houses and their increased geographic distribution throughout the Newberry Period may indicate some increase in sedentism as well as decreases in temperature. Petroglyph themes traditionally are thought to have changed from abstract to more "representational" during this time (Heizer and Baumhoff 1962; Gilreath and Hildebrandt 2008), although this assumption has been challenged by chronometric results (e.g. Dorn and Whitley 1984; Whitley and Dorn 2010).

Lahontan Trough: Early Washoe?

Northwestern Basin ecosystems were impacted by geologic activity. Earthquakes changed watercourses and valley elevations, causing shifts in wetlands such as Stillwater Marsh (Kelly 1997:18). These events have complicated the study of Newberry settlement patterns in the Lahontan Trough. Patterns indicate increased sedentism and pit-house use at Pyramid Lake, especially between 3,000 and 1,500 BP, after which mobility increases (Kelly 1997:29). Hidden Cave's Newberry component contains diagnostic Gatecliff points, characteristic of a time range from 3,000 to 1,300 BP (Thomas 1981:22; Kelly 1997:29). Occupants of this period may have been the direct ancestors of ethnographic period Washoe. Changes from pit-house to aboveground perishable architecture after 1,500 BP, however, could indicate some level of population disruption. Shifting drainage patterns further obfuscate land use patterns, leaving the matter of continuity unresolved.

Basketmaker II/early Uto-Aztecan

Since the 1960's, some researchers (e.g. Hunt 1960; Wallace 1965, 1977) have suggested cultural connections and even intrusions into the Death Valley area from Puebloans and their ancestral Basketmaker predecessors. These claims, however, clearly avoid homogenizing the Newberry/Gypsum peoples. The eastern Great Basin during this period diverged from its central and western counterparts, and instead more closely resembling patterns of the Colorado Plateau region. These divergent trends include the adoption of horticulture, with cultivation of maize, squash, beans, and sunflower (Kelly 1997:23). Uto-Aztecan speakers are believed to correspond with the emergence of Basketmaker II life-ways (Hill 2001). A common ancestral dialect to Hopi, Numic, Tübatulabal, and Takic languages is projected to have arrived in the Colorado River, drainage between 3,500 and 2,500 BP (Golla 2007; Gilreath and Hildebrandt 2008:18). Hopi may have diverged ca. 2,500 BP, and the Numic and Takic subfamilies around 2,000 BP. Concurrent with the arrival and regionalization of Uto-Aztecan languages, maize agriculture was adopted in the eastern Great Basin at least as early as 2,000 BP (Kelly 1997:20). Other models, however, suggest Uto-Aztecans or their direct ancestors arrived much earlier, possibly along with maize agriculture ca. 4,000 BP (see Sutton et al. 2007, Sutton 2017).

Bonneville Basin: Fremont

Cultural traces in the Bonneville Basin closely follow the course the Basketmaker/Puebloan chronology on the Colorado Plateau. Evidence of maize agriculture at the Great Salt Lake began somewhat later, though, around 2,000 BP (Kelly 1997:20-22). Evidence suggests increased sedentism as indicated through pithouse architecture, above-ground storage, and horticulture. Especially during the first half the Newberry Period, however, early Fremont likely retained some seasonal mobility. Fremont rock art is stylistically identifiable by characteristic triangular bodied anthropomorphs with headdresses (e.g. Matheny et al. 1997:85-86; Heizer and Baumhoff 1962:125). While Fremont traits emerged during the latter half of the Newberry Period, their peak populations (from 1,600 to 700 BP) span the Mojave's Rose Spring Period, the Great Basin's Haiwee Period, and the Colorado Plateau's Basketmaker II-III and Pueblo I-III periods. Like Ancestral Pueblo (formerly termed Anasazi), Fremont represents an outgrowth of early Uto-Aztecan/Basketmaker progenitors.

Mojave Desert: Gypsum Complex (4,000 to 1,750 BP)

The Mojave Desert timeline diverges from the Great Basin during the Gypsum Complex. Above-ground architecture with unmodified stone foundations is more typical than pit-houses, a trend true of the area's subsequent periods, as well (Sutton 1996:238). Shell bead trade from the southern California coast (contemporaneous with that region's Millingstone Horizon) throughout the Great Basin was likely routed through the Mojave Desert. This exchange network peaked in trade volume between 4,000 and 2,200 BP, then declined to its lowest pre-contact level between 2,200 and 1,250 BP (Sutton 1996:234; Kelly 1997:19). Intriguingly, the decline of shell trade between the California Coast, the Mojave Desert, and the Great Basin corresponds with an exponential spike in Coso Volcanic Field obsidian quarrying and trade throughout these deserts lasting from 2,300 to 1,275 BP (Sutton 1996;235; Hildebrand and McGuire 2002:242; Gilreath and Hildebrandt 2008:10). More recent models question the timing of this decline, especially in terms of later regional cultural and climatic shifts (e.g. Allen 2013:5). During this period, evidence of rock art-related rituals abound the the form of paint, quartz crystals, and of course parietal art (Sutton et al. 2007).

The widespread increased reliance on groundstone for plant product processing lead to the adoption of the term Millingstone Horizon to describe technological and subsistence shifts throughout California after the Middle Holocene. Consequently, researchers like Davis (1970) term the period lasting from 4,500 to 1,000 BP in the eastern California deserts the Milling Archaic. These variables also in part define Hunt's (1960) Death Valley II Period (from 4,500 to 2,000 BP), and Wallace's (1977) Mesquite Flat/Amargosa I/Pinto Basin Period (from 5,000 to 2,000 BP).

China Lake and Coso Range during the Newberry Period/Gypsum Complex

Located on what is now the China Lake Naval Base and bombing range, the Coso Range (alternatively spelled Koso, with the same pronunciation) is host to a major obsidian source, and one of the largest concentrations of rock art on the continent (Whitley 1994:356). Consequently, it has been a centerpiece in supporting vastly divergent models of rock art interpretation (e.g. Heizer and Baumhoff 1962; Bettinger and Baumhoff 1982; Lewis-Williams and Dowson 1988; Whitley 1994, 2013; Lewis-Williams 2002; Hildebrandt and McGuire 2002; Quinlan and Woody 2003; Garfinkel 2006). Some (e.g. Lewis-Williams and Dowson 1988; Lewis-Williams 2002) advocate examining the Coso area as a testing ground for interpretive paradigms for parietal (non-mobile) art globally; others (e.g. Gilreath and Hildebrandt 2008:1) urge situating Coso rock art "within its contemporaneous archaeological context using routine analytical methods." The disparity in approaches highlights conflicting theories, methods, and study scales. Even period naming can conflict between studies, with some opting for Newberry, some Gypsum, and others skirting the issue altogether.

The China Lake playa located in the vicinity of the Coso range was previously part of the pluvial Owens Lake/Lake Manly hydrological system. As previously discussed, this hydrological area did not undergo the same degree of Little Lake Period depopulation as other localities (see above data for Stahl Site on the north shore of Little Lake). Its Newberry Period (4,000 to 1,350 BP) settlement features shared similarities with other previously mentioned hydrologic systems that also did not undergo a Middle Holocene hiatus. Habitation features demonstrated a trend towards more (limno-)sedentism, implying reduced mobility (Bettinger and

Baumhoff 1982). Household architecture of the period demonstrated both the semi-sedentary lifeways, and similarities with contemporaneous regions' above-ground wikiups comparable to Gypsum Period Mojave Desert to the south, and pithouses reminiscent of Lahontan Trough and Great Salt Lake to the north (Whitley and Dowson 1988). Gilreath and Hildebrandt (2008:18) use these similarities to interpret Coso as a boundary territory between two diverging culture areas. Alternatively, other researchers (e.g. Huffman and Earley 2017) describe an Uto-Aztecan speaking Great Basin Desert Culture as being widespread throughout the Basin during the period. As used in this context, the Great Basin Desert Culture is a convenient heuristic for ethno-linguistically related peoples of the period, and is not to be confused with Jennings' (1957) "Desert Culture" (Huffman 2017 personal communication). What is clear is that cultural processes around Coso, and its parent Owens-Death Valley hydrological system, were not as isolated from other Basin oases as has often been suggested.

Researchers have often placed emphasis on the importance of big-game ungulate hunting in the Cosos and throughout the Basin during the Newberry Period, both as a subsistence strategy, and as having ideological primacy (Bettinger and Baumhoff 1982:493-495, 498). This model contrasts with the ethnographically documented life-ways of historic period Numic peoples (see Driver 1937; Kelly 1938; Steward 1941), and has consequently been mobilized to argue against continuity between the so-called Archaic Coso Culture and Numic peoples (e.g. Bettinger and Baumhoff

1982; Hildebrandt and McGuire 2002; Gold 2005; Garfinkel 2007). Supporters of the population replacement model cite both the occurrence of dart type projectile points best suited for hunting big game with atl-atls, and the ubiquity of sheep motifs in pecked rock art (Grant et al. 1968) (c.f. Whitley 1994, 1996, 2000; Lewis-Williams 2002; Whitley and Whitley 2012). Archaeofaunal profiles demonstrate that during the Newberry Period only, ungulate exploitation exceeded all other vertebrates three-to-one (Hildebrandt and McGuire 2002:238; Gilreath and Hildebrandt 2008). These data, however, are misleading. They do not specify from which sampling standard (NISP or MNI) the data is constructed, and only 7.7% (510 out of 6,608) of the big-game sample is identified as bighorn sheep (*Ovis canadensis*). With 92% of the Newberry Coso big-game faunal profile identified no further than order *Artiodactyla*, there is far more room for margin of error in the Gilreath and Hildebrandt study than any certainty.

Coso economy substantially benefited from inter-regional exchange. Obsidian hydration dating profiles of Coso Volcanic Fields debitage and sites with Coso obsidian present demonstrate exponential growth in utilization during the Newberry Period (Sutton 1996:235; Gilreath and Hildebrandt 1997:174-175; Hildebrandt and McGuire 2002:241-242; Gilreath and Hildebrandt 2008:13-14). While it was not the sole source of obsidian in the Great Basin and Mojave (Sutton 1996; Kelly 1997:18-20; Hildebrandt and McGuire 2002), the Coso Volcanic Fields were used to produce more more than any other source.

The booming obsidian biface industry with immense volumes of surplus production, in conjunction with the proliferation of parietal art, has been interpreted to indicate reflections of changing ideology and social relationships. Whitley (1994) proposes that rock art was produced as a part of shamanic rituals, aimed at restructuring social (specifically gender) power relations (c.f. Whitley 2013b). Garfinkel (2006) alternatively proposes that the Coso petroglyph panels represent illustrations of public religious ceremonies, supporting this claim with ethnographic evidence of seasonal communal dances. The rising population, targeted obsidian quarry outcrops, flourishing long-distance exchange, and public works of stylistically standardized art all are consistent with emergent social complexity.

Coso's ascendancy to become a predominate regional obsidian source and ideological influence accelerated dramatically, immediately following supposed disruption of the shell trade network which spanned from the southern California coast through the central Mojave Desert, presumably at the close of the Gypsum Period (4,000 - 1,500 BP). Gilreath and Hildebrandt (2008:18) portray the Newberry Coso as engaged in "escalating inter-group competition" with nearby foragers. The quote, however, is perhaps more appropriately applied to Coso's dramatic impacts on Far West interregional economy. For a different perspective of shell bead trade during the Newberry/Gypsum Period in the immediate vicinity, see Alice Hunt's comments on Death Valley's Basketmaker connections[7].

7: The discrepancy may in part because of the relatively low resolution in obsidian hydration dating, but almost certainly is exacerbated by ignorance of Death Valley's role in inter-regional cultural processes during the era.

At the very foot of the Coso Range, Little Lake's social processes are largely presumed to have proceeded in lock-step with Coso. During the Newberry Period, INY-182 on Little Lake's north shore gradually fell out of use, with final deposits dated to around 1,500 BP (Gold 2005:204). During this same time, CA-INY-3826 – a large and long-used village site – emerged on Little Lakes western shore. Occupied into historic times, INY-3826 derives its common name *Pagunda* from indigenous placenames *pawo'nda* or *paa-vonda* (Van Tilburg et al. 2012:29-30). Enormous quantities of lithic reduction debris cover the landscape, virtually exclusively Coso obsidian; this debris strongly indicates overproduction, with production far outstripping local necessity. Like the Coso Range, Little Lake's activity (and population by proxy) peaked late in the Newberry Period to early Haiwee Period, then precipitously declined (Gold 2005:206; Van Tilburg et al. 2012:29). CA-INY-3826 was never entirely abandoned – during ethnographic contact, Steward (1938a:92) recorded inhabitants were Coso (Panamint) Shoshone, Southern (Owens Valley) Paiute, and Desert Kawaiisu living at *Pagunda* proper. As a side note, this evidence suggests that – following conventional practice – *Pagunda* ought to be designated INY-3826/H (indicating a historic period component), and not to recognize continued habitation is either a failure to recognize the ethnographic record, or bias for Euro-American materials.

Death Valley: Basketmaker connections?

Research and interpretations by Death Valley's most prolific and systematic archaeologist, Alice Hunt, remain influential in the national park's cultural resources program. Hunt (1960) notes substantial continuity throughout Death Valley II (4,500 to 2,000 BP) and III (2,000 to 1,000 BP) occupations, which together span the Newberry. During this range, Hunt reports continuity in burial, and concludes Death Valley III gradually developed out of II, which a shift towards more seed-and-nut processing and storage (especially mesquite). Using her unique perspective on spatial patterns across the 3.4 million acres of parkland and its relationship with the broader region, Hunt concluded that there were strong ties between indigenous Death Valley II and III populations, and neighboring Basketmaker and ancestral Puebloans to the east. One such exemplary line of evidence is a cache containing miniature unfired clay effigies of *wosa* (conical carrying baskets) and figurines – exemplified by Wallace's (1965) Mesquite Dunes cache – strongly resembling those found further east in Basketmaker III/Pueblo II and Patayan contexts. Specifically, Lost City, Nevada features a number of similarities to Death Valley III sites like Tule Spring – unfired clay figurines, comparable arrow points, limpet and *olivella* shell beads (note: these would be imported, likely from trade networks reaching Chumash ancestors along the Channel Coast, or Takic speaking Tongva from ca. 3,500 BP onward), pendants/slate charmstones, conical pottery pipes, intaglio and rock mound geoglyphs, and stacked stone cairns (Hunt 1960:112-113). Hunt notes that while these share remarkable similarities with Yuman peoples of the Mojave Desert, these material expressions of visual culture were retained by Shoshone as far north and east as Wyoming and Montana into ethnohistoric times. Ideological connections are likely expressed in burial practices, as at least one particular Death Valley III rock mound interment of a child and an adult lain in the flexed position with long-bladed, corner-notched arrow points is virtually identical to an 850-800 BP burial in Lost City's Mesa House (*ibid*).

Hunt's detailed account of this rather rich symbolism and visual culture starkly contrasts with accounts by ethnographers and archaeologists working outside the park, who have historically described – and continue to portray – Death Valley archaeology and Panamint (Timbisha) Shoshone as impoverished of strongly symbolic visual culture (e.g. Grant et al. 1968). Additionally, connections to Basketmaker and Publoan society go largely ignored – likely at least in part due to environmental conditions discouraging telltale maize-squash-beans agriculture, giving natural preference to local cereals and nuts. Contrary to this persistent primitivization, material evidence indicates Death Valley was an important cultural nexus during and after the Newberry/Gypsum Periods – playing an integral role in shell bead trade from the California Coast to the Colorado Plateau interior, as well as providing a conduit along which the bow-and-arrow entered California from the east[8].

8: Although very important, this is typically left out of models claiming the bow-and-arrow triggered the Coso Collapse.

Late Holocene

Punctuated but dramatic changes characterize the Late Holocene, termed the Rose Spring in the Mojave between 1500 and 1000 BP (Sutton 1996), and somewhat later the Haiwee Period in the Great Basin (Kelly 1997). It was during this time period that most ethnographers and archaeologists believe that Numic and Takic speaking peoples spread widely throughout the Mojave and *central* Great Basin, possibly displacing or merging with earlier populations. Substantial reduction in projectile point sizes indicates bow-and-arrow technology replaces atl-atl darts. Pottery production, largely not pursued previously in the Great Basin, begins to occur on a limited scale. Regional exchange reorganized substantially as well.

Diagnostic artifacts of the period, unsurprisingly, are primarily projectile points. Late dart-type Elko points co-occurred with inferred arrowhead Rosegate points between 1,300 and 600 BP, based on ^{14}C dates obtained from associated samples (Kelly 1997:17). Date reporting and characteristic features of these points, however, are a matter of debate, and although these data may be used for indirect petroglyph dating, doing so is still mostly beyond the scope of this study. A shift in projectile technology believed to coincide with the precipitous decline in the geographic distribution and sum volume of Coso obsidian bifacial artifacts reported (Gilreath and Hildebrandt 1997, 2008; Sutton 1996; Hildebrandt and McGuire 2002) may in fact have occurred centuries prior and far less dramatically (Sutton et al. 2007; Bettinger 2015).

Great Basin: Haiwee Period (1,350 to 650 BP)

Confusion exists in the archaeological literature over the presence of Numa and Numic ancestors (Liwosz 2017:178). Specifically, the spread of Numa into the eastern reaches of the Basin has repeatedly been used to deny their presence in Basin/Mojave convergence. Contrary to these positions, the area of the convergence spanning from Owens Valley through Death Valley appears to be the Numic heartland, and evidence of population continuity between Numic and Pre-Numic peoples abounds (e.g. Hunt 1960; Reynolds 1996; Brosman 2012:73). The persistence of Numa and their development from Proto-Numic ancestors in the heartland does not negate later expansion, nor should it be construed as a means to "flatten the past." In fact, Proto-Numa likely literally shared landscapes of the Mojave Desert with several other ethno-linguistic groups, including Encinitas, Hakataya, and Puebloans (Sutton et al. 2007; Sutton 2017). Regardless of the matter of continuity, however, regional exchange reorganized substantially, and social interactions reorganized as well.

Obsidian and shell production dramatically restructured, and it is likely each of these commodities moved through different exchange mechanisms (Hughes 1994; Sutton 1996; Kelly 1997: 19). Around 1,275 BP, lithic resource procurement strategies shifted away from long-distance obsidian to more localized utilization of cryptocrystalline silicates and local obsidian when available. Shell bead trade decreased to its lowest levels during and/or immediately following the dissolution of the obsidian network (see Coso Collapse below). From 1,250 to 250 BP, shell trade recovered, but never to the early Newberry Period levels (Kelly 1997).

However gradual (see discussion above under Late Holocene), or abrupt, the shift to bow-and-arrow technology also changed hunting practices. The bow-and-arrow entered California from the east, spreading rapidly west and north, with some of the earliest dates around Death Valley and neighboring portions of the northeast Mojave (Hunt 1960; Giambastiani 2005; Sutton et al. 2007; Sutton 2017) Atl-atl techniques are believed to have employed large hunting parties in communal drives (e.g. Hockett et al. 2012). Bow and arrow, techniques, by contrast, utilized comparably smaller landscape features such as hunting blinds. The relatively more recent model for the correlation of hunting practices and landscape features and their adorning petroglyphs is somewhat discordant with earlier views. The long-standing assertion has been that hunting blinds and game trails closely correlated with rock art locales (e.g. Heizer and Baumhoff 1962; Grant et al. 1976; Bettinger and Baumhoff 1982). Those same researchers credit Pre-Numic "Archaic" (Little Lake/Pinto Period, and Newberry/Gypsum Period) hunters with rock art. Those who ascribe to this model assert that during Haiwee Period, subsistence scheduling underwent wholesale change, with emphasis shifting away from big game (implicitly decommissioning the rock art locales associated with blinds and game jumps), and towards small game and seed and nut processing (c.f. Sutton et al. 2007, re: bow-and-arrow and lagomorphs). More recent studies refute these rock art associations, however. Brosman (2012:70) demonstrated by applying GIS in Piute Valley that “rock art sites do not denote particularly close resources, but when displayed on a map, show routes more than resources.” Rather than serving as the hunter’s hideout, rock art clusters in foothills “identify upland resources that would not be visible from the valley floor” (*ibid*.).

From 2,000 BP onward - and increasingly supported after 1,000 BP - rock shelter caches increasingly included hunting nets for *lagomorphs* (e.g. Meighan et al. 1953; Sutton et al. 2007), reflecting the ethnohistoric pattern. Given recent data for the western Basin (at least), it is likely the increased evidence is an outcome of preservation of these perishable objects. Based on similarities to the ethnographic evidence, gender scheduling of subsistence activities can be inferred. Solo bow-and-arrow hunting was considered generally (not exclusively) a masculine activity (Whitley 1994; Gilreath and Hildebrandt 2008; Garfinkel and Austin 2011). Net hunting, and processing pinyon nuts and mesquite beans, were generalized as women’s activities (Steward 1941). Many reports (e.g. Driver 1937; Steward 1941) exist of two-spirits (“berdaches” is the original deprecated term) transgressing gender boundaries to varying degrees; each anecdote thereof appears to reflect a broader pattern of non-binary gender expression having been individually negotiated within immediate communities on a case-by-case basis. The apparent permeability of gender boundaries raises the question about the gendering of large scale big game hunting drives. Similar to small game drives, antelope drives were communal activities for which ample evidence exists throughout the western and central Great

Basin (Hockett et al. 2012). Large stone corrals, usually topped with perishable branch and/or brush fencing (and sometimes but infrequently embellished with petroglyphs) hosted these communal events. Given small game drive participation could involve persons of any gender, the emphasis on the social nature of the event, and the divergence of this strategy from the solo hunter, it is prudent to consider that these too may have included participation from able bodied men, women, and those otherwise identified.

Gendered divisions did exist, however rigid or flexible, and connections to parietal images is of interest for both the Haiwee Period and the later Marana Period (see discussion below). Given the prevalence of hunting imagery in petroglyphs, and the many (however erroneous claims) of rock art's close association with hunting features, it is no surprise that rock images have been gendered as a masculine pursuit. In addition to hunting parties, connections with boys' coming-of-age rites (e.g. Dubois 1908:92; Kelly 1938; Steward 1941) have been argued (Whitley 1994:264-265; Liwosz 2017:201; fuller discussion presented in Chapter 7). At the same time, Gilreath and Hildebrandt's (2008) findings that the presumed later "Numic scratched" style corresponded with pinyon processing foreshadowed LaPierre and Garfinkel's (2013) argument that Numic women produced scratched style abstract images. While the gendering of production techniques and iconographic themes is a productive avenue of discussion covered in later chapters in more detail, it is also unfortunately vulnerable to tautological arguments, particularly when projecting cases deeper into the past.

Carson and Humboldt Sinks

Ethnographic patterns emerged somewhat earlier in the Carson City-Reno area than they did in the central and northern Great Basin. Presumably, direct ancestors of Washoe produced the cultural deposits of this area at least since the Newberry Period. Ethnographic patterns, however, emerged primarily during the Haiwee Period. Around 1,500 BP, stone foundation houses and stone lined caches appear at Fort Rock Basin (Kelly 1997:17, 29). This coincided with a subsistence shift to upland root harvesting. At the Vista Site along the Truckee River, shallow pit-houses continued to be used between 1,400 and 800 BP. Haiwee Period Washoe adopted the well documented stone foundation and perishable walled above ground buildings along the Truckee river slightly after the subsistence strategy. These constructions were frequently utilized primarily during the winter season. Stillwater Marsh's population declined after the Haiwee terminated, but elsewhere in the Lahontan Trough populations remained consistent until contact.

Cultural Fluorescence

Gilreath and Hildebrandt (2008:18) characterize the Haiwee Period as a time of "cultural fluorescence" for the Great Basin Anasazi, Coso, and Fremont Cultures. During a 700-year period beginning 1350 BP, populations boomed in the areas of the Bonneville Basin, China Lake, Colorado Plateau, and Virgin and Muddy Rivers. At the same time, cultural expressions diversified, including in architecture and mobility patterns. The Anasazi (current preferred term “Ancestral Puebloan”) timeline diverged from the Basin and Mojave neighbors, as Basketmaker III gave way to Pueblo I (Cordell 1984), as evidenced in dramatic changes to settlement patterns, architecture, widespread pottery production, ideological shifts, and social restructuring. Localized differences in material culture and offset timing in peak population densities (as well as subsequent declines) more resemble Marcus’ (1998) Mesoamerican “Dynamic Model” sawtooth curves than synchronized processes of rise and decline. Offsets like that of the Dynamic Model can be seen in Basin, as well – Coso, in fact, peaked right around the Newberry/Haiwee interface (see graphic in Gilreath and Hildebrandt 2008:13), and already declined dramatically centuries prior to the collapse of the Chaco cultural phenomenon at the Pueblo II/III boundary.[9]

Lost City

Among those Great Basin cultures that thrived during the Haiwee Period, the Basin settlement of Lost City, along the Colorado River outside present day Las Vegas, stands out. This pueblo reached peak population from about 1,000 to 850 BP (Kelly 1997:10). Uncharacteristically, it retained its influence from the Colorado Plateau into Pueblo II. As previously discussed (see Death Valley Basketmaker connections), Lost City also seems to have maintained contact with Death Valley Proto-Numa, roughly 160 km (100 mi) to the west (Hunt 1960:111-113). Lost City

9: Strong evidence to suggests the traditional Great Basin timeline is deeply flawed.

distinguished itself from central and western Basin sites by forming a large presumably mostly sedentary community of several dozen households (Kelly 1997:10, 23). This differed from the rest of contemporaneous Basin Pueblo II settlements, in that the latter typically remained in small collectives of only a few households. Architecture featured formalized courtyard enclosures, and integrated habitation rooms into storage rows. Lost City appears to have declined after 850BP, and been completely abandoned by 775 BP (*ibid*).

Fremont

Between 1,600 and 700 BP, Fremont expanded their influence from marshes around the Great Salt Lake into the Uinta Mountains and Colorado River to the east, Bald Mountain to the west, and Parowan Gap to the South (Kelly 1997:2, 20-22). Similar to common Basketmaker ancestors with emerging Puebloans, Fremont employed dry farming horticulture, and processed harvests with metates. Fremont supplemented horticulture with a "mosaic" of other strategies, with each community adopting idiosyncratic diets (Madsen 1982; Sharp 1992). Interestingly, Fremont mixed sedentary agricultural and semi-mobile hunter-gatherer strategies that provide examples which could complicate understandings of Numic subsistence patterns[10,11].

10: Not just Numic subsistence, but because it is often *the* defining marker of late Haiwee and Marana Period material culture, the culture-history of the region could be in question. Irrigation systems in Owens Valley and Death Valley, discussed later, are often overlooked, or dismissed outright – despite ample evidence of their use.
11: Outside the scope of the present study, another subsistence marker complicating the current accepted picture is the spread of pinyon out of the Inyo-White Range ca. 6,000 BP, which happens to coincide with the spread of incised slate in the same geographic and ecological contexts – 4,650 to 5,000 years before the Numic Spread; hence, Kelly's (1997) qualifying that the Numa moved into the Great Basin at least once in the last 12,000 years.

Fremont architecture diverged from Pueblo, as Fremont retained pithouses, as well as the separation between in-ground residences and above ground storage units.

Visual culture most distinguished Fremont from neighboring Uto-Aztecans. Haiwee Period Fremont produced a variety of ceramics in addition to their distinctive basketry tradition. Ceramics included utilitarian corrugated and undecorated gray wares, and white slipped ceramics with stylized geometric black painted designs (Kelly 1997:21). Technologically, potters commonly used volcanic ash for temper, and fired in a reducing atmosphere (preserving the black pigments). Both engraved petroglyphs and red painted pictographs featured telltale Fremont stylized triangular bodied anthropomorphs, often with headdresses; these do not appear outside Fremont territories (Matheny et al. 1997; Heizer and Baumhoff 1962:125, 144, 193-194). Fremont figurines also expressed the parietal anthropomorphic features.

Coso Collapse

China Lake region populations continued Newberry Period lifeways into the first century of the Haiwee Period. Obsidian production using the Coso Volcanic Fields source (as previously discussed), spiked dramatically. The sheer volume of debitage from this time in comparison to the small estimated population unambiguously indicates surplus production (Hildebrandt and McGuire 2002:240-242). Obsidian quarrying focused progressively on a smaller number of outcrops within the major deposits (Garfinkel et al. 2004:90), which may indicate somewhat centralized socio-economic coordination (96). Abrupt peaks in obsidian production corresponded with spikes in rock art production according to Gilreath and Hildebrandt (1997; 2008), who go further to suggest motifs of the period were predominantly bighorn sheep and patterned body anthropomorphs (PBAs).

Disruptions to life in the Cosos occurred around 1,250 BP (Sutton 1996:239), although reports of the timing vary to as late as 1,000 BP (Bettinger and Baumhoff 2002), or even 650 BP (Gilreath and Hildebrandt 1997). Others indicate drought drought cycles linked with the Medieval Climatic Anomaly (MCA) between 600 BP and 1,150 BP were more responsible for a Coso decline no later than 800 BP (Antevs 1955; Whitley 1994; Sutton 1996:239, 242; Sutton et al. 2007). Other explanations (e.g. Gilreath and Hildebrandt 2008) predict that overexploitation of *Ovis canadensis* as a result of competitive male prestige hunting was the primary cause. While bighorn sheep are somewhat rare in the region now, their prehistoric population levels remain vague. Given the ambiguous faunal profiles[12] reported (see Newberry Period above), and exploitation of other anatomically similar game animals like pronghorn antelope[13], the conclusion that a bighorn population collapse *alone* caused the sudden cessation of Coso lifeways is a dubious hypothesis (Whitley 1994; Keyser and Whitley 2006). Furthermore, the presumed big game decline is inconsistent with the overall count of Haiwee and Marana Period projectile point finds (Reynolds 1996:156) when accounting for other toolstone sources. Expanding the scope of

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12: namely, that the presumed dominance of “bighorn” is often based on assemblages reporting a majority of large game not identifiable beyond *artiodactyl*, which includes other known game animals, specifically pronghorn and deer.
13: *wantsi* in *Tümpisa* (Dayley 1989:378)

events, the cessation of Coso obsidian network and proliferation of the Kumeyaay-Patayan-Hohokam shell trade network both ca. 1,250 – 1,000 BP together linked major interregional economic and political shifts (Sutton 1996:240; Garfinkel et al. 2004:96). Including obsidian rim hydration data from a cache of 26 obsidian bifaces tightly dated to between 800 and 650 BP (Garfinkel et al. 2004), the presumed Haiwee Period hiatus at Little Lake would become one of the most *active* periods of obsidian production. This is not to say, however, that the converging factors of drought and introduction of the bow-and-arrow did not decrease *Ovis canadensis* populations, nor that its loss would lack social repercussions. Instead, the scope of evidence used to build hunting-magic, hunting-cult, and costly-signaling models at large has yet to account for the roles of neighbors (e.g. Death Valley, Panamint Valley, and Saline Valley), or visual culture beyond wall-art (c.f. Van Tilburg et al. 2012; LaPierre and Garfinkel 2013 on basketry).

Mojave Desert Rose Spring (1,500 to 1,000 BP)

Substantial subsistence changes have been inferred by an apparent dramatic increase in milling features in conjunction with shifting hunting practices. Relatively small Rose Spring and Eastgate projectile points appear in the Mojave around 1,500 BP (Sutton 1996:235). These types share morphology with the contemporaneous Death Valley area Amargosa Period projectile points (Wallace 1962), and in the Great Basin Berkeley and Antelope Valley typologies are merged into the singular Rosegate category (Bettinger and Erkens 1999). Data from others, however, does not agree with these apparent dramatic shifts. Both Reynolds (1996:iv) and Brosman (2012:73) emphasize their data demonstrates that the seasonal foraging pattern of pinyon exploitation developed slowly over a long period, and does not appear to have undergone dramatic shifts during the region's occupation. Like this project, Reynolds' and Brosman's studies sampled archaeological sites within the hypothetical Numic heartland in the Basin/Mojave convergence.

Continued usage of both wikiup and pit-house style architecture evidences continuity with the preceding Gypsum Period. Particularly pit-house style structures imply that there was an ongoing limnosedentary pattern of reuse of seasonal camps. Ceramic production in the Providence Mountains (south of present day Las Vegas) further evidences limnosedentism over higher mobility. The Providence timeline, however, diverged from the Amargosa (Death Valley) timeline during the Rose Spring Period (Wallace 1977). The greater Providence area exhibited evidence of Basketmaker III attributes beginning around 1,300 BP in the form of maize cultivation and ceramics. These Basketmaker III Phase connections were strongest in southern Nevada (Cordell 1984), and eastern Mojave Desert Patayan (Sutton 1996). Patayan/Hakataya developed in place (Sutton 1996:238), influenced by sustained contact with with neighboring Hohokam, and potentially Mogollon.

Compelling patterns of regional interconnectivity emerged during the Rose Spring Period. A daisy chain of trade networks may be reconstructed linking Gila River Hohokam with southern California coast Kumeyaay through Patayan (Kelly 1997).

Shell goods, pottery, and exotics like turquoise moved into, through, and beyond the central Mojave (Sutton 1996:237, 239, 242; Kelly 1997:19, 22-23; Hildebrandt and McGuire 2002:247). Decreases in large game hunting and increased agricultural cultivation reflected a movement of Virgin River Basketmaker influence moving westward deeper into the Mojave Desert (Sutton 1996:237). Slab-lined storage cysts were likely facilities used to contain agricultural surplus. The Muddy River/Virgin River pattern of a row of multiple such storage cysts enclosing a communal exterior, accompanied by a single pit-house, became prevalent in the northeast Mojave.

Between 1,250 BP and 1,000 BP, the northeast Mojave Desert paralleled the Basketmaker III traits more so than the Pueblo I cultural expressions further east. No kivas have yet been identified among Patayan settlements, indicating socio-political and religious distinctness from the Four Corners area. Yuman-speaking Mohave people in the lower Colorado River drainage around developed out of Hakataya/Patayan ancestors (Sutton 1996:238; 2017).[14] During this time, Yuman peoples are thought to have mediated a peak in inter-group conflict through a ritualized landscape linked with the *keruk* – a mourning ceremony, and Yuman correlate to the Numic Round Dance – resulting in geoglyphs like the Blythe Intaglios (Altschul and Ezzo 1995).

14: disjunctures in the material record some interpret as the Mohave replacing the Patayan may likely instead be signs of a well-known Numic Chemehuevi incursion (Kroeber 1963; Sutton 1996; 2017).

Owens and Death Valleys – Amargosa II

Rose Spring and Basketmaker II approximately correspond with the Amargosa timeline's Amargosa II/Saratoga Springs Period (Hunt 1960; Wallace 1977). In Death Valley both terms are used synonymously with Death Valley III (previously discussed), all corresponding to dates between 2,000 and 1,000 BP. Anasazi/Ancestral Puebloan influence manifested in incised stone objects, rock shelter inhumations, petroglyph motifs, and highly stylized unfired figurines (e.g. Wallace 1965), although the timing has been questioned (Meighan 1953). Despite the coincidental timing pottery appearing contemporaneously in the Amargosa and Puebloan timelines, the lack of technical similarities and divergent styles call the idea of true Puebloan presence into question. More likely, cultural ties through economic (and likely ritualized) systems of exchange connected these peoples, who shared common Uto-Aztecan roots.

Unlike the Virgin and Muddy Rivers to the east, and the bordering northeast quadrant of the Mojave Desert, agriculture was never adopted (until sustained Euro-American contact) in the Owens-Death Valley span. Instead, ambiguous and often overlooked evidence indicates human-constructed ditches irrigated horticultural fields of managed native plants after ca. 1,350 BP (Reynolds 1996:5, 39, 42, 41-50, 155; Stoffle et al. 2011:7, 32, 46-47; Giambastiani et al. 2005; Huffman and Early 2017:3). This with correlates the patterns Bettinger (1989; 2015:240) notes of intensive seed processing operating out of low-mobility "base camps" beginning around 1,350 to 1,000 BP. The base camp strategy is characteristic of Numic speaking Kawaiisu, Southern (Owens Valley and Amargosa) Paiute, Western (Panamint/Timbisha) Shoshone, Tübatulabal, and Ute (Garfinkel et al. 2004:93; Stoffle et al. 2011; Bettinger 2015). With irrigation structured along communal rabbit drive corridors, Bettinger (2015:240) finds good reason to suspect hydrological engineering was undertaken by the same sort of temporary leadership as game drives. Crops included wild seeds and cereals, as well as corn, potatoes, squash, watermelon, and beans (Coville 1892:352; Stoffle et al. 2011:47). General ignorance of indigenous farming practices by archaeologists may well be a result of high mortality preceding the ethnographic era, as fields of the recently deceased were left fallow for a year or more (Steward 1938a; Stoffle et al. 2011:47).

Little Lake

Habitation patterns at Little Lake share some commonality with those of Death Valley. Just beyond the north end of the lake, near the base of the falls of the the now dessicated Owens River, is the Stahl Site. The site itself is comprised of the remains of habitation structures, and a cave in a volcanic bedrock outcrop. Harrington (1957:76-77) reported that excavations in and around the Stahl Site Cave (INY-205) revealed unambiguous Basketmaker II and III deposits below later Shoshone (see ethnohistoric period for the latter). It is curious that the same pattern in Death Valley has been used to interpret continuity, while at Little Lake (also in tradition Panamint Shoshone territory, overlapping with closely related Kawaiisu and Owens Valley Paiute) it is used to argue the exact opposite. As noted previously, the village of

Pagunda (INY-3826) occupied Little Lake's shores peaking in the Newberry Period, and crashing at the outset of the Haiwee, yet it was never fully abandoned (Gold 2005:207-209; Van Tilburg et al. 2012:29). Despite this abrupt decline, occupation continued unabated until the twentieth century, when Steward (1938a) recorded Kawaiisu, Shoshone, and Paiute living side-by-side at *Pagunda*.

Late Precontact and Ethnohistoric

The central story to the Late Precontact times in the Far West deserts is the ethnic spread of Numic, Takic, and Yuman ethnolinguistic groups. Timing for these events is variable and controversial, with evidence coming from hypothetical mechanisms, as well as materials. Debate continues over where and when Numic cultural traits represent innovation, acculturation, population replacement, or some other process in between. By the time of sustained Euro-American contact, much of the Mojave, as well as the Sonora west of the Colorado River (Colorado Desert, not to be confused with the Plateau or State of the same name) was occupied by Yuman and Takic speakers, namely Mohave and Serrano tribes. Navigating the matter of ethnicity is tricky as individual and group identity may cross-cut socio-political, linguistic, genetic, and material communities (Kelly 1997:34). For example, both Numic and non-Numic knappers and fletchers flaked and hafted Desert Side Notched points diagnostic of Late Precontact (see below).

Figure2. 5: *Example Desert Side Notched projectile points of chalcedony (left) and obsidian (right), from other previous archaeological projects in the Great Basin, and diagnostic of Late Precontact bow-and-arrow technology [photo credit: author]*

Great Basin: Marana Period (650 BP - present)

During late Precontact times, the Great Basin was inhabited primarily by Uto-Aztecan peoples of varying ethnic identity (Steward 1929, 1941, 1943; Driver 1937; Kelly 1938; Whitley 1992b:96; Liwosz 2017). The Northern Uto-Aztecan language family tree, as spoken at the time of contact, consists of Hopi, and Numic and Takic languages (Hill 1992:118).[15] Numic languages further subdivide into Kawaiisu Paiute, Shoshone, and Southern Paiute/Ute, with Tϋbatulabal often included, but influenced heavily by neighbors like Yokuts. Paiute originates from the Owens Valley/Mono language,[16] while Shoshone branched off the Panamint language.[17] While also influenced by Panamint, and in sustained contact with Mono, Kawaiisu is itself a candidate parent dialect for Southern Paiute and Ute. As Shoshone spread into

15: The Tϋbatulabal language is included in Northern Uto-Aztecan, and debatably as Numic.
16: Whether Owens Valley Paiute and Mono are the same, or distinct dialects ,is also debated.
17: Called *Tϋmpisa* as spoken in the Death Valley area and recorded by Dayley (1989)

the Rockies and onto the western Great Plains, these far northeast branches adopted linguistic and cultural elements of Comanche whom they contacted. Yuman languages are chiefly represented by Mohave (Mojave people). Neighbors Washoe in the Reno Area, and Zuni in what is now New Mexico, both appear to be holdouts of linguistically and genetically more distinct (yet related) Uto-Aztecan neighbors. Given periodic, if not sustained contact with Yuman Mohave, Kumeyaay is similarly apart but influenced by it (*ibid.*).

Numic Expansion

Both population movements, and sweeping social movements, are known for the Marana Period and Ethnohistoric times. With the topic of migration typically carrying more academic salience (in Great Basin archaeological circles), influence from neighbors might confuse linguistic evidence. Nonetheless, evidence overwhelmingly supports the nonetheless highly controversial matter that in that prior to contact, Numic populations expanded across an immense range. Known also as the Numic Spread, this cultural event began at a debated time as early as 4,000 BP, typically 1,350 to 950 BP, and some assert as late as 650 BP[18] lasted for a debatable period at an unresolved speed, and originated from a heartland for which scholars heave yet to reach a unanimous consensus. Rock art factors heavily into the reasoning, as the faint and shallow marks of Great Basin typology's "Numic

18: Hildebrandt and McGuire (2002) propose 1,000–650 BP, based on subsistence. On the opposite extreme, Grayson (1993) proposed that Numic expansion coincided with people repopulating the Great Basin circa 5,500 to 4,000 BP, after the Mid-Holocene Long Drought.

scratched" style are believed newest, replacing "Coso representational" (e.g. Gold 2005; Gilreath and Hildebrandt 2008). Consequently, any non-scratched or non-painted style is often presumed the product of a "Pre-Numic" population for which there is no ethnographic period correlate. The petroglyph-population movement entanglement tugs both ways on scholars, as the Numic Spread's initiation, and duration, informs our most fundamental assumptions about the timing, distribution, affiliation, and interpretation of much of the body of desert far west parietal images (Reynolds 1996:36; Kelly 1997:24-25,27-28).

Most scholars would agree on some variation of a Numic Heartland (or homeland) model, in which a small area saw largely *in-situ* development, until,due to debated pressures, a sudden outflux surged throughout the rest of the Basin. Mapping language distributions, linguists for decades have suggested Numa moved out from the Owens and Death Valley vicinity (Lamb 1958; Miller 1983). Based on recognizably Numic material culture (for example, basketry, clay figurines, and burial practices at Chatham 1 in the Coso Range/China Lake area), some archaeologists interpret groups already living in the heartland ca. 1,500 BP spread north and east during the Haiwee Period/Rose Spring Complex, beginning between 1,350 and 1,150 BP (Gold 2005; Garfinkel 2007:110-111).[19] Along the Virgin River, Southern Paiute/Ute replaced earlier Puebloan inhabitants by 1,150 BP, suggesting that, by this point, the spread had already begun (Sutton 2017). Material culture, genetic

19: Gilreath (2000:30) asserts Numic affiliation at Chatham 1 begins at 650 BP.

evidence, and linguistics thus all distinguish Numa from Newberry Period inhabitants of what are now Oregon, Utah, and much of Nevada, although these data (and interpretations from them) are not in agreement.

Interpretations of genetic markers supports the Numic did spread in the northern Great Basin, with evidence from Pyramid Lake tested against sampled populations. Resaerchers report on the five most common mitochondrial haplogroups among Native Americans: A, B, C, D, and X groups (e.g. Kaestle and Smith 2001, who control for the age of sampled human remains). In brief summary, mtDNA haplogroup frequencies (see Table 2.3 below) between modern Numic populations differed from ancient populations at Stillwater Marsh and and Pyramid Lake. With ancient occupant's haplogroup A absent in modern Numa, and Numic haplogroup C absent in the ancient Western Nevada populations (except for one temporal outlier at Stillwater Marsh), one scenario infers a move out of Owens Valley area northward (Gold 2005:189-192; Garfinkel 2007:110-112).

Table 2.3: *Select Haplogroup distributions reported by Kaestle and Smith 2001; As haplogroup X is not present in either Numic or ancient NV populations, it is omitted.*

	Sample	**A**	**B**	**C**	**D**
Modern populations (mixed geographic and linguistic groups)					
Great Basin	n=127	0%	44%	17%	39%
N. Uto-Aztecan	n=116	0%	42%	15%	43%
N. Hokan	n=6	0%	33%	17%	33%
California	n=37	19%	35%	8%	35%
Washoe	n=28	0%	53%	36%	11%
Cal. Penutian	n=16	12%	44%	0%	44%
Ancient populations					
Stillwater Marsh	n=21	4.8%	38.1%	0%	57.1%
Pyramid Lake	n=19	11.1%	33.3%	0%	55.6%
Fremont	n=30	0%	83%	10%	7%

As seen above, Groups B and D are fairly similar among ancient and modern populations in California and Great Basin, except Washoe and ancient Fremont (the latter added here as a point of comparison). Ancient populations in Stillwater Marsh, and Pyramid Lake, did differ slightly from modern Numa, represented in both the Great Basin and Northern Uto-Aztecan groups, with Stillwater Marsh somewhat transitional between the two. The major points of distinction, haplogroups A and C, occur in lower frequencies (with only one group A from Stillwater Marsh).

Chord-distance analysis contextualizes the scales of these distinctions. Kaestle and Smith's (2001) combined set from Stillwater Marsh and Pyramid Lake (ancient Western Nevada) has a high affinity with California Penutian (0.011) and modern California (0.088), some for Great Basin (0.178), and low for Southwest (0.605). For comparison, modern Washoe (historically from the Tahoe and Lahontan Trough area) show similarly high affinity for ancient Fremont (0.079) and Northern Uto-Aztecan (0.104), but a greater distance from the combined ancient Western Nevada population (0.420). Surprisingly, a much stronger connection is found between Northern Hokan and Northern Uto-Aztecan (.007) than between Northern and Central Coast Hokan[20] (0.370).[21] Regionally, ancient Western Nevada is twice as close to the modern Great Basin as it is with the Washoe-Fremont group, and 3.5 times closer to California and modern Great Basin than it is with the Southwest cluster (*ibid*). None of the mtDNA goups reported in the study were either modern or ancient peoples of the Coso Range, Panamint Valley, Death Valley, Saline Valley, or Charleston Peak leaving some ambiguity in the heartland.[22]

Linguistically, Numic languages split from each other a *minimally* 1,000 years before present (Lamb 1958; Sutton 1996:244; Kelly 1997:24-26), and from a parent Northern Uto-Aztecan (NUA) language shared with the Takic family between 3,000 and 4,000 years ago (Sutton et al. 2007; Sutton 2017). Tϋbatulabal territory in the southern Sierra Nevada (north of the Tehachapi Mountains, and west of Little Lake) was likely established in the early Gypsum Complex,, with archaeological evidence indicating historic ethnolinguistic boundaries were established between 2,400 and

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20: including Chumash
21: Clusters of similarity are found between ancient Western Nevada with modern California Penutian, Washoe with Fremont, Northern Hokan with Northern Uto-Aztecan and modern Great Basin, and a Southwest cluster of Central Uto-Aztecan with Yuman, Zuni, and Baja.
22: One interpretation takes the proverbial middle road, dually proposing Numic groups wound up “replacing or absorbing pre-Numa" (e.g. Garfinkel 2007:147).

3,000 BP, remaining stable up to the twentieth century (Garfinkel 2005; Gold 2007). For Ash Meadows, as well as Amargosa, Death, and Pahrump Valleys, Sutton's (2017:28) suggestion that Timbisha Shoshone and Southern Paiute/Ute replaced Virgin Anasazi and/or Yuman groups is unnecessary: abundant archaeological (e.g. Hunt 1960; Wallace 1965, 1977) and ethnographic (Coville 1892; Steward 1938a; 1941; Stoffle et al. 2011) evidence indicates that early Timbisha Shoshone and Pahrump Paiute were transitional between fellow Numa of the Western Mojave (e.g. Kawaiisu, Mono), and Puebloan related peoples to the east (e.g. Lost City).

It was Steward's (1925, 1938, 1941) Depression-era characterization of the Numa as "gastric people" that has led to the archaeological definition of "Numic" population identity being ultimately equated to pinyon-based subsistence. Based on the advent of green cone pinyon harvesting procedures, behaviorist models of subsistence report the late onset of the above pattern (Hildebrandt and McGuire 2002). After studying diachronic shifts in pinyon harvesting camps in the Inyo-White Mountains (between Owens and Saline Valleys), Reynolds however concluded green cone harvesting from semi-permanent villages peaked during the Newberry Phase, between 1,950 and 1,350 BP (Reynolds 1996:156). Such a discrepancy complicates the "seed-eaters replaced hunters" story, but not population movements entirely. The Inyo-White Range seems to be the origin of the variety of pinyon that spread throughout the Basin during the Holocene (Reynolds 1996:29; Kelly 1997:12; Cole et al. 2013:103). This mountain range is also within the proposed Numic heartland, where other seed staples are also found, including mesquite in Death Valley. Additionally, the case for a "mosaic" of mixed agricultural and semi-mobile hunting practices among Fremont (Hughes 1994) indicates the conventional approach to Numic subsistence may take too narrow of a view on what constitutes culturally-diagnostic foodways.[23]

Summarily, the Numic spread *did* happen, and most models suggest this occurred after the Coso Collapse – except for evidence of continuity in the Owens Valley-Death Valley heartland, which would cross through and include Coso Range (Sutton 2017:22-23). Decreasing populations interpreted from economic decline at Little Lake is not seen as starkly in Death Valley, which shows both cultural connections and economic ties with it. Spread of pinyon-juniper not only does not solve the matter, but may raise the question of a previous migration by and offshot of ancestors having previously occurred.

Though not resolved, at least *some* of the extant rock art must have been created by ancestors of the Numa around today. Finally debate will return in the Chapter 7 discussion, and will not be resolved by a literature review alone in this chapter. The timing of Numic expansion, and related geographic origins, are however critical concerns for substantiating the relevance of theoretical models elaborated upon in Chapter 3, and establishing applicability of the ethnographic record and oral traditions covered in Chapter 4. Inferred temporal depth and geologic extent of ethnographic

23: Bettinger (2015:91-93) discusses Numic subsistence in terms of storage and privitization of a wide variety of botanical resources – including grasses, roots, and other nuts – as opposed to the conventional focus almost solely on pinyon intensification.

groups need not necessarily be a mere Boolean value, as recent models of population movements (e.g. Bettinger 2015; Sutton 2017) indicate dynamic sequences of interactions, influences, and developments among many neighboring ethno-linguistic groups.

CHAPTER 3: THEORETICAL PERSPECTIVES

A number of theoretical perspectives have been proposed for rock art of the Great Basin, Mojave Desert, and for rock art globally. This chapter surveys a history of archaeological thought regarding rock art and visual culture, with an emphasis on region of the southwestern Great Basin and northern Mojave Desert in which my project areas lie. Typically, the last three decades of this discourse has been characterized by a tension between two competing paradigms, although the reality is somewhat more nuanced. By placing these opposing paradigms in conversation with other relevant models, this chapter demonstrates that many of the professed incompatibilities do not necessarily make models mutually exclusive. This is not to argue that certain models cannot be more fitting, rather simply the consideration of one does not preclude evaluating another independently.

Mythograms and Mythography

One of the earliest scholarly inventories of North American rock art - extending from the Great Lakes to the Columbia Plateau, and encompassing the Great Basin among other regions - was commissioned by the United States federal government in the late nineteenth century (Heizer and Baumhoff 1962:5; Grant et al. 1969; Lewis-Williams 2002; Whitley 2011). Project lead Mallery considered two possibilities: first, that the pictographs (and presumably also petroglyphs) composed one or more hieroglyphic writing systems; alternatively, the rock art might illustrate scenes from (or reenactments of) shared legends. Although Mallery's (1886, 1893) findings led him to reject the notion that indigenous North American rock art was any kind of formal writing system (hieroglyphic or otherwise), there was insufficient evidence to reject the mythogram hypothesis. More recent renditions of ways to "read" rock art indicate these images utilized the context of their landforms to operate functionally as libraries, wherein iconography encoded cultural knowledge as mnemonics (Whitley 1982, 1992b, 1994; Carroll et al. 2004:132-133). These recent approaches consider mythography as merely one of many possible inspirations, recognizing "scenes" from oral tradition without any requirement the rest of the narrative be expressed (Whitley 2011)

Little further attention was paid to the notion of rock art as mythograms, especially in western North America, for several decades following. Steward's (1929, 1941) ethnographic research led to him applying his theory of cultural ecology to the Basin's visual culture. Largely as a result of Steward's influence, themes of subsistence and environment came to dominate scholastic discourse on the matter (see hunting magic below). Recently, however, research linking rock art sites with ceremonialism (also below) has revived the mythogram hypothesis - albeit often without direct reference to Mallery.

Annual and seasonal festivities are well documented in the Basin (Schaafsma 1985:261-263), and likely incorporated music and singing as an accompaniment to dances, gambling, and other activities described by Quinlan and Woody (2003:379).

Garfinkel and others (2016:195) clarify that participants would "dramatically act out sacred oral traditions associated with the religious site." The nature of these festivities, and their relationship with rock art, will be explored in more detail in the ceremonialism discussion. The key connection to myth, however, is (as mentioned in previous chapter) that song, poetry, and oration were means of recounting these sacred narratives, with primacy given to song (Hill 1992). Recent research (e.g. Garfinkel et al. 2007, 2016) suggests at least a limited number Basin rock art sites not only served as gathering locations for such ceremonies, but that the songs' verbal imagery and performers' reenactments are the express subject matter of panels at these locations.

(Sympathetic) Hunting Magic, and Sorcery

Quite possibly the longest enduring interpretive framework for petroglyphs is that of sympathetic hunting magic. Sympathetic magic is distinguished from contagious on the following grounds: the former functions by symbolically representing the intended outcome, with the symbolic act projected through supernatural forces (energy, spirits, deities) to affect the material world to a practical ends, usually beneficial to the casting person (Keyser and Whitley 2006:4).[24] This contrasts with contagious magic, which requires some previous interaction between the device and the target, after which they remain ethereally linked; a helpful comparison to

24: One possible ethnographic correlate to these acts might be found among Shoshone of Lida, Nevada, whose ritually deposited arrows are still wedged in crevices on rock targets believed to endow hunting success (Carroll et al. 2004:131-132).

understand how contagious magic functions would be to compare it to the particle physics concept of “quantum entanglement.”[25]

First proposed by Spencer, Gillen, and others (see Conkey 1981:21; Lewis-Williams 2002:46) to explain large fauna depicted in Neolithic European caves of Lascaux (France) and Altamira (Spain), the hunting magic model lent itself well to theories of ecological determinism. The fundamental principle driving the hunting magic model is that the primacy of large game animals in the diets of mobile hunter-gatherers encouraged hunters to depict game prior to the hunt, in an effort to improve success by means of sympathetic magic. Heizer and Baumhoff (1962) introduced sympathetic hunting magic to Great Basin rock art, along with several other propositions. Recognizing the apparent ubiquity of sheep,[26] Heizer and Baumhoff note “hunting scenes” and “kill scenes,” with the latter depicting projectile-impaled sheep, at times upturned. Grant, Baird, and Pringle (1968) picked up on this as their leading interpretation, although the Grant team, too, reserved room for other understandings as well. While few ascribe strictly to this model currently, its influence, especially as adopted by behavioral ecologists, has given rise to the hunting focus driving other models.

In addition to hunting, the Yokuts ethnographically known practice of “sorcery” is also included within sympathetic magic. Simply explained, this form of sympathetic

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25: The parallels between quantum entanglement and sympathetic magic were apparent early on, leading Einstein and colleagues (1935) to famously dismiss the former as “spooky action at a distance.”

26: Although, as I discuss later, that identification is more of a cognitive biase towards that which is familiar and recognizable, and disregards the unfamiliar.

magic might, as in a panel in Rocky Hill, California (Keyser and Whitley 2006:8 figure 2), supplant the sheep being shot in our hunting magic example with a person. These depictions are rare but present, and heartland Numa at once knew of, and discouraged, the practice (c.f. Whitley 2000a).

Prestige/Costly Signaling

Cultural ecology explanations, as applied by Steward and others, utilize datasets and types of reasoning which lend themselves well to adoption by evolutionary biology. Out of these traditions emerge a set of theories about human behavior and subsistence, collectively called human behavioral ecology (HBE). Behavioral ecology assesses the adaptive advantages of behaviors and strategies, and the consequences of maladaptive responses to ecological stresses. Much of the predictive potential is based on models of animal behaviors. The ecology of human adaptation in the broadest sense is implicit, if not inherent, in many mid- to late twentieth century studies (e.g. Grant et al. 1968; Bettinger and Baumhoff 1982), and may be most pronounced in the works of Hildebrandt (Gilreath and Hildebrandt 1997, 2008; Hildebrandt and McGuire 2002; McGuire and Hildebrandt 2005), in which costly signaling is proposed to both explain Coso petroglyphs, and Coso Collapse. Although strictly speaking cultural ecology is a separate body of theories from the later HBE, the aforementioned lead scholars of the later HBE paradigm directly trace their behaviorist paradigm's intellectual lineage to Steward's cultural ecology (McGuire and Hildebrandt 2005:695).

Building on previous ecologically-oriented works (e.g. Heizer and Baumhoff 1962; Bettinger and Baumhoff 1982), the costly signaling hypothesis relies on key conclusions shared with the hunting magic hypothesis, specifically proposing a social motivation for the apparent discrepancy between the inferred big-game hunting intensification and optimal foraging predictions (Gilreath and Hildebrandt 2008:17). The key distinction, however, is that while the hunting magic model treats the value of big game as solely measurable in calories, costly signaling considers that the social currency of successful hunts may well increase the value of the prey. Magical thinking, although not technically required for the costly signaling mechanism, is nonetheless expressly supported in its “original” form as a hunting aid (via Heizer and Baumhoff 1962; Grant et al. 1968; Bettinger and Baumhoff 1982; Nissen 1982), with the conclusion it is selected for based on social success even while subsistence practices deviate from optimal foraging expectations (Gilreath and Hildebrandt 2008:17-18).

Simultaneous with peaks in “representational” rock art, and lithic reduction debris, many attribute the arrival of the bow-and-arrow in the Great Basin with declining bighorn populations (e.g. Heizer and Baumhoff 1962; Grant et al. 1969; Bettinger and Baumhoff 1982; Hildebrandt and McGuire 2002; Gilreath and Hildebrandt 2008:13, 17). Consequently, symbolic and religious practices surrounding hunts would accrue added value, resulting in a positive feedback cycle between game population decimation (in this case, *Ovis canadensis*), and a ritualized prestige hunting complex often referred to as “increase rites” (e.g. Garfinkel and Austin 2011; Garfinkel et al. 2016). Costly signaling and increase rites models interpret this motif’s proliferation as an attempt to restore said declining game populations.

Social Boundaries and Resource Indicators

These next two points are quite distinct from each other, but are nonetheless reported together for their distinctness from the rest of the body of popular theories in *not* relying on magico-religious explanations. First, the Social Boundaries model tackles territoriality and socializing landscape. Second, considerations that rock art locations might link seasonal rounds with resource patches are expolored.

Socializing the Landscape

Although Schaafsma’s (1985:246-254) works address both earlier, Quinlan and Woody (2003) received more attention when they employed the same concept as a wedge between the competing hunting-magic and shamanism camps. In principle, socializing the landscape begins with simply marking where pioneering groups having been, with defining styles of each ethnolinguistic group developing regionally. This process can be observed in the Fremont trapezoidal-bodied anthropomorphs, colorful Chumash pictographs.[27]

The notion of a socialized landscape began as an implicit distinction between virgin wilderness, and in- and out-of group territories. It attributes production to “pioneer” groups alone, assuming production cessation thereafter, until later

27: Or, for that matter, with the Hawai‘ian archipelago’s triangle-bodied anthropomorphs diverging from pan-Polynesian stick-figures in the Late Precontact.

population displacement encourages defacement (Quinlan and Woody 2003). Implicit in stylistic approaches which attempt to define sub-regions by the very sorts of distributions Heizer and Baumhoff attempted to assemble (e.g. Shaafsma 1985:253-254). Quinlan and Woody (2003)'s Great Basin application interprets Numic and Pre-Numic interactions through the Heizer and Baumhoff typology: that "Numic scratched" comes later implies the Numa used it as a tool to obliterate traces of their predecessors, therefore indicating an adversarial, rather than descendant relationship.[28] The matter becomes complicated with palimpsests entering the equation, and a moot point when critically examining it as an outgrowth of the very sort of Victorian-era romanticism ubiquitous in the zeitgeist of the earliest waves of Euro-American settlers who were fascinated with the "virgin" landscapes of the area.

Rather than conceiving of landscape as inert and passive until it is granted the personhood of a social role, contemporary approaches considering animic ontologies understand landscapes always as active agents (Wallis 2009:48-50). A positive legacy of Quinlan and Woody's proposition, however, is that it has sparked interest in untangling the complex webs of interactions between peoples and places, and especially the roles of parietal-art-marked natural landforms in mediating inter- and intra-group conflict at and within typical range margins. The Sutton model, among these, expressly considers violent response to episodic climatic stresses.

28: Ultimately a tautological argument. Ascribing scratched to Numa infers it is Numic because it is late, and so on circuitously (also again failing to recognize preservation bias).

Resource Indicators

Similar to, but distinct from, socializing the landscape, many of the same strategic positions associated with managing others' access to resources could be quite comparable to facilitating in-group access. In his master's thesis, Brosman (2012) infers forager land-use patterns in Piute Valley, NV (along the Colorado River/modern Lake Mojave) from the distribution of archaeological sites. Among 78 archaeological sites in the Piute Valley study area, 24 (31 percent) are petroglyph locales (Brosman 2012:49-51). Using GIS to perform landscape-scale catchment analysis on the relationships between activity areas and resources, he notes rock art sites tend to cluster in foothills below upland resource patches, positioned between his proposed effective seasonal round circuit, and said upland clusters; in part because the upland areas may not always visible from the proposed foraging route, he proposes that petroglyph sites may have functioned as waypoints, indicating invisible resources (Brosman 2012:68-70). The proposed migration route markers is both substantiated by his data (see map, Brosman 2012:68 figure 14) and compatible with the bulk of other interpretive frameworks. Implicitly, however, his proposal breaks from previously described behaviorist interpretations by a) acknowledging petroglyph location and resource location are not necessarily the same, and b) implicitly relying on conscientious actors who can recognize landscape-visual expression relationships, as opposed to costly-signaling proponents whose modeled humans need not really be aware, at all.

Conflict and Warfare

As editor Irwin noted on the Kerr (1980:30) manuscript, " War is a dimension of intertribal relationships and constitutes a dimension of politics." The role of conflict and warfare, described here, sets up the role of violence in the following section on the emergence of Numic identity from ancestral Pre-Numic and their interactions with neighboring groups. Although inhabitants of Central and Eastern California preferred other unmediated conflict resolution, such as multi-ordered avoidance (Bettinger 2015), Numic warfare was not unknown. Goss (1972) and Miller (1983) record that donning black paint was a typical preparation for Numic war parties shortly before embarking on episodic skirmishes. Altschul and Ezzo's (1995) landscape approach considers the geoglyphs of what Whitley (2000a:66-68) terms the the Earth Figure Tradition as expressions of Yuman Mohave ritualized conflict mediation along *keruk* pilgrimage trails during protracted hostilities with Southern Paiute breakaway Chemehuevi (Kroeber 1963:74-81; Sutton 1986:74-75).[29,30] With complex networks of trade, cooperation, and intermarriage between Tübatulabal and Coso Shoshone and Kawaiisu, Kawaiisu with Coso/Panamint and Owens Valley Paiute, Paiute Mono with Yokuts, and Yokuts with Chumash, relationships to the west were mediated in a decentralized way that discouraged violence through chain-reaction ostracization

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29: According to Kroeber and Sutton, Chemehuevi originated from Southern (Pahrump) Paiute at Charleston Peak, splintering off as they intruded into Mohave territory, first peacefully, then forcefully. Mohave traditions include an epic narrative detailing successive skirmished in which territory repeatedly changed hands, before recapturing their lands.
30: In the Chemehuevi-Mojave case, at least, the Earth Figure Tradition (EFT) in can mediate societal differences. While significantly different from the parietal art traditions, Death Valley is one of the northernmost extend of EFT, and so an aerial UAV survey could be fruitful.

(Steward 1938a; Lee and Hyder 1991; Bettinger 2015). The picture was much different along northern and eastern frontiers during the Numic spread, where disruption and displace frequently led to open conflict without the established deescalation mechanisms of California (Sutton 1986).

Data from the last 1,500 years demonstrates resource scarcity, especially during the Medieval Climatic Anomaly (MCA), encouraged armed conflict elsewhere in California (Allen et al. 2016). Proposed resource scarcity at the close of the Newberry and early Haiwee (e.g. Bettinger and Baumhoff 1982; Hildebrandt and McGuire 2002; Gilreath and Hildebrandt 2008) corresponds with extreme MCA fluctuations in the Mojave Desert (Sutton et al. 2007; Allen 2013:4; Sutton 2017:22). In this manner the key trigger for the Numic Spread in the Sutton (1986) model was the MCA, and its consequent conflict, culture change, economic shifts, and population movements at the outset of the Rose Spring Complex (Allen 2013:3; Bettinger 2015).

Political Economy

Recent shifts in Great Basin and California hunter-gatherer archaeological discourse have introduced political economy theory of social processes (Bettinger 2015; Sutton 2017:24). Contextual associates between petroglyphs and pictographs, their recognizable thematic context, and the more portable resources proximal to the physical manifestations of these symbolically charged features[31] implies power

31: The metaphysics of which we will return to later [[hyperlink]] relationships. Bettinger (2015), however, argues much of indigenous California operated according to ad-hoc system of "orderly anarchy,"[32] in which power asymmetries were situational and temporary.[33] This is not, however, the first attempt at a Great Basin hunter-gatherer political economy. Whitley (1994) drew some controversy with an article discussing power dynamics of task gendering in Numic societies, in part with the bold title "By the Hunter, for the Gatherer." He succeeded, however, in igniting a conversation about gender asymmetries among "the archetypal egalitarian society" (Whitley 1994:364). Household scale economy was, as he argued in part through *puha* and rock art, asymmetrical and dependent on marriage status. On the community level, temporary leadership typically went to those with *puha*, so securing some economic resource would be socially and beneficial. Suggestions that rock art might function to regulation economic production and power relationships are not incompatible with models of prestige hunting, moieties, shamanic rituals, or the "big man complex" Bettinger (2015) posits may have existed in the Coso area during the Newberry Period.

Totemism

As addressed in Chapter 4, Coulam and Schroedl's (2004) analysis of Southwestern split-twig figurine not only revived interest in totemic religious practices in the Southwest, but also gained a following among western Great Basin scholars. Included in their analysis was the well publicized specimen from CA-SBR-

32: Adapted after Evans-Pritchard's (1940:77) "ordered anarchy" used to describe the Nuer.
33: As opposed to neo-Marxist political economies, Bettinger's model is overtly neoliberal

199 (Newberry Cave), in California's Mojave Desert (e.g. Hildebrandt and McGuire 2002:243). With no local correlates, the SBR-199 figurine eluded supportable interpretations until the above authors situated it in the context of similar visual culture of the Grand Canyon and Snake River areas. Their analysis divides the greater corpus of willow animal figurines into two ritual functions: "social totemism," when an animal or plant comes to signify a kinship or community (Garfinkel et al 2016). By contrast, "increase totemism" is a magico-religious endeavor in which a clan or moiety raises the effigy (often of a prototypical animal ancestor) in conjunction with fertility imagery during an ceremonial event, charging the effigy and proto-ancestor with supernatural power (Coulam and Schroedl 2004:53). As proposed for the western Great Basin, the ceremonial bighorn cult reified its conceived mastery of bighorn death and regeneration through acts of hunting magic.

In these derivations of world-renewal rites, scholars synthesize the regeneration of sheep after the hunt by the Animal Master, and high horticultural yields, with seasonal ceremonies from coming seasonal rains (c.f. Whitley 2011:122). Rituals intensified in response to bighorn sheep populations collapsing (Gilreath and Hildebrandt 1997; 2008), and as ritually hunting bighorn is believed to have been a symbolically regenerative act, the intensification resulted in a positive feedback loop. As a derivation of world-renewal ritual, this self-perpetuating cycle is semantically distinguish from world renewal as "increase rites" (Garfinkel et al. 2007; e.g. Garfinkel and Austin 2011; Garfinkel and Yohe 2012). It has been posited that later period Animal Master *Yahwera*'s known role of regenerating the animals was previously held by bighorn in the Cosos (Garfinkel and Austin 2011:11). The theories currently postulates hunting moieties overseeing ritual intensification as increase rites elevated bighorn as fertility symbol, animal master, and clan totem as a conceptual ancestor of ancient Coso (Garfinkel et al. 2016:196).

Ceremonialism

Periodically, members of neighbor villages and camps would gather for communal feasting (Driver 1937:126; Steward 1938a, 1941; Miller 1983:79). These events fostered social interactions among people who frequently spent seasonal spans in small, scattered groups. In addition to feasting, cooperative performances at once encouraged social cohesion, expressed religious themes, and facilitated the exchange of information through narrative and sacred song (Crum 1980; Hill 1992; Crum et al. 2001). Recurring festivals celebrated changes of seasons, various harvests, and the fertility of the land (Schaafsma 1985:261-263). Not all communal ceremonies were so regularly timed, as more stochastic timing characterized intervals in between communal game drives (Grant et al. 1968:14; Van Tilburg 2012:155), as well as coming-of-age celebrations (not to be confused with the puberty power quest) (Steward 1929:207; Whitley 1992b:95; Van Tilburg 2012:255-256). In historic times, a shelter in the Panamint Mountains is believed to have hosted the Ghost Dance (Garfinkel et al. 2007), a relatively late incarnation of an enduring tradition.

Archaeological evidence can range from clear, through ambiguous, to apparently absent. Death Valley's annual mesquite harvest festival concentrated on an area now long since buried by development and deposits of alluvium. Surface evidence currently amounts only to the exposed uppermost portion of a large boulder, once the focal point of processing during the event. Geoglyphs, however, abound. Despite finding examples of big game depictions on stones used to construct large-scale trapping features ("rock alignments,") such as those reported for communal drives, Hockett and others (2012:12 figure 10) plot a map showing little to no correlation between drive features and petroglyph sites.[34] A rather large sample of geoglyphs abound in Death Valley (Hunt 1960), and throughout the Mojave. Further south, Altschul and Ezzo (1995) describe Yuman *keruk* religious events and pilgrimage trails in terms of warfare and integration – relying on the ceremonies to aid in assimilating captives of the former into the latter.

Neuropsychology Model

Since Lewis-Williams' and Dowson's article "The Signs of All Times" launched thirty years ago, fervent debate over the depth, applicability, and ethics of shaman/shamanism/shamanistic practices in anthropology has raged; similarly, hold-outs of the positivist scientific community continue to cast doubt on the interdisciplinary cognitive studies as valid, quantifiable, and "real science." And yet, the conversations that introductory paper to the neuropsychology model lit up are still

34: Similarly, a map of the area around Death Valley's Wildrose Peak a higher affinity between petroglyphs and storage pits, than for hunting blinds (Wallace and Taylor 1955:357).

going, growing, and evolving. Both Lewis-Williams' initial publication with Dowson, and subsequent works (e.g. Lewis-Williams 2002), use Coso Range rock art to demonstrate the fundamentally cognitive, and expressly neuropsychological model of image-acquisition.

Fundamentally, Lewis-Williams' argument is inspired by, and reliant upon, a relatively small set of cross-cultural practices that individually or together operate to temporarily, intentionally, and radically, alter perception on one or more sense – in popularized neuropsychology parlance, to induce an altered state of consciousness (ASC). Embedded in their cultural contexts, this rather specific suite of practices (see Table 4.1) has caught the interests of, and been thoroughly documented by anthropologists for a century in the Great Basin. Much of the detailed contents of shamanic and shamanistic models are covered in Chapter 4 (shamanism and nagualism) and revisited in Chapter 7 (neuropsychology model, shamanism, weather control, and puberty rites). Consistently drawing criticism, scholars of the shamanism paradigm have responded by systematizing the identification of expressions, and thoroughly substantiating claims of these practices through as many lines of evidence as possible. In brief, ethnographically documented practices conforming to Winkelman's (2010) criteria for shamanistic expressions fall under two general categories, as defined by Keyser and Whitley (2006): *shamanistic* rites, which includes non-specialists engaging in the practices, and *shamanic*, denoting that which is directly connected to practiced ritual specialists. The distinction is worth exploring, as it defines bounds of social roles and therefore structuration. Shamanic visual and material culture would be expected in more restrictive contexts (however there are caveats, and taboo spaces can conceivably by found in public places). Other indicators can potentially sort through these ambiguities, especially stylistic variability within motif classes, as this may indicate less specialization and greater accessibility.[35]

The Neuropychology approach to parietal visual culture was innovative on its introduction precisely because instead of categorizing visual culture by image content (as the Great Basin typology does), it treats image *source* as an analytic category. For cognitive archaeologists who regularly employ semiotics in visual culture analysis – and the titular word “signs” calls attention to this as the intended audience, and the conversation from which the concept grew – this was a logical step to take. Lewis-Williams had, after all, already been thoroughly involved in Paleolithic cave studies tackling post-Structuralist (but not necessarily post-structure) symbolic analysis. For researchers not initiated into the informal cult of the study of sign-object-interpretant relationships, however, the suggestion no doubt seemed jarringly out of place. While some have adopted and adapted it readily (e.g. Whitley 1994, 1998; Liwosz 2014), the prevailing paradigm “for the past 70 years” (McGuire and Hildebrandt 2005:695) has been more that a little reluctant. That the neuropsychology model’s

35: After Keyser and Whitley’s (2006) precedence, I use “shamanism” to describe a cultural/religious system containing these elements, “shamanic” to describe such practices as performed by a ritual adept, and “shamanistic” to describe practices as performed by either non-specialists or specials.

reliance on intentionally radically altering perception to elicit spontaneous endogenous experiences (see techniques in Table 4.2) is most likely unrelatable to more intellectually conservative behaviorists. It is, however, thoroughly scientifically observable, and readily reproducible, thus thoroughly and demonstrably substantiated (c.f. Froese et al. 2013).

Application of the neuropsychology model, in practice, relies upon the analytic construct of shamanism. In the strictest sense, Lewis-Williams has always and consistently used "shamanistic," as opposed to "shaman," by convention making the semantic distinction between practices directly relevant to the mechanisms of the neuropsychology model for the former, and a social construction often applied from and etic perspective to describe various indigenous and usually non-western knowledgeable specials who may repeatedly intentionally engage with comparable practiced rites, or with ethnobotanical or ethnomedicinal knowledge, as a means to an end. Criticisms from Klein and other (2002; Sundstrom 2012) are addressed in Chapter 4. Suffice it to say, despite anecdotal cases of religious leadership partially permeating the boundaries between priestly and doctoral social roles, Winkelman's (2010) quantitative approach demonstrates the defining aspects of both unconstrained shamanistic practices, and of more formalized and/or sanctioned roles of "doctors" or "doctor-shamans" co-occur in clusters with sufficient regularity to substantiate the construct – in part originating from ethnographic and ethnological engagements which Numa among many others.

Archaeoastronomy

Although not one of the intended focal points of this study, connections between parietal art and astronomical observations should nonetheless be addressed. Throughout the intermountain desert west, many assertions have been made (to varying degrees of supportability) connecting parietal motifs with astronomical events, alignments, or verbal traditions. Expanding the scope to consider geoglyphs (alignments and intaglios) as well, and a pattern of thought potentially motivating this vein of research begins to emerge. Inherent symbolism (understood or inferred) in visual culture can be notoriously difficult to decode, and affixing such signs understandably complicates the process by adding the possibility for intentional spatial relationships.

A certain amount of well-earned skepticism has amounted around the topic. Much as is also the case with popular archaeoacoustics narratives at any location with relatively smooth and upright sound reflecting surfaces, heavenly bodies distributed around 180 degree arc provide ample opportunities to develop a story reasonably coherent enough to seem consistent with some component of a set of observations. To use the specific example of architecture, all structural enclosures will approximately align with a "zenith star" for that location (simply a star which passes directly overhead), and every corner can be shown to approximate the bearing of some rising or setting star (Raven 1985:94). Casually developed explanations comparable to these examples consequently rely on anecdotal evidence, lacking sufficient systematic grounding to substantiate scientifically (Whitley 2011:98-99).

In practice, the scenario is often a perfect setup for falling into the logical fallacy of confirmation bias – a trap which has snared even some of the most prominent scholars of archaeology.

To demonstrate the risks of confirmation bias, Raven (1985) subjects an abstract but somewhat intricate geoglyph comprised of some 700 stones at the Great Basin site of Duck Flat to cursory archaeoastronomical tests. Given a reasonably small tolerance of ± 2 degrees margin of error, Raven (1985:94) calculates the probability at least one of seven Duck Flat lines would correlate to a solstice rise or set, as well as for lunar alignments.[36] For alignments with *only* the 25 brightest stars over the last 3,500 years[37] there have consistently been two or more co-occurring alignments, and no years without any (Raven 1985:95). Regarding the contemporaneity of peak stellar hits (five) ca. 950BP (reported 1000 AD) with the arrival of Paiute in the immediate area ca. 1,000 BP (Bettinger and Baumhoff 1982), Raven (1985:89,95) makes no interpretive comment.

Post-postivist Science

Paradigm shifts in the philosophy of science have led many archaeologists away from the design structure of the processual era. These epistemological shifts have not, however, been universally adopted, despite decades of ever increasing

36: An anticipated 1:6.4 chance for solstice rising doubles to 1:3.2 including both summer and winter. Through a 9.6 year lunar azimuth cycle, five out of 14 rock rows meet a stellar alignment, with the probability of at least one aligning outweighing the chance of none, at a ration of 5:1.
37: accommodating for 500-year interval measures of long period changes to Earth's axial tilt, eccentricity, and apogee/perigee precession

acceptance. Discrepancies may be as much innocent ignorance of developments in discourse, and so a brief summary of the philosophical shift is included, outlining means by which to resolve the change without abandoning scientific practice altogether. Critiques of social science practices in the 1970's and 1980's (e.g. Toulmin 1977) identified a few crucial shortcomings. Summarily, the constructed distinction between theory as intangible and facts as empirical that could not be upended (Whitley 1992a:64-65). As with many theoretical disputes, competing research would at once seem to dogmatically confirm, and unequivocally refute, the same hypothesis. The paradox arises from the presumed infallibility of observations as undistorted perceptions of the concrete and tangible, when in reality they are neither (Alexander 1982, 1987). To resolve the matter, philosophers of science have argued for the abandonment of attempting simply to confirm or refute hypotheses, or "positivist," approaches. The preferred "post-positivist" approach weighs an accumulation of lines of evidence for a best fit model, and allows for contradictory data. According to Whitley (1992a:67; 2011:95), criteria to substantiate a post-positivist model are:

- Amount of data explained
- Diversity of data explained
- Ability to integrate within existing accepted large theories/models
- Internal consistency, logical coherence
- Generates *new insights* and avenues of research
- Accommodates new and unexpected data

The research presented here was undertaken expressly within the post-positivist paradigm. Both in acknowledgement of these debates, and in a sense of scholarly duty, the Mojave Desert slot canyon acoustics study considers several theoretical models in which to frame the data. Criteria are laid out in Chapter 5, and the evidence evaluated in Chapter 7. I make my interpretations not by selecting only the signle best paradigm, but how these theoretical models interact given the evidence. In addition to archaeology results, I also consider oral traditions in the next chapter.

CHAPTER 4: ETHNOGRAPHIC COMMENTARY, AND SYMBOLISM IN VERBAL EXPRESSION

Introduction to chapter

Certain attempts to address rock art as a topic have eschewed ethnographic evidence in favor of using only archaeological assemblages for an interpretive foundation (e.g. Gilreath and Hildebrandt 1997; 2008); conversely, many (e.g. Whitely 1994, 1998; Garfinkel et al. 2007; Garfinkel and Waller 2012; Waller 2012; Whitley and Whitley 2012; Allen 2013; Huffman and Earley 2017; Liwosz 2017) have found value in integrating indigenous knowledge into interpretation and query. As support for a wholly material archaeology of Great Basin and Mojave Desert parietal images continues to degrade, researchers are progressively compelled to borrow from other lines of evidence. While ethnographic analogy has long informed archaeological research, improved approaches and ethical standards in recent decades have demonstrated its indispensability. As Myers (1997:46) states, "Numic myth, since it is oral in nature, acts as a repository of this knowledge." Similarly, Whitley (2008:549) defines myth as sacred histories with certain attributes, among which are a creation story and settings from a prior time period. In the discussion below, this word is used sparingly, and its use should not be interpreted to imply doubt. Rather, it is used in the sense of a sacred history, in a prior time, in which supernatural agents may appear, and which carries an enduring social weight. In the footsteps of Myers, Whitley, and many scholars of religion preceding them, this discussion considers traditional narratives as mnemonics, encoding fundamental cultural knowledges into plotlines and personalities, and employing metonymy (among other devices) to personify cultural and historical processes as larger-than-life characters, in what Sahlins (1985:35) terms "heroic histories."

Application of oral memory can be quite variable thematically. Pragmatic solutions to quotidian matters (e.g. subsistence) are among the most recognizable. These direct and unambiguous levels of understanding, however, are often not the whole of encoded information. Conventionalized signification relationships permeate narrative, such as metaphors, metonymy, and abstract symbolism. For much of the twentieth century, leading scholars including Steward dismissed the notion that Numic song contained metaphor and abstract symbolism, characterizing messages in the performance as secular and meaningless. In the 1980s, however, native Shoshone speaker Crum (1980; in Hill 1992) argued to the contrary, citing Round Dance songs. Even among those songs accessible to children, both the language used was elevated, and references figurative, simultaneously imparting meaning on multiple levels (Hill 1992:126). These properties in pan-Uto-Aztecan oral traditions have given rise to the term "verbal art." Given above written testimony, ongoing denial of complex metaphors among Numic cultural expressions perpetuates the inaccurate racialized stereotypes of evolutionary simplicity ascribed to Numa under the now deprecated environmental determinism of the cultural ecology school of thought.

Complex metaphors, however, may from an etic perspective appear obscure, obtuse, and ambiguous. These confounding factors perpetuate cultural misconceptions somewhere below the conscious level, leaving scholars vulnerable to assuming deeper levels of signification are not present when, in fact, they are simply not obviously apparent. Both the presumed presence and presumed absence of metaphors and other such cultural conventions are pitfalls of symbolic interpretation, highlighting the need for both ethnographically informed interpretation, and semiotic approaches.

To understand indigenous ontologies, researchers must acknowledge these systems of knowing are *not* mere fabrications, but instead have been formulated empirically (Sahlins 1985; Whitley 2011:104). Knowledge of the cosmos and its metaphorical mix of predictable and timed clockwork with unpredictable surprises is codified into cultural complexes – including religion and other ideology – not through ignorant superstitions, as many missionaries and other such early primary sources may assert from times of early Euro-American contact across much of the globe. To the contrary, Whitley reminds his readership that these complexes are composed through empirical observation, inferring causal relationships through pattern recognition (see also Myers 1997:33; Echo-Hawk 2000)[38]. Etiology is not simply a body of fictional myths, but a coherent system of relating observations of the natural world. Of course,

38: Some researchers have problems coping with this; more than likely, it is because to acknowledge indigenous empiricism is to face Western empiricism's own limitations. We then confront the frightening but very true history that much of our empirically-determined knowledge is, in fact, constructed through trial-and-error tests of causal connections inferred through correlations.

to suggest scholars “read” these narratives as literal accounts would be absurd; the very epistemes employed to construct them rely upon metaphor. Where causal connections are vague, nature of materials difficult to examine intimately, or entropy defies daily experiences, humans often employ metaphor to bridge the cognitive gaps. One of the most common of these metaphors, anthropomorphism, defines many animistic ontologies by ascribing human-like agency to other-than-human phenomenon where surprise outcomes diverge from otherwise predictable circumstances (hence “clockwork and surprises”). This transference, or abduction, of agency helps to demystify myth when understood as a component of meaning-making processes under unfamiliar circumstances.

Given this foundation, we can approach the ethnographic commentary and verbal expressions related below in the present chapter while remaining critically aware of their underpinnings. This is not to say either author or reader are privy to unequivocal meanings of the topical Native American cultural systems as an informed insider might be so enlightened. Instead, it establishes the non-dualistic scenario in which multi-tiered abstractions are neither ascribed nor not ascribed. Post-positivist positions like this best consider symbolism and signification, as positivist approaches fail to cope with apparently paradoxical circumstances such as non-dualism in communication. To remove a level of obscurity, consider the circumstances in which oral traditions were shared. Those such as the Round Dance songs were imparted to mixed audiences of men and women, adults and children, and persons in liminal states between such categorical social roles. The same performance could function as meaningful to the broad audience by layering metaphors, so that the same expression or passage or verse might contain themes consistent with role-specific experiences (Hill 1992:127).[39] In short, multi-layered metaphors may make the content relatable to children, profound to pubescent adolescents, and still a meaningful message to community elders (Crum 1993:180-183). There is little need for any one individual to understand every level of significance, because as a group effort it remains understood, reproduced, and modified to suit later circumstance (Echo-Hawk 2000). Consequently, to even an emic individual, recognizing *every* level of abstraction (or just how many layers may be intended) is less relevant than sharing in the process which entangles sociality with these symbolic relationships (Myers 1997:32).

Chapter structure

This chapter synthesizes recorded oral traditions with ethnological and ethnographic research. Further evidence is presented in the form of previous archaeological studies which conspicuously integrated these types of evidence within their theoretical and interpretive frameworks. At times, the contrasts between these sources can be jarring. Furthermore, applications of social theory as described below can risk conflict with indigenous sources, although the intent is usually quite the opposite. Consequently, the following contents attempt to negotiate between rich

39: Conceived of like an elevator, layered metaphors require the audience to have at least some idea of where they or going, or risk getting off at the wrong level and becoming lost in an unfamiliar and confusing place.

analysis and cultural sensitivity. If and where there are shortcomings, I not only take responsibility, but invite critical discussion in the future. The intent of this chapter, primarily, is to provide context for the content of data presented later in results. Secondarily, it is explicitly to explore productive areas of inquiry and discourse which both highlight and avoid pitfalls and trappings of preceding generations of Great Basin archaeologists. Finally, it is an albeit clumsy attempt at multivocality; although I did not formally undertake primary ethnographic research, works of previous authors – western and indigenous – and their respondants serve to bolster cross-cultural dialog.

Non-western ontologies are formulated over many generations, living vastly different lifestyles from the modern industrial Anglosphere. While this may seem self-evident, it bears mentioning, as accounting for these foundational experiences must proceed more abstract discussion of meanings encoded in oral traditions. Ethnographic and ethnoarchaeological evidence of lifeway patterns contextualizes animal behavior and symbolism, and is thus one of the first points discussed.

Productive and systematic iconographic inquiry begins at more obvious sign-object relationships and proceeds progressively into abstraction (instead of diving off the deep end into occultism). Consequently, for hunter-gatherer cultures, the relationship between settlement patterns and resource distribution becomes one of the most basic and foundational launching points. While the position of this study is one critical of "gastric" characterizations, it would be an egregious error to dismiss that subsistence was behaviorally and cognitively significant; hence, this chapter on symbolism begins – rather than ends – with subsistence and economics themes. In the interest of attempting a holistic approach, this includes not just procurement of food resources, but behaviors around indirect contributions, and matters of materials that might in previous decades have been dismissed as "epiphenomenal," or otherwise not contributing to survival. My position in the following holds the dynamics of human behavior, cognition, and adaptation preclude the possibility of dismissing downstream effects of actions which do not directly contribute to calories or nutrition.

Following the aforementioned introduction to pragmatics, this chapter's discussion somewhat abstractly covers etic means of recounting religious practices. These are outlined as they relate directly to Numic religion. Included is a cursory discussion of categorical elements and proposed dominant expressive outlets. Exhaustively listing excluded material is unnecessary, but suffice it to say there is a vast body of knowledge outside the strict confines of what follows. Despite enduring descendant populations persisting today, we cannot assume religion in antiquity to be identical to the more recent past. Impacts from historic processes – external and internal – around the time of sustained Euro-American contact tragically dismantled Numic institutions of knowledge, including religious expressions (e.g. Zedeño et al. 2003:56). Consequently, the reconstructions available and presented in the current study are inherently incomplete and imperfect.

After concluding more abstract discussion of religious complexes and their institutions, this chapter proceeds to oral traditions. These provide content and themes from which to propose interpretations in the later discussion chapter. Key among these narratives are the Numic origin myths. Myers (1997) explicates those narratives as documented by Lowie (1924). Origin stories for the Numa varied between tellers and communities, followed three distinct story arcs or “series” (Myers 1997:32-34), and were likely originally expressed in a more sophisticated mode of expression, as defined by Hill 1992 (see iconography below). The origin (of people) stories should not be confused with very different creation (of the world/cosmos) stories, one of the latter of which Huffman and Earley (2017) relate while making an argument for Uto-Aztecan origins of petroglyphs in what is now Southern Colorado. Additionally, Waller (2004, 2012, 2016; Garfinkel and Waller 2012) relate narratives which connect parietal images with profound religious experiences, and acoustical properties of landscapes.

With the themes of a sampling of common and relevant Numic oral traditions, the discussion proceeds to Uto-Aztecan iconography. Iconographic discussion benefits in content and structure from the oral traditions’ attributes. Symbolism (and other means of signification) covered in this section primarily remain constrained to specific examples. While visual motifs and other images are an obvious iconographic subject, this section also discusses coloration, example abstract concepts, and conceptualizing cosmological topology.

What this chapter does not cover are specific applied interpretations, which will be reserved for discussion after results are fully covered. This chapter also does not attempt to exhaust resources on symbolism. Contents are constrained to those themes and points which exhibit some relationship with the research locations - albeit at times distantly. A breadth of activities and beliefs are omitted, in the interest of succinctness and relevancy. Despite such omissions, it is the author's hope that this chapter serves as a useful resource for future researchers seeking a succinct synthesis of symbolism and metaphor in Numic oral and visual culture.

Subsistence in Symbolism

One enduring legacy of Julian Steward's (e.g. 1938:46) work is the "gastric culture" or "gastronomic orientation" of Basin cultures (Miller 1983; Whitley 1994:369-270; Blackhawk 1997). This legacy has led scholars of Numic religions (e.g. Hultkrantz 1966, 1976) to relate their research to interactions of symbols with religious ecology and subsistence technology (Miller 1983:67). It thus follows that to comprehend scholastic discourse on Numic ontology, foundational knowledge of subsistence is required. Although some of this material is covered in the previous chapter, and its prevalence in the literature is as much a relic of scholars' unchecked theoretical biases as it is Numic cognition, a brief summary linking subsistence, technology, and ideology nonetheless follows.

Although for decades the only resource of significant subsistence value linked with rock art sites was game animals (specifically large game), research at the turn of the millennium has expanded in botanical resources, as well. Gilreath and Hildebrandt (2008) conclude that "scratched" petroglyphs (using the Heizer and Baumhoff 1962 typology) of the Coso Range were distributed with a distinct preference for uplands. These uplands were and continue to be the habitat hosting pinyon-juniper forest. Given the long-standing characterization of Numic diets as largely dependent on pinyon nuts (e.g. Steward 1941), the authors conclude that scratched designs in the uplands should be a attributed Numic peoples - but not so for pecked "representational" images. Gilreath and Hildebrandt (2008) support their conclusions with obsidian hydration dating, showing a strong late Marana period component in the pinyon uplands. In truth, lowlands, uplands, large fauna, and seeds were all exploited during ethnographic times, and throughout the Precontact periods. Movement between lowlands and mountainous woodlands recurred annually among collectors consolidating resources at base camps (Binford 1980; Brosman 2012:22). As this ethnographic pattern demonstrates, contrasting highland-lowland use does not on its own clearly define peoples or periods, and alternative considerations for the implications must be made.

Distinguishing the historical patterns of "scratched" from "representational" images both implies information about task scheduling, and opens the door for discussion of other plant-based resources. Although seed-and-nut gathering was largely a communal task, processing has long been considered womens' work (Driver 1938; Steward 1941). La Pierre and Garfinkel (2013) also suggest petroglyphs made with the scratched technique were the results of womens' work, albeit based on examples ascribed to different tasks. Van Tilburg (2012:162-172) suggests numerous rock art motifs at Little Lake depicted weaving patterns, basket decorations, and cradleboard frames. As weaving was typically a task for women, and cradleboards were made by grandmothers of the children (Wheat 1967), LaPierre and Garfinkel (2013) conclude that both depictions of the structure and ornament of cradleboards and other woven media links these images to the objects' producers, namely adult women. Additionally, this encapsulates scratched portable "charmstones." Grasses, tule, cattail, willow, milkweed, spike rush, and yucca all were used in a variety of woven objects (Wheat 1967), and especially cradleboard frames.

Yucca was particularly useful, as fibers from its fronds, trunk, and roots all had different applications. Specifically, Joshua Tree (*Y. brevifolia*) root fibers oxidize red to orange. This attribute lent Joshua Tree fibers well for use in colorful designs. Another use reported for *Y. brevifolia* comes from Driver (1938) and Steward (1941), who observed tree trunks being used a noisemaker to emulate the sounds of male bighorn competitions. The long-held interpretation of this act has been that it was a means of attracting game into an ambush. Fruits and fronds of the Joshua Tree are also edible when roasted, and a source of sugars and carbohydrates (Coville 1982:355).

Religious Practices

Animism

One common word to categorize many indigenous ontologies of peoples of the Americas is "animism," although this term's use has come under scrutiny (e.g. Bird-David 1999:67-68). Despite criticism that its origins imply primitivistic beliefs in contrast to researchers' own presumed enlightened modernism, its use has seen resurgence. Bird-David (1999:68, 77) recommends those who employ the term explicitly reject its original connotation of assigning "souls" to natural phenomenon *à-la* nineteenth century author E. B. Taylor. In contemporary parlance, scholars (e.g. Bird-David 1999; Wallis 2009, 2013) ascribing to the "new animism" employ the term to describe relational ontologies, in which humans develop social relationships with non-humans. Wallis (2013:22) concisely captures this notion with the description that "the world is filled with people, only some of whom are human."

Animistic ontologies blur the lines between humans and their surroundings in a manner which may be counterintuitive to some Western scholars. In the twentieth century, fixation on which and whether objects possessed "souls" missed the implications of animate places and other-than-human "persons." Instead, Wallis (2009:48) advocates understanding animism as conceptualizing material as inherently living. Thus possessing agency even prior to human interaction. In this capacity, rock art landscapes would not only be animate places, but ones whose life and agency predate the visual culture (Wallis 2009; Liwosz 2017). Consequently, the visual culture can be conceived to index social interactions between human and other-than-human agents, sanctifying connections humans made with places and/or spirits (Carroll et al. 2004:134).

Rather than describing other-than-human agents as “spirits,” it is often more productive to consider them as living entities. Wallis (2009:50) rejects the use of “spirits,” as the implicit immateriality is a lingering Cartesian characterization (Liwosz 2017:198). Presuming some ethereal spirit or soul gives animacy would require recognizing the landscape as inert prior to human engagements - a conclusion which would be contrary to the concept of animism and unproductive to unraveling aspects of its expression. Instead, animacy reveals itself through discursive engagements between humans and other-than-humans (Conkey 2001, 2009; Wallis 2009, 2013; Baur and Kosiba 2016; Liwosz 2017). Previously (Liwosz 2017:198), I have retained limited use of the term “spirit” as a convenient analytic category denoting other-than-human agency. This constrained scope of the term nonetheless matches the use (if not always the intention) of ethnographic applications of the term (e.g. Driver 1937; Kelly 1938; Steward 1941; Hultkrantz 1987). For its occurrence hereafter, this use should be understood generally to connote an apparently life-like manifestation of agency, as opposed to some intangible disembodied consciousness.

Numic ontologies, prior to influences from Euro-American encroachment, were patently animistic (Hultkrantz 1983, 1987). Other-than-human entities inhabited caves (e.g. Garfinkel and Waller 2012), canyons (Lowie 1924; Waller 1999, 2000), springs and waterholds (Carroll et al. 2004:133-134), and whirlwinds (Laird 1984), just as a few examples. Like in many traditional cultures elsewhere, other-than-human entities also served as explanations for natural phenomena, including acoustic events personifying echoes (Waller 1993a, 1993b, 1999, 2000, 2002) and thunder (Waller 2012). Non-human agents were not mundane, however, but were instead exceptional instances. The concept is codified in the Numic concept of *puha*, often translated as a pervasive spiritual force (Kelly 1938; Steward 1941; Hultkrantz 1987:51; Stoffle et al. 2011:43-44). For the reader's convenience, *puha* is power remarkably similar to Polynesian *mana* (Miller 1983:69), as the latter was popularized in contemporary Western culture through fantasy gaming. Miller (1983:73) explains tha animating forces, especially Numic *puha*, are not static power, but more appropriately a kinetic flow.

In eastern Shoshone oral tradition, *puha*'s unequal distribution across the world can be equated with a spider web, with leads intersecting at potent nodes (Huffman and Earley 2017:8), leaving large voids of low potential. Webs of *puha* radiate from mountain peaks and water sources, linking sources in a sort of "master web" (Stoffle, Zedeño, Eyrich, and Barabe 2000:52; Daehnke and Raymond 2008:37). From this metaphor, we can see what Wallis (2009; 2013) calls the enchantment of animic landscapes. Conventionalized terminology from cross-cultural comparisons of similar phenomena recognize place-spirits, or *genii loci*, as among such potential manifestations. The results of actions by both free-moving and location-bound other-than-humans are thoroughly attested to throughout the Great Basin, Mojave Desert, and neighboring regions (Lowie 1924; Driver 1937:86, 126; Kelly 1938; Steward 1929, 1941; Aginsky 1943; Gayton 1948:33, 34, 113; Kerr 1980; Hultkrantz 1986, 1987; Whitley and Whitley 2012:259-261).

Shamanism

Developing social relationships with other-than-human entities may be widespread among religious genera, but it is an essential characteristic of the scholastic category of shamanism. While the term was already in use in the first half of the twentieth century, Eliade (1964) is most often credited with popularizing the term as a descriptor of a cross-cultural phenomenon. Furst (1965; 1972; 1974) somewhat systematized studying shamanism by establishing criteria for archaeologically identifying shamans. According to Furst, these religions were largely led by ritual magic specialists who gained spiritual power in altered states of consciousness attained during typically private rituals. Indications would then be evidence of specialization in rituals, ritual spaces removed from the public sphere, and mind-altering substances (entheogens).

Furst's reductive application of the shamanism concept fails to distinguish between individual or informal practitioners, and ritual specialists; consequently, shamans and non-shamans engaging in magico-religious ritual would be indistinguishable. According to contemporary academic convention (e.g. Keyser and Whitley 2006), the appropriate use of the term "shamanic" encapsulates expressions of rights of shamanism by the ritual specialist (shaman); religious systems containing shamanic elements are "shamanistic," as are all such religious expressions made by both specialists and non-specialists (thereby including non-shamans). Shamanic rights are enacted by at least part-time ritual specialists (Keyser and Whitley 2006:25), while shamanistic expressions can be made by anyone.

Much debate has persisted over the decades about the value and relevance of shamanism in archaeological interpretation, both within the Great Basin and worldwide. In discussing the southern reaches of Uto-Aztecan influence (Mesoamerica), Klein and others (2002:383-384) reject use of the words "shaman" or "doctor" in the archaeology of visual culture and religion as primitivizing the progenitors of artistic expressions, while overly romanticizing an excessively reductive and globally homogenized portrait of spiritual officers. Arguments like those of Klein et al. (2002) and Sundstrom (2012) attribute the rise of enthusiasm for shamanism to Eliade's (1964) relationship with the New Age movement. New Agers adopting an uncritical reading of Eliade's ideas accounts for this primitivist perspective, which manifested in well known degrading "noble savage" motifs. To avoid this kind of pitfall, Klein et al. (2002:400-401) suggest applying culturally specific terminology in order to highlight idiosyncrasies that distinguish these roles between cultures. While there is legitimate concern that uncritical application of "shaman" or "shamanism" (exemplified by well-meaning but naïve New-Agers) leads to undue "noble savage" type primitivisations, Klein and others' arguments however fails to recognize ethnographic foundations established decades prior to Eliade (e.g. Steward 1929, 1941; Driver 1937; Kelly 1938). Post-structuralist thought, as characterized Klein and Sundstrom, promotes individualism by atomizing cultural processes to particularistic and consequently analytically unhelpful cases (Whitley, personal communication 2017). Particularlistic conclusion carry consequences, and contribute to an ongoing legacy of archaeological research generating social fallout for living indigenous communities.

Klein and other critics unfortunately risk missing the pinyon-juniper forest for the pine trees in their approach. Calls to abandon the term in favor of indigenous terminology unique to each instance is are not without merit, but risk disarticulating religious studies discourse. While "shaman" is a term borrowed from studies among North Asian religious specialists, Winkelman shows the traits the term's use describes are demonstrable in cultures separated by vast periods of time and expanses of space. Winkelman (2010:165) outlines a set of key characteristics defining Eliade's use of shamanism, which are outlined in the table below. ASC as an acronym stands in place of "altered states of consciousness."

Table 4.1: Winkelman's (2010:165) criteria for shamanism	
Shamans are preeminent charismatic leaders	Divination, diagnosis, and prophecy
nighttime community rituals	supernatural/sorcery cause illness
Chanting, singing, drumming, dancing	Healing focuses on soul loss/recovery
death/rebirth in initiatory crisis	Animal relations source of power
fasting, isolation, and ASCs in training	Animal transformation by shaman
ASCs characterized as soul journey	Malevolent acts, i.e. sorcery
ASCs involving visionary experiences	Hunting magic and other assistance

Through quantitative meta-analysis, Winkelman (2010:170, 179) substantiates the validity of a cross-cultural category of religious practices and officers, defined by the traits in the table above. Despite reticence of some scholars, the shamanism paradigm is validated through ethnology and ethnography (e.g. Hultkrantz 1986, 1987; Winkelman 2010), neuropsychology (e.g. Lewis-Williams and Dowson 1988; Lewis-Williams 2002), and primatology (Winkelman 2010). Primitivist implications from inappropriate or inexpert use of the term, however, may still require addressing. Adopting terminology derived from within ethnolinguistic families about whom studies are written may be one measure to address this. For Uto-Aztecan shamanism broadly, it may be accurate to apply a term such a "nagualism," derived Nahuatl *nagual*, or spirit helper (c.f. Whitley 2000a, re: Spirit Helper Complex).

Ethnographically rooted neologism however cannot fully supplant the use of the etic terminology such as “shamanism” without erroneously euphemizing cross-cultural phenomena to the brink of unintelligibility.

Etic information is not the only source from which these categorizations are derived. As a point of order, this chapter - and the final chapter - use several words for relevant social roles semi-interchangeably. Following in the stead of some 90 years of anthropological practice, with precedence set by influential scholars such as Alfred Kroeber, Julian Steward, and their students, “shaman” and “doctor” as etic categorizations of ritual adepts whose specialized knowledge and skills were recognized within their communities. In the context of the Great Basin, these are somewhat synonymous, with subtle implicit differences. “Shaman” describes a ritual adept of specific religious practices, and is distinct from the puberty initiate and life crisis archetypes; “doctor” implies education in some specific practical knowledge, usually requiring five years of training simply to begin practice (Driver 1937:102-105; Kelly 1938:160; Steward 1941:257-264); theses knowledges include healing, botany, tools of hunt and war, rocks, rainmaking and weather control, among other specialties (Whitley 2000a; Carroll et al. 2004:133).

While these etic terms may be helpful in discussing comparable social roles across ethno-linguistic differences, Great Basin indigenous languages have specific corresponding terms as well. For contexts in which ethnic affiliation can be reasonably inferred (e.g. a specific account related by a member of that group, or late

Precontact/Ethnohistoric/Historic Period cases, or sites located well within generally agreed upon traditional territorial boundaries), Numic words may be used. Both the Fossil Falls Archaeological District and INY-3074 landscapes, for example, are known to be inside the traditional range of Panamint Shoshone; consequently, the Tümpisa (Panamint) word *puhakanti* is applicable (Dayley 1989; Giambastiani et al. 2005:89). Not much further south or west of Little Lake, and spanning from the foot of the Sierra Nevada across parts of China Lake to the southern section of Death Valley, is Desert Kawaiisu territory. For Mono (Paiute), the term is *po'hage* (Driver 1937:126; Whitley and Whitley 2012:261). In Kawaiisu, two words for the role distinguish between dispositions: *huuiyagadi* designates healers and singers; interestingly, the cognate with neighboring Panamint, *pohagadi*, indicates someone who causes sickness, mischief, and solely seeks self-gain (Giambastiani 2005:91-93). This practice follows precedence of the use of *pohagunt/poagunt*, which an 1880 word list by John Wesley Powell indicates connotations of both medicine man and writer (Whitley 2004:362, 2010:9; Keyser and Whitley 2006:6; Whitley and Whitley 2012:262).

Having demonstrated the persistent viability of the shamanism concept, content can be addressed in better detail. For Uto-Azteca, there are both the shared commonalities of the broader concept, and culturally specific idiosyncrasies in its expression and related beliefs. This portion of the discussion covers both, with an emphasis on traits specific (but not necessarily unique) to northern Uto-Aztecan speakers. Summarily, *puha* is acquired during seemingly significant visionary experiences, of which there are two primary varieties. Spontaneous (or unsought) visions – including dreams – were received unprompted (e.g. Hultkrantz 1986, 1987; Whitley 2000a; 2010:15). Sought visions, on the other hand, entailed ritualized behavior to catalyze altered perceptions, and thus have the potential to leave more patterned evidence in the records of material culture, visual culture, and oral tradition. "Visions," in fact, would be a misnomer, as the methods outlined below to facilitate these religious experiences were, by all evidence, multisensory. Numic, Chumash, and other Native Californian languages either correlate visions with, or use the metaphor of, "dreams" (see Lewis-Williams 2002; Whitley and Whitley 2012:261), while one of the most common trance metaphors among these groups (particularly in Numic languages) is "death" (e.g. Whitley 1998; 2000a & b; Lewis-Williams 2002).[40]

Table 4.2*: experiences/techniques effective in facilitating ASCs including dissociation, ecstasy, and disinhibition; non-exhaustive list compiled from Goodman 1988; Lewis-Williams and Dowson 1988; Whitley 1994:362-363; Till 2001, 2009; Lewis-Williams 2002:167; Conkey 2009; Froese et al. 2013)*

Auditory driving/droning	Fatigue and exhaustion	REM dreaming
Dance, rhythmic motion	Haptics (tactile vibration)	Schizophrenia
Entheogens (psychotropic)	Meditation	Sleep deprivation
Epileptic seizures	Migraines (esp. "visual")	Visual flashing (~10-13Hz)

Not all venues were suitable for these experiences. *Puha*'s distribution on the landscape is uneven, concentrated on mountaintops, watercourses, and cavities in the earth (Hultkrantz 1987; Huffman and Earley 2017; Liwosz 2017:198). Oral tradition

40: This recontextualizes ethnographic reports collected by Driver (1937), Steward (1938, 1941), and Kelly (1938) that vomiting from ingesting jimsonweed causes "death."

(see below) employs the metaphor of spider webs, with large swatches of lower energy between threads of *puha,* radiating in spoke-like patterns (Laird 1973, 1974; Miller 1983; Carroll et al. 2004; Huffman and Early 2017:6-8). Junctures, places perceived to possess *puha* on multiple accounts, often functioned as *axis mundi* of the sorts described in narratives of power and crisis quests (e.g. Whitley 1992b:102; Whitley 2000a:77-80, 82-83; Waller 2004:47-48; Garfinkel and Waller 2012:44-45), sharing many features with Mesoamerican manifestations of *axis mundi* as well (Moyes 2006). Substantial power was acquired not simply by embodying one or more of the practices/experiences listed, but by journeying on pilgrimages to places of power such as *pachki* (doctors' caches, *tukuutüah* in *Tümpisa*), mountaintops, waterholds, and calderas, so that the high intensity of animic power might reveal itself (Gayton 1948:168-169; Hultkrantz 1986:38; Dayley 1989:306; Whitley 1998; Carroll et al. 2004; Huffman and Earley 2017:4).

Nagualism

Animistic ontologies recognize, and sometimes personify other-than-human agency in the natural world (see discussion above). These agents are manifestations of the animating force (*puha* or *poha*, for Numic speakers). Commonly among animists who engage in shamanistic practices, ritual specialists and spiritually potent practitioners may acquire one (or usually more than one) of these other-than-humans as a helper companion (Whitley 2000a:25-29). Hulktranktz (1983) describes the belief of a perpetual supernatural presence who accompanies and aids the practitioner as ‘nagualism,’ after the Hispanicized Nahuatl word for spirit helpers, *naguales.* Different *naguales* offer different special powers to their hosts, at least partially based on the (often animal) form they take (Driver 1937; Kelly 1938). Consequently, *naguales* are a highly personalized experience of layered metaphors describing cultural expectations (Liwosz 2017:198). Numic nagualism is thoroughly attested to in accounts of their shamanic religious system (e.g. Driver 1937:102-103, 126; Kelly 1938; Steward 1941:322; Hultkrantz 1983, 1986, 1987). As applied to both Numic and non-Numic Native Californian religions, the more generic term “Spirit Helper Complex” can be applied (Whitley 2000a:25-29). As a point of order, although *nagual* is an Uto-Aztecan word (Nahuatl), it is used here as a etic categorization constructed to approximate the practice and experience of the phenomenon.

Numic *naguales* first materialize out of Lewis-Williams and Dowson’s (1988) altered state Stage 1 mental imagery during either sought (vision questing) or unsought (dream or epiphany) visions. The experience of Stage 1 imagery is demonstrable in fMRI scans as Turing patterns, or self-referential geometries (Turing 1952; Froese et al. 2013). During Lewis-Williams and Dowson’s (1988) Stage 2, it begins to embody its animal or personified form, as cultural knowledge defines expectations connecting its apparent image to perceived attributes. Despite cessation of the initial ritual, the *nagual’s* presence can often persist (Kelly 1938). Such persistence is consistent with Froese et al.’s (2013) observation that Turing Instabilities observed in neural activity via fMRI during both drug-induced and meditation-induced altered states can behave in a self-reproducing manner, even after the initial stimulation is removed. These geometries in both neural activity and subjective experiences are understood as a natural outcome of the diffusion of neurotransmitters and/or psychoactive compounds (entheogens) from a state out of equilibrium. Patterns Lewis-Williams and Dowson (1988) observe likely reflect interactions between the almost rhythmic or cyclical diffusion wakes and various coordinate systems of synaptic integration structured differently dependent on specific regions of the central nervous system (Froese et al. 2013:211).

A likely scenario is that Uto-Aztecan cultural recognition of *naguales* encourages shamanic specialists to socially engage with the trance-induced Turing activity; in doing so, the practitioner reinforces neural pathways useful to its continued consideration, similar to forging a social bond. Deliberate and regularly repeated meditative dissociation following the initial visionary experience helps maintain contact between person and *nagual* (Whitley 2000a:28-29; Liwosz 2017:198-199), in a way potentially expressed as "can't get them off my mind."

Naguales, in turn, experience and are experienced. The same Turing instabilities that when active in the parietal lobe's V1 (visual cortex) are implicated in Lewis-Williams' entoptic phenomena occur across perception. *Naguales* are consequently seen, heard, and felt. The phenomena are inherently synesthetic in that they are experienced as a presence non-specific to any singular sense. Stimulus inducing the experience of initial contact, therefore, benefits from multisensory engagement. In other words, while it is technically possible to use audio droning alone to dissociate, or the proprioception of dancing to encourage ecstatic feelings, coupling multiple such sensory feeds encourages a more perceptually complete experience. After initial introduction, the experience persists through meditative maintenance in which mindful symbolic engagements take precedence over psychoactive substances.

Possession of powers imparted by a spirit helper made one valuable not only to the local community, but neighbors as well (Whitley 2000a:26-27). Exchange of practices and rites which could only be performed by certain specialists (e.g. Kelly 1938) was known, such as in instances where a rain shaman might be brought in from a neighboring community. This sharing of supernatural specialization linked Western Shoshonean and Northern Paiute communities with their neighbors (Harris 1940; Olofson 1979). Because these powers are granted by the *naguales*, the shaman-spirit partnership was a real, powerful, and impacting force in Basin societies (Miller 1983:79; Whitley 2000a). Not only do *naguales* grant *puha*, they exemplify how other-than-human agents *embody* it (e.g. Hultkrantz 1986:38; Liwosz 2017:198, 205).

Coming of Age

Puberty rights were known throughout indigenous Californian communities at the time of contact. Usually, these would be gender-segregated events, with boys and girls celebrating puberty separately. Gendered segregation of puberty rites also included variations upon related rock art themes, as well as administering entheogens (Lewis-Williams 2002:170-171). Numic girls were typically sequestered in a shelter outside, possibly north of the village or camp (Driver 1937; Steward 1941). For some Native Californians, including coastal Chumash, the pubescent girl would smoke tobacco and paint red pictographs after a race (Kroeber 1908:174-176; Steward 1929:207; Strong 1929:299; Schaafsma 1985:260; Whitley 2000a:27, 86-87). Others report use of lithophones (ringing rocks) as a part of the ritual (e.g. Hedges 1990; Devereux 2008). Van Tilburg (2012:172) notes that pubescent Northern Paiute girls might carry a "spirit stick," often painted white, with sagebrush and beads as ornaments.

For boys, competitions may have been involved. Garfinkel and Yohe (2012:212) state the winner of a boys' foot race memorialized his victory in rock art. Indirect lines of evidence can be inferred from pigments used on the bodies during these rights. Miller (1983:68) reports that for Western Shoshone Gosiute, both boys and girls were painted red at their corresponding puberty festivals. White paint would be used before a vision quest – a separate ritual which may nonetheless have occurred in conjunction with such a life changing event. These rights existed within the larger religious system, and Myers (1987, 1997:37) has thoroughly linked both male puberty and female menstruation with oral traditions, specifically "Coyote Begets Indians" otherwise known as Series I. Consequently, we must consider that sacred stories - such as those included later in this chapter - may act a script, which the initiate may perform by embodying its events, during a guided experience (Liwosz 2017:199). Discussed more in detail later, Series II also demonstrates multiple elements of coming-of-age rites, and may be the girls' variant. Given these connections, discussion in Chapter 7 covers the case for Series III as a third path, in part laying out a potential course for non-binary "two-spirits." Puberty initiations also articulate with themes of fertility and fecundity, a recurring theme through Numic religious discourse.

Ceremonialism

During the first century of sustained Euro-American contact, indigenous Great Basin inhabitants hosted large gatherings involving feasting, song, and dance (e.g. Driver 1938; Steward 1941). These events were an integral part of shared religious practices, and so suggestions that they are intimately entwined with both sacred narrative (e.g. Hill 1992), and visual culture (e.g. Garfinkel et al. 2007) should not be surprising. Both periodically recurring, and more stochastically scheduled public ceremonies occurred. Dominating communal gatherings of more regular periodicity, seasonal observations included the arrival of the rainy season, seed-and-nut harvest, and broadly annual resource cycles (Schaafsma 1985:261-263). Such was the case for a prominent and well-used boulder bearing bedrock mortars, in Furnace Creek, Death Valley. Still partially exposed, anonymous modern-day tributes of mesquite pods left with the yellow stone hint at aspects of ceremonies that continued into the twentieth century. Contents of these seasonal rights often included festivities such as communal feasting, dances, games, and gambling (Quinlan and Woody 2003:379). Some of these elements were, however, shared with events not necessarily (or, at least, exclusively) linked with a narrow window of the year, such as send-off ceremonies for hunting parties (Grant et al. 1968:14; Van Tilburg 2012:155). Although each celebrated occasion may come with its own associated songs, narratives, and performances, Round Dance/Circle Dance songs seem to have been regularly associated with a variety of ceremonies. In the Basin and Mojave Desert, residual traces of these ceremonies include geoglyphs, bedrock grinding features, and middens (Hunt 1960; Altschul and Ezzo 1995; Giambastiani et al. 2005). Some (e.g. Garfinkel 2014; Garfinkel et al. 2016:200) report associations between ceremonial locations and parietal visual culture of the Americas, especially pictographs. Parietal art, among other rock manipulations such as rock alignments, rock cairns, and intaglios, complimented natural prominent geological formations in demarcating Numic religious sites – both ceremonial and shamanic (Carroll 2004:135; Allen 2011).

Large gatherings offered opportunities for sociality and exchange between people who otherwise operated somewhat disconnected from each other. Leadership – usually in the form of a male ritual adept (e.g. *po'hage/ puhakanti/ huuiyagadi*) – organized events with distantly neighboring communities (Whitley 1994). Many members of the community participated, however these participants varied on the nature of the ceremony. Consequently, ceremonious festivals were crucial events integrating domestic religious practices on the community level, and for spanning socio-political differences.[41] Precedence for household archaeology addressing diachronic changes in symbolic and religious expressions in visual culture are ubiquitous in other culture areas (e.g. Liwosz 2009), however the relative mobility of Basin peoples – and fluid nature of community membership – has hindered such an approach. The preference for base-camp strategies in the Owens-Death Valley span (Bettinger 1989), however, results in what Schlanger (1992; c.f. Reynolds 1996:79, 158) terms "persistent places," providing the prerequisite potential for re-use and spatial structuration necessary to attempt such a study in the future.

Given abundant archaeological literature focusing on hunting practices, pre-hunt rites remain a popular topic (e.g. Garfinkel et al. 2016). Building on earlier interpretations that linked rock art sites to sympathetic hunting magic (e.g. Grant et al. 1968), many current renditions of the ceremonial interpretations for rock art emphasizes big game hunting, and intensification upon world-renewal (Garfinkel et al. 2016:196). With rutting season coinciding with the onset of the rainy season, congregating herds of bighorn were understood to be harbingers or bringers of rain (Myers 1987:96; Gilreath and Hildebrandt 2008). Bighorn, as the categorical term for large game in Numic languages (Goss 1972:126; Garfinkel and Austin 2011:15), accrued sufficient significance to embody fertility and renewal of game as a master of animals (Garfinkel et al. 2016:196, 201). It is on these grounds that the existence of an Archaic Period hunting cult in the Cosos is argued. In the specific instance of the

41: although Numic peoples were generally egalitarian during ethnohistoric times, in Chapter 7, Political Economy commentary, I lay out a case for incipient heritable inequality during the Coso Fluorescence.

hunting cult, ritual intensification is suspected of creating a positive feedback loop in response to evidence of *Ovis canadensis* population decline, resulting in game population collapse and the cessation of the ceremonial complex (Gilreath and Hildebrandt 1997; 2008; Garfinkel et al. 2007; e.g. Garfinkel and Austin 2011; Garfinkel and Yohe 2012).

Again, however, hunting was not the only occasion on which inter-community ceremonies were held. Although aspects of human ecology are implied by the seasonal ceremonial system, even subsistence when defined broadly did not encompass the whole suite. Not to be confused with first menstruation observations, girls' coming-of-age ceremonies celebrated initiates' entry into maturity and emerging sexuality (Steward 1929:207; Whitley 1992b:95; Van Tilburg 2012:255-256). For Native Californian groups including Chumash, Kawaiisu, Paiute, and Shoshone (among others), these culminated in painting pictographs. This practice may not be wholly disconnected from a Paiute seasonal festival held in the spring, in which associated floral symbolism invoked girls' names and metaphorical blooming (Hill 1992:133).

Public ceremonies provided a context for ideology to be embodied, and the empowering qualities of song to be realized. It was in these gatherings that cultural information could best be transferred (Clemmer 2006:30). Adept oration at these events provided opportunity to gain prestige as an orator, but also fostered cooperative interactions. Often inspiring an overall sensation of ecstasy, groups at these events manifested Durkheim's (1959[1912]) principle of *collective effervescence.* Coupled with the exhaustion of dancing and singing for days on end, the physical and mental effects were well known to inspire religious experiences *vis-a-vis* comparable mechanisms to shamanism. Emic understandings described the effects as cooperative, increasing empathy and religious feelings as participants amass power and concentrate it within the circle[42] (Olofson 1979:19; Miller 1983:80).

Whether Pine Nut ceremonies in the central Great Basin, Death Valley's Mesquite Festival, or the syncretic Sun Dance as practiced by Wind River Shoshone on the Great Plains (e.g. Hultkrantz 1983, 1987), these group gatherings persisted into the twentieth century. Hybridization with – or perhaps more accurately, being supplanted by – a pan-Native American pow-wow-and-rodeo movement occurred relatively late (Clemmer 2006:30-31). This transformation was preceded by a ceremonial system Euro-Americans often referred to as the Fandango, which grew out of the Pine Nut festival (*ibid*). Perhaps more famously, however, the 1888-1890 Ghost Dance[43] – another pan-Native American religious movement – began with Paiute Jack Wilson (*Wovoka*). Utilizing familiar elements of the Round Dance tradition (associated with a variety of ceremonies), Wilson communicated the message of a world-renewal vision he had experienced to audiences enthusiastic for such change (Kehoe 1989). The foundations of one of the widest reaching ceremonial movements – the Ghost Dance – resting upon the Round Dance tradition of songs is not insignificant. For

42: particularly those of the Round Dance/Circle Dance (e.g. Hunt 1960:157, Figure 47a).
43: not to be confused with Wodziwob's 1870 Ghost Dance.

Wind River Shoshone, Round Dance songs belong to the *Naraya* genre (or *nua hupia* in Crum 1980). Crum et al. (2001) distinguish between *Natayaa hupia* for the Ghost Dance, and *nua hupia* for the Round Dance. There is significant evidence of a long-lived tradition of religious symbolism encoded in *Naraya and nua hupia*, reaching back deep into Old Uto-Azteca (Hill 1992:126-127, 140; Vander 1997).[44]

Totemism

Although not yet widely adopted, recent discussion initiated by Coulam and Schroedl (2004) considers that certain expressions of visual culture may indicate totemic beliefs and practices. Durkheim (1959 [1912]) outlined the first set of criteria for totemism, which he believed to be the fundamental progenitor to virtually all religious practices. This particular religious expression inherently involves elevating mood through shared experiences of group gatherings, and is thus a special case of ceremonialism. Elevated emotional states are reached through festive shared experiences, in the same "collective effervescence" described under ceremonialism. Communal objects and signs are incorporated into these shared events, associating these widely-recognized signs with both the ecstatic state and social unity of the moment. The outcome is that these signs come to stand-in for, or prompt recollection of, both the ecstatic experience of sociality, and the group identity forged of shared experiences of the ceremony.

44: Demonstrating the power of these songs, Hill (1992:121-122) recounts an instance of a Havasupai man taken ill while traveling in Utah to learn Ghost Dance songs from Paiute. His symptoms can be understood as a metonym for great antiquity of the loaded symbolism.

Two variants on totemism are currently recognized: social totemism involving lineage identity but no magico-religious component, and increase totemism comparable to ceremonial rites of renewal but with an emphasis on a singular item or image (Coulam and Schroedl 2004:53). Willow split twig figurines have been recovered with peculiar regularity, leading to suggestions that these represent a diagnostic component of a regional religious complex – specifically one or both of these variants. Thirty Precontact sites are known to have hosted preserved figurines of these items of unusually standardized manufacture. Among these 30 sites, roughly 400 such figurines have been recovered (Garfinkel et al. 2016:193-194). The standardization resulted in only two methods of production: larger Grand Canyon style from what is now Arizona, California, and Nevada, and smaller Green River style exclusively from Utah. Coulam and Schroedl (2004) conclude that out of these 30 sites, 16 exhibit signs of totemism, 14 of which appear connected to rights of renewal. Garfinkel and others (2016) propose that one component Coulam and Schroedl's dataset, the split-twig figurine from Newberry Cave (CA-SBR-199), links Coso Range bighorn petroglyphs with the proposed Grand Canyon area totemic complex.

The totemism proposition has the benefit of re-visiting Hunt's (1960) too-often ignored connections between Basketmaker and Eastern California, although neither set of authors appear familiar with Hunt's works. Unfortunately, whereas Death Valley is more or less directly in between Coso Range and Lost City Pueblo, SBR-

199 is significantly further south. Geographically, the position would bypass Coso from the Grand Canyon.[45] SBR-199 is an outlier on a number of accounts: it is approximately 160 km (100 mi) south of Coso, outside of Basin/Mojave convergence (see Hildebrandt and McGuire 2002:233 figure 1). It is by far the geographically most distant Grand Canyon style figurine from the proposed ceremonial center along the Colorado River in Northern Arizona (see Coulam and Schroedl 2004:46); the SBR-199 figurine's context appears to be domestic, much more consistent with the distant Green River social totemism complex than the presumed Grand Canyon increase totemism complex (*ibid*). The site is geographically within Patayan territory, rather than the Ancestral Puebloan ("Anasazi") implicit in Coulam and Schroedl's model. Finally although roughly contemporaneous with examples to the east, SBR-199's carbon samples range from 3,320 ± 180 BP to 2,970 ± 250 BP (Coulam and Schroedl 2004:50), well before Coso's fluorescence from 2,200 BP to sometime after 1,350 BP.[46]

Totemic beliefs overlap cases of animism. The object (or sign) at the focus of attention becomes an animate object, often imbued with supernatural agency. Although compatible with ceremonialism and animism, totemism often conflicts with nagualism. Both nagualism and totemism account for ways in which identity might be

45: Nonetheless, this would remain consistent with Hunt's (1960:174) position that the Mohave were influential intermediaries in the coast-interior exchange systems, thereby reinforcing connections between ethnographic Mohave people, and the powerful political economy of the Patayan presumed by many to be their direct ancestors.
46: Whether or not Totemism is consistent with known Kawaiisu/Coso Shoshone religion may be a moot point, as the theory's proponents tend to emphasize population discontinuity.

forged in a religious context. The former, however, largely accounts for the shaping of personal identity as both in relationship to, and as an embodiment of, the spirit helper; the latter by contrast accounts for how shared group identities arise out of collective ritual. In each system, there are many instances in which an animal can be a powerful stand-in for this new identity. In nagualism, this animal may represent a complex metaphor for the powers of the person linked with it. In totemism, the animal is more of a clan sign, less describing traits, and functioning more as a primordial ancestor. Coulam and Schroedl (2004:53) distinguish hypothetically similar figurines depicting totems versus spirit helpers, in that the latter, unlike the former, would not be transmitted intergenerationally.

Other Evidence of Religious Complexes

An epicenter of rock art research, Coso Range and its immediately surrounding area features one of the largest and densest concentrations of petroglyphs in North America. In addition to the mountains of Coso Range, the area also includes adjacent places such as China Lake, and Little Lake. Located in valleys at lower elevations, these lakes/lakebeds provided resources crucial to the seasonal rounds of those who who hunted, foraged, and procured toolstones in the Cosos. Hot springs and other prominent features of the Coso area are also referenced oral tradition, as integral to the storied moment of creation, and associated with both winter and early spring in annuaol cycles. Eastern California Paiute and Shoshone both recalled a narrative involving Coyote arriving in the Cosos. Coyote, winner of a race to Coso Hot

Springs, tossed losers, including the Sun, into the fire. To stay safe, all the animals stayed indoors during the darkness that followed. Coyote sent Lizard out for reconnaissance, and Lizard returned reporting berries had already ripened. Mallard and Goose sang to bring the light back, illuminating a verdant world (Steward 1936:415; Garfinkel et al. 2016:205). This narrative marks the hot springs at Coso as a sacred place, and possibly a winter refuge. The sacred nature of the Coso area is also understood in terms of dense supernatural power. According to a Timbisha Shoshone consultant, "it is also a place where where petroglyphs are known to occur, with new ones added by spiritual forces all the time," (Fowler et al. 1995:55, in Whitley and Dorn 2010:14). Accounts such as this one directly connect the spiritual and religious significance of the Coso range with petroglyphs.

Oral Tradition

Although the historical applicability of oral traditions was often dismissed by scholars throughout much of the twentieth century, recent efforts to integrate this line of evidence with that of the archaeological material record are increasing in frequency (Echo-Hawk 2000:270). In this section, select oral traditions are recounted in abridged form, as an effort to make just such an integration. Each is organized under a titular theme, however this presentation is more rigid than how these stories would have been traditionally remembered and retold. Each of the instances below is based on a variety of stories from different informants, told to different ethnographers, at different times, in different geographies within the research region. Individuals and communities would have recalled different variations of the same core story. As is common with Native American oral traditions, the tales below would have likely been "living" narratives, whose recitation also might vary each time based on storyteller's prerogative (Echo-Hawk 2000:273). Rather than becoming mired in such nuance, the discussion follows a convention by which a single myth is understood to be comprised of all of its variants (Lévi-Strauss 1963:217; Myers 1997:34). Again, in the context of this paper, myth is not used derogatorily nor to imply doubt; instead, it is used in sense of an enduring sacred history rich in meaning, set in an earlier era.

David (2016:69), a rock art scholar of Klamath-Modoc heritage, expresses that the use of indigenous myth brings native voices into research from which these voices had previously been excluded. These sacred narratives encode customs, motivation, and ideology, as expressed in action and material culture – including rock art. Knowledge of these sacred narratives imbued shamans with their power (David 2016:22). While Klamath-Modoc and Numa are of different ethno-linguistic families, similarities in the integration of narrative and song into religious practices and institutions validate the parallelism (See Whitley 2000a:20-21). Furthermore, Hill (1992) expressly identifies the Uto-Aztecan (and specifically Numic) religious weight of song and narrative. Consequently, a thorough discussion of parietal images must consider its perceived potency as derived from oral traditions.

Recitation of oral traditions took various forms. For Uto-Aztecans, oral traditions were recounted primarily in three ranked genres (Hill 1992:119-120). The least formal version, narrative, contains the plot but may lack many of the descriptive embellishments. Much of what we have available through scholastic sources is in this "impoverished" form. Oration as a performance ranked between narrative on the low end, and song on the top of the hierarchy. Songs could be sung by performers, and sometimes the audience. Unlike narration and oration, song is identified as an integral part of collective ritual, shamanistic practice, and individual power quests (Hill 1992:120). Similar to the scenario with Klamath-Modoc, Uto-Aztecan (and thereby Numic) song thus contained spiritual power, or *puha*. It can consequently be assumed that important traditions – such as creation and emergence stories – would in their fullest expressions be performed as song. While the song format is not presented below, it should be implicitly considered as a possible means of expression in most instances wherein this study references traditional stories.

For many such Numic verbal traditions, it is the narrative version which survives recorded in Western resources; oration, poetry, and song are not so readily available. Myers (2006:14) argues that Numic myths were ritual in their own right. Set and setting were typically constrained to nights and winter, and the oration had to be completed in its entirety (*ibid*.) It is thus an unfortunate but necessary shortcoming of this chapter to provide only a synopsis of choice tales; it is necessary in the interest of space and conciseness, and unfortunate in the impracticality of comprehensiveness. Those sacred narratives covered (which may be referred to by other names elsewhere) are: Sun Spider the Creator as recounted by Huffman and Early (2017), the three storylines or “series” of the origins of people as recounted by Lowie (1924; in Myers 1987), and select references to acoustical phenomena, particularly the story of Teugai and Togoav as recounted by Waller (2004, 2012). Although the Sun Spider and Origin Stories (and to a less extent other included narratives) fit a class of narrative that Robert Lowie once denounced as “pseudo-histories,” embedded cultural elements and abstractions do not negate the potential for their historicity (Echo-Hawk 2000:274).

Sun Spider

As one of the primary connecting forces between life-affirming, supernaturally charged, sacred places, *puha* is fittingly laden with layered meanings. Spiderwebs are employed as a metaphor for its distribution (Miller 1983:79-80; Huffman and Earley 2017:3-5). The invisible watery web of *puha* was lain and woven at the time of creation, in what Huffman and Early (2017:5) describe as concentric circles and radial lines. These radially patterned webs of *puha* were lain down by Sun taking the form of a spider, much as Coyote in another legend morphed into a water spider to ferry humans (Miller 1983:79). Because the *puha* web’s construction is tied to the moment of creation, it links the Sun Spider (sometimes a black widow, as in Chemehuevi traditions) and the Creator (Laird 1974:20; Miller 1983:70). Reading rock art ethnographically, Huffman and Early (2017) demonstrate petroglyphs referencing spiders and interpret certain geometric designs to mimic this web-like distribution of *puha* at the Uto-Aztecan and likely Numic Apishapa Canyon sites. They take care to note that common entoptic imagery of webs experienced during altered states may likely have invoked a culturally transmitted notion of the *puha*-spider-web connection. In several versions of the Series I origin story, Coyote must transform into a water spider in order to cross large bodies of water – thus associating the potential progenitor of people with this web of *puha* (Miller 1983; Stoffle et al. 2011:16).

Uto-Aztecan Hopi oral tradition also features spider symbolism linked with supernatural agency and creation. According to Waller (2004:48), echoes are the product of *Palongawhoya*, keeper of order in the world, who was sent by Spider Woman as a means to demonstrate "all sound echoes the Creator" (Waters 1963). When *Palongoawhoya* did so, the earth and its axis trembled at vibratory centers, the universe quivered, and the world became an instrument to praise the Creator (Waller 2004:48).

Not only does this Hopi narrative link the spider-web symbolism with the concept of the Creator, but it expresses this connection through sound, echo, and song. Interestingly, it suggests a topology in which these sounds resonate with particular vibration points, implicitly increasing the power of song to reach divinity at key locations along crossing lines and web-like imagery. *Palongoawhoya* embodies rites customary in inducing an ecstatic state of mind: singing. Given the multisensory descriptions of sound as vibrating the world, we can conclude this song was haptically felt, as well as heard. Together these two senses synesthetically blend to aid in inducing the transcendental or ecstatic state in adoration at creation. Such synesthetic experience of sound would best be encountered at resonant spaces, which may be the vibratory centers to which Waters (1963) and Waller (2004) referred. As Huffman and Earley (2017:5) note, the Numic worldviews consider landscape features that seem alive as imbued with *puha*; other-than-human agents are thus *puha*'s manifestation(s), often personifiying landscape agency (Liwosz 2017:198). Web-building spiders and *Palongoawhoya* are both manifestations of these agential landscapes, but also projections of the agency of Sun Spider and Spider Woman, respectively. If we make the assumption that the Numic Sun Spider and Hopi *Palongoawhoya* stories are in fact both rooted in a common narrative (or more likely song) of shared cultural background (cultural contact and/or common Uto-Aztecan ancestors), then we can understand them better by decoding one with the other. It then follows that these themes are religious metaphors describing rites by which resonant singing in key locations forged of the forces of creation results in a synesthetic experience bridging haptic and acoustic sensations which induce or inspire an exceptionally divine experience.

Origin Stories

Series I

Complimentary to – but not to be confused with – the creation stories are Numic origin stories. Like Sun Spider distributing the web of *puha,* or another about when "Sagehen saves fire" (see below), origin narratives take place in the time "when animals walked like people," during which the topological order of the world was just being established. In this sense, the origin stories fit the defining criteria of "myth" outlined in the current chapter's introduction: set in a prior time, with supernatural agents; Miller (1983), Myers (1987; 1997; 2006), and others (e.g. Whitley 1982, 1992b, 1994, 2006) analyze these narratives' social weight in great detail. For the non-professional, however, the word "myth" can be misleading in this context. As Miller and Whitley argue, and as covered in Chapter 7, with proposed refinements, these narratives have multi-tiered meanings: to adolescents, there are lessons about entering into adulthood; to adults, the closings list neighboring peoples and the directions in which they live; to historians and elders, there are memories of very real past events in very real places (c.f. Historic Preservation Committee of the Timbisha Shoshone Tribe 1994:5 regarding Ubehebe Crater), both of which have come to define Numic communities and catalyze linguistic and geographic differentiation (c.f. Finger 2012:185 regarding migration). Myers (1987) compiles several variants of the Series I origin story, invariably starring Coyote. I have chosen among these to summarize variant (M7), from Death Valley (Myers 1987:177), as it seems most relevant to INY-3074. Additionally, below, a significant Panamint Valley version follows.

> Coyote had a home. He had many skins from hunting rabbit. He began to make the blanket, but a shadow crossed the door. Outside, he saw a woman with a bunny tail on her buttocks running. She went west, and he chased her, all the way to the "large water." At the shore, she sat and said, "I will lie on my back and swim across and carry you over." When he moved, she dumped him into the water, but he was ready. Coyote turned himself into a water skate

> (insect), and beat her across. Coyote came to a tree, and made a bow, tied it with "green stuff from the water," and made some arrows. With cane arrows, he brought ducks to the women's house. She lived with her mother, and disused fox fur quivers were along the wall.[47] The women ate, and disposed of the bones…[48] Coyote made advances, but failed.[49] The next morning, he took his bow, hunted a small sheep, and brought it back, hiding the neck. He made successful advances that night. In the morning, the women's bellies were large. The older one wove a basket jug, and they put the babies in it. They told Coyote to go home, and to carry the jug with him; he did. He went to the ocean, he went to his home, and he went to Owens Valley. He heard a noise, and stopped to open the jug. Indians came out. He left the remaining Indians at Death Valley. (paraphrased from Myers 1987:177-178; Whitley 1982:263)

As an addendum to the the Myers account of the Death Valley Series I variant, the federally recognized Timbisha Shoshone Tribe provides detail otherwise omitted. Significantly, Timbisha today remember that in the closing scene, Coyote carried people in a *wosa* (burden basket, as opposed to jug). At the bottom of Ubehebe (volcanic) Crater, called *Tümpingwosa* (Dayley 1989:322), on the northern end of the Cottonwood Mountains, people emerged from both basket and crater to spread in all directions and populate the Earth as Coyote rested from the exhausting hike (Historic Preservation Committee of the Timbisha Shoshone Tribe 1994:5; Finger 2012:185). It may be significant that in the Tümpisa (Panamint) language[50], among women's names is *Kwasikantün*, or "Got a Tail" (Dayley 1989:82). Throughout documentation of Numic origin myths, women's names are regularly not recorded (presumably omitted in the telling). Rather than propose this may be the name of Coyote's love

47: Implying their original owners are dead.
48: Myers' source, Julian Steward, left a note here "sexual episode deleted."
49: Myers' source, Julian Steward, left a note here "sexual episode deleted." both episodes are of vagina dentata, and (despite Steward's reservations) are symbolically important.
50: Timbisha is the Federally recognized tribe; Tümpisa is the language, as recorded by Dayley; Panamint in a loosely defined ethno-linguistic group prior to the reservation system.

interest in Series I (although this well could be), it seems likely the name is in fact a *reference to* these origins.

Many similarities exist between the Death Valley origin stories, and those of surrounding areas, including Amargosa Valley, Pahrump Valley, and Panamint Valley. Versions are not all the same, however, and ambiguities may paradoxically be created and clarified in cross comparison. For example, Myers (1987; 1997) states the "large water" described is an ambiguous way of describing both lakes and oceans. For Southern Paiute of Pahrump Valley, this is expressly the Pacific Ocean (Stoffle et al. 2011:15). In this version, the basket is eventually brought to *Nuvugantu* (Charleston Peak), by which time the basket was nearly empty. Wolf (c.f. Kroeber 1908:240 indicates Coyote) used remnant ingredients to strengthen the remaining people into Chemehuevi and Southern Paiute, staining their skin dark in the process (Stoffle et al. 2011:15).

The following synopsis of the latter reflects both an emphasis on a few differences between select variants, as well as the shortness of the original collected:

> Once water covered the Earth. It dried quickly, and this was the time birds and animals were as people. Walking along the Panamint Mountains, Coyote met Pabon'-posiats ("tan house"), who was carrying a jug of water. When he asked for a drink, she pointed at a place about a half mile away where she would give him a drink; when he got there, this scene repeated, time and again, until they arrived at Pabon'-posiats' home. She lived with her mother. The women tried to strike him, but he dodged; this is when Coyote noticed many bows and arrows around the walls[51]. The first night, Coyote's advances were frustrated (note: probably another deletion of vagina dentata in the original). At Pabon'-posiats request, he fished and hunted duck the next day. By morning both

51: Just like at Yahwera's house (Whitley 1992b; 2000a:78-79; Garfinkel and Waller 2012). see also footnote 47.

> Pabon'-posiats and her mothers' bellies were large[52]. The babies were birthed into a water jug, and Coyote was told to carry them but not open it. Feigning thirst, they tricked him into opening the stopper. Coyote lost a piece of paper as the people spread out to become the different tribes. (paraphrased from Myers 1987:175)

The Panamint version deserves a few remarks before proceeding. First, the chase following water – be it a stream, river, jug, or lake – is common to, if not defining of, the beginning of Series I. In another version, this manifests as "a waterway flowing off a mountain peak" (Miller 1983:72) emphasizing three qualities linked with *puha*: water, mountains, and kinetic flow. Second, it is peculiar in that fish and duck satisfy the women, when in virtually all other versions big game is required. Lowie (1924) notes that the loss of paper in this version indicates an old knowledge of writing existed, but was lost. This may not be in the Western sense of writing proper, but in the sense of "rock writing" and other related mnemonics, and will be explored in Chapter 7. Overarching themes of Series I include exogamy, male adolescence, overconsumption (non-reproductive man-eating cannibals), and overt sexual symbolism (Whitley 1982; Myers 1987; 1997). Myers (1987:93-93) holds that the breaking of the vagina dentata represents menstruation as a marker for the transformation from non-reproductive to reproductive, as opposed to the more obvious breaking the hymen (which, presumably, happened for the mother at least well before the story commences). Thus, it is Coyote who is the origin of menstruation (Stoffle et al. 2001:15). That Coyote features prominently is no

52: Double entendre

accident – he is a personified metaphor for ideal human etiology (Whitley 1982; 1994; Myers 1987; 1997).

Series II

In his Ph.D. dissertation, Myers selected a variant collected by Isabel Kelly at Pyramid Lake from Billy Steve, who was *Kuiyui'tikadü* (Sucker-eaters band of Paiute, following Numic tradition of diminutive names for neighbors based on idiosyncratic food habits; see also Bettinger 2015:92-93). It seems Billy Steve's reputation as a skilled orator had earned him the respected reputation of equivalent to *pakwinavi* (Panamint title for both skilled hunters and great orators, see Chapter 7). It was this reputation for elaborate retelling and creative interweaving with other narratives which seems to have set Billy Steve's version apart from others, and informed Myers' decision. Unfortunately, the following executive summary will not do Billy Steve's skilled wordsmithing justice. As collected by Kelly and recounted by Myers (1983:109), Steve's rendition opens with a synopsis of a typically separate flood myth, "Sagehen saves fire".

> …After the floodwaters receded, the antagonist, a cannibal giant named Numuzoho – Paiute for people-pound – is introduced. Numuzoho approached from the south to interrupt a large group of people at a "big tule camp" playing the handgame (traditional gambling guessing game).[53] The protagonist, a woman who was camped by herself and whose name is not recorded, heared Numuzoho loudly bragging of his appetite for Indians by calling "wi moho moho." She tried to warn the gamblers what she had heard, but they paid no heed as she hid under a winnowing tray in a hole with her seed stash. As Numuzoho killed the gamblers, the woman saved a baby. As she and the baby made an escape to find a man for her to marry, another cannibal ates the child

53: All of this implying a communal festival of sorts.

> while it lay unattended at the fireside, as the protagonist gathered roots. Making another escape, the protagonist found shelter with Beaver. Cannibals arrived at Beaver's house, having been able to track her from her shoe prints.[54] Using a long stick, Beaver threw the protagonist to the house of the former's sister, Gopher. When the protagonist headed out again to find herself a husband, Gopher warned her not to disturb a head and a winnowing basket in the trail along the way, she did not heed Gopher. Pursued by the basket and skull, the protagonist reached safety with Beaver and Gopher's brother, Woodrat. Hearing the "tsai a tsa" sound of the approaching basket, Woodrat painted his house yellow for protection.[55] The skull and basket shattered against the protective coating. Once the protagonist departed again, she was finally able to safely arrive at a man's house. He asked her to what tribe she belonged.[56] The man denounced the food outside,[57] and fed her mountain sheep, and sometimes deer. For a time they were the only Indians, for the cannibals had killed all the rest. In time, the couple had four kids. As their offspring – two boys and two girls – grew from children to adulthood, they constantly fought; the protagonist and her husband begged them "Stop, don't do that; you are brothers and sisters." Said the father, "if you won't stop, I'm going to the other side of the clouds,"[58] and then he did. The children spread far, and became the Paiutes and the Pit Rivers (paraphrased from Myers 1987:109-112; 1997:40-31).

Although cannibalism is implicit in Series I (both the empty quivers, and *vagina dentata*), the degree of explicitness in Series II bears addressing. In the simplest way of saying, Numa considered cannibalism generally repugnant (Clemmer 2006:35). It was not unknown, however, and among the Numa the label was used as a narrative device to describe violent others. An exemplary instance of this application is its use to denote early Euro-American settlers and especially United States Armed Forces. Encroachment-driven famine (mining, pinyon decimation for charcoal to smelt ore,

54: woven soles of Numic footwear were well known to express group-specific patterns, so an out-of-place tread imprint would be noticeable.
55: Woodrats urinate in their nests, creating a hard, amber-like coating (Myers 1987:117; 2006:99).
56: No reply is mentioned.
57: probably because it was the food of cannibals.
58: A euphemism for death.

ranching to support clearing native cereals), combined with disease outbreaks, decimated Numic populations in the middle nineteenth century (Zedeño et al. 2003). This led to a Kawaiisu, Paiute, and Shoshone response which would come to be known as the "Owens Valley Indian War." At its termination, Western Shoshone and US Government forces signed the Ruby Valley Peace Treaty (Clemmer 2006:33). Upon the surrender of about 1,000 allied Numa, Natives were taken captive and marched to San Sebastian Reservations, with many dying or being murdered en route (Garfinkel et al. 2007:86). Western Shoshone oral tradition of this event, retold in the twentieth century, described federal forces killing and cooking Native American captives, then forcibly feeding the cooked captives to survivors (Clemmer 2006:33-34). The Cannibals in Series II, then, can be understood to be aggressors, and this is a key concept to arguments made in Chapter 7. It also implies over-consumption (Myers 1997:38), and the recurrence of this theme in Series I and II may support hypothesized over-hunting of large fauna during the Late Newberry/Early Haiwee – although that is only if we allow the consideration that some or all area's "Pre-Numa" were, in fact, ancestral Proto-Numa.

Series III

Generally, Series III receives less scholastic attention than Series I and II. Its contents are generally more varied, especially in latter portions of the narrative, beginner when Coyote delivers the child. Additionally, its divergence from the gender binaries underlying Series I and II may simply be difficult to digest for some.

It is interesting in the decades following his dissertation, Myers (1997, 2006) drops all mention of Series III; no note or reason is given. A different aspect of Series III is the prominence of chromaticism: green blowflies, white goose feathers, red deer/menses, and implicitly iridescent lake water. While Hill's emphasis on chromaticism in Uto-Aztecan oral tradition ought to hold true for all series of the origin stories, Series I and II seem to have mostly lost these allusions; alternatively, the relatively rich coloration of Series III may itself be of cultural significance, in which case the disparity would be deliberate. The account below is a synthesis of essential components, with preference given to those elements shared between as many variants as reasonable.

> Coyote lived alone in his house, collecting willow to make baskets. He killed green blowflies for buzzing, but the buzzing continued. Hearing singing in the sound, he began to sing and dance. "Maybe I am going to be a doctor," said Coyote. He heard laughter and saw geese.[59] The geese[60] gave coyote white feathers with which to fly. For reasons which vary from fear to sheer spite, the Goose/geese tricked Coyote, sending him tumbling into the rocks below.[61] His head split open, spilling his brains out onto the ground. Coyote ate the mind-mush believing it food left for him. It made him ill. Coyote filled his head with white rocks.[62] He tried to follow the geese, but could not catch up. He came to a body of water.[63,64] Here he saw dead people strewn face down on the shore. One dead woman he saw had a swollen belly; he cut her open, and found a little baby girl[65]. "You will be my sister," he told her, "you will be my baby."

59: sometimes this is Goose, sometimes Flying Goose Tribe, always white migratory waterfowl; the implications being they are powerful (water=*puha*), transient (migratory) beings of the heavens (white), connected with trance (flight). The white color led to them being called "swans" in at least one variant (Myers 1987).

60: In the Kaibab variant, the geese expressly self-identify as traveling cannibals.

61: Some variants tell of the geese actively bashing Coyote's head with the rocks.

62: the color of the stones indicates they are sacred, and likely quartz.

63: This is the same "big water" ambiguity, meaning lake or ocean.

64: In the Ash Meadows variant, the location is expressly at the foot of the Sierra Nevada

65: this is almost invariable, and seems to depict a cesarean section

> Coyote became a woman to raise the child, fashioning teats of clay, and steamed by the fire.[66] Coyote made a willow cradle to carry the child. As they traveled together, the child[67] grew. In time, Coyote fell in love, and so turned back into a man. "You will be my wife" he told the matured child. The adopted child reminded Coyote "When you first found me, you said I would be your sister."[68] Wolf was Coyote's brother. They traveled together to Wolf's house. When they arrived, Wolf offered them deer to eat. Wolf went out while they dressed the deer, and Coyote tricked his adopted daughter into getting blood from the knife on her inner thigh. "Oh no," he said, "you cannot eat meat while you are menstruating; you will get old and wrinkled. Work hard and get wood, then you will live to get old." The daughter angrily obliged, and left, but did not return. Coyote ate all the meat. When Wolf returned, he scolded Coyote for what he had done. The daughter went to a cave in the mountains, where she met a bighorn sheep. The sheep was a human man[69], and they were married. (adapted from Myers 1987:132-136, 224-242).

Although Myers (1987:132) characterizes Series III as "a negative example of origins," Series I and II also record negative actions. The bunny-tailed girl (*Kwasikantün*?) and her mother were cannibals at the outset, yet came to be mothers of the Numic peoples. Meanwhile, Coyote provides no care for his children, shirking responsibility while unsupervised. In Series II, the Protagonist's inattention leads to the death of the baby she tried to save; after that, she disturbs grave goods despite warnings not to do so. Despite these transgressions, though, she manages to become progenitor to all the Numa. In Series I and II, warnings against cannibalism are clear, and exogamy in overtly emphasized. Myers' negatives are transgressions of these boundaries. First, the autocannibalism, during which Coyote eats his own brains atop a mountain. This, according to Myers (1987:138-139) is a metaphor for the next

66: possible reference to pottery, or unfired clay *wosa* effigies like in Wallace (1965)
67: sometimes Coyote calls the female child "son," continuing themes of non-binary gender
68: In some versions they then have children, others they do not; therefor the scene is omitted
69: Similar human-animal transformation or conflation described by Whitley (2000a: 122)

transgression, endogamy, when Coyote falls in love with the daughter. It is no accident that the one to wish for (and in some variations, carry through with) incest has a head full of rocks. While this next point seems to have escaped Myers, Coyote's abuse of the meat-and-menstruation taboo drove away "son"/daughter; it is also a moment of hypocrisy which costs him. While on the surface the ethnographic record supports Whitley's (1994) well-founded proposal of androcentrism dominating Numic social order, myths like the Series III origin allude to preferences for flexibility over inflexibility when it came to gendered social mores. While not upending the androcentric model in its entirety, this oral evidence indicates a more complex reality.

Trance metaphors also abound in the origin stories, and for good reasons. All three feature characters coming-of-age, whose target audience would implicitly be pubescent youths soon facing the visionary and ceremonial puberty rites (these were separate; see Whitley 1992b: 95, 108; 1998; Whitley, Simon, and Dorn 1999). Coyote must follow the *Kwasikantün* character over several steps, usually days and nights, up towards a water source (*puha* source). This is consistent with a gradual precession during the course of a guided personal dream-quest, which would last four to five days (Whitley 2000a:83).[70] At least in the Panamint version, the lost paper with writing (as discussed) likely relates to "rock writing," undertaken both by puberty initiates and doctors/shamans on behalf of the other-than-humans with which they

70: The effects of *Datura*, or *Muippüh* in *Tümpisa* (Dayley 1989:108), may also linger this long, allowing that the first day or so was probably reserved for ritual prep work.

engaged. In Series II, Protagonist begins implicitly in menstrual isolation, camped alone outside of a festival. Her journey takes several days as well, during which she is pursued by an animate skull highly reminiscent of the “wrestling with a skeleton”[71] vision quest trial (Steward 1941; Zigmond 1977; Hultkrantz 1977; Whitley 1998:29). Most overt, however, is Series III. Coyote somewhat spontaneously acquires a song dancing, and seeks to become a shaman. White feathers of geese signify visitors from the celestial spirit realm, fitting the other-than-human manifestations experienced in ASCs (although it is unclear if they also represent actual people or not). Receiving feathers, Coyote takes flight – a metaphor for dissociative states (Whitley 1998:30), one that is iconographically indicated by bird-feet on Coso patterned-body anthropomorphic petroglyphs (Whitley 1994:363). Coyote's death in Series III, too, is a widely recognized aspect of intense visionary experiences (Lewis-Williams and Dowson 1988; Whitley 1994; 1998:30; Lewis-Williams 2002), and closely related to traumatizing visions (i.e. “bad trips”). The white stones can reasonbly be inferred to be either mineral or macrocrystal quartz, demonstrated through both battered cobbles and quartz granules embed in the majority of the region’s petroglyphs to be by far the most common percussor used in the pecked method (Whitley et al. 1999). Given the abundance of the above information, it would be impossible to thoroughly discuss the religious context of Numic maturation without recognizing abundant connections

71: Reminiscent of Winkelman’s analysis of Moche pottery depicting relations between living and skeletons, the ideological connections are nonetheless distant. More than likely, these are non-deterministic metaphors of generally universal human ruminations of mortality, ancestors, and the flow of animic energy – all manifested as grappling with one’s inevitable mortality and learning to manage related emotions as ancestors and predecessors have.

between verbal art and shamanistic initiations into adulthood known to be moments for parietal visual culture to be expressed.

Animal Master Yahwera

Among Kawaiisu oral traditions, the Animal Master (Master of Animals, Master of Game) *Yahwera* is a prominent supernatural entity (Whitley 1992b; 2000a:78, 115; Garfinkel et al. 2009; Garfinkel and Waller 2012:42). *Yahwera* manifests in different forms, including a hawk, or a yellow bird, or a raven or crow, and wears a quail feather blanket or robe (Garfinkel and Waller 2012:44-45). *Yahwera* regenerates slain animals, but is not directly involved with deceased humans. One example *Yahwera* narrative reported by Whitley (2000b) is attributed to relatively recent and reportedly real events.

As Whitley (1992b:102; 2000a:78-79) relates the account, a man acquainted with the grandfather of respondent Emma Williams encountered the Animal Master. The record is ambiguous as to whether the man was ill, or seeking hunting success – an ambiguity which may indicate potential variants of the story. To aid in resolving whatever the man's issue was, he ingested the entheogen *Datura sp*., and/or *Nicotiana attenuata*. More ambiguity surrounds the ritual in which he took the entheogen(s), and it may also have included pain with stinging nettles, or ants (Whitley 2000a:27). To add to the potency of the ritual, the man visited a cave, finding an opening to the animal underworld and home of *Yahwera*. The opening closed behind him. Inside, both animals and animal-people were present, with the latter speaking intelligibly. Where hunting implements rested, rocks made noises of deer. Proceeding through a tunnel, the man climbed over *kogo* (gopher snake, *Pituophis catenifer*), whose body was the threshold to *Yahwera*'s house. Beyond *kogo* was rattlesnake, and beyond rattlesnake, bears who growled. Finally reaching *Yahwera* who was clad in quail feathers, the man requested assistance with his quest for health, success, or whatever his trial on the surface world. *Yahwera* gave the man endless food, and song, until he was well. Satisfied, the man left through water without getting wet, and re-emerged on the surface world from a cave far from the one into which he had gone (Whitley 2000a:78; Garfinkel et al. 2009; Garfinkel and Waller 2012:44-45).

The above myth about the Animal Master contains many elements of the traditional vision quest ritual (Whitley 2000a). Additionally, it is comprised of rich symbolism ingrained within Numic religious ideology. *Yahwera*'s dual nature of (often) a predatory bird such as hawk or raven contrasts with implicit fertility imagery of the quail feathers (see iconography discussion later in this chapter). Uto-Aztecan mythology often associates snakes with the entrances to the underworld (Moyes 2006, 2009; Monticello and Moyes 2012). In the context of the narrative of the encounter with *Yahwera*, crossing the snake(s) is a metaphor for experiencing death, both in the sense of a metaphor for the visionary experience (Whitley 1992b; 2000a), and as necessary step to reach the Animal Master dwelling in the underworld. As previously noted, song is spiritually important, and the gift of song is tantamount to the gift of *puha/poha*. Transportation between caves emphasizes the journey aspect of the power quest, and the scale of the protagonist's journey. Such outlets from the underworld are known in both dark and twilight zones, caves and canyons, where the earth opens. One such named access is in Back Canyon, in the foothills of the Sierra Nevada (Garfinkel and Waller 2012); another is near the village of *Pagunda* at Little Lake, which is itself only roughly one kilometer from the Fossil Falls research area (Garfinkel 1980; Garfinkel and Waller 2012:45).

Teugai and Togoav

Powell (1881) and Lowie (1924) recorded a Paiute legend which expressly details the connections between echoes, stone, and sorcery. As recounted by Waller (2000, 2004:48), the legend begins when a witch (*tso-a-vwits*), named *Teugai,* kidnaps a little girl by tricking her into thinking she was the child's mother. In some versions, the girl brings a baby boy, *U-ja*, along with her. *Teugai* hides the children first in a basket, and then sometimes in the belly of a mountain sheep. The children are rescued either by people, or by Eagle. Frightened, *Teugai* hides inside the stomach of Rattlesnake (*To-go-a*, or *Togoav*). Swallowing the *tsoavwits* makes *Togav* ill, so he slithers out of his own skin, leaving *Teugai* trapped within. In some versions, *Teugai* wriggles the shed snakeskin into a rock crevice, which she made into her home. Safe from view within the snakeskin among the rocks, she mockingly repeats villagers' or Eagle's yells as they call for her; despite hearing her voice, they could never locate *Teugai*. Since then *Teugai* remains so hidden, delighting in mocking passersby.

The *Teugai* and *Togoav* narrative, like the encounter with *Yahwera*, uses the metaphor-laden verbal symbolism of Numic, and more broadly Uto-Aztecan, ideology. Much like the Animal Master story, the *Teugai* tale employs the idea of a snake's body as an entrance to another adjacent world. By paralleling the snakeskin with rock surfaces as openings into the earth, the myth implies that beyond the membrane of the rock surface is a realm inhabited by supernaturally potent beings. Also like the *Yahwera* encounter, acoustics play an integral role - although in this one more mocking, and less animalistic. Similar to the *Palongawhoya* parable, echoes express agency and indicate the presence of supernatural potency. In both, *puha* manifestsf in personified form, as an other-than-human agent who interacts with the world.

A similar version of the *Teugai* myth appears in Smith's collection of Western Shoshone narratives. Bill Doc of Beatty, Nevada recounted a variant in which both the name *Teugai* and the word witch or sorceress *tsoavwits* is supplanted with *Tso'apittse* - a term also synonymous with rocky giants (Smith and Hayes 1993:62, 137-139). Like in the previously recounted versions, the antagonist *Tso'apittse* tricked people of a camp in order to kidnap a baby boy. *Tso'apittse* hid with the boy, whom she groomed to become her lover as he grew. As the boy grew into a man, he acquired skills which his captor did not teach him (including fire-making), and eventually escapes. With the help of Coyote and a Rock Wren man, the grown boy hid while his new allies lured *Tso'apittse* into a cave by exploiting her lustful nature.

Trapped within the cave, *Tso'apittse* became echo. Because of the relatively close proximity between the Beatty oasis and the INY-3074 petroglyph site, this variant may be particularly relevant to site interpretation. This version's sexual themes largely reflect negative consequences of unchecked lust. Positive themes include empowerment through learning the skills of adulthood. For the protagonist, these messages converge onto the theme of male puberty and coming-of-age.

The association of "witches" with echoes parallels accounts of connections between malicious shamans[72,73] and rock art. It is to these malicious practitioners, and their *naguales*, to which some Shoshone ascribe petroglyphs. Coso Shoshone man Harold Bevers reported that his mother scattered flour inside their house for protection when she heard pecking sounds of petroglyphs being made (Whitley and Dorn 2010:140).

Notably, the *Teugai* variant of this story reserves a significant role for the snake *Togoav.* Rattlesnakes, or *tokowa* in *Tümpisa* (Dayley 1989:492), were commonly connected with pubescent females, serving as a gendered introduction to the to the spirit world (Whitley 1992b:101-102; Van Tilburg 2012:166). Conventionalized abstractions as diamond chains abound on baskets, and are "unequivocally" rattlesnakes (Kroeber 1925:233). *Togoav* is thus the apt asp, so to speak, for *Teugai*, implicitly a longtime familiar since entry into adulthood. Snakes were also spirit

72: Allowing room for loose translation, "witches" and "sorcerers" are merely differently gendered translations of the root concept of shamans/doctors who use their supernatural powers for harm.
73: While some arguments (e.g. Whitley 2000a) equate female shamans with sorcery because of danger, the reader should remember <u>all</u> *puha* can be dangerous – regardless of gender.

helpers who serviced initiates in the *Chinigchinich* cult, and were believed to be the first other-than-human agents to receive pubescent visionaries into the spirit world (Whitley 1992b: 102; Lewis-Williams 2002:170-171). This is exactly what *Togoav* does for *Teugai* in her time of need – moments before trapping her on the other side of the veil.[74] The shed snakeskin itself may be a metaphor: its scaly texture parallels certain "entoptic" imagery, and this texture combined the with translucent appearance is a reasonable approximation for somatic hallucinations and visual distortions of ASCs.[75] Corroborating this, Lewis-Williams (2002) describes entering the spirit world as passing into the rock as its solid surface becomes a membrane – again not unlike snakeskin.

Water Babies, Rock Babies, and *Pandzoavitz*

Many named actors recur throughout Numic oral traditions, including a host of personified animals (Liwosz 2017:197). Among agents known to have been active around Basin rock art sites and caves are Coyote, (*tsoavitc*, *itsappa*, or *itsappö* in Tümpisa), deer, pumas,[76] snakes, lizards, and bears. Less animalistic other-than-humans also featured in narratives of these places, with names often translated to "Water Babies" (*nunumi*, *newewe, pau'ha, po'ohmaa/-ttsi, bõuhõ, pah*, or simply *oh*), "rock babies," "rock giants," and "rock ogres" (*pandzoavits*, *tso'apittse*),

74: More likely than not a moral lesson for would-be puhakanti not to use powers selfishly. The consequences – being trapped in the underword/behind rock/inside a snake is most likely a reversal of the trance-is-death metaphor; in other words, Teugai's entrapment implies her metaphorical death became her real one.

75: and especially three to four days of sleep-deprivation

76: and Puma, proper name, joining Coyote at CA-KER-508; see Sutton (2001).

"elves," or "little people" (Driver 1937:126; Kelly 1938:161; Park 1938:27-28; Kerr 1980:32; Hultkrantz 1987:50; Whitley 2000b:111-112; Carroll et al. 2004:134; Waller 2004:48; Clemmer 2006:35; Whitley and Dorn 2010:140; Garfinkel and Waller 2012:50). Hultkrantz (1987:50) identifies *pandzoavits* iconography as bipedal figures with two horns. As recounted above, *pandzoavits* and other similar beings were often portrayed as dangerous or in antagonistic roles with people.[77]

According to Paiute oral traditions, Water Babies were difficult to kill inhabitants, usually each connected to a particular spring (Miller 1983:75). Properties of the springs - bubbling water, warm springs, etc. - might be attributed to the actions of its attached resident water baby. In this manner, Water Babies act as *genii loci*, resident spirits or beings which protect or manage the place to which they are attached. These beings thus personify the agency of the landscape they inhabit (Liwosz 2017a:198, 205). Miller's (1987:75) account of Paiute and neighboring (but not linguistically related) Washoe descriptions of Water Babies portrays them as human-like but diminutive in stature. Conversely, Smith and Hayes (1993:62-64, 82-84, 154-155) recount several stories in which *tso'apittse* took the form of a giant, or rocky giant; these versions commonly contain themes of hunting humans. Even though connected with places (sometimes even particularly anthropomorphic or zoomorphic rock formations), a disturbed or angered *pandzoavits/tso'apittse* is quite able to track and

77: Dayley (1989:300) lists the name of another Timbisha storied being, *Toyatsukunümüttsi*, whose name means "guardian of the mountain" (a compound word; *toyapi* = mountain, *tsuku*(-*ttsi*) = old man or old animal, and *Nümü* = people).

follow unfortunate people. Some variants of these stories end with a doctor/shaman mobilizing personal spirit helpers to ward off the dangerous being.

Water Babies, despite their often diminutive stature, still inspired fear. Connected directly with petroglyphs or *nawoi'na* (literally, "rock writings"), Water Babies could be heard crying, and were not to be approached at these times (Steward 1929; Driver 1937; Aginsky 1943; Kerr 1980:32). Anna Premo of Owyhee, Nevada reported to Smith and Hayes (1993:78-79) that a Water Baby inhabited archaeological remains at a spring called *Paohmaa*. Premo recounted that male acquaintances out on a successful hunt were terrified to hear the cries of such a Water Baby at night, although afterwards a family elder explained the sound as Porcupine. To some, these cries were death omens (Smith and Hayes 1993:165). *Tso'apittse*, according to Premo, simply means ghost. In this usage, the term could also be applied to whirlwinds (Smith and Hayes 1993:79), as well as aforementioned *genii loci*. At night, red lights are said to be the lanterns or eyes of *po'ohmaa* or *tso'apittse* (Smith and Hayes 1993: 83, 166).

Connections between petroglyph/pictograph sites, *tso'apittse/ pandzoavits/ po'ohmaa*, and shaman's powers are particularly poignant. Names like *po'ohmaa* pun off of *puha* (lit. "power,"[78]) and *paa* (water; see Dayley 1989:508). To some, the spirit/petroglyph connection was direct, as is the case among Wind River Shoshone from Wyoming who reported that "The rock drawings are supposed to represent

78: In the sense of supernatural power, but also in the sense of "knowledge is power."

spirits and have been made by the spirits themselves. Each spirit draws its own picture," (Hultkrantz 1987:49). Only rarely were the rock writings works of humans, as most often they were the products of powerful other-than-humans. Given the themes of several of the above accounts, spirits (and shamans) at places of *puha* were often dangerous, and sometimes outright malicious. As mentioned, in several stories, it took the work of a shaman and associated spirit helpers to ward off the angered entity. Similarly, it was the rare and supernaturally endowed person who could use the rock writings as a gateway to spirit world contact (Carroll et al. 2004:134). The shaman's mastery of these beings being greater than those of compatriots, it should be assumed that the doctor would fare better visiting their dwellings than others would. For this reason, doctors/shamans might have retained some stewardship of such places. This links these elemental entities with other powerful beings reported to guard *tukuutüah* (shamans' caches).

Basketry

Van Tilburg (2012:162) recounts a peculiar story originally related by Owens Valley Paiute George Collins to Steward (1936) regarding rock spirits and basketry. The passage is an excerpt from a variation on the creation (emergence) myth series. In it, brothers heard the sound of baskets being made within a rock. To investigate, and because the brothers presumed the weaver was trapped, they split the rock with an antler tine. This action revealed the rock's interior to be the residence of a beautiful woman, surrounded by fine baskets. Here again, perceptions of sound inform an outside observer about a hidden space with a living being inside, just behind the surface of a rock. Additionally, it implicitly genders the task of basket weaving as women's work. Weaving basketry is largely believed to have exclusively been women's work (Finger 2012:189; c.f. Wheat 1967 for men's fiber crafts).

Symbolism and Iconography

Situated in the Northwest extremes of the Uto-Aztecan language tree, Numic linguistic groups share deep-rooted connections and enduring systems of relational metaphors with as different and distant peoples as Hopi, Tohano O'odham, Huichol, and, of course, Mexica. Additionally, protracted contact with Central California groups like Yokuts, Penutians, and Yuman speakers like the Mohave left indelible impressions on the culture. Reasoning from ethnographic and verbal sources outside of Numa must therefore be undertaken with caution, however it also promises to be a productive avenue of discourse. Remarkably, Numic symbolism in verbal and parietal art bears striking resemblance to geographically distant and linguistically unrelated Mayan speakers in the Yucatán. Leading models conclude these parallels demonstrate cultural transmission of ideas across broad regions and vastly different cultural habits. Nonetheless, Numic worldviews and languages reflect not only enduring traditions from proto-Uto-Azteca, but also unique histories with Uto-Aztecan and non-Uto-Aztecan neighbors. Manifestations in colonial ethnohistoric times, along with primary records by Numic authors (e.g. Crum 1980, Crum et al. 2001), provide baseline data from which to trace out timing and impacts of such neighborly influences. Working from the other end, large-scale analysis of patterns in pan-Uto-Aztecan symbolism and metaphor reveals core concepts and potentially enduring traditions (e.g. Hill 1992). These approaches are not, of course, mutually exclusive, but instead mutually reinforcing in the endeavor to glean ever better understandings of the symbolic and social world.

Chromaticism

Basin Uto-Aztecans, including but not limited to the Numa, value a system of chromatic metaphors etically referred to as chromaticism (Miller 1983:68; Hill 1992). Although chromaticism is not unique to the Numa or Uto-Azteca generally, the particular manifestations that Numic expressions carry strongly suggest more than a mere superficial resemblances exists. For southern and central Uto-Azteca, a corpus of often religiously charged floral metaphors dominates the highest forms of verbal expressions: poetry and song. Hill (1992) identifies floral metaphors as foundational for colors and cultural weights of those colors, in what is deemed the Flower World complex.[79] For Numa on the margins of Uto-Azteca, the Flower World complex has largely been supplanted by two predominant systems of metaphor: feathers (Hill 1992:118-119) and celestial bodies (Hill 1992:127; Fowler 2006; Vander 2006). Despite these substitutions, structural similarities remain, such as the Ancestral Trail along the Milky Way manifesting in both Flower World and distinctly less-floral but no less chromatic Numic expressions (Hill 1992:125). This is not to say Numa have

79: After the Nahuatl celestial paradise of warriors and poets.

not held on to any components of the Flower World complex to recent times. The *Naraya* or *Nua hupia* traditions of songs – performed and lived on occasions including the Round Dance, and the Ghost Dances of 1870 and 1890 – build upon the most layered and enduring chromatic metaphors, yielding insight into the enduring Uto-Aztecan legacy within the most sacred expressions. In Chapter 7, interpretive discussion revisits specific floral, feathery, celestial, and otherwise natural associations in building interpretations for the research locations.

Borrowing from many vibrant themes, flowers alone do not monopolize Uto-Aztecan chromaticism. Feathery symbols feature prominently in narrative and material culture. Much as flowers might indicate some of the most powerful existential concepts – such as fertility, renewal, and afterlife of ancestors and warriors – feather chromaticism also invoked divine concepts of fertility, renewal, and the soul (Hill 1992:118-119).

In Aztec foundational myth, newly settled Mexica cleverly persuade rival city-state ruler *Achitometl* to arrange for his daughter marry Mexica war deity Huitzilopochtli using feather symbolism, "we beg you… to concede, to give us your necklace, your precious quetzal feather, your daughter, that she might be venerated as *Toci, Tonantzin*," mother and grandmother (respectively). *Achitometl* arrives the day of *Toci Tonantzin*'s wedding with offerings of incense, flowers, and a sacrificial quail, only to be confronted by a priest draped in the flayed skin of his deceased daughter (Bassett 2015:206). It is understood the Aztec won the ensuing war. The twofold feather chromaticism – iridescent quetzal, and fertile quail – are both wide reaching. Transitional between Natuatl *Xōchipilli* (Flower Prince) and *Toci Tonanztin* is *Xōchiquetzal*, "Flower Quetzal Bird" deity (Hill 1992:133). Feathers, thus, are not only chromatic, but markers of social status and economic value as well.

Cosmology

Like other linguistic families connected in some way with Mesoamerica, Uto-Aztecans often conceptualized a multi-tiered cosmic topology (e.g. Hill 1992:118-119). For Numic speakers further north, sources differ but generally agree this still holds true. In the Mojave Desert and Western Great Basin, some (e.g. Garfinkel et al. 2007; Garfinkel et al. 2014) ascribe to the five-tiered model produced by Goss (1972) and updated by Vander (1997). Further east in southern Colorado, others (e.g. Huffman and Earley 2017:8) relate Numic speakers conceived of a three-tiered model. Minimally, researchers agree the Numic cosmos hosted an underworld, surface world, and celestial realm.

In the Goss (1972) and Vander (1997) model, five tiers correspond not only to tiers of existence, but to sacred coloration. This manifestation of the chromaticism deviates from the four-zone color-coded compass commonly known in the Colorado Plateau and Rio Grande areas.[80] Perhaps unintuitive from a Western standpoint, the functions of both Numic colored tiers and the widely known "medicine wheel" color compass are similar. Both encode topology and orientation chromatically. In the

80: However much more in line with Native Californian beliefs regarding mountains as focal points of creation (e.g. Whitley 2000a:23, 31).

Great Basin, north-south trending mountain ranges offer ample landmarks. Dividing these chromatic tiers on the experience of elevation change, Numa may have expressed a means of orienteering based on the individual's physical movement through cosmological levels, with mountain and valley systems cuing cardinal directions.

Goss (1972:128) argued the five-tiered worldly and cosmic topology of Southern Ute may have been inspired by five biotic zones of Charleston Peak in the the Spring Mountains, west of present day Las Vegas. At nearly 12,000 feet (approximately 3,630 meters) in elevation, Charleston Peak's snow-capped peak is not only one of the most prominent landmarks in the area, it also feeds freshwater streams well into the summer (Miller 1983:72). It is not surprising, then, that Charleston Peak is sometimes identified as a place of creation, cosmic center, and setting for prominent oral traditions (for example, a cave near Mummy Peak on the same mountain may have been the home of Wolf and Coyote in the origin myths; *ibid*). Southern Ute symbolism surrounding Charleston Peak is thus used to abstract a model of Numic cosmologies, and therefore is the primary line of evidence for a more broadly adopted five-tiered model.

Tiered Worlds: the Charleston Topology

Roughly 85 km (approximately 50 mi) east of Death Valley, the Charleston topology based on Ute tradition (Goss 1972; Vander 1997) may be of particular relevance to INY-3074. As it is uncertain whether Ute ported this model to the

Pahrump area, or if they developed it *in-situ* the extent of its relevance and diffusion remains largely unknown. Because of the flexible and often embellished chromatic worlds of Uto-Aztecan poetry-song, it is helpful to consider coloration of the tiers as approximations or baselines, used loosely and not to the exclusion of a richer pallet among the flora, fauna, and peoples therein. That said, these inhabitants of the conceptual realms contribute to this coloration. The following also integrates the Huffman and Early (2017) three-tiered model when and where applicable, but the color associations are not so well defined.

The basic structure of the multi-tiered cosmos should be familiar: an underworld, a celestial realm, and humans occupying the middle. The Charleston model, however, subdivides the middle habitable zone itself into three tiers. Huffman and Early (2017:8) seem not to make the same distinction, providing only for the lower, middle, and celestial worlds. Mapped onto Great Basin topography, large-scale undulations see the land crossing distinct interim biotic zones with long-period cyclical regularity. In ascending order, then, the Charleston five-tiered model (see Figure4. 1) begins below ground in the underworld, above which are the valley floors, topped by foothills, overshadowed by mountains, which reach into the heavens (Goss 1972; Vander 1997; Garfinkel et al. 2014). Color associations with each layer may operate as a mode of orienteering, occupying the symbolic niche elsewhere in North America as the directional "medicine wheel." Goss (1972) and followers ascribe color patterns with cosmological tiers, rather than cardinal directions: black for the perpetually shadowed underworld, red for valley floors, blue-green (comparable to the Mesoamerican color conflation) for foothills, yellow in connection with mountains, and white with the heavens. Appropriately for Uto-Aztecan cosmology, these color associations carry symbolic implications. Black, associated with the underworld from which animals regenerate, implies both shadow and existential uncertainty (Garfinkel and Waller 2012:46); red in valleys may be inspired by the indigenous name of Death Valley, *Tümpisa''*,[81] meaning “red stone (ochre) place” (c.f. Dayley 1989); blue-green for foothills evokes vegetation and renewal, particularly important for Joshua Tree and pinyon-juniper forests (Gold et al. 2016:204); yellow, for the exposed mountain slopes; finally white for foggy snow caps, already in the sky, implies ancestors, creation, and storms (Miller 1983:68).

81: With the double glottal stop character ’ unspoken when the word stands alone, and adopting the double consonant form from the lead-in of any suffix (Dayley 1989).

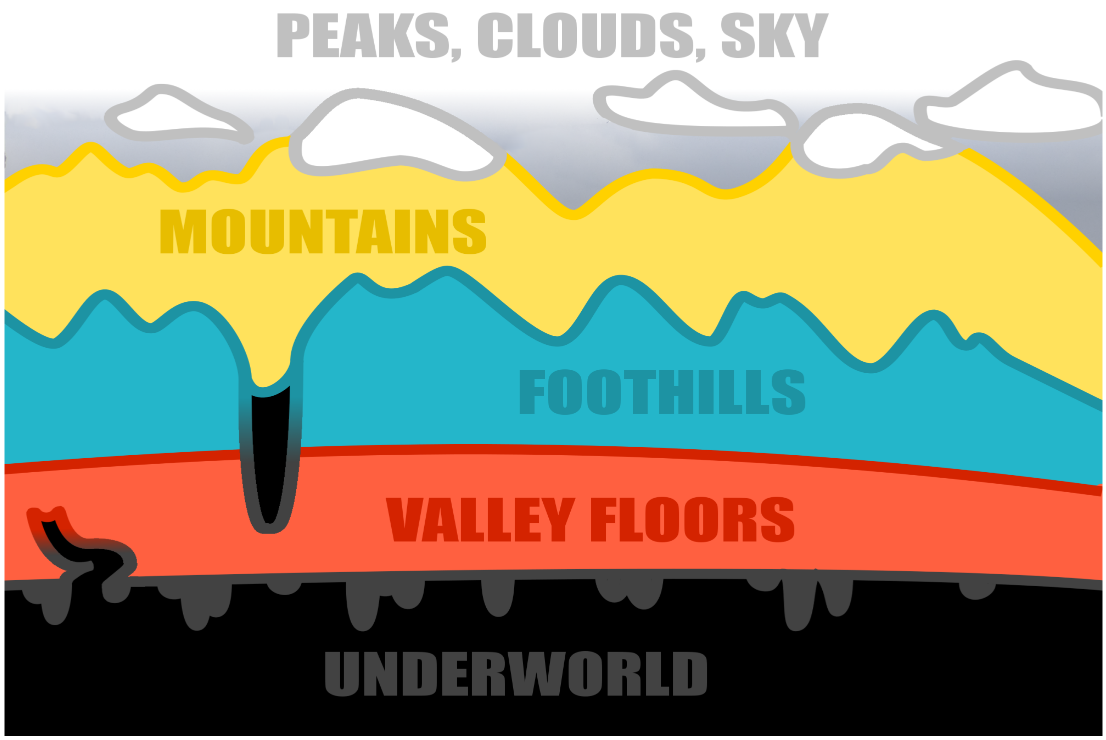


Figure4. 1: *Abstract representation of Charleston multi-tiered cosmic topology, with chromatic associations. [credit: author 2017]*

Elsewhere in the world, both the underworld and celestial world are nearly impenetrable outside of exceptional circumstances. Great Basin terrain, however, hosts numerous small caves, perpetually shadowed canyons, and mountain tops of mist and snow piercing the clouds. Numic ontologies emphasizing the animating force of and web-like distributions of *puha* encourage preferentially utilize these transgressive areas for navigation and religious exploration. Consequently, a person seeking water and/or supernatural potency would be encouraged through cultural understandings of the landscape to utilize these *axis mundi* at opportune times.

Like all symbolic systems, the landscape-coloration interrelationship of the Charleston Peak model carries many-layered associations, not any one of which is guaranteed to be intended for a particular situation. Red, for example, also indicated joy, and red ocher was used as face and body decoration for boys and girls on appropriately joyous occasions (Miller 1983:68). Conversely, although connections between black and the underworld by extension link it with animal (especially big game) regeneration, it was also used by male warriors in preparation for war (*ibid*). Green (really blue-green-gray) carried esoteric implications of resurrection, as when (according to Northern Paiute), Coyote revives the bones of the deceased on the shores of a lake with his breath, which makes the grass grow verdant (Kelly 1938:414; Garfinkel et al. 2016:205). The green-resurrection connection may either be of great antiquity, or a natural cognitive connection, as the Nahuatl word *xopan* expresses resurrection as "greening of spirits" (Vander 1997:597).

Astronomy

While the present chapter has not even begun the exhaust Numic symbolism, to do so here would be excessive. More detail is integrated into Chapter 7's archaeoastronomy discussion, where introduction along with aides from the projects areas is much more fruitful and clear. Building a Numic (and Pre-Numic) iconographic baseline is a task which many researchers have approached from a variety of material culture parallels. For the interests of the present study – one with field methods which emphasize exploring the potential for song, and thus implicitly narrative – concluding the pre-data primer with sources of verbal chromatic inspiration and existential wonder seems most fitting. One of the aspects of Numic narrative which distinguishes it from much of Uto-Azteca is that for Numa, stars are not necessarily colored by flower metaphors; they are, instead, the iridescent source of these metaphors. Also fittingly, historic Numic lands – with low humidity, fewer urban areas, and often low vegetation – remain exceptional places for stargazing, while coastal and Midwest night skies continue to fade against light pollution. Great Basin National Park, on the Nevada-Utah State line, hosts some of the darkest and clearest skies in the United States. So too does the Numic heartland of *Tümpisa''*, where Death Valley National Park spans 3.4 million acres of dark desert, with aptly named lookouts like Telescope Peak.

Although the concept is certainly not unique to Numa, Kawaiisu considered supernatural beings to be connected with the sky and night (Zigmond 1972:133; Miller 1983:70). With its varied bright patches and distant dark dusty bands, the Milky Way is the largest such celestial patch with the most internally variable coloration, and thus a logical place from which to begin. Known as an Ancestral Road, its cognitive links with central and southern Uto-Azteca as the way to the ancestors have already been explored in this chapter. It is uncertain when (or even if) the Numic Milky Way forked from the Flowery Road, however Nicols (1981) suspects the Numic Milky Way once flowered, too. Its chromatic character may have changed from secondary to primary metaphor in conjunction with the relatively late *Chinigchinich* syncretic religious movement among Numic and Yuman peoples anthropomorphizing the Milky Way; in exchange, Cupeño of the Southern California coast received non-astronomical Flower World metaphors (Miller 1983:70; Hill 1992:131-132).

The Pleiades, a tight kite-shaped cluster of young, bright stars, may be be one of the most recognizable formations in the night sky. Their histories, according to Numic lore, link back to the "time when animals walked like people," and perhaps the origin stories themselves. Fowler (2006:43) reports they are Coyote's Daughters, implicitly linking the cluster to Series I and III origins (Fowler 2006:43). In a turn evocative of dialog in the latter origin, the Pleiades are alternately (or in terms of Series III, supplementary) Coyote and Wolf's sisters; in the latter (sisters) case, the sisters are married (polygynous?) to Moon Frog (Miller 1983:70, 81), whose role as a source of fresh water distantly recalls Classic Lowland Maya lore of Moon as a water vessel, to be tipped over until filled (e.g. Moyes 2009). The sun was a spider who laid the web of *puha* interconnections, perhaps even a Black Widow (Harris 1940:56; Miller 1983:70). Venus' motion through the sky was also tracked, and featured in prophecy. Finally, Orion; the constellation is comprised of the three belt stars in the middle, and usually named hunters around. Called *Naga, Nagau*, or N*aagangy*, the belt stars form a bighorn in the sky, pierced by an arrow or dart; instrumentally, Chemehuevi and Southern Paiute to the east of Las Vegas describe *Naga* as three sheep (one at each belt star) – and often four hunters (at Bellatrix, Betelgeuse, Rigel, and Saiph (Fowler 2006:46-47). In the *Tümpisa* language, *Wassüppin* is at once the name for the stars of Orion's belt, the word for bighorn sheep, and the categorical term for all big bame (Dayley 1989:379). It is on the point of a bighorn constellation in Orion I will address suggestions by D'Ascenzo and Deal (1987) that INY-3074's Chamber 2 has archaeoastronomical potential, towards the close of Chapter 7.

Other Symbolism

Apodaca (2001:218) proposes ubiquitousness of columnar cactus section game pieces manifest in visual culture in the Sonoran Desert, particularly among Seri Native Americans. While Seri language is not Uto-Aztecan, their presence in the Sonora puts the Seri in contact with cultures known to extend into the Mojave Desert. Proposals that the Seri language branched off of Yuman-Hokan languages form a basis for projecting Seri symbolism into Southern California. Based on this evidence, Apodaca (2001:220, 223-224) argues that "cogged" shapes in Channel Coast Chumash pictographs can be read as icons of such cactus cross-sections. As Chester King demonstrated Channel Coast-Great Basin exchange based on *Olivella biplicata* shell beads incorporated into an *Ovis canadensis* headdress (Garfinkel et al. 2015), it is not unreasonable to postulate an exchange of symbolism between these regions, as well. While stylistically distinct, pictographs in traditional Kawaiisu territory (e.g. Garfinkel and Waller 2012) have been inferred to demonstrate interaction (Lee and Hyder 1991; Lebow et al. 2016). As Apodaca's argument for the presence of “cogged” cactus cross-section imagery is in part based on present and past distributions of columnar cacti, it is reasonable to hypothesize that the present study’s research areas, which feature barrel cacti, could host depictions of cacti in visual culture.

Chapter Summary

Numerous Numic oral traditions seem directly relevant to the attribution and interpretation of Great Basin rock art – despite pundits’ positions that Numa supposedly denied knowledge of its creation. Previously, researchers have applied the Series I origin story, the tradition of the Sun Spider, and various verbal references to the Animal Master in building their interpretions (e.g. Whitley 1994, 1998; Garfinkel and Waller 2012; Huffman and Early 2017). Other narratives appear also to be quite relevant, and I have included a select set with some of the most conspicuous connections to both rock art sites, and perceptions of sound. These include Coyote (in the Series III origins), Water Babies (*po’omaa*), rock giants (*pandzoavits*), and the variably described *Teugai*/*Tso’apittse*. The narratives recounted are best understood through ethonographically documented cultural and religious practices, which indicate animistic ways of understanding perception and agency. It is in this context I have formulated my field moetds and post-field analysis. The following chapter describes my research approach, one which is designed to attempt to understand how cultural values of perception articulate with the process of meaning-making.

CHAPTER 5:PROJECT DESIGN AND METHODS

Summary of Project Design

Although a relatively small scale undertaking, the project reported here employs several approaches in an attempt to innovatively address longstanding issues in Great Basin rock art research, as well as to posit new directions for research by the author and others to take. Theoretical and methodological approaches outlined in this chapter aim to extract an archaeology of hunter-gatherer visual culture from exhausted conversations and to advance parietal art discourse. Interventions include:

- Revisit rock art catalogs to address semiotic assumptions and logical fallacies
- Propose analytically useful and reproducible catalogs, avoiding above issues
- Challenging stereotypes of indigenous peoples in archaeology literature
- Contribute to develop improved cognitive approaches
- Apply ethnographic and native perspectives to ground inquiry and inferences
- Investigate reported emically significant phenomena, namely novel sounds
- Demonstrate non-invasive methods to study culturally sensitive sites
- Demonstrate scientific, scholastic, and analytic usefulness of above methods
- Democratize archaeological methods, improving accessibility to the discipline
- Democratize datasets by eliminating pay-walls

In practical application, these points guided research decisions in two related archaeological landscapes in the northern Mojave Desert and western Great Basin. Although background on these locations has already been covered in Chapter 1, basics bear revisiting. In the broadest sense, this study addresses cultural use of archaeological landscapes associated with parietal art – that is, visual culture affixed to immobile natural surfaces. Drawing from a host of cognitive, neuropsychology, and even behaviorist theories, this project set out to test certain correlations proposed between constituent components of rock art sites, hunting activities, processing stations (as a foil), and novel acoustical properties reported ubiquitously in oral tradition. Among valid candidates, two slot canyons, both containing petroglyphs, were selected as sites to study.

CA-INY-3074, the first of these, is located in the greater Death Valley area, north and east of Coso Range. The site proper has until recently been strictly constrained to the interior of a slot canyon, with the first note of features extending significantly into the discharge change taken during fieldwork for in 2016. Prior to that field session, INY-3074 was documented to have 64 rock art panels spanning 0.5 km from mouth to head; additional features extending beyond the mouth into an associated drainage are reported in Chapter 6, this volume. Despite no other records of nearby sites on file at official archives (See Chapter 1), sparsely distributed rock ring features, metates, lithic debitage, and a previously excavated rockshelter all within 3 km of the canyon's exit (and mostly much closer) indicate more intensive Precontact use of the area than previously believed. Whether these represent near randomly dispersed temporary encampments or more substantial small, seasonally reused settlements has yet to be addressed. Thus far, the record of material culture on the INY-3074 slot canyon's alluvial fan results only from chance encounters, and no systematic survey of the area is on file.[82]

82: At least three have been done in the immediate vicinity: Martin &/or Skolnik between 1948 and 1984, Meighan and Baumhoff in 1951, and D'Ascenzo and Deal from 1985 to 1987. A 1953 report prepared by Meighan's team appears to predate the canyon's earliest record, and (intentionally?) mis-plots the locations of nearby sites. D'Ascenzo and Deal's survey area does not include the site, yet they alone filed the only site record on the books

The second selected canyon, at Little Lake, is also similarly situated within an intensively culturally utilized landscape - the Little Lake Rock Art Complex, and NRHP-listed Fossil Falls Archaeological District. Entrance to this canyon is at the top, unlike the previous site, however there is evidence that basalt rubble may have been used to construct unfaced stair-steps.

Although the major village of *Pagunda* is fairly near by (less than 2 km south), the canyon seems more directly influenced by a complex of sites immediately above the the rim, expanding out along the tablelands overlooking Little Lake and *Pagunda*; these include CA-INY-1634, INY-1635, INY-1638, INY-1641, INY-1643, INY-1655, among others (see Chapter 1 for complications with site designations), with INY-185 and INY-205 below, just beyond the gorge.

Although most of the photographic, spatial, and experiments (acoustic) activities concentrated on the petroglyph features, this research is informed by regional landscape approaches. Although they remain convenience constructs for systematizing investigations, small-scale spatial divisions such as “site,” “feature,” and “panel” are considered here ultimately to be meaningless on their own. Immediately surrounding areas were visited and are taken into consideration for the remaining chapters as continuous extensions cultural activity at varied densities. This treatment is expressly borrowed from Reynold’s (1996:8, 99) application of

(D’Ascenzo and Deal 1987). It appears the site was first assigned the Smithsonian trinomial CA-INY-3074 under Martin and/or Skolnik, however the date is unknown, and neither NPS nor CA EIS has any record on file of their involvement. It is likely neither did D’Ascenzo and Deal have a copy prior to their visit, as they were unprepared for the canyon interior’s obstacles.

Schlanger's (1992) "persistent places" to land use patterns in, on, and along shifting pinyon-juniper woodlands in the Inyo-White Mountains. This concept is particularly useful in rock rock studies, which are themselves more often than not by definition persistent places, with inherent qualities lending themselves to reuse. At the risk of unduly downplaying the work of field sessions and minimally several hundred hours of data processing that followed, ongoing archival research has proven itself the unquestionable cornerstone not only of interpretation, but also for formulating field and post-field approaches (with the example of persistent places just one of the many payoffs).

Research goals for this project sought not only to ground humanistic interpretations in reproducible scientific data, but also to innovate in methods and theoretical application. Given the popularity of rock art subject in the public imagination, and its fixed nature on the landscape, I also adopted a rock climbing philosophy of "ghosting" for the broader suite of activities undertaken. Ghosting is a practice of avoiding the use rock anchors, spikes, cleats, or any other tool or technique that might permanently alter the rock. Instead, I utilized natural points of anchor (an alternative would be to construct a "dead man" or temporary rock pile, but this was not necessary); additionally, I ensured that I removed all climbing equipment, including webbing, prior to my final exit. Consequently, this study is to serve as a demonstration of the feasibility of relevant *non-destructive* archaeological methods, and the sorts or data which can be produced without building material collections. In no way should such particular goals serve as an indictment of destructive analytical methods. Instead, my goals seek to inspire further innovation in addressing particularly sensitive subject matters, and to provide avenues of scholarly inquiry where and when destructive methods may be ill-advised.

Hypothetical outcomes

Prevailing theoretical interpretations regarding Great Basin rock art provide interpretive avenues, and consequently are a major focus of this study. These theories are covered in greater detail in other chapters. Each interpretive framework yields a different hypothetical outcome, and some (but certainly not all) have been treated by previous researchers as mutually exclusive. From my perspective, exclusivity seems presumptuous, and thus this study proceeds by considering each model's hypothetical outcome independently. While evidence from both literary and materials evidence are of direct relevance, it is the latter which generally is to be afforded more weight in site-specific study. To avoid certain complications, two research locations, and their broader landscape contexts, are considered. In doing so, assertions about region-wide patterns versus site-specific processes may be addressed. Following, Table 5.1 covers aspects of existing models within the confines of the this project’s methods, expected results, and anticipated (in-)compatibilities.

Table 5.1: *Existing interpretive frameworks, with select criteria addressable by project methods, as well as anticipated compatibilities and incompatibilities amongst each other.*

	Context(s)	Iconography	Acoustics	Other Attributes	Compatible with	Mutually Exclusive
Ceremonialism	large, public venues	iconic, mnemonics, abstracted or conventional; symbols; colors	amphitheater effect	rock alignments, geoglyphs; elaborate regalia	totemism (all), mythographs, shamanic/-ism, hunting magic (pre-hunt), broad resource indicators	sorcery, social boundaries, costly signaling
Costly Signaling	visible with restricted access	Iconic: large game, weapons, status goods	*n/a*	displays prestige; strained resources; "show-off" behavior	social totemism, increase totemism	ceremonialism, mythograms, resource indicators, shamanic/shamanisitic,
Hunting Magic	walls, fences, corrals, dead falls, blinds, game trails	Iconic: large game, weapons	may amplify mimicking sounds of male competitions	possible log noise makers	ceremonialism, costly signaling, increase totemism	shamanism, mythograms
Increase Totemism	large, public venues; possibly resource patches	Iconic: large game, weapons, fertility imagery;	possible but not necessary	dense clustering; feasting; competing clans/moieties	ceremonialism, costly signaling, hunting magic	shamanism, mythograms, social totemism
Mythography	*n/a*	iconic/figurative, mneumonic; "scenes," repeated figures; colors	"animal noises;" possible vocal resonance; thunderous	hieroglyphic writing? (Mallery rejected writing)	ceremonialism, increase totemism, resource indicators	costly signaling, sorcery, hunting magic
Resources indicators	near trails, downhill of upland resources, visible	non-specific; iconic useful; abstract/geometric; chromatism	soundsheds span landscapes	indicates resources otherwise unseen from seasonal trails	ceremonialism, mythograms, shamanic/-stic, social boundaries, increase totemism	hunting magic, costly signaling, sorcery
Shamanic (restrictive)	restricted entrance, may be near or far; places of power	abstract patterns; storms; colors; somatic symbolism; mnemonics	reverberation; audio droning; resonance; thunderous	access/ingress prohibitive; darkness/twilight zones	mythography, sorcery, social boundaries	increase totemism, costly signaling
Shamanistic (inclusive)	secluded but not managed. Places of power	pictographs; not-standardized; gendered signs; fertility signs	reverberation; audio droning; resonance	access socially mediated; darkness/twilight zones	mythography, ceremonialism, resource indicators, social totemism, social boundaries,	social boundaries, hunting magic, increase totemism
Social Boundaries	borderlands, resource patches, public boundaries	geographically distinct; ethno-linguistic conventions	*n/a*	other signs of territoriality, conflict; non-migratory	sorcery, shamanic/shamanistic, resources indicators	ceremonialism, increase and social totemism
Social Totemism	household/domestic, private	conventional iconic flora & fauna; low variability	possible but not necessary	standardized icons endure generations; spatial patterns	shamanisitc (inclusive), costly signaling, ceremonialism	increase totemism, shamanic/shamanism, sorcery, social boundaries, resources
Sorcery	private; distanced from target	Iconic/figurative: spirit helpers, violence, death, weapons	unknown/unlikely	individual/ideosynchratic; may accompany ritual cache	social boundaries, shamanic/shamanistic, hunting magic	ceremonialism, mythography, totemism (all kinds), resource indicators

Methods here are developed to address not only advanced theories, but foundational concerns which qualify their applicability. These foundational concerns include site formation processes (production), chronology (antiquity and continuity), and cultural affiliation built upon those. Similarly, other outcomes are also contingent upon not simply upon singular variables, but overall patterns of overlapping possibilities. Rock art studies and an archaeology of visual culture often exceed the limits of deductive logic – and consequently, positivism – requiring inductive reasoning to account for said contingencies (Whitley 1992a:59; Whitley 2011).

Reconnaissance and Assessment

Initial archaeological inquiry at the investigation locations was completed by previous researchers, whose work is integral information in formal site records. Early stages in this study required revisiting these previous documents, and comparisons between the original site records and the locations' physical properties as they were at the time of field visits. Site records for rock art locations are notoriously frequently incomplete, with critical data regarding artifacts or other features all too often missing (Gilreath and Hildebrandt 2008:8; Liwosz 2014:427). Especially given that associations with other archaeological features is one of the primary points of argument used in Great Basin rock art interpretations (e.g. Heizer and Baumhoff 1962; Grant et al. 1969; Bettinger and Baumhoff 1982; Gilreath and Hildebrandt 2008), any rigorous study of previously documented locations can only proceed following both verification of, and amendments to, site records. This process of reconnaissance and condition assessment is also indispensable to stewards and land management agencies, and is a service to agencies including the Bureau of Land Management, and the National Park Service.

Both reconnaissance and condition assessment are frequently carried out in a systematic manner at all locations, regardless of antiquity or content. Depending on jurisdiction and project principal investigators, usually archaeological “sites” are defined in the United States as locations containing either at least one fixed landscape feature, or three or more artifacts within a 30 meter radius. This is the standard that was applied in the 1970’s when the (then future) Fossil Falls Archaeological District was recorded, resulting in a culturally contiguous landscape nonetheless comprised of no less than thirty individual sites.[83] While entirely arbitrary and not analytically significant, this definition nonetheless forms the foundations of field documentation. Both the notion of a definition of a site, and the practice of bounding it, have been critically challenged by landscape approaches (e.g. Schlanger 1992; Reynolds 1996). Both in rock art studies specifically, and in archaeological practice more broadly, many researchers have expanded spatial analysis beyond what Ouzman (1998:38) describes as “dots on a map,” placing conventional sites in dialog over distance kilometers apart.

83: Thirty sites on the tablelands north of Little Lake have received Smithsonian trinomials, ranging from CA-INY-1634 through INY-1677. Unpublished survey papers indicate minimally 51 sites, plus those previously recorded by Harrington, and below the cliffs.

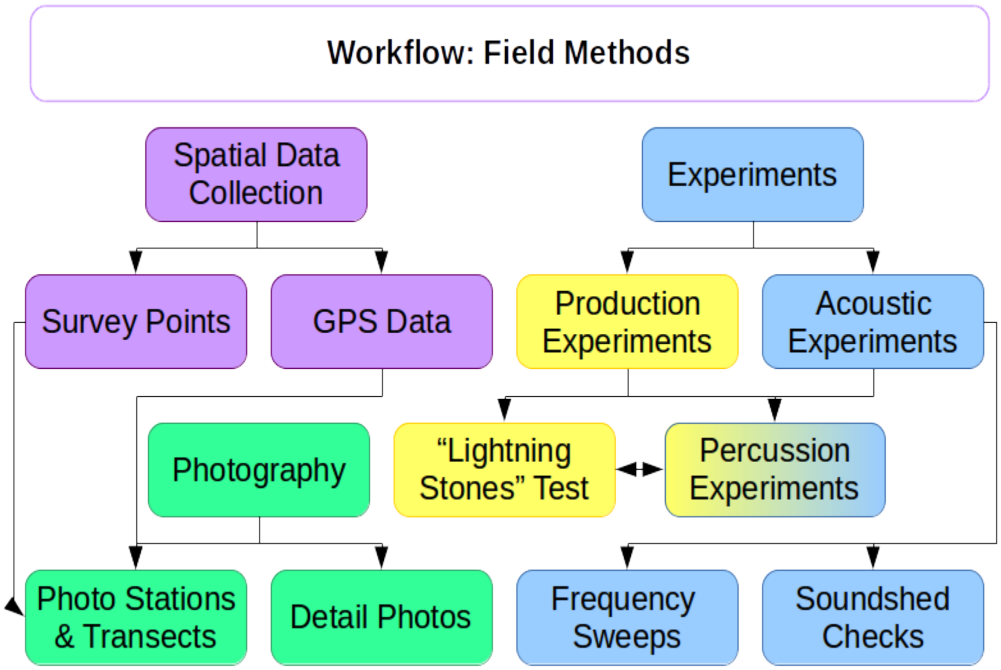


Figure5. 1: *Basic workflow for fieldwork at both canyon gorges (Death Valley and Little Lake landscapes).rt Additional non-site-specific tests (yellow) included to reproduce results of other researchers*

Cartography

Within sites, fixed constructions, modifications to large or fixed rocky outcrops, and dense concentrations of artifacts are mapped in as "features." Mapping, consequently, is essential to establishing the layout and structure of any density of archaeological evidence. Methods for mapping have evolved throughout the history of archaeological practice, and particularly in recent decades with the introduction of new technologies. Mapping fundamentals have long employed the use of compasses, maps, tape measures, and graphing paper to produce scaled sketches of sites. Physical and analog measurements of distance and bearing, and sometimes slope, are translated into positions graphed by hand; use of an optical transit can greatly enhance the accuracy of these measures.

The unscrambling of Global Positioning System (GPS) satellite signals for civilian use has revolutionized data collection. Handheld GPS receivers were used to record 3-dimensional positions within a range of accuracies. Small, affordable units such as the Garmin eTrex are used both by professionals and avocational outdoors enthusiasts, and usually provides accuracies between three and seven meters; these were the choice for the present project, as photogrammetry was used for more detailed spatial data collection. More expensive and powerful units - like the Trimble products - are capable of sub-meter accuracy, given adequate atmospheric conditions, but were unnecessary for the project goals.

Post-field processing of spatial data is more than ever integrated into digital archaeology. A somewhat recent industry standard, ESRI's ArcMap (™) is now used for not only these same operations, but also more intensive data processing. The digital age has not abandoned analog measures, however, as ArcMap offers several means of manually adding spatial data, and of projecting images (such as hand-drawn sketch maps) onto digital representations of the Earth's surface. Digital sketch maps (e.g. Liwosz 2017:7, 15) were also readily generated using hybridized approaches to digital cartography.

Increasingly in recent years, demand from cultural heritage preservationists calls for expanding spatial datasets beyond two-dimensional site and regional maps, into higher resolution three dimensional environments (Bohler and Marbs 2004:291). Archaeological and historical subject matters ranging from architecture to sculpture, from artifacts to rock art, and from reconstructions to meta-analysis of methods, all benefit from the newly emerging spatial techniques of 3D modeling. Single and mixed methods applications of laser scanning, photogrammetry (explained below under Digital Archaeology), and structure-from-motion all have demonstrated unequivocal indispensability in efforts to document, salvage, restore, preserve, and interpret humanistic experiences of the data (.e.g Altschul and Ezzo 1995; Daehnke and Raymond 2008; Gilreath and Hildebrandt 2008; Brady and Gunn 2012; Hockett et al. 2012). For the confines of this project, only static photos were used for photogrammetry.

Visual Documentation

Digital Archaeology

Ongoing technological advancements have long been, and continue to be, integrated into archaeological. Leroi-Gourhan (1958, 1965, 1967) established an early precedence for the use of computerized systems in both database storage and analytic potential. Leroi-Gourhan's initial interpretations and Structuralist (proper) theories in said study subsequently succumbed to critique (e.g. Conkey 2001; Whitley 2011:174). For the Great Basin, Heizer and Baumhoff (1962) established the most-cited framework for classifying rock art motifs although this system is not without its detractors (e.g. Liwosz 2014, 2015, 2017), and some researchers (e.g. Whitley 1992, 1994, 2000) avoid using it at all. Nonetheless, Van Tilburg et al. (2012:51-54) employ a modified version of the Heizer and Baumhoff classification in tabulating motif contents by locus at Little Lake. Van Tilburg and team's (2012) use of digital cataloging improved the usefulness of their volume reporting on Little Lake petroglyphs, however proved too cumbersome for the relatively smaller assemblages at hand. In the following chapter, petroglyphs are reported in narrative format, grouped by panel. This is in-line with National Park Service recording standards, and allows the present document to readily be adapted for updated site records. It also remains searchable by location and content, while maximizing coverage and detail. Images comprehensively inventorying every panel have been filed with the California Eastern Information Center for all sites evaluated, and with the National Park Service for the . Systematic photography and detailed narratives of panel contents and context were done inexpensively, and can used to present the same body visual culture in terms of the more tradition Great Basin Classification system (or any arbitrarily chosen or constructed classification, depending on goals), as well as models like the semiotics systems used here and illustrated below (Figure5. 2).

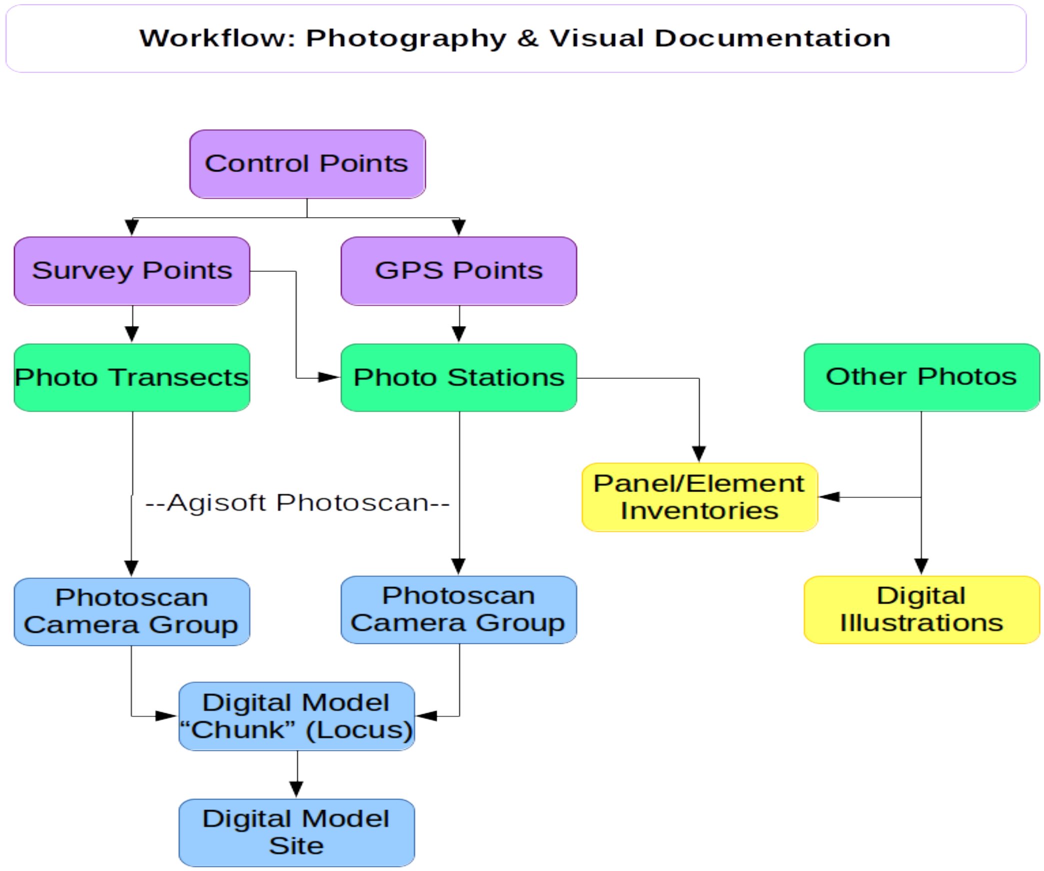


Figure5. 2: *flowchart of visual documentation and analysis*

Semiotic Catalog and the *"Rough-and-Ready" Index*

CA-INY-3074 motif documentation and classification has already been carried out to some degree (D'Ascenzo and Deal 1987; Liwosz 2010, 2014). The initial site record produced by D'Ascenzo and Deal (1987) laid out the groundwork for images and spatial relationships. Fuller documentation by a small 4-person crew decades later (Liwosz 2010) included a comprehensive set of photographs used for later analysis. Previously, I attempted to organize the 1987 and 2010 data vis-a-vis the

Heizer and Baumhoff classification system, only to find weathering characteristics did not substantiate that model's culture-historical implications.

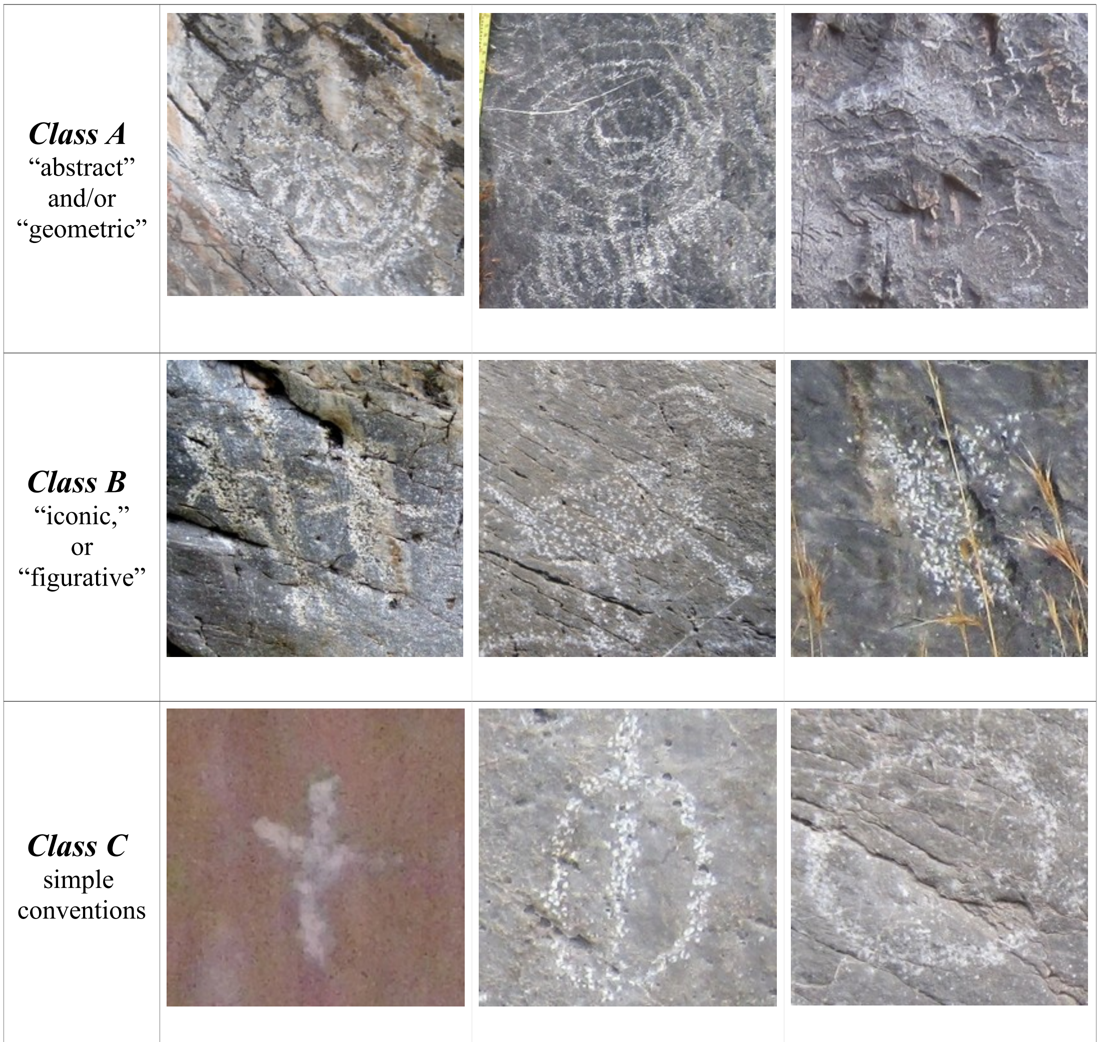


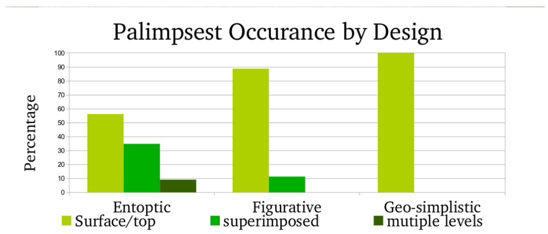
Figure 5.3: *Semiotics-based classification systems such as above reduce the types of unsupported inferences and logical fallacies inherent in other models*

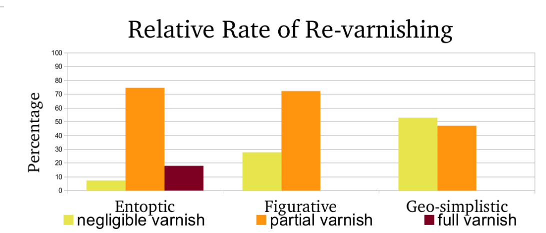
As a solution, I devised a simple seriation exercise, in two easy steps. The first step categorized contents of the photographic catalog of INY-3074's petroglyphs into Peircian semiotic categories: signs inferred to operate as indexes of experience (Class

A), icons or figures (Class B), and symbols understood by cultural convention (Class C). For step two, each element cataloged was assigned an age value (non-calendric), adapting the "rough-and-ready" index to assign subjective values for relative sequence markers superimposition (none, superimposed once, or multi-layered palimpsest; see Figure 5.4.a), and for re-patination (negligible, partial, and complete; Figure 5.4b).

***Figure 5.4a (Left)**: Rates of palimpsest-making superimposition, per semiotic class; one of two variables used in "rough-and-ready" index adaptation*

***Figure 5.4b (Right):** Relative rates of patina redevelopment, per semiotic class; the second of two variables used in "rough-and-ready" index adaptation*





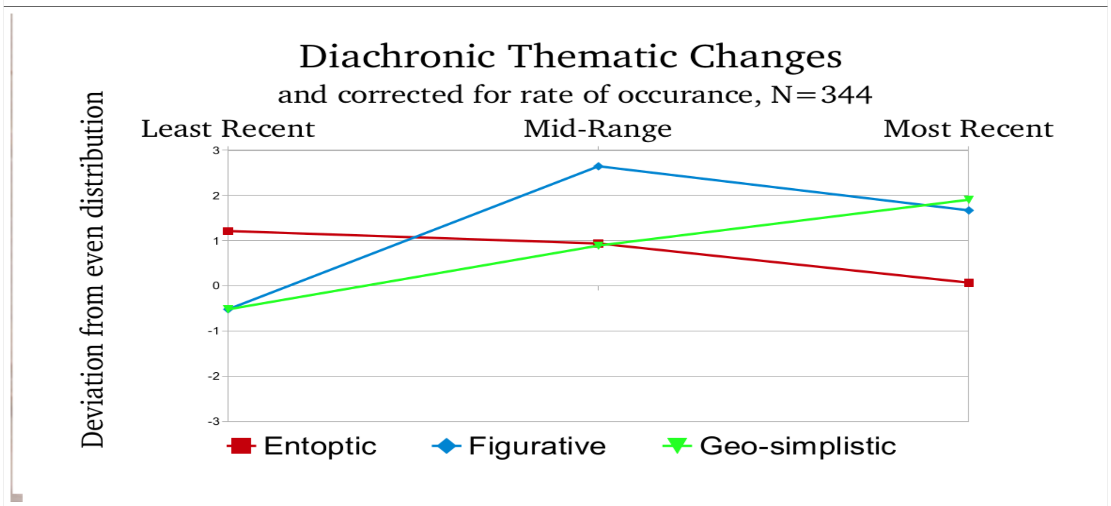


***Figure 5.5:** Changes in semiotic motif occurrence over time, measured in standard deviations from and idealized assemblage in which all classes represent equal parts of the assemblage at all time intervals. The value in the representation is that instead of showing static ratios at block intervals, in emphasizes changing TRENDS in time.*

3D Digital Environments

Whether from photographic or scanning based technologies, models developed with digital techniques readily integrate archaeological data from essentially the full continuum of scales, from "microcartography" to landscapes, regions, and beyond (Firnhaber 2007:108; Daehnke and Raymond 2008:13-14; Brady and Gunn 2012:630-631). Terrestrial Laser Scanning (TLS) has demonstrated its usefulness in settings comparable to this study's research locations, such as Cova del Parpalló on the Iberian Peninsula (Lerma et al. 2010). Authors of the Parpalló study emphasize the benefits of both TLS and photogrammetry 3D models for cultural heritage conservation and data manipulation (Lerma et al. 2010:505). With advances in digital camera resolution, photogrammetry software, and personal computing, photogrammetry is fast supplanting TLS as an expedient means of modeling. Because of these advances, the versatility of the equipment, and the relatively low cost, this study of Mojave Desert slot canyon rock art sites employs close-range photogrammetry alone to build these models.

Results are reported in the following chapter. Photos collected for the models at each research site were taken with a Panasonic Lumix DSLR camera. Photographing strategy evolved during the course of this project, responding to limitations identified during the course of documentation and analysis. In the event of future efforts to digitally model these or other spaces, it is the authors' position these technical refinements be taken into account. At INY-3074, photographs taken solely for the sake of photo-modeling were taken in 360° horizontally and vertically, from arbitrarily chosen “photostations.” Although this strategy is contrary to recommendations by Agisoft © (the publishers of the Photoscan software used), it lent itself to ensuring effective time management and coverage. Each photostation was designated with a unique identifying number (PS01 - PS58), which was subsequently used for organizing folder hierarchies. Photostation locations took into consideration viewshed, and were placed to be within visual range of both the previous and following stations. Because each photostation corresponds with a distinct spatial position, they then could be grouped by corresponding locus (see Table 5.2below). The locus level of organization describes discrete natural divisions of space, and was used during modeling. Within Photoscan, the “chunks” feature allows a model to be processed in parts (Figure5. 6). This study treated “chunks” and loci as the same level of organization; using this strategy, each “chunk” in the photoscan file(s) was designated by a Locus name, and was subdivided into folders of photos, each folder corresponding with a field photostation. Each locus chunk additionally contained one (or in a few instances, two) additional folder for the nearest photostation of each adjacent locus. By including this overlap between chunks (rather than constraining them to the locus boundaries entirely), chunks could much more readily be aligned and merged into singular larger models, effectively using pairs of boundary photostations as data rich control points. Unfortunately, the canyon’s walls prevented adequate signal to collect GPS coordinates at these control point stations, although for the sake of this study georeferencing with such accuracy proved superfluous anyhow. It should be noted that the photographic strategy as initially carried out was suboptimal, and would not be recommended in the future. Nonetheless, this less-than-ideal strategy still produced reasonable results for reconstructing spatial features, and served as an experimental case by which to refine modeling strategies at the CA-INY-1634.

Table 5.2: *Photostation locations for the INY-3074 canyon*

Locus	1	2	3	4	5	6
Station(s)	PS36-PS39	PS40-PS43	PS44-PS46	PS47-PS48	PS49-PS50	PS51-PS52
Locus	7	8	9	10	11	12
Station(s)	PS53	PS54-PS58	PS35	PS33-PS34	PS26-PS32	PS20-PS25
Locus	13	14	15	16	17	18
Station(s)	PS15-PS19	PS13-PS14	PS11-PS12	PS09-PS10	PS05-PS08	PS01-PS04

The gorge descending from a dessicated waterway down from the tablelands towards Little Lake was not only an opportune location to learn from the lessons of the INY-3074's field strategies, but also presented problems of its own to resolve. With even more complex topography in some areas, the site's morphology proved another challenge to overcome. Photogrammetry was an expedient method selected for this, but stark shadows and numerous blind spots in the multicursal areas created confusion for both observer and software (more about this is following chapters).

The photographic procedure at the gorge at Little Lake hybridized INY-3074's photostation strategy with Agisoft's recommended procedure. The hybridized strategy combined photostations with several series of photographs taken along transects (see figure below). Resultant model quality - particularly at the texture stage - improved markedly (see following chapter).

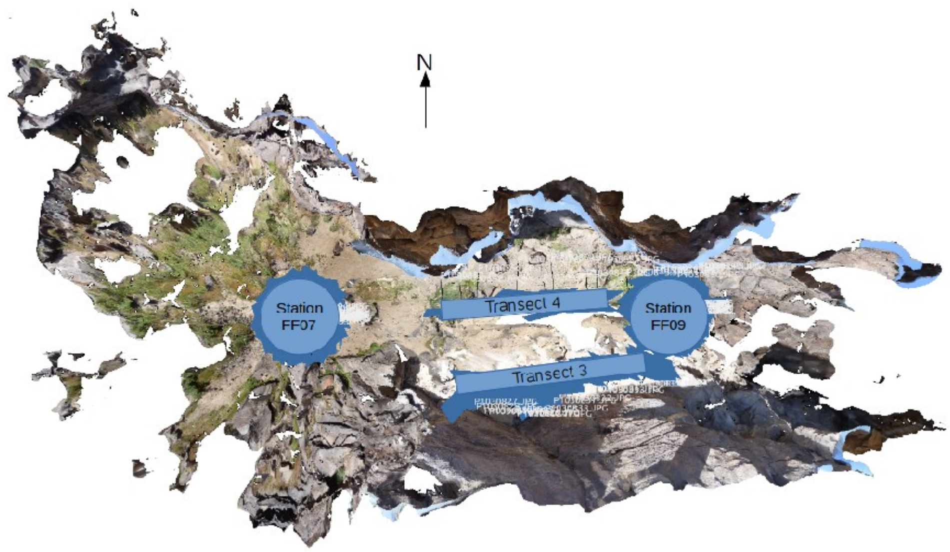


Figure5. 6: *Plan view Locus 4 model, Owens River gorge, illustrating photography strategy.*

Similar to the process used for INY-3074, workflow at INY-1634 divided data by locus. Again, each locus corresponded to a "chunk" in Photoscan (note: as a consequence of strategy, this photo-modeling and acoustics study are smaller than, and defined differently from, the more commonly found use of the term, such as along *Pagunda*'s shores). Within each locus chunk, photos were organized into folders corresponding with either the photostation or transect to which they belonged.

In the example Figure5. 6 above, the textured 3D model of the Gallery (Locus 4 of from Little Lake's gorge), presented with camera positions shown. The hybrid station and transect model worked well for Loci 4 and 5, as well as the canyon's rim; middle areas, however, featured rocky formations which precluded walking transects, so for these areas only the photostation system was used.

Table 5.3: *Photograph locations for the canyon near Little Lake area*

Locus	1	2	3	4	5	Perimeter
Station(s)	FF31-FF32	FF11-FF13	FF10-FF11	FF07, FF09	FF01-FF08	--
Transcects	--	--	--	T3 - T4	T1 - T2	T5 - T6

Post-fieldwork processing to build the 3D CAD models from photographic data involved several steps (see Figure5. 7). Images were imported into Photoscan, using the folder hierarchies described above. Each image was then individually evaluated, and masks applied to areas depicting sky, equipment, background landscapes, or lighting wash-out. After masks were applied, photographs could be aligned one chunk at a time, establishing their spatial relationships and a sparse cloud of tie points. This was carried out with the highest possible accuracy. The next step was to build dense point clouds, again one chunk at a time. In some instances, dense clouds were computed at either "high" or "medium" quality, to facilitate the following step; quality varied based on equipment limitations, and was reduced as necessary when downstream processes failed. A target range for point cloud density at this stage was between ten million and twenty million points per locus. Once a dense cloud was complete, it would then be used as the basis for building a triangular mesh. Depicting the surface linking the positions of the point cloud, successful meshes balancing accuracy with computation limits could be made with approximately 300,000 faces per locus. At any point during the sparse and dense cloud stages, rogue points were deleted to clean up the models. In the final stage, the mesh was "textured" by the software referencing colors in photographs back onto the triangular mesh surface. The final textured model could then be exported in a variety of formats compatible with other CAD programs. For this study, completed models exported in the Wavefront object (.OBJ) format were successfully imported into both the Blender and MeshLab programs. Storing completed datasets in formats readable by open source software (like Blender and MeshLab for CAD) helps further the democratization of digital archaeology, ensuring paywalls are not a barrier to access.

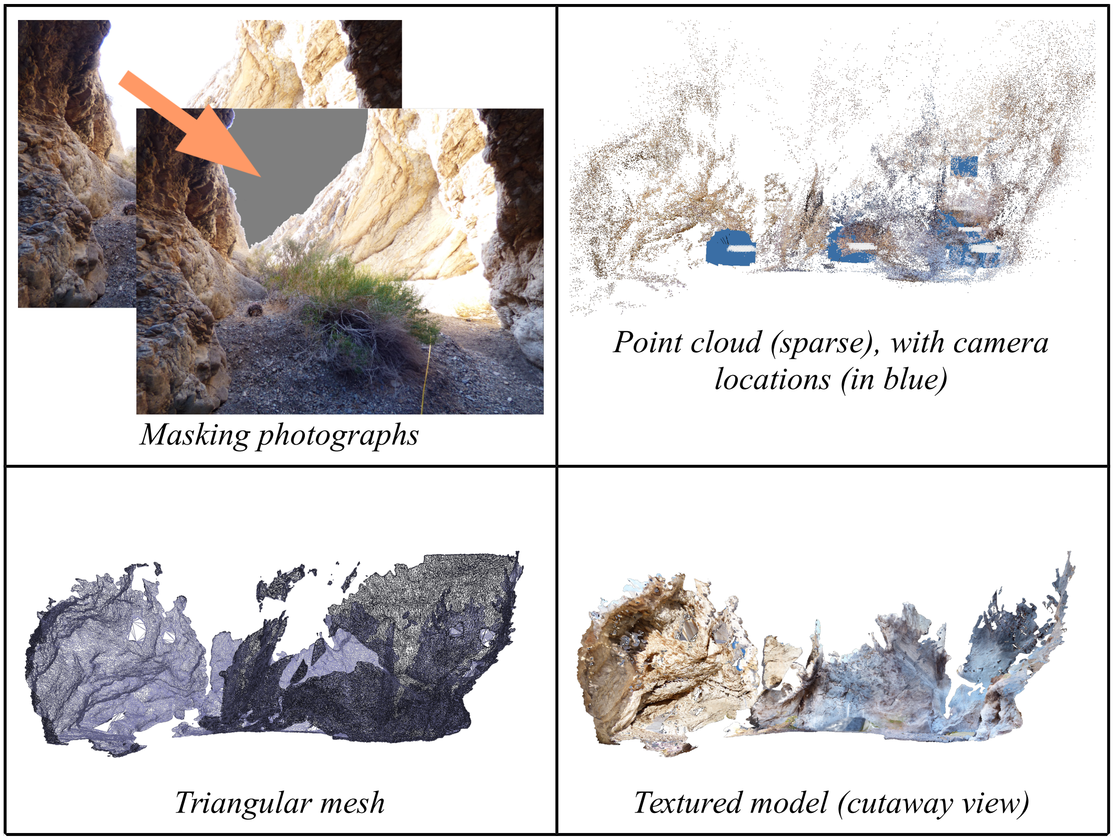


Figure5. 7: *illustrations of photogrammetry process; from CA-INY-3074, Lower Gallery.*

Actualistic Experiments

This study employed experimental methods to explore technical and phenomenological characteristics of the rock art production process. Both ethnographic reports and numerous preceding archaeological studies indicate petroglyphs of this region were largely made ritualistically. Considerations were made for the material and symbolic characteristics of implements and surfaces involved. Most notably, this study tests sonic effects of the petroglyph manufacture process known as "pecking," in the contexts of both research locations in which it is observed. Materials used to make these marks are themselves of interest to the study, and so material selection was included as a component of the actualistic experiments. Beyond percussion experiments, tests also included evaluating the propagation of sound directionally, and the propagation of sounds matching the human vocal and hearing ranges.

Archaeoacoustic Experiments

Precedence

Recently, phenomenological approaches to archaeology have increasingly highlighted the need to account for intangible aspects of experience. As a consequence, interest in sonic properties of archaeological sites has risen globally (e.g. Till 2009; Marshall 2016; Kolar 2017). In North American archaeology, and in particular the Great Basin, ethnographic evidence validates exploring acoustic phenomena at rock art sites as signs of other-than-human agents (e.g. Waller 1997, 2004, 2012, 2016; Garfinkel and Waller 2012). Some of the supporting ethnographic evidence is presented in the previous Ethnographic Commentary chapter.

Given the work by Waller and others, an archaeoacoustics model is sufficiently substantiated to warrant tests at the Mojave Desert research locations. In both research locations, the predominant manufacture technique employed was the percussive stippling referred to as “pecking.” Taking previous models for Great Basin rock art interpretation, such percussive sounds could reasonably relate to big game hunting (resembling horn/antler clashes from mating competitions), rain shamanism (resembling thunder), and ceremonialism (establishing a musical beat or tempo). Additionally, rhythmic audio droning is connected with inducing altered states of conscious, and would thereby support the neuropsychological model.

Recognizing this variability in studies, Díaz-Andreu and Mattioli (2014) describe three primary criteria commonly of concern to archaeoacousticians: echo, reverberation (reverb), and resonance.[84] These three variables characterize acoustical analysis of this Mojave Desert slot canyon study.[85] Echoes arriving sufficiently close together as to become perceptually indistinguishable give rise to reverb; the limit for this phenomenon varies on sound qualities, but a useful metric is about 50ms. Reverberation in a semi-enclosed space corresponds with a build up in pressure waves, and the time necessary for these sound reflections to drop 60dB (approximating the threshold of hearing) is a metric called RT60 (*ibid*). Thirdly, resonance is the effect of the closed or semi-enclosed space's dimensions on building sound waves, wherein frequencies with wavelengths that are an integer function of one or more of these dimensions persist and build, while those which are not become dampened. Waller (2004, 2012; Garfinkel and Waller 2012) has successfully employed relatively inexpensive field equipment and software for research at sites in California, Michigan, New Mexico, Quebec, and Utah. While more complicated

84: Testing acoustic properties of archaeological sites has not yet been standardized, and so equipment and methods remain variable in application.
85: Field and reporting methods were chosen as easily reproducible means by which to investigate ethnographically reported phenomena, using Díaz-Andreu and Mattioli's (2014) criteria, with data comparable to Waller's (2004, 2012) precedence.

analysis can be done (e.g. Murphey 2006; Cook et al. 2010), the present study's methods are largely informed by Waller's approach.

The general process involved producing sound impulses on site using portable materials, recording these impulses and the sound reflections, noting subjective observations in the field, and processing the recordings through audio software after the fact. Given the percussive nature of the pecking strategy, the primary impulse source for both research locations was clacking quartz and quartzite cobbles onto larger tablets of limestone and basalt. These materials were selected both to mimic the exposed rock (for the tablets), and the proposed hammerstone materials (see previous studies in the following Other Experiments section). At Fossil Falls, additional "signal sweeps" were added to the impulse repertoire, as will be described momentarily.

Specific experiments included

One site acoustic experiments were conducted in three phases. Phase I was a feasibility test conducted at INY-3074 during the summer of 2014. During a single day in August, a crew of two archaeologists and one geologist visited the site, recording preliminary sound samples. Percussion tests on portable tabular stone at 120 and 240 beats per minute (BPM) comprised the entirety of the sound impulses. Recording procedures were simple, using only a laptop computer and two small microphones - one USB omnidirectional condenser microphone, and one 3.5mm powered omnidirectional boundary microphone. Audio was saved in two formats,

.wma and .flac. Later analysis on the sound files was conducted using the open source program Audacity, and results reported by Liwosz (2015). Equipment limitations included poor microphone sensitivity below 300Hz, and the possibility that noise from the laptop's cooling fans might have interfered (although there was no evidence of such interference observed).

Phase II went full scale for acoustical tests at INY-3074, in September 2016. Equipment was upgraded to alleviate limitations encountered in 2014. The possibility of fan noise interference was eliminated by using a Zoom H5 audio recorder to record sound files onto an SD card, eliminating the need for a laptop in the field. Four XLR studio grade cardioid microphones were brought for use recording, however these failed to perform properly; instead, recordings were taken with the H5's stereo XY (left and right channels) attachment, still at a markedly higher quality than in 2014. Three types of test signals were planned: tabular percussion, frequency sweep, and music playback. For the latter two, files stored on an Android tablet were to be played back on-site through a small bluetooth speaker. Due to technical issues, the frequency sweep files could not be replayed, and this portion of the test was skipped. Percussion tests were carried out at each locus with petroglyphs, at a cadence matching the ranges reported by Busby et al. (1978). Music files were played through the bluetooth speaker to test the boundaries of soundsheds, a phenomenon accidentally observed in 2014 when crew members unexpectedly left hearing range of each other despite conducting activities loudly. Such a disconnection implied that at one or more points within the INY-3074 slot canyon, rock formations obstructed the transmission of sound waves, effectively creating "soundblinds."

While discussing the concept as exemplified by a study on Swedish ringing stones, Hultman (2014:6) defines a soundshed as the area encompassing hearing range from a sound source (e.g. rock gongs). Interaudibility between sonic features would place them within a shared soundshed. For the purposes of the slot canyon petroglyph study, music files mentioned above were used to examine the extends of interaudibility, at the boundary of which obstructing features might be identified. These music files, including traditional Shoshone songs and contemporary electronic music, were selected for possessing both percussive and vocal attributes (Liwosz 2017:190). In 2016, the speaker and tablet were placed in a stationary position, and I continued further into the canyon until the sound became inaudible. The speaker was then moved further in, and the test repeated, until the entire cultural section of the canyon was tested. Results and observations were documented in field notes, are reported in Chapter 7. As loci within INY-3074 are contiguous, each can be presumed to be audible from its immediate upstream and downstream neighbors; soundsheds of the canyon were thus divided into "zones," with each zone representing a contiguous series of loci sharing common interaudibility, and beyond which outside sounds would be inaudible, and beyond this same boundary sounds from within the zone became inaudible (see Chapter 7). Finally, a related impromptu test was conducted after observing percussive sound reflections from unexpected distance. The impromptu test consisted of climbing the north canyon wall around Locus 3, and producing sound impulses through percussion, shouting, and clapping. This test yielded further information about soundsheds, and its results are covered in detail in the following chapter, and also have been reported in a preliminary fashion elsewhere (Liwosz 2016, 2017). Audio was recorded in .wav format.

Phase III acoustic studies were carried out at the Fossil Falls site in May 2017. Crew consisted of myself, and one assistant. Issues with both the sound sources, and recording equipment from Phase II were resolved. The Zoom H5 with the stereo attachment was again used, making recordings comparable to those from INY-3074. Additionally, issues of powering the XLR cardioid microphones were resolved, and two were joined to the recorder, allowing for a total of four audio tracks to be recording simultaneously. Two cardioid microphones were placed strategically and at some distance (five to ten meters) from the recorder, with their positions documented. Tabular percussion was again used for the first series of impulses, at loci either containing, or in visual range of loci containing, petroglyphs. Again, these were undertaken at a cadence matching the ranges reported by Busby et al. (1978). Signal sweeps were tested at all loci at the Falls. Like the soundshed test at INY-3074, the Fossil Falls signal sweeps were played through a bluetooth speaker from files stored on an Android tablet (again preventing the use of any equipment with cooling fans). Signal sweep audio files were generated to test the behavior of tones ranging the full span of human hearing, for both simple sinusoidal and more complex waveforms.

Sweeps ranged from 20Hz to 20KHz, then back down to 20Hz; these were generated in linear, stepped linear, and logarithmic patterns. For each pattern, three waveforms were played: simple sinusoidal (single tone), square wave (containing all odd number harmonics of the fundamental signal), and sawtooth wave (containing all integer harmonics). Subjective experience of “louder” ranges, and haptic sensations, were noted as well. Audio was again recorded in .wav format.

For both the Death Valley area, and Little Lake/Fossil Falls area, test locations (or control sites) were also established. Each test location was selected to represent the surrounding landscape, and control for factors being tested (Figures 5.8a and 5.8b). Both control sites were outcrops of rock with upright faces higher than a standing person. Additionally, control sites were not generally enclosed, allowing for analysis to identify differences in sound behavior between the control sites and enclosed areas of each archaeological site. The same equipment and experiments were used at each corresponding control site, so that INY-3074’s (Phase II) experiments were carried out at the Death Valley control site, and Fossil Falls (Phase III) experiments were carried out at the Little Lake control site. The Death Valley control site consisted of a significant section of exposed bedrock in a drainage, mimicking INY-3074’s entrance, sans opposing walls, occluding corners, or plunge pools. The Little Lake control site abutted against a 3 to 4 m high basalt wall, similar to some of the exposed areas in canyon’s amphitheater, and especially to the escarpment along Little Lake’s eastern shoreline.

Figure 5.8a: *Little Lake area control site.*

Figure 5.8b *Death Valley area control site (camera positioned level).*

Audio files from Phases II and III were processed through Audacity, as well as the open source program Sonic Visualiser. When necessary, files were converted from .wav to lossless .flac. Before analysis went any further, all tracks were normalized to -1db (but not independently). Both programs proved useful in identifying discrete echo events, helping to establish delay and reverberation. In the present study, echo delays are reported for the first few clear signals. Reverberations identified by series of echoes arriving within 50ms of each other are simply reported as present, weak, or not evident; RT60 is not reported, but could be obtained from the raw data collect.

Resonance requires a somewhat more cautious and skeptical approach. Both audio programs mentioned above also include features for visualizing frequency intensities both as a function of time (spectrogram), and synchronically (spectrum). A number of algorithms are incorporated into Audacity's plot spectrum tool, and each yields slightly different but similar values. In samples for which harmonic resonance was suspected, the same subset of data was passed through multiple such algorithms for verification. Additionally, these were all also checked (or sometimes initially identified) in Sonic Visualizer. Harmonics thusly substantiated should consequently be understood to be approximations of a frequency band.

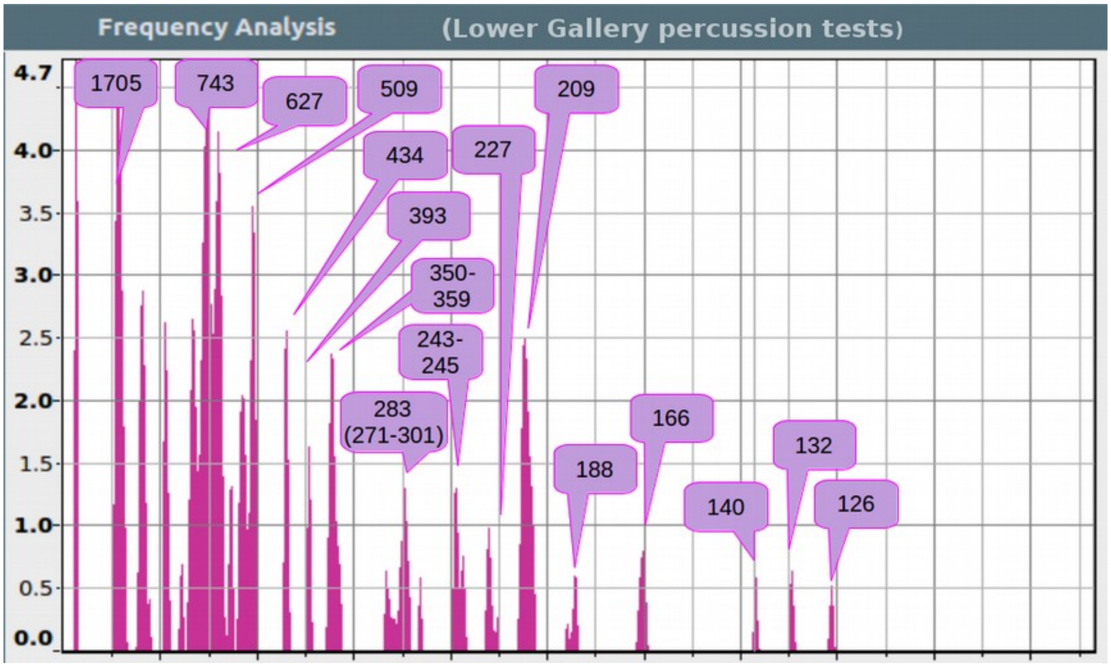


Figure5. 9: *Spectrum (logarithmic scale) from INY-3074 Locus 6, demonstrating use of autocorrelation algorithm to show peak frequency bands (labels in Hz), among which are likely harmonics.*

During analysis, the author noted that matching resonant peaks for the same locus could vary up to ten percent between recordings, with variables being microphone position and impulse location (Liwosz 2017:194). For narrow harmonic bands, the central tendency alone is reported; for wider bands, the range is reported either alone or in conjunction with the central peak. Spaces determined to exhibit resonance include multiple such resonant bands. Specific to this study, designating a space as "resonant" is reserved for those with multiple bands between 75Hz (the equipment's practical limit, although this varied by up 25Hz between higher and lower quality recordings), and 2,000Hz (beyond typical soprano range), as the theoretical premise posits vocal engagement important to establishing cultural significance. For these results, attempts were made to determine the mathematical relationship between bands from all samples recorded at the same location. Because constructive and positive interference of soundwaves can theoretically map spatially, microphone location(s) and impulse source position are understood as factors in identifying (or failing to identify) resonant signals in each sample file. In some instances, efforts were made to relocate equipment in order to account or adjust for these factors.

Other Experiments

Among the most fundamentally defining principles of the scientific method is the verification and reproducibility of results. Due to economic and social pressures within and outside the academy, however, duplicative studies are often passed over in favor of those seeking superlatives – biggest, oldest, first, etc. The unfortunate consequence is that studies in archaeology – and the sciences broadly – often fall short of this final crucial step. It is my hope that while the research I present is innovative, it still operates to alleviate this widely troubling methodological shortcoming. For instances in which familiarity with the literature permitted, and experiments readily integrated into this project's mission, efforts to verify or refute previous researchers' findings were made.

Employed in many earth and materials sciences, here including archaeology, the concept of *actualism* infers formation processes in the past can reproduce similar results in the present. Core to what some (e.g. Binford and Sabloff 1982:14) term middle-range theory, actualism is a key conceptual tool to understanding material culture with both the patterned behaviors and weathering processes which produced the archaeological record today. Given the fleeting and essentially immaterial character of acoustical events, reconstructing sound profiles requires actualistic experiments in petroglyph production.

Precedence exists for actualistic studies in petroglyph production processes (e.g. Busby et al. 1978). While identifying the substrate or surface onto which the images are emblazoned is straightforward, identifying tools is often inferential. Many rock art studies simply circumvent the question of tools and processes involved, and these concerns may not be critical in all investigations. As mentioned, however, acoustics requires substantiating inferences in order to correctly produce relatively accurate phenomena. These evidences are gleaned not only from on-site observations, but site formation process studies, and other sites in California (e.g. Whitley et al. 1999; Whitley 2000a).

Archaeologists from the University of California systematically reproduced previously documented petroglyphs to scale, measuring substrate hardness, starting and ending Munsell colors, motif content and area, blow cadence, and passage of time (Busby et al. 1978). Some twenty years on, Bednarik (1998) critiqued many petroglyph reproduction experiments as being subject to confirmation bias, and not appropriately considering engraving toolstone selection. Deeming these objects *mur-e* (or to some proceeding studies, *peckers*) based on an Aboriginal Australian word, the *mur-e* category encompasses a large suit of potential implements (Bednarik

1998:27). For percussion implements, Bednarik notes that the hardness and durability of quartz and quartzite make them ideal *mur-e*. In the Great Basin and perhaps elsewhere, however, David and Tamara Whitley, Ronald Dorn, and others (Whitley et al. 1999) propose other properties of quartz gave it symbolic value in religious expressions, especially in rock art production. Consequently, a comparison was done between like-on-like (basalt on basalt, limestone on limestone, and quartzite on quartzite), and harder-on-softer (quartzite and quartz hammerstones only). These initial test, undertaken outside archaeological contexts near the Death Valley control site, indicated sufficient differences in durability to decide continuing only with quartz and quartzite hammerstones for onsite tests.

Percussive tests outlined above under *Archaeoacoustic Experiments* provide the platform and opportunity to test the results reported by Busby et al. (1978), Bednarik (1998), and Whitley et al. (1999). These tests were conducted both on-site with modern manuports (both brought in and taken back out for the sake of the study), and later under controlled conditions. Audio recordings provide both experiment and control data. Narrative notes record additional observations, and along with photos provide a record of the dimensions and makeup of experimental materials. Percussion tests, especially those on-site at both INY-3074 and INY-1634, were carried out at multiple tempos, with quicker tempos hypothesized to foster standing waves inherent in acoustical resonance. Tests were undertaken on a variety of substrate tablets, each selected because of some similarity to rock art site surface stone. These tablets receiving blows were of raw limestone, partially metamorphosed limestone, and patinated vesicular basalt. Blows were delivered both using direct and indirect percussion, with engraving toolstones of quartzite, and quartz macrocrystals. All stone tablets and hammerstones were ethically acquired off-site, and were removed for off-site disposal after tests concluded.

Figure5. 10: *example modified cobble hammerstones used percussion experiments.*

Lightning stones

Additional experiments were done with various combinations, including quartz-on-basalt, quartz-on-quartz indirectly onto tablet stones, and quartz-on-quartz alone. A study by Whitley (David and Tamara), Dorm, Sim, and Rechtman (1999) concluded battered quartz cobbles abounding at the small rockshelter and engraving site CA-SBR-4895 were used as percussive engraving instruments at least in part because of the stone's natural properties. Specifically, the team suggests ethnographic accounts of spiritual and religious power derived from breaking or pulverizing the mineral results from quartz's scientifically verified piezoelectric properties. When struck, quartz generates a pressure-induced electrical field, which releases energy as a brief burst of light in a phenomenon called triboluminescence (Whitley et al. 1999:236). As subject matter is linked with present study both by archaeological materials and ethnographic evidence, and because it is directly related to the actualistic experiments addressing the phenomenology of the carving/engraving/"pecking" process, attempts to reproduce the results were included. This experiment necessitated controlling lighting. Triboluminescence experiments were pursued in several settings: indoors (laboratory) in artificial light, indoors (residence) in controlled darkness, outdoors in daylight (Little Lake control site), and outdoors at night (same venue) both during the full and new moons. Results, discussed in subsequent chapters, were simply recorded qualitatively based on whether or not such flashes were observed.

Complications

A number of actions could not be completed due to a variety of circumstances. Furthermore, data quality proved quite variable, impacting processing and analysis. For the sake of scholarly and scientific rigor, the most impacting of these complications are listed here. In some instances, I was able to compensate for minor issues; in others, complications required modifying or limiting the bounds of the study. In reporting these matters, I acknowledge the study's limitations, and create a record useful in avoiding some of these issues in future studies.

First among these complications are those involved with photography and photogrammetry. Primarily because of time management (especially in 2016 at INY-3074, when I had no assisting crew), photos were mostly taken in "intelligent auto" mode, and so camera operation variables (focal depth, aperture, shutter speed, ISO, and F-stop) were not controlled. This reduced the accuracy of the photogrammetry models. Additionally, the expedient strategy used at INY-3074 is not that recommended by the software publisher, further complicating processing. None of these were impacting enough to wholly prevent building the models, however.

Second, audio recording faced several complications. At INY-3074, an equipment issue prevented replaying the systematic test signal sweeps planned. Acoustic analysis could therefore only be carried out on recordings of percussion impulses, therefore the signal-to-noise ratio for the results at that site are low - especially at loci with fewer recordings. Another complication arose at the same site when attempting to deploy the XLR cardioid microphones, which failed to capture audio. Although post-fieldwork identified and remedies the issue, recording in the field had to proceed with the less sensitive stereo audio attachment. Additionally, this prevented recording synchronized tracks at multiple locations in each chamber, reducing the ability to detect standing soundwaves and increasing the necessary testing time. The impact of this was that in order to conclude the field session on-time, I had to forgo recording percussion experiments at several lower-priority loci.

At Fossil Falls Archaeological District, visitor use was also a factor. The BLM developed the canyon and its surroundings for public day use and camping in 1980 (Garfinkel 1980). Although the impacts on archaeological resources are minimal, documentation and experiments at INY-1634 had to operate around tourists. People in photos, and voices and UAV rotor noise are in some recordings, however the files are still usable.

CHAPTER 6: RESULTS

Introduction to chapter

Research data originated from archival research and fieldwork sessions. The most intensive phases of this study spanned from 2013 through 2018, although limited field and archival data was collected in 2010. Archival work and laboratory analysis began in earnest in 2013, spanning through the rest of this study's duration. Several field sessions following those early limited visits were conducted as well. At CA-INY-3074, a preliminary proof-of-concept field investigation specifically oriented at acoustics was carried out in August of 2014. More intensive acoustical and photographic documentation proceeded in August 2016; these data were combined with written and photographic records from 2010. For CA-INY-1634, three field sessions occurred in Spring of 2017: one in March, one in April, and one in May. These also were comprised of both photographic and acoustic documentation. At both primary research locations, additional pedestrian inspection of the surrounding landscape revealed useful context information. During and following the field sessions, audio and photographic data was further processed. This processing continued into early 2018. Data analysis was concluded after sufficient progress towards addressing research goals was made, but prior to exhaustive study. Additional measures may be taken in the future to expand the study, beginning with the existing data set. These expanded efforts were nonetheless deemed superfluous to the conclusion of a comparative, phenomenological investigation, and thus not further pursued.

The present chapter aims to present data in a systematic manner. Interpretive discussion is kept to a minimum here, as it is the topic of the following chapter. In compartmentalizing results and interpretation, my hope is that these data may prove useful in its own right, regardless of whether or not future scholars and discussants agree with this study's conclusions. Furthermore, it functions to diminish confusion between data collected during this study, and that collected by other researchers. Some mid-range interpretation is however included in this chapter, especially regarding iconography. In other aspects, the results reported here also aim to produce and refine mid-range theory. These become contextualized on a more conceptual level in the following chapter.

Chapter structure

Two modes of thought govern the organization of this chapter. First is spatial and landscape context. Results are reported in relationship to their landscape contexts - first the Death Valley region project area (with a focus on CA-INY-3074), and second the Little Lake landscape project area (with a focus on CA-INY-1634) where a gorge bridges lacustrine flats with volcanic tablelands above. Within each preselected landscape, data is then divided by archaeological site, and then by locus within that site. For the sake of clarity, the landscape is given a broad narrative description, the site a digitally rendered sketch map, and each locus is first introduced as labeled on these maps. Data for each site is organized in part by locus, and loci are arranged by their spatial relationships. The second mode of thought governing the organization of this chapter relates to the various methods and experiments carried out. Most of these data are associated with a particular locus, and are thus reported under the relevant loci's subheading. Other experiments, such as those relating to production methods, may not necessarily be constrained to particular loci, sites, or landscapes. These more freely associated results are reported independently of locus or site level data.

Death Valley project area landscape

CA-INY-3074

Geomorphological structure

Geology is a defining aspect of INY-3074, with the site virtually entirely contained within a slot canyon cut into bedrock formation. The only exception is a cluster of features immediately at the canyon mouth, located in the bed of the stream discharging from the canyon onto alluvial bajada. The bajada itself is a gently sloping apron built of debris discharged from the Cottonwood Mountains, with the most voluminous deposits accumulating at the outlet of seasonal waterways such as that which formed and continues to shape the INY-3074 slot. Within the slot, the canyon can be divided into three sections based on predominant bearing, average slope, and bedrock at ground level. Rather than being inconsequential, these natural characteristics likely yield cognitive effects during human interactions with the location (Liwosz 2016), a point on which this discussion will later return. All three aforementioned bedrock strata along the culturally utilized extent of the slot canyon are sedimentary marine deposits in varying stages of metamorphosis. Outside of the site boundaries, the same mountain range also hosts nearby volcanic deposits.

An active mountain range in the Great Basin block-fault systems, the Cottonwood Range continues to experience various geologic stresses that compress, uplift, tilt, and fracture the upper lithosphere. Consequently, the bedrocks of the INY-3074 canyon exhibits joints, seams, and faults. This faulting action not only influences direction changes in the slot canyon's watercourse, but most likely is also responsible for the initial conditions which started the canyon forming in the first place. Such minor faults are especially evident at the seams between the three primary bedrocks or basements. Here the term basement is applied loosely as a label, as the bedrocks are only partially (rather than fully) metamorphosed.

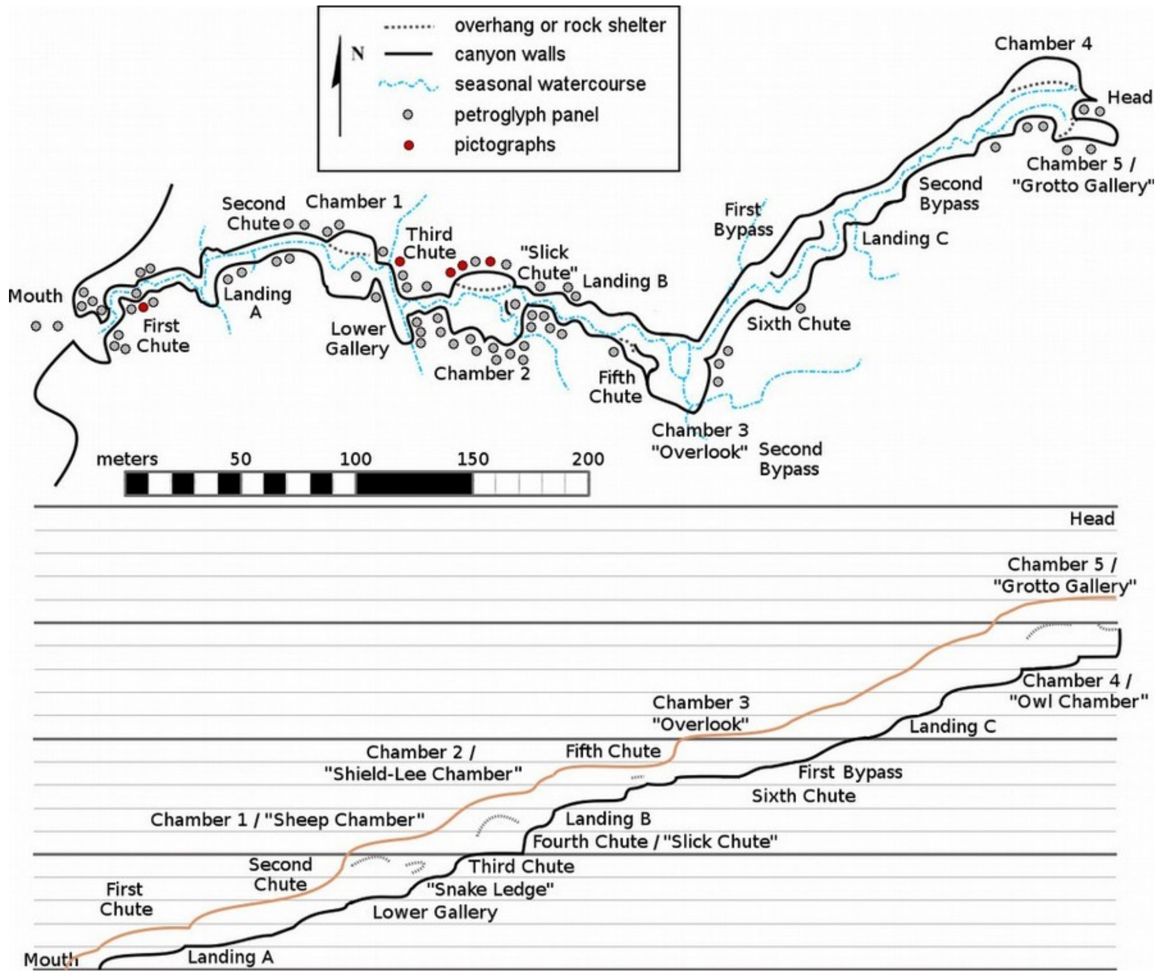


Figure6. 1: *INY-3074 schematic of canyon loci, from overhead (TOP), and vertical profile ascending eastward (BOTTOM). Figure revised from early schemata previously published in Liwosz (2017:181, 189)*

Basement A is the first exposed rock formation encountered when approaching the canyon from the bottom, and is the stone first seen rising above the bajada debris at the canyon mouth. A dark, highly weathered, metamorphosed limestone abutting pockets of dolomite (see Figure6. 3), Basement A stretches from the mouth through Chamber 1, and forms part of the southwest wall of the Lower Gallery. Basement A is characterized by angular and sub-angular fractures, many but not all of which are cemented with calcium carbonate (or similar) deposits. These secondary seams appear to have been utilized in the production of panel 48 (below).

Figure6. 2: *INY-3074, Locus 5, Panel 48 overhang above low dark void in dolomite*

Reaching from the northeast wall of the Lower Gallery up to the Chamber 3 “Overlook,” Basement B (alternately referred to as Formation B) is a lighter bluish-grey limestone (Liwosz 2016). This stratum erodes in a more curvaceous manner than Basement A, and features far fewer flat fractures. Its smooth weathering and dark patinas lend Basement B well to petroglyphs, such as the prominent extensive panel in the Lower Gallery just before the Third Chute. Basement B is separated from A by a fault which crosses through the Lower Gallery at a tilted but nearly vertical angle. (Figure6. 3).

Beginning at the Chamber 3 “Overlook,” the slot canyon again changes slope and direction, as another seam distinguishes Basements B and C (Figure6. 37). Basement C (alternately referred to as Formation C) is a course, yellowish stone with angular fractures (Liwosz 2016). It is most likely either quartzite or partially metamorphosed sandstone. The light color, tough, granular surface, and fracture qualities do not lend this stone to carving, and likely contribute to the reasons why no rock images are observed on it. Between Chambers 3 and 4, the canyon’s course roughly follows the seam or fault dividing Basements B and C, with C forming the north wall of the canyon.

Outside of the canyon, a small number of remarkable geologic features are also present. These include two potential igneous plugs. One such plug borders the northern edge of the uphill wash which feeds runoff into the slot canyon, while the other constitutes a hillside hosting a rockshelter site (identified as CA-INY-130). The former plug may have contributed to the formation of a box-canyon geologic feature upstream of the slot canyon, referred to in reports as the Upper Gorge (Liwosz 2016). Currently, the Upper Gorge remains un-surveyed, but photographs taken at a distance demonstrate the potential for archaeological evidence.

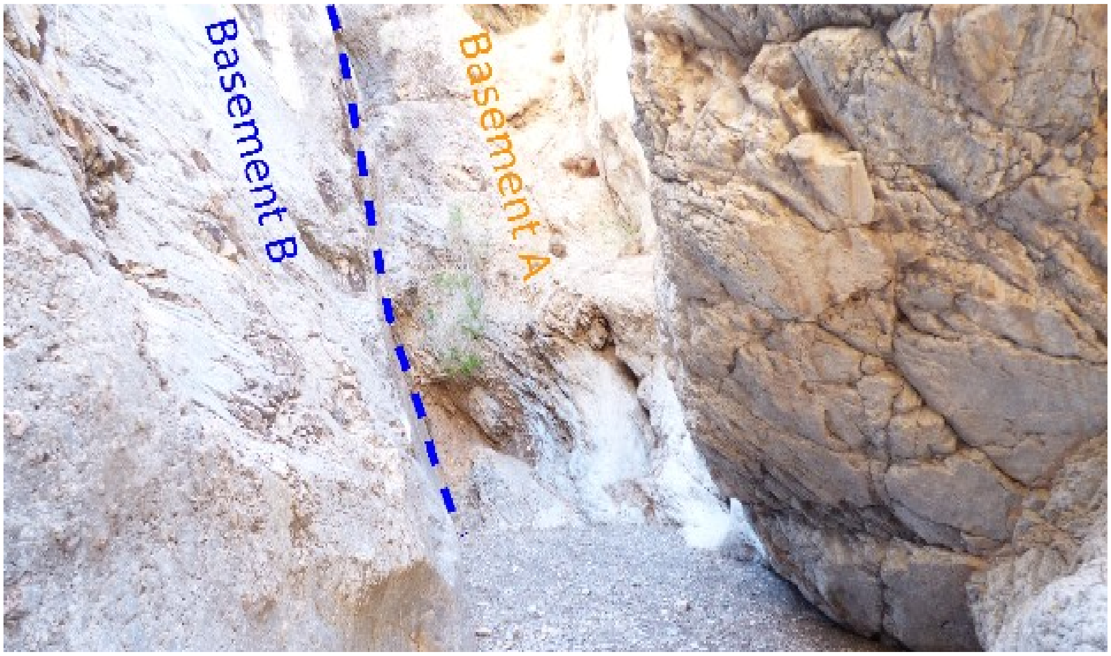


Figure6. 3: *INY-3074, Locus 6, with seams/faults between meta-sedimentary levels. *note: between Chapters 5 and 6, Basements (A, B, C) are alternately referred to as Formations (A, B, C)*

Archaeological site structure

INY-3074 is divided into eighteen discrete loci, based on both geomorphological factors, as well as distributions of archaeological evidence. These eighteen loci serve as the fundamental spatial divisions of this Death Valley area slot canyon site, and are used to organize how data is reported. Here, the loci are listed in order by elevation, from an ascending approach. To begin, Locus 1 is the the mouth of the canyon, and also includes features located nearby in the drainage as it discharges out onto bajada. Locus 2 is alternately named the First Chute, and is a short series of slick, sloping steps at first entry. The canyon levels somewhat at the top of the chute, and Locus 3 (or Landing A) is the relatively level portion with near-right-angle direction changes, spanning from the top of the First Chute to a chokestone. The first chokestone is wedged in the Second Chute, also designated Locus 4. Locus 4 stretches to a set of carved handholds/footholds ascending up into Chamber 1 (or Locus 5). Chamber 1/Locus 5 has in previous documentation been referred to as the "Sheep Chamber" or "Sheep Hunt Chamber," because of a corral scene depicted on Panel 49 (Figure6. 2, Figure7. 3, Figure7. 28) on the chamber floor. The back of Chamber 1 opens into the long and narrow Locus 6 or the Lower Gallery, where a seam between Basement Formations A and B is evident. The canyon changes direction and increases pitch at the juncture of the Lower Gallery (Locus 6), and Locus 7, the Third Chute.

The Third Chute is a high series of stepped dry falls, and contains at least one pecked foothold/handhold. This chute opens in to Locus 8, or Chamber 2. Also referred to in previous documentation as the "Shield-Lee Chamber," Chamber 2 is a wide room wedged between two chutes. The east wall of Chamber 2 ascends up the Fourth or "Slick Chute," a geologic feature that has impeded previous archaeological investigations. The Slick Chute (Locus 9) ascent terminates at Locus 10, alternately named Landing B after its shape recalling the capital letter B. Beyond Landing B, the Fifth Chute is another high and steep dry fall similar to the Slick Chute, but wider. The Fifth Chute (Locus 11) tops out at the foot of Chamber 3 (Locus 12), alternately called the Overlook because of its view over the adjacent valley. At the Overlook the canyon changes direction again, angling towards the northeast into Locus 13 or the Sixth Chute.

Again a seam in the bedrock is evident at Locus 13, and following the Basement C quartzite/metamorphosed sandstone leads to Locus 14 - the First Bypass. This bypass is a ledge overlooking the canyon, part way up to the rim. The First Bypass terminates by dropping back down to the canyon floor at Locus 15 - Landing C. A Second Bypass (Locus 16) rises up from Landing C along another narrower ledge in the Basement C formation, circumventing towering rock features and chokestones. Beyond the Second Bypass, the canyon opens up to Chamber 4 (Locus 17), where high overhangs are found in the quartzite basement. Finally, the head of the canyon is a metamorphosed limestone grotto opening in the back of Chamber 4. Locus 18/Chamber 5 is also referred to as the "Grotto Gallery." This gallery is partially closed at the east end by a chokestone and roof, and features high vertical walls and a dry fall.

Site-wide results

Briefly summarizing the canyon site's parietal art, 346 distinguishable elements among 64 panels have previously been reported (Liwosz 2014). This conservative figure does not account for instances in which several series of superimpositions have obfuscated element boundaries, among other limitations. Notes and images from 2016 field work not only reveal previously unnoticed elements on existing panels, but also nine more panels previously overlooked. The current revised total counts 417 elements among 73 panels, not accounting for questionable or difficult to discern components. Contrary to Gilreath and Hildebrandt's (2008:11-14) findings in the

Coso Range, yet in line with Allen's (2013:152-153, 268) findings at Sage Canyon, INY-3074's production rates are weighted towards more recent times (see Figure6. 4). Unlike Sage Canyon's KER-226/H, however, INY-3074 demonstrates *some* panels of great antiquity (this may in part be due to the substrate's durability).

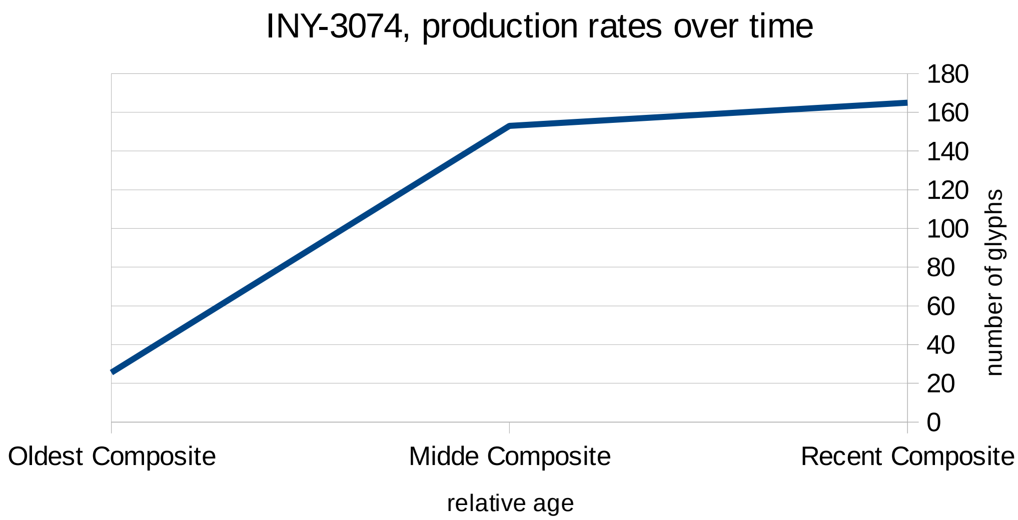


Figure6. 4: *Petroglyph production rates for all Loci, CA-INY-3074**
**based on 2014 inventory of n=346*

The 'sound blind' experiment was conducted on the site-wide scale, and thus the changes in bedrock and canyon morphology directly influenced its results. Music played with the speaker positioned at the canyon mouth was clearly audible through Chamber 1 and into the Lower Gallery, but not in the Third Chute (Liwosz 2017:191). Music played in the Lower Gallery at the foot of the Third Chute was audible as far up as the Overlook, but not in the Sixth Chute. Finally, music played in the Overlook was audible back to the Grotto Gallery, but became garbled and distorted in both the Grotto and in adjacent Chamber 4 (*ibid*). This distortion was qualitatively described as lyrics being rearranged or being heard slightly out of order. Additionally, echo reports from percussion tests, clapping, and shouting on the canyon's north rim above Landing A were heard and recorded returning from Chamber 1's high overhang/shelter (delay approximately 0.27s), and from the INY-130 rock shelter[86] on a neighboring hillside (delay approximately ~3.42s)(Liwosz 2017:191-192). Together, these data supports dividing INY-3074 into three soundsheds (zones). Referring back to crew experiences in 2014 which inspired this experiment, the culprit spot can be identified. With two crew members in Zone 2 (Chamber 2), and the third in Zone 3 (Grotto Gallery), the point of disconnect was likely at the direction change from the Overlook into the Sixth Chute (see Figure6. 5 below).

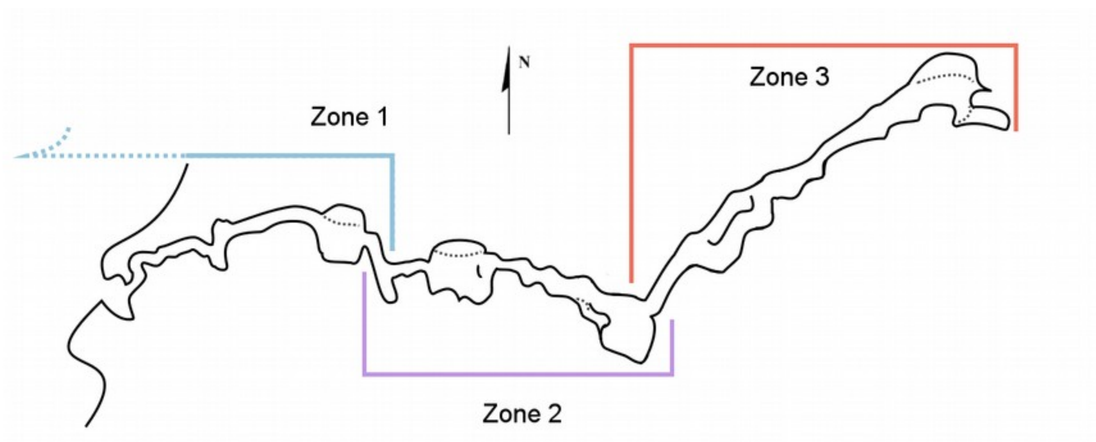


Figure6. 5: *Three-zone breakdown of soundsheds at INY-3074. Figure originally published by Liwosz (2017:190), reproduced with permission by author.*

Of note, each identified soundshed corresponds with a different dominant bedrock, and the boundaries of each of these zones are all at changes in slope and bearing of the canyon's course. Zone 1, comprised of Loci 1 through 6, extends out onto the

86: See Chapter 1 notes on site designation discrepancies valley bajada, and towards INY-130; within the canyon, this zone is in geologic Formation A. In Locus 6, a seam between geologic Formations A and B redirects water flow shaping the canyon, causing the course to change bearing by 25° to ESE, and for the incline to increase by 10-15° (Liwosz 2017:190). Although view of the speaker (while situated at the mouth) was obstructed past Locus 2, audibility was not impacted until the trend in bearing and slope changed between Loci 6 and 7. Between Locus 6 and Locus 12, the pitch and direction are nearly continuous, allowing for sound to be conducted readily. This span is designated Zone 2, in which sound waves are likely funneled along the steeply angled course. Beyond Locus 12, the pitch decreases substantially, and the bearing swings by at least 50° to NE. These course changes mark the seam between Formation B and Formation C, the latter of which accounts for the canyon's north wall from Locus 13 through Locus 17. Pitch changes diminish the ability for funneled sound from Zone 2 to continue past Locus 12, however the change in bearing likely contributes even more to the sonic separation. Zone 3, spanning from Locus 12 through Locus 18, mostly follows a relatively straight course at a gentler grade. A change in direction from the large and curved Locus 17 abruptly southward to the east-west aligned gallery of Locus 18 likely accounts for some or most of the "garbled" qualities of sound played in Locus 12.

Each soundshed zone shares one overlapping locus with its neighbor. Specifically, Zone 1 overlaps with the immediate surroundings to the low site, and with Zone 2 at the Lower Gallery. Zone 2, in turn, overlaps Zone 3 at the Overlook. It is thus possible both to obscure and to relay sound between Loci. A source in Zone 2 could in principle remain inaudible from Zone 1 (excluding the Lower Gallery) and Zone 3 (excluding the Overlook) so long as it remains at or between the Third and Fifth Chutes. Similarly, a source in Zone 3 (like myself in 2014) remains inaudible to Zone 2 until descending to the Overlook. Alternatively, placing a repeater (for example, a person) in just the three strategic locations of Loci 1, 6, and 12, could allow for information to be relayed from the valley or even INY-130 all the way through to the terminus at the Grotto Gallery. As will be discussed in the following chapter, another implication is that canyon occupants only need retreat inward past the petroglyph panels of the Lower Gallery to become both inaudible and invisible from the valley below.

Alternate access routes

Today, two primary routes are used to access the Death Valley slot canyon's interior by recreational visitors: the ascending route from the mouth upward, and the descending route from an upstream gorge, entered by rappelling from the canyon head. As demonstrated by the impromptu sound test above Landing A, the relatively low walls of Zone 1 permit access from the rim at minimally one (and possibly many) point(s) in this section. Zone 2's high walls preclude such an approach. During 2016 fieldwork, another access route was identified in Zone 3; this upper access route was then utilized to transport equipment into the upper loci, thereby bypassing difficulties presented by the Fourth and Fifth Chutes. It is unknown whether this rim route in Zone 3 has been used previously, however no evidence of such use could be found. As previously demonstrated (Liwosz 2014, 2015, 2016, 2017), the general concentration of petroglyphs towards the lower half of INY-3074 (Loci 1-8) seems to indicate that the ascending route entering from the mouth was preferred in antiquity.

Features outside canyon

Upon approach to the canyon from the valley bajada, the first portion reached is the mouth area. Water discharged out of the mouth when the canyon floods has both deposited an alluvial fan contributing to the fanning bajada, but also eroded a wash more than a meter deep into these deposits. Three features are found in the deepest portions of the wash immediately adjacent to the mouth, and are thus reported alongside the first locus. In order of proximity from closest to farthest, these features are a small boulder with petroglyphs, a stacked stone circle with abstract petroglyphs, and a large boulder with petroglyphs on two exposed sides (Figure6. 6).

Prior to the 2016 field season, one petroglyph-bearing boulder (Panel 3) was known in the wash out the canyon mouth's outlet (Liwosz 2010). During field operations in 2016, efforts were made to inspect the area outside of the canyon mouth, and along its corresponding alluvial fan, for associated features and potential nearby sites (Liwosz 2016). Features of similar nature were found in a newly located small Precontact camp during the 2014 field session approximately one kilometer west along the alluvial fan adjacent to an ephemeral wash; unfortunately, and despite multiple systematic attempts, the 2014 site could not be relocated in 2016. Efforts were not fruitless, however, as two features and several nearby Precontact and Historic Period sites were located (Liwosz 2016:22). The features are within reasonable distance (<30 m of canyon or nearest contiguous feature) of the canyon mouth, and can therefore be considered extensions of INY-3074. Locations of these features are indicated in Figure7. 10, and Figure6. 1 as petroglyph panel locations west of the canyon's mouth.

Discrete features numbers had not previously been assigned to cultural traces at INY-3074, as the characteristics of the site lent itself to sole use of the "panel" convention. Feature numbers can now reasonably be assigned to both of the newly observed features in the wash, as well as the previously documented Panel 3 boulder. These numbers increase with distance from the canyon mouth, so that the Panel 3 boulder receives the designation Feature 1, a stacked stone circle bearing petroglyphs further west along the same drainage Feature 2, and a lone large petroglyph boulder Feature 3.

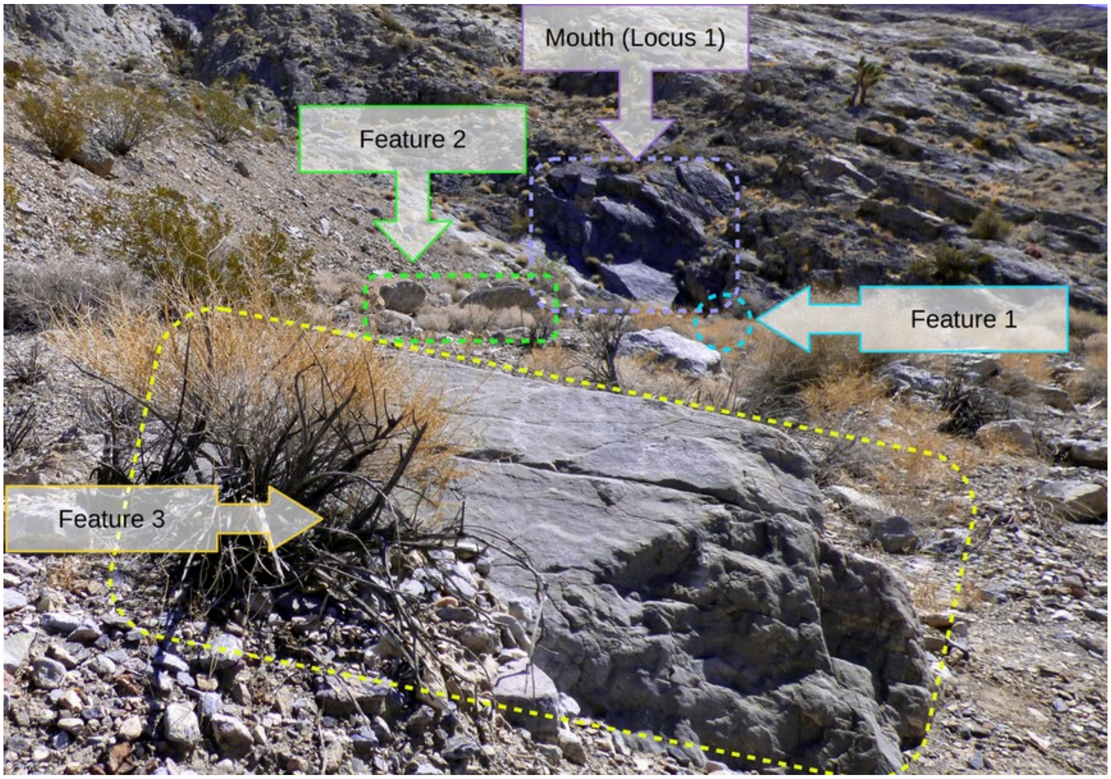


Figure6. 6: *Overview of features in wash, Locus in background, view ESE*

Feature 1

Feature 1 is a small boulder located in close proximity (roughly 5m) to the canyon mouth, and has been recorded on multiple occasions (e.g. D'Ascenzo and Deal 1987; Liwosz 2010). Two simple abstract geometric forms (both variations on the 'bar bisecting a circle/box motif) were pecked onto the west face of this boulder. Oriented away from the canyon mouth, Panel 3 appears to have been intended to be observed on an uphill approach following the drainage (Figure6. 7). Neither of the petroglyphs in Panel 3 are superimposed by, or over, any other elements; additionally, both show negligible patina development (Liwosz 2014).

Figure6. 7: *Feature 1, Panel 3. [credit: author 2010]*

Feature 2

Feature 2, located approximately 10m downstream of Feature 1, consists of stacked stones in a small ring (Liwosz 2016). With an inner diameter of only 1m, the ring is comprised of two opposing large boulders, and several smaller stones stacked in arcs to complete the circle between them. Each of the larger stones appears to be composed of differently weathered blocks of limestone. Composition of the small stones is far more variable, including limestone, sandstone, and quartzite. The rock ring's current position is just north of the drainage's thalweg (lowest line along a watercourse), on a low (80cm high) terrace. The drainage may meander over time, however, so the rock ring's relationship to the edges and center of the drainage may have changed as well.

Figure6. 8: *Locations of petroglyph panels on Feature 2 rock ring, with canyon mouth in background. View SE*

Feature 2 has three petroglyph panels (Figure6. 7 and Figure6. 8). Two of these are on the lower (southern) large limestone boulder. One small highly patinated element depicting five parallel pecked lines sits alone on a small angular protrusion on the west side of this boulder (Panel 66). The boulder's second panel (Panel 67) is larger, containing a palimpsest of seemingly random clusters of pecking (negligible patina), over a grid of more than a dozen parallel lines and fewer diagonal lines (moderate patina). Panel 67 primarily faces upward, leaning slightly to the north. Finally, Panel 68 is a tabular limestone fragment, featuring a single vertical bar and a small circle.

Figure6. 9: *Enhanced details of petroglyph panels on the Feature 2 rock ring.*

Feature 3

Feature 3, a naturally marbled limestone boulder along the northern edge of the wash discharging from the canyon mouth, is an additional 8 meters west of Feature 2. This lone large limestone boulder juts out from the low terrace on the northern edge of the current terrace bounding the drainage fed by the canyon. As has been noted for Feature 2, the actual outflow of the canyon has meandered over great periods of time. Consequently, the exposure of Feature 3, and its proximity to the season watercourse, may have varied in the past.

Feature 3 bears two petroglyph panels, numbers 69 and 70 (Figure6. 10). Panel 69 faces the drainage, and is composed of a series of pecked abstract and figurative forms superimposed over each other, including a bisected semi-circle or “shield,” a digitate quadruped, and two small fields of clusters of pecking. Panel 70 is comprised of a circle with at least eight tightly packed lines radiating to the viewer’s left, and three widely spaced lines to the right of the center axis. Current ground surface meets with the lower rays on Panel 70, raising the question if there are more petroglyphs below the present ground surface.

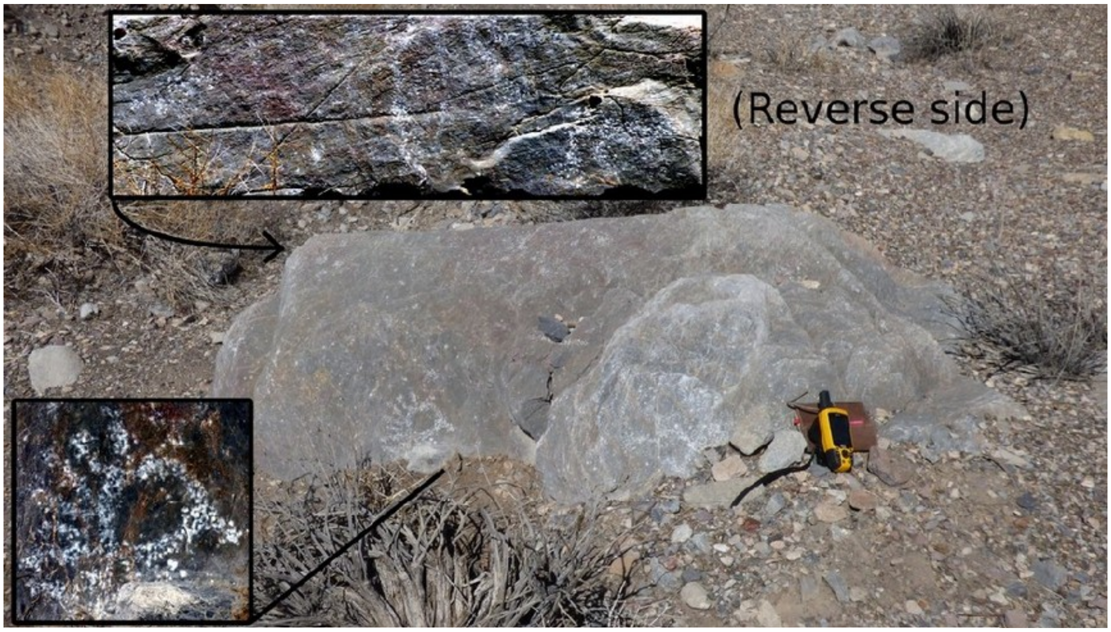


Figure6. 10: *Feature 3, Panels 69 (reverse side), and 70. Contrast enhanced.*

Native shrubs, dominated by creosote bush and A*rtemesia sp.*, thrive in the gravels at the canyon mouth, as well as in cracks in the bedrock of the rising mountain. *Yucca brevifolia* is also present in the immediate vicinity, both on the canyon's alluvial fan, as well as growing on the mountain's sloping slide. No yucca plants grow in the canyon itself. In addition to creosote bush, sagebrush also grows at the canyon mouth and in the drainage. More sparsely spaced, ephedra sprouts from the mouth area, adjacent talus slope, and also from cracks in the exposed bedrock.

Locus 1: Mouth

The mouth area itself, Locus 1 proper, provides expansive smooth stone surfaces on which petroglyphs have been pecked. Panels 1 through 8 cover the rock surfaces of the mountain as it rises above the valley floor, at the outlet of the slot canyon (save for Panel 3, as previously described). On the north side rock outcrop, Panel 5 is found at the western foot, Panel 6 is closer to the canyon entrance, and Panels 7 and 8 are over numbers 6 and 7, respectively. Panel 1 is located immediately adjacent to the slot's outflow, Panel 2 to the south of 1, and Panel 4 above both. Each such cluster represents continuous use of uneven exposed bedrock surfaces. In addition to the petroglyphs, and irrespective of patina, the partially metamorphosed limestone bedrock has acquired a marbled quality to its color. The visual effect (Figure6. 11) results in a sense of scintillating light, such as reflected off ripples in water. Optical illusions of this marbling will be of covered by symbolic discussions in the following chapter.

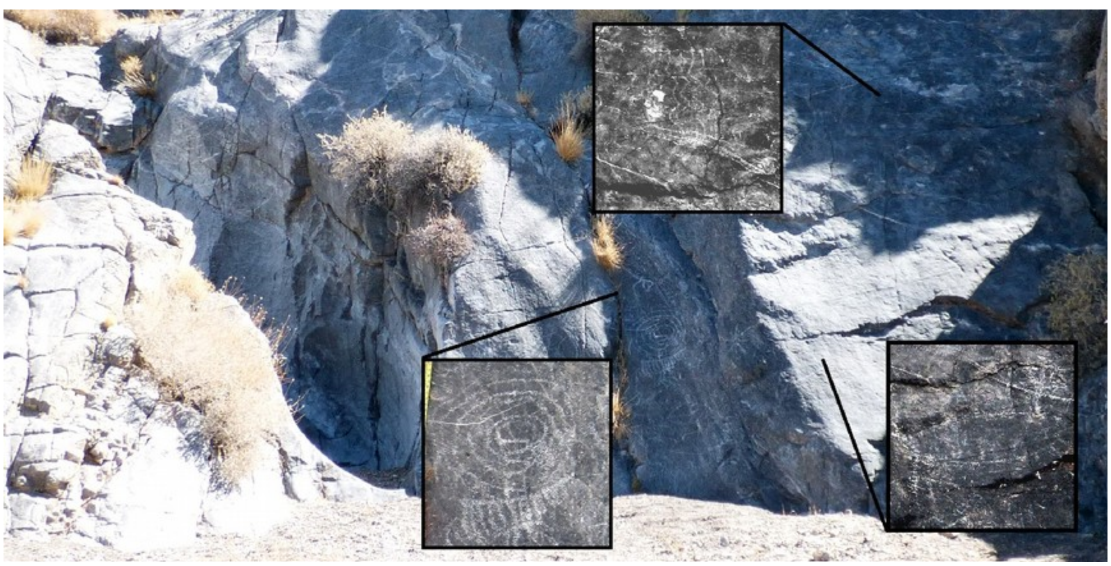


Figure6. 11: *Canyon mouth, with entrance chute on left, and prominent motifs emphasized.*

Panel 1, immediately to the south side of the canyon's outlet, is situated on a sloping face of stone, face outward towards the valley. It contains no figurative or iconic images; instead, the motifs are exclusively intricate geometric forms, plus several cupules. Some of these cupules are incorporated into a large circular abstract element, with one of the cupules ringed by a smaller circle at the center. The circular cupule element has a fully developed patina, and erosion has obscured parts of its intricate contents. Both the implicit age derived from weathering, and the merger of cupules and lines, make this element an exemplary instance of the pit-and-groove style/tradition (Heizer and Baumhoff 1962:208-209; Whitley 2000a:47-49). To the viewer's right (south) is a moderately patinated labyrinth motif of recurving arcs to form a circle infixing a meandering/curving line (Figure6. 12, Figure7. 20, Figure7. 25). A series of parallel vertical lines terminating at horizontal arcs in opposed curves appears to be incorporated at the bottom of this element. Between the highly weathered circular form and the labyrinth motif, a prominent crack sprouts grasses. Additional elements are unclear, but immediately below the labyrinth motif is a horseshoe-shaped element with opposed internal diagonal lines curving inward towards a centerline. Below that, a rugby ball shaped motif infixes another cupule, through the middle of all of which runs another line; this element also shows partial patina development. Curving and meandering lines with only partial patina overlap the cupule circle element to make a palimpsest. Some of these less-patinated forms retouch sections of the cupule circle's outer ring. Additional lines stray in and out of the more weathered elements. Linked circles are located near the prominent crack. Above the labyrinth element, there is an element composed of short lines intersecting a longer line at diagonal angles. Lighting has a substantial effect on the visibility of elements on Panel 1. Cupules and more weathered elements are more visible around midday, and indiscernible in mornings and afternoons. These cupules are diagnostic of the multicutural Far Western Pit-and-Groove Tradition that spanned across California, the Great Basin, and north to the Columbia Plateau (Whitley 2000a:47-49). The INY-3074 example's extreme weathering and position under multi-layered palimpsests is consistent with Heizer and Baumhoff's assertion that these represent the oldest style in the region.[87]

Figure6. 12: *Panel 1, photographed around midday, when cupules were visible.*

87: However, pit-and-groove petroglyphs continued to be made in California well into the last millennium (Whitley 2000a:50), hence using the term "tradition," rather than "style" here.

Panel 2 is nearly continuous with Panel 1, located where the rock surface projects outward by 15 - 20cm. This panel is roughly 1m wide by 2m tall. It contains a mixture of figurative and abstract imagery, with elements concentrated in greater density towards ground level. Partially and negligibly patinated abstract elements include "snowflake" or "sunburst" designs of radiating lines, meandering curving lines, chains of parallel lines bisected by a curving "spine" central line; false color imagery illuminates chains of circles with more patina development, as well as forms of indeterminate nature. A partially patinated Coso-style bighorn sheep with divergent horns (Figure6. 13) utilizes natural microtopography of the rock surface in shaping the conventional boat-body. Despite the sheep being the biggest element on the panel, its visibility is low, both due to significant patina development, and the incomplete pecking leaving most of the interior of the body not filled. Finally, above the bighorn, a horizontal bar tops an element containing parallel curving/meandering lines, a so-called "waterfall" motif.

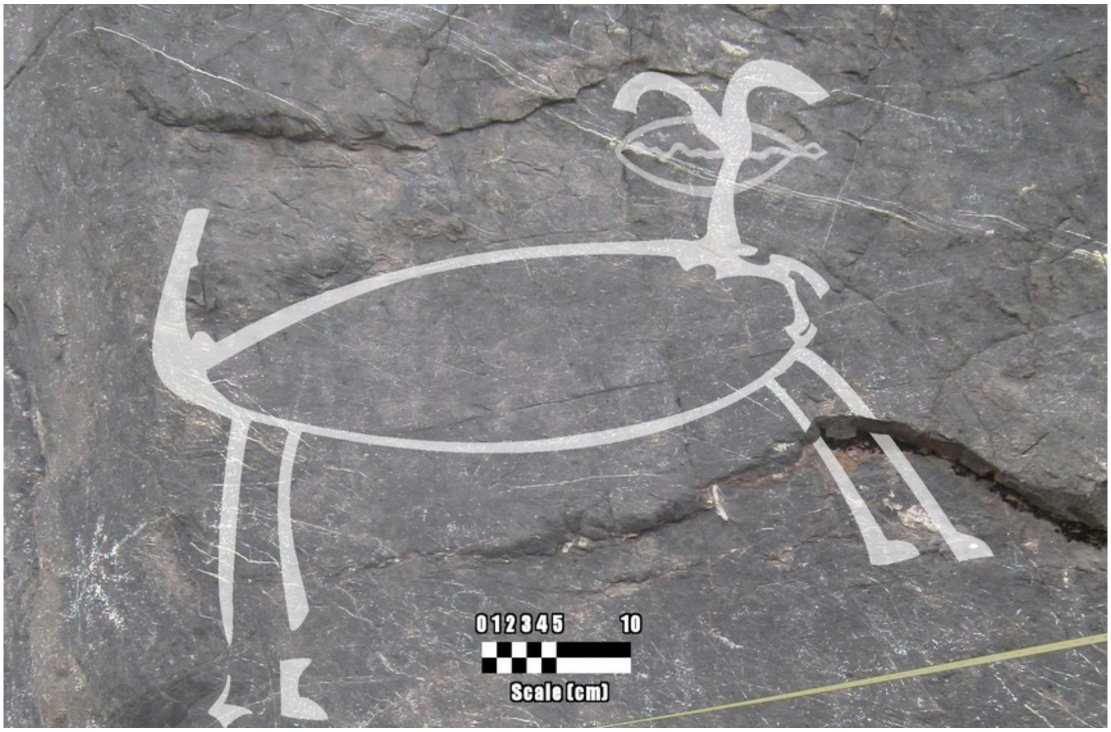


Figure6. 13: *Locus 1, Panel 2, digital overlay of Coso-style bighorn sheep, with approximate scale. Notice relationship of lines with natural relief of rock surface.*

Panel 4, located above Panel 2, crosses a cracked surface where the rock face curves upward more vertically. Abstract elements include a series of six parallel lines, four parallel linear "tracks" transversing spalled surfaces to descend to Panel 2, isolated bars, a dot grid, and rectangular fields of pecking. Additionally, one of these rectangular fields adjoined to an arc may be an instance of the "medicine bag" motif. Other forms include two elements of the rain-cloud or "waterfall" motif, and pair of circles of different sizes. False color enhanced images indicated chains of linked circles with substantial but not complete patina.

On the rock faces north of the canyon outlet, four panels contain fewer, smaller, and less densely packed petroglyph elements. Panel 5 features a row of dots, and concentric circles (or "bullseye"), with full patina; an artiodactyl motif is superimposed over the bullseye, with "rainbow" horns (curving backwards together, what Van Tilburg et al. 2012 term "horns-side") reusing curves of said concentric circles; above, a dorsal-view lizard emerges from a crack. Multiple lone pecked bars of variable width are oriented both horizontally and vertically. An amorphous rugby-ball shaped element with appendages is located at the top of the panel adjacent to a crack, and may be a top-down lizard motif obfuscated by partial patina development. Panel 6 contains an element with three to four parallel vertical lines descending from a crack. Adjacent, a stone's edge features an additional such vertical pecked line. Panel 7 contains an amorphous field of pecking, and a bighorn sheep. Panel 8 contains two small elements, an infilled pecked circle, and an infilled pecked box. Both elements are surrounded by more sparse and random pecking. A third, larger element to the right (south) side of the panel appears to be another series of parallel short bars linked by a longer central one. Motifs in Panels 5 through 8 are partially obfuscated by marbled colors of the bedrock.

Acoustic experiments were carried out at Locus 1 during the 2016 field session, but not during the 2014 pilot study. As mentioned in the chapter on methods, only an X,Y axis stereo microphone accessory docked directly onto the audio recorder was used at all INY-3074 recording locations. For Locus 1, features outside of the immediate mouth area were disregarded, as conditions necessary for reverberation and resonance were not present. Attention, then, was focused on the mouth proper, specifically a wide, somewhat level, concave, unsheltered space between Panel 1 and Feature 1. Here, the microphone/recorder apparatus was attached to a tripod positioned approximately equidistant from Panels 1, 5, and 6, as well as from the mountain foot/descending low rock wall opposite the latter two. Tests included sound impulses made by clapping and by percussion on the basalt tablet (selected based on results from Locus 18, described later under other experiments).

Results from the canyon mouth were unsurprisingly similar to the Death Valley control test location, with rapid sound decay and no distinct resonant bands. Each discrete rapport from both the clapping and percussion tests returned with a single echo at a delay of 12 to 13ms. No evidence of resonance or any significant reverberation was documented. The Mouth also briefly hosted the bluetooth speaker as a sound source during inter-audibility experiments. As will be discussed later, music played in the Mouth at the base of the First Chute could be heard clearly from the Lower Gallery, and vice-versa.

Locus 2: First Chute

The second locus at INY-3074 is the first located entirely within canyon walls. This locus comprises the initial ascent inwards along a short chute of medium pitch. Upon entering this first chute, the climber becomes entirely obscured from view for any observer along the valley bajada. The hypothetical climber remains thusly concealed for the rest of the climb up the canyon floor route, save for a narrow position in the Chamber 3 “Overlook,” at the top of the Fifth Chute. Although the walls are sufficient to obscure a climber, the First Chute locus has the lowest average rim height of the entire canyon. Locus 2 sports smoothly polished switchbacks ascending upward and inward from the mouth. Four interlinked plunge-pools comprise the short series of switchbacks, adding to the First Chute's topological complexity. One of the more interesting features of this locus, a sloped rocky outcrop ranging between one and two meters above the floor, exhibits human modifications to increase climbing ease. A series of several alternating handholds and footholds have been pecked into a crack in this outcrop. This is one of three places in the canyon featuring the addition of such climbing aids, all in the lower half. This modified overhang also represents the eastern end of Locus 1.

Six petroglyph panels are located within Locus 2: Panels 58, and 60 through 64. Because the 2010 documentation expedition recorded petroglyphs as the crew descended from the canyon head, panel numbers inside the canyon increase as elevation decreases and proximity to the entrance becomes closer. Panel 64 is located on a long-ago spalled surface with relatively light but consistent patina, and an upward facing direction. All petroglyph contents consist of amorphous fields and curves of pecking, with no discernible contents. Partial patina development may contribute to the ambiguity of image contents.

Whereas Panel 64 faces somewhat upward, Panels 62 and 63 are on the even and fractured stone comprising the south canyon wall, near the floor. Most of the elements in this panel are easily reached by standing on said gravel floor. Five elements are recorded as comprising these two adjacent panels. Two of these elements are quadrupeds, one with short antler tines or ears, another is a clear bighorn with the horns swept /horns-side; the latter is depicted inverted at a diagonal angle. The position and orientation of both quadrupeds places their feet on a crack or fold in the rock surface, suggesting placement and angle were intentional rather than random. Below the unidentified quadruped, a small rock protrusion features a pecked rectangular area with some patina development, part of which has been retouched with a narrower rectangular field of negligible patina. Above these is a pecked area of indeterminate abstract form. To the east, a pecked quadrangular grid features streaks of red color. Although previous expeditions have concluded the grid's coloration is natural mineral staining, it does not match any of the numerous mineral stains which streak the rest of the panel. Consequently, this study concludes that the pigmentation on the grid element was intentional, although it may be distorted by weathering.

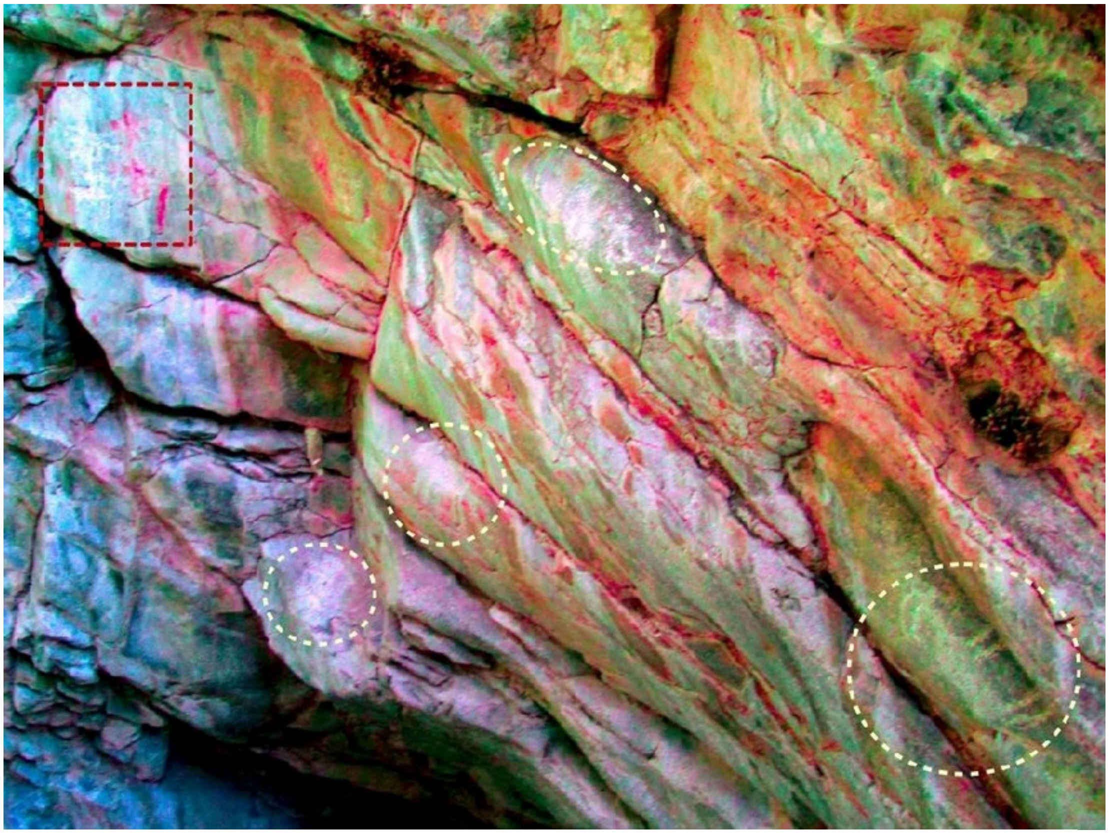


Figure6. 14: *False color enhanced image of Panels 62 and 63, with petroglyphs in white circles, and grid with pigments in dark red box.*

Panel 61 is one of the more unique features of this petroglyph site. It is located on a low, flat, steeply pitched ledge above Panels 62 and 63. As briefly mentioned in the introduction to this locus, a series of pecked footholds on the ledge lead the climber around chokestone wedged at floor level, which restricts passage. Eleven such holds have been pecked along a crack in the limestone ledge (Figure6. 15, Figure6. 16). Liwosz (2017a:191) describes the Panel 61 series of climbing aids as “toe-holds,” and provides an image with a different view in Figure 9 of that article. Two more minor panels are found along the northern canyon wall within Locus 2. Panel 60 contains open rectangular box and a 5 pointed "snowflake" of radial lines, along with random peck marks, all located opposite Panels 62 and 63; patina development is light. Panel 58 is a collection of open circles and bars, and one curviline, with light patina; one set partially superimposes, and adjoins, a chain of circles with more patina development. Additionally, a rectangular grid below these is composed of small pecked clusters. Panel 58 is on the north wall, alongside the aforementioned chokestone.

Figure6. 15: *Overhead view of Panel 61 ledge from north canyon rim, with pecked climbing aids indicated.*

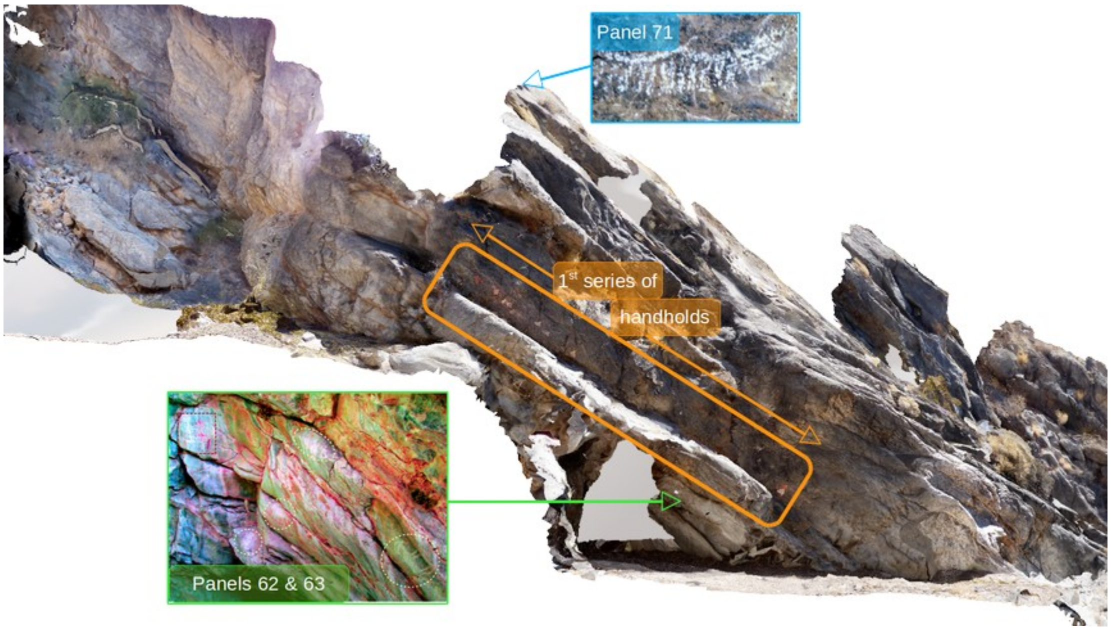


Figure6. 16: *Virtual cross-section of Loci 2 and 3, showing the ascent grade for the first series of handholds comprising Panel 61. View SE.*

For percussion experiments at Locus 2, the recorder tripod was positioned at the head of the First Chute, where a gravel floor below the first climbing-holds-ledge meets exposed bedrock descending into the chute's plunge-pools. Percussion impulses were made near and facing Panels 62 and 63, below Panel 61. This spot was chosen both for the rising walls, and the density of petroglyph panels. Delay for the first and by far strongest echo was merely 6ms. Spectrograms showed only marginal evidence of reverberation. The strongest resonant tone recorded was at 266Hz, however weaker signals of 90, 95, and 101Hz (near the equipment's practical detection limit) correspond well with integer divisions of higher frequency resonant tones. The lower series shares a weak 2:3 relationship as well, while the 266Hz series exhibits a weak 3:4 (perfect fourth) relationship.

Locus 3: Landing A

The aforementioned modified sloping overhang terminates at a narrow dry fall under two meters high, beyond which is a relatively level surface. This level area, Landing A, begins as a short north-south corridor aligned nearly perpendicular to the general course of the canyon, before turning east-northeast. Locus 3 is comprised of both the north and east-northeast trending corridors, throughout which the gravel floor remains relatively level. Walls begin relatively low, but rise quickly towards the Second Chute and Chamber 1 beyond.

Several petroglyph panels are found in Locus 3: panels 54 through 59, and Panel 71. Panel 59 is located on an upward facing outcrop near floor level, in a position made prominent by brief changes in the canyon direction. This change in direction comes at a convergence between the main canyon cut where it joins with a smaller ephemeral tributary descending from the south rim. This merger of the smaller channel creates a small open space not quite perpendicular to the primary canyon course. Panel 59 is located on the floor at this union, directly in front of the ascending observer where they would have to make a short series of sharp turns to continue upward. Panel 59 contains 16 documented elements, most of which are nondescript areas of pecking. Notable simple abstract (non-recursive) elements include an upturned omega shape atop a stem, an open semi-circle, and pecked bars, all of variable partial patina. Elements of negligible patina include two bars, and nondescript clusters. The most prominent motifs are two quadrupeds. A bighorn motif with the swept back horn (horns-side) variation shows partial patina development. Above this, there is a quadruped of negligible patina composed of a semi-circle with the flat side down (opposite orientation of the classic “boat body”), with a low-positioned head bearing the same swept horns. These horns reuse two of at least a dozen lines radiating from a circular sunburst design which has developed a substantial but not complete patina. Adjacent, a series of parallel wavy lines shows substantial patina development.

On the north wall past the juncture is panel 56. Panel 56 contains only two elements, neither of which show substantial patina development. One element is an amorphous field of pecking. The second element is a quadruped or “bighorn” motif, again with horns side. Both elements are small (roughly 15 cm long).

Panel 55 is located along the north/northeast canyon wall, in a shallow overhang or alcove. The shielded nature of of the alcove has prevented the development of any substantial patina. It contains four abstract elements, none overlapping. Smaller elements are two series of parallel wavy lines, one oriented horizontally and another vertically. Another element is a series of strait parallel horizontal bars. The largest element is a dense grid of horizontal and vertical lines;. Visual inspection of this element identified the potential for pigments, but this streaked discoloration could not be consistently distinguished from mineral staining.

On the canyon’s south wall opposite panel 56, panel 54 is a significant collection of petroglyphs. Mineral stains streak the limestone surface, covering some of the petroglyphs. Panel 54 contains only abstract geometric forms of varying nature (save for one bighorn depiction). Superimposition, close spacing, and mineral stains make separately cataloging each element difficult. Designs include series of parallel wavy lines descending from horizontal lines, chains of ovoids, spirals, open circles, pecked fields, isolated wavy lines, and “cogged” designs of lines radiating from a circle, all infixed within outer circles. Many of these abstract elements show lichen grown. A large, open circle contains random embellishments of lines, curves, infilled triangles, and small circles.

Panel 71, which overlooks the juncture of Loci 2 and 3, is a lone element reflecting the “fringe” motif. Due to its small size, and especially its position well above the climbing route, towards the top of the south rim, this element was overlooked during all of the 2010, 2014, and 2016 field visits. It was first identified during the project’s data processing phase while reviewing the photogrammetry models.

Including interaudibility (soundshed) tests, Locus 3 was subject to three different acoustic experiments. Panels 54 especially drew attention, as a complex series of individual production events resulted in a predominantly abstract panel with numerous palimpsests and highly variable weather suggests repeated reuse over a long period. Additionally, its host rock face presents both a relatively flat surface, and a dramatic increase in rim height, marking the potential for sound reflection. Although not so densely covered in elements, Panel 59 also shows signs of reuse over time; additionally, Panel 59’s location at floor level at a change in direction raised questions about how this might affect sound propagation. Tripod and recorder were positioned at this juncture immediately in front of Panel 59, and sound impulses were produced at the Panel 59 juncture, and further up canyon at Panel 54. For the Panel 59 impulses, echos arrived at 8 ms, and 27ms. Although this technically meets the criteria for reverberation, rapid decay and no further evident echoes indicates Locus 3 reverb is weak at best. For comparison, impulses from in front of Panel 54 were followed by only one identifiable echo 5ms later; interestingly, the arrival of the wavefront from the initial impulse at the recording station was *preceded* by a consistent but faint signal 7 ms *earlier*, and only measurable for frequencies of 2 kHz and lower. Early arrival and pitch-shift seem to indicate this preceding signal is conducted through a different medium, so a proposed explanation (certainly not definitive, however) is that it represents sound conducted through the bedrock.

Vocal range harmonics show a few potential peaks, but most are weak and share no clear mathematical relationship. The exception is for a series of potential resonant tones in the Panel 59 recording, beginning with a fundamental tone between 238 and 253 Hz; this tone shares a 3:4 ratio with an observed band at 320 Hz, and together these tones have integer relationships with other higher pitched peaks in the vocal range. Some weak higher frequency resonance bands may also be present. Overall, however, the set of peak tones in the Panel 59 recording is inadequate to firmly establish resonance. Even less evidence of resonance was detected for the Panel 54 recording. Although 2:3 and 3:4 ratios links peaks at higher vocal tones and a strong band ranging from 515 to 560 Hz, no integer relationships between observed peak tones exist. Overall, the Panel 54 recording's spectrum is comparable to the control audio. Based on the evidence at hand, this study confirms Liwosz's (2017:195) preliminary findings, concluding resonance cannot be substantiated in Locus 3.

Locus 4: Second Chute

The fourth locus ascending the slot canyon includes a 3m tall dry fall just prior to the entrance to the first chamber. A nearly vertical wall of bedrock ascends up out of the gravel floor. Along the southern edge of this steep rise, another series of holds have been pecked into the bedrock. Despite a much more dramatic slope, this feature shares similarity as a climbing aid with the earlier described set connecting Loci 1 and 2. Locus 4 spans from a chokestone at the west end of Landing A to the west edge of Chamber 1.

The second chute contains three petroglyph panels: one on the falls, one along the ascent route, and one at the culmination of the ascent. The dryfall contains Panel 52. A few, small, abstract elements are on this panel. This includes meandering lines, and a chain of circles. All such elements show partially developed patinas. Panel 53 is a second series of climbing aids, containing several holds along a steep surface along the fall's edges. Five such holds compliment small natural steps formed of eroded cracks (Figures 6.18 and 6.19). Panel 50, at the head of the falls, is located to the ascending climber's right at the upper terminus of the aided ascent. Panel 57 is a lone boat-bodied bighorn, with horns-side.

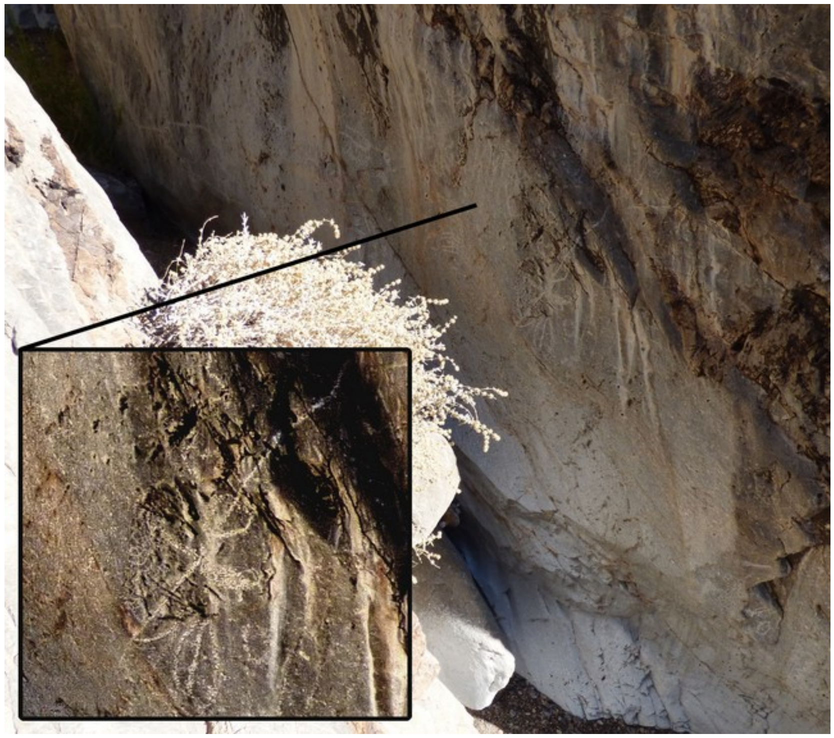


Figure6. 17: *Two variants on the bisected circle: the prominent "atl-atl" motif (inset center, diagonal to frame), and vulva motif (just below, inset center bottom), Panel 54, and the boundary between Loci 3 and 4.*

Figure 6.18: *(ABOVE) Virtual cross-section of Locus 4 (Second Chute) climbing aids ascending to Chamber 1 indicated (orange)*

Figure 6.19*: (RIGHT) Photograph of Locus 4 climbing aids, with flagging locating position of each hold.*

Unfortunately, little acoustic data is available for Locus 4. Qualitative observations characterized the sound in this irregularly-shaped space as muted or somewhat dampened. As the likelihood of reverb was predicted to be low, the locus was deprioritized during fieldwork. During sound experiments from the north rim above Locus 2, sound reports from the Locus 5 overhang were documented, but no such sound reflections corresponded with Locus 4's direction or distance/delay. Were such experiments to be carried out at the site in the future, comparing simultaneous tracks from the base of the dry fall with the nearby Panel 55 alcove at the terminus of Locus 3 could prove to be an informative acoustic experiment.

Locus 5: Chamber 1

Continuing inward and upward into the canyon, the next locus is Chamber 1. This is the first space since entry at the mouth where the interior of the canyon widens substantially at floor level. The space itself features two shallow overhangs or shelters, outcrops in the floor, and a wide interior space. Along the north wall, the taller of these shelters has an overhang well above the reach of a standing person, but the space between its back wall and drip line is in fact very shallow. D'Ascenzo and Deal (1987:1) note that roughly 40 feet above Chamber 1, there is (was) a shelter with a prayer stick wedged in the roof (see Figure7. 3 for example at nearby INY-130). Although they indicate the prayer stick shelter is on south side, their sketch map flips north and south, and 40ft roughly corresponds with the height of the north Chamber 1 shelter. One of two conclusions can be drawn: either the referenced shelter is indeed above the south side beyond the rim and was not relocated in 2010, 2014, and 2016, or the shelter is in fact the known one in the Chamber's north wall and the prayer stick has been displaced or removed since 1987. The roomy Chamber 2 can accommodate several people, more than were included in the crews of any phase of this project. Additionally, vegetation including creosote bush, ephedra, and native grasses grow in the gravel areas of this chamber's floor. Chamber 2 terminates at a juncture in the bedrock formations, where a much narrower corridor continues beyond and somewhat behind the southeast wall. Lighting is bright, with the wide room allowing for significant sunlight to shine into this room most of the day. Seasonally, sunlight in the late afternoon shines directly up the second chute and into Chamber 1, as was observed during summer fieldwork.

Eight rock art panels are associated with Locus 5, excluding the holds and dry fall panel listed for the previous locus. On the west end, panels 50, 55, and 56 are found along the north wall. Panels 51 and 52 are located under a shallow but high overhang adjacent to these. Opposite, on the southeast wall, Panel 48 is found directly above a very low overhang. Panel 49 is located on a bedrock outcrop in the floor of the room, somewhat off-center. Panel 51 features ambiguous darkening over abstract geometric designs, which may reflect pigments. Panel 72, on the ceiling of the Chamber 1 shelter, was identified in digital models during the data analysis phase of this project.

Panel 49's image contents earned it the titular role in the "Sheep Hunt Chamber," according D'Ascenzo and Deal's (1987) naming scheme. The panel contains numerous elements, several of which appear to interact in a scene. Elements in the scene include three stick figure anthropomorphs and up to six (including faint and obscured elements) unconventional bighorn with horns-side and exaggerated necks. Between the zoomorphs and anthropomorphs, a line jogs back and forth at sharp angles, with short spurs off of it. None of the sheep are upturned, and no weapons are depicted in the scene. The composition, however, is reminiscent of Numic large game trapping features, such as that described by Hockett et al. (2013). In addition to the corral scene, there are small random clusters of pecking, "snowflakes" with radiating lines or several overlayed bisecting bars, and two equilateral crosses of different sizes. The scene shows marginal patina at most. The smooth and light-colored stone outcrop onto which it is carved shows evidence of water erosion from the channel along the canyon floor, limiting the age of petroglyphs which could be preserved in this location. Adjacent to this stone surface, much vegetation grows, especially creosote bush and ephedra.

Panel 48 is one of the most unique petroglyph panels in the slot canyon, not just because it is situated directly above a low overhang. Measuring approximately 3.5m long by more than 2m high, this exclusively abstract panel occupies a wall surface with exceptionally rough texture, which would normally preclude petroglyph carving. A frieze of rectilinear forms, concentric circles, and unidentified elements projects in relief out from the rock surface (Figure6. 2, Figure7. 28). How this has been achieved is uncertain, and the contributors to its production may have targeted high spots. Alternatively, previously I suggested (Liwosz 2014) that this relief is a product of erosion processes. Large areas interrupt motifs, and it is unclear whether this is a result of incomplete pecking, or if these may have weathered away. The petroglyphs show less patina than the surrounding rock, however, the tone does match nearby naturally spalled surfaces. The direction of the rectilinear components cross-cuts the grain of natural fractures in the rock, rather than following them.

Panel 51 is a small concentration of abstract elements under the high overhang on the northern end of Chamber 1. Like Panel 55, Panel 51's host overhang has shielded the rock surface from weathering and diminished patina development. Panel 51 contains a small equilateral cross (negligible patina), a bullseye (full patina), and interlinked abstract curvilinear forms (partial patina). The curvilinear forms include a chain of amorphous round shapes linked together, three series of parallel curving lines with each series terminating at the next, and finally linking to the chain. A rectangular area of stone encompassing the curvilinear forms has a reddish-orange hue, but the coloration may be a result of mineral accumulation in an area exposed by ancient spalling, and is not necessarily pigment. Panel 72 contains a single Y-shaped element, crossed by seven lines (Figure7. 11). The significance of the cradleboard motif clearly represented in Panel 72 will be covered in Chapter 7.

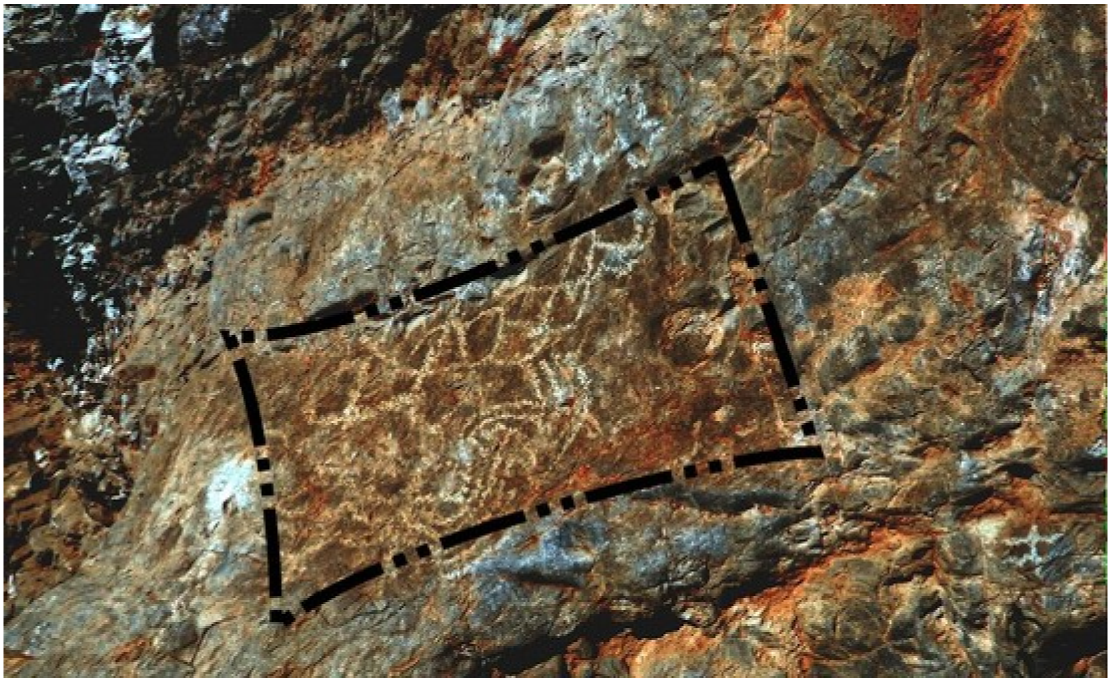


Figure6. 20: *Color-enhanced image of Panel 51 in Chamber 1 shelter, showing area of mineral accumulation on spalled surface utilized for densely clustered petroglyphs.*

Given the dimensions of Chamber 1, prominent panels, and overhangs, it was expected to also possess novel sound characteristics. Results from both the 2014 pilot study, and 2016 intensive investigation, however, were underwhelming. With the recorder placed on a tripod in the center of the room, near Panel 49, and approximately equidistant from Panel 48 and the high overhang, percussion tests were carried out with impulses originating from multiple positions. The largest panel, number 48, was one spot chosen, as well as Panel 49. None of the recordings associated with Chamber 1 feature any strong signs of resonance within the vocal range, and overall response is poor under 700 Hz. Echo delay was variable, but averaged 24 ms. With no odd affirmative acoustic signature, Locus 5 can safely be considered devoid of such properties.

Locus 6: Lower Gallery

Behind Chamber 1, the canyon's course takes a sharp jog to the south-southeast, behind Chamber 1's Panel 48. Locus 6 is a long, narrow passage stretching from the north rockshelter/overhang of Chamber 1, to a few meters south of a junction with the Third Chute. The passage's gravel floor levels between two high, vertical, and nearly parallel walls. This change in course and depth creates the first of the slot canyon's several perpetual twilight zones at Locus 6. Named for the mostly smooth plane featuring densely grouped petroglyphs, the Lower Gallery owes its character to a fracture zone between bedrock Formations A and B. No plants currently grow in the Lower Gallery. Evidence of fauna (an ungulate skull fragment) appears to have been carried into this locus from up-canyon by seasonal flooding. The lower gallery is one of the more significant loci for its high density of petroglyphs, perpetual shade, acoustic properties, geologic character, and potential for psychological effects.

In addition to its formation along a seam between severely tilted geologic strata, the Lower Gallery's rock itself sports an unusual pattern of chemical erosion. The Formation B substrate has developed a superficial cracking or (more appropriately) crazing texture, which increases in intensity with height above the floor (and implicitly, exposure time out of the the flow of water). Additionally, the northeast wall has developed some of the darkest patinas found at the site, which are even more prominent in surface crazing. Ronald Dorn (Dorn and Oberland 1982; Liu and Dorn 1996; Dorn 2009) has extensively studied similar patinas in the form of desert varnish on igneous rocks, and other related rock coatings. He concludes that these patinas take several millennia to form, result from a positive feedback loop between microbes and geochemistry, and develop more rapidly in certain microclimates. Given the perpetual shade of this locus' position at the bottom of a chute observed to have held small pools of water well into the dry season, the Lower Gallery fits most of the criteria for an ideal environment to develop a biogeochemical patina comparable to desert varnish.

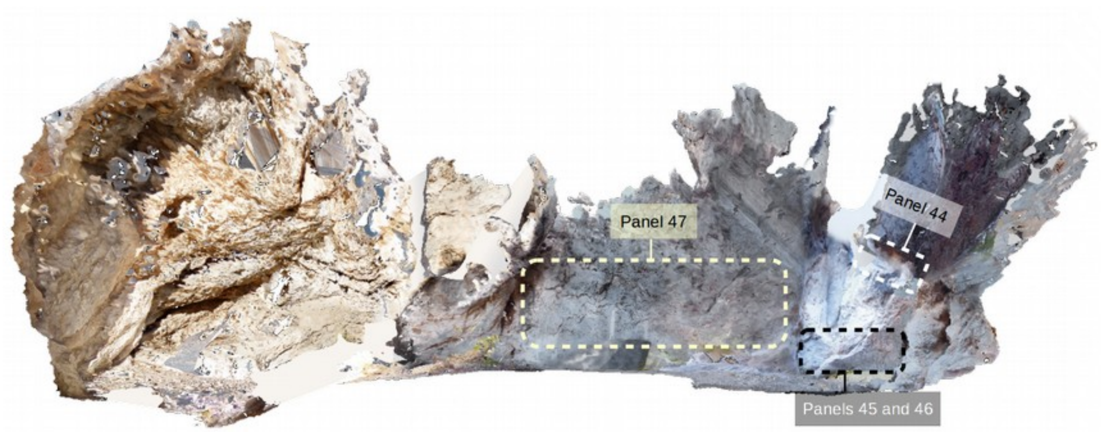


Figure6. 21: *Virtual cross-section of Lower Gallery, with overhang of the Chamber 1 shelter on the far left, and the Third Chute on the far right. View ENE.*

The petroglyph density in the Lower Gallery is exceptionally high, and evidence suggests its east wall accumulated petroglyph elements over a protracted period of time. Preferential treatment seems to have been given to Formation B over Formation A, as the latter ceases to feature rock art past the turn from Locus 5 into Locus 6. Proceeding from the Chamber 1 overhang southward, Panel 47 stretches much of the length of the Lower Gallery, reaching to the north side of the Third Chute. Below the chute juncture is Panel 46, separated by a crack from Panel 45. Above Panels 46 and 45, Panel 44 is set into a recess in the rock face some four meters above the current gravel floor. D'Ascenzo and Deal (1987) designated the Panel 44 recess as "Snake Ledge," most likely for its curvilinear elements.

Petroglyph motifs vary by panel, and patina development varies highly at this locus. Panel 47 is one of the more expansive panels in the slot canyon, with the span described in the paragraph above. Numerous curvilinear and rectilinear forms, along with figurative motifs such as bighorn sheep designs, are on this panel. Individual elements are difficult to discern, however, due to poor natural light, deep and apparently rapid patina development, and mineral staining. While elsewhere mineral stains range from black, to red trhough orange, and even yellow, the predominant stains obscuring Panel 47 are white streaks of calcite, emerging from small holes in the porous limestone. A single abstract motif was observed to contain red pigments inconsistent with any of these mineral intrusions.

Panels 45 and 46 adjoin each other at the base of the Third Chute, separated only by the edges of a deeply ancient spall. Both of these panels show very dark patinas, likely emphasized by the biological feedback system described above. Recursive geometric forms on these two panels show full patina development, and include spirals, concentric circles, and a set of recursive lines curved into an arc on one end, and tapered to a point on the opposite (shaped somewhat like an "Edison bulb"). On Panel 46, four quadrupeds including three boat-bodied bighorn with horns-side, and one unidentified animal, are all superimposed over fully varnished and more deeply pecked abstract forms. The quadrupeds, by contrast, show only partial patina development.

Panel 44 is located in an elevated alcove/ledge, approximately 3m above the canyon floor. D'Ascenzo and Deal (1987) nicknamed this feature "Snake Ledge," both for the geomorphology and iconography. Like other overhangs, patina development in this geologic feature is somewhat diminished. The height from ledge bottom to the top of the overhang is only about 50-60cm, however its length is 2.5 m: all sufficient for an adult human to place their entire body inside. The ledge is carved with curvilinear petroglyphs, all segments being comprised of a pair of parallel wavy lines, which together meander or change direction every four to five waves. Despite multiple closed terminuses throughout the length, these paired curvilines together all appear to comprise one continuous element with a total length approaching 2 m. In addition to the partial patina of the petroglyph, red to orange mineral stains seeping out of cracks in the overhang roof streak over the pecked areas, though not as opaquely as they do over the unmodified rock surface. Sparse vegetation sprouts of of cracks in the rock surface immediately above the south end of Snake Ledge.

The Lower Gallery's long, high, parallel walls lend its natural morphology to functioning as an echo chamber. Additionally, it is a liminal space, situated so as to receive sound from lower and upper loci, but not necessarily conduct sound between them. This places it as the boundary between soundshed zones 1 and 2. Sounds originating in the Locus 6, then, reach in one direction to Locus 1, and the other direction up to Locus 12. This interaudibility reinforces the significance of strong resonance detected in the Lower Gallery. Based on percussion tests, the Gallery's fundamental tone is 166 Hz, with minor overtones at 188 and 209 Hz. For each of the 166, 188, and 209 resonant bands, there is a series of several iterations at a 3:4 ratio between fundamental and chord. Marshal (2016:46-47) identifies this relationship as the "perfect fourth" in the western music traditions. The identification of a perfect fourth in the Lower Gallery is significant to concerns of psychoacoustics. It also revises and replaces the 2:3 relationship previously reported after preliminary examination of the same dataset (Liwosz 2017:195). Of the loci in Zone 1, the Lower Gallery's resonance is strongest, and the relationships between its harmonic tones the tightest. In addition to 166 Hz and minor tones above, stronger resonance can be identified at 290 Hz, 350-360 Hz, 610-620 Hz, 940 Hz, and 1.65-1.7 KHz.

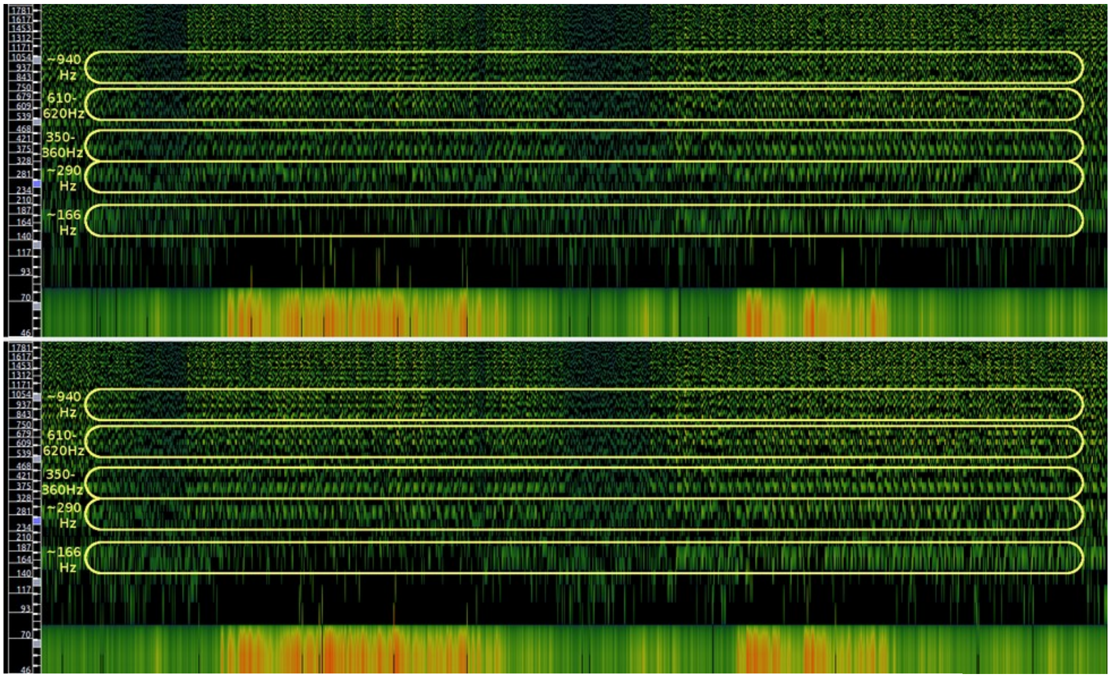


Figure6. 22: *Locus 6 stereo spectrogram from 50Hz – 2KHz, highlighting fundamental (166Hz) and significant overtones (290Hz, 3560-360Hz, 610-620Hz, and 940Hz) (Software: Sonic Visualizer, GIMP)*

Preliminary results reported very low frequency multiples of 6 and 9 Hz as possibly indicating infrasound, while also acknowledging these values are well below the equipment's designed detection limits (Liwosz 2017:195). With a low spectrogram peak from 3-4 Hz (and the lowest common denominator of these low frequency intervals also 3 Hz), the purported infrasound may, in fact, simply be the product of using percussion in the experiment. During the experiment, the tempo of percussion taps varied from 180 to 240 BPM, averaging about 220 BPM; in cycles per second, these equate to the same ultra low frequencies of 3 and 4 Hz, averaging 3.67 Hz. Presently, the evidence of infrasound for the Lower Gallery must therefore be rejected. Were future acoustic tests to be carried out in this locus, impulse response should be compared between the opposing ends, and a more thorough infrasound examination conducted. Given similar proportions to Locus 18, infrasound tests would be well warranted in the Lower Gallery.

Locus 7: Third Chute

Linking the Lower Gallery with Chamber 2 is a chute of steeply ascending pools, which were observed holding small amounts of stagnant water as late as August during the 2014 field session. Given this observation, formations such as these suggest the slot canyon may be a minor oasis well into the dry season. Like the Lower Gallery, the Third Chute is virtually perpetually in twilight. The third chute is comprised of a series of three narrow slides of variable pitch, each terminating in a small pool of less than a meter (and mostly less than 0.5m) across. These pools were observed holding stagnant water well into the dry season, especially during the 2014 field season. Evidence of animal activity (scat) has been observed in the Third Chute pools, but no plant life is present.

Locus 7 opens up at its base in Locus 6's Panel 46. Additionally Panel 40 in Locus 7 follows along the southern wall. Panel 42, containing multiple faces of abstract geometric motifs, might alternately have been designated by more than one number using the same naming convention, but was not when originally recorded by NPS. This may suggest some of its constituents are in fact newly observed.

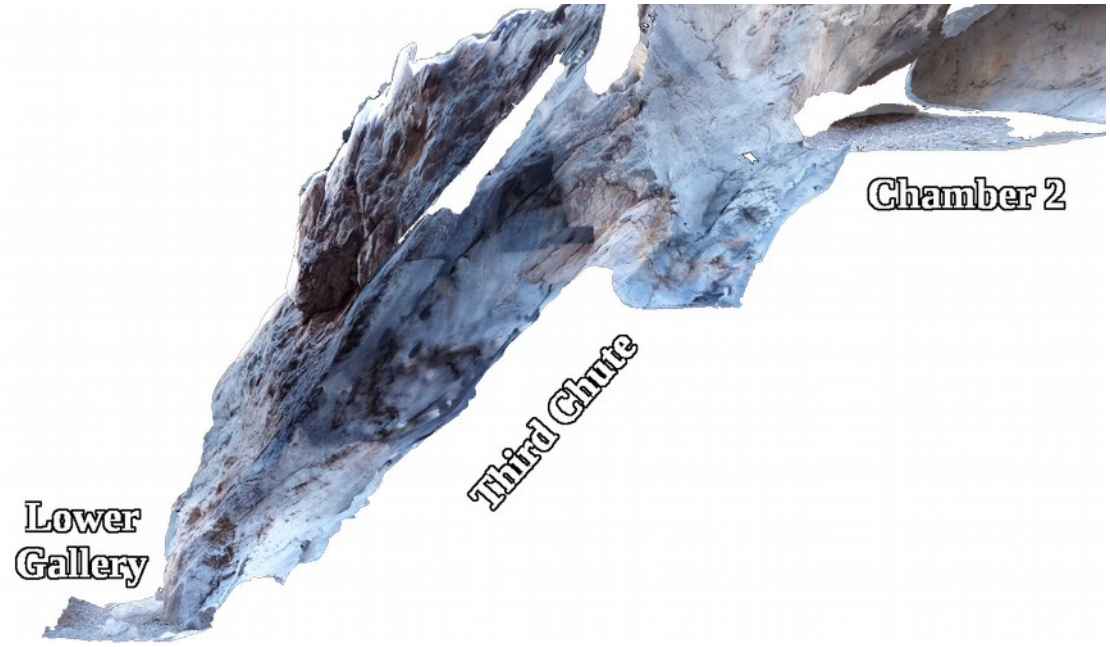


Figure6. 23: *Virtual cross-section of Third Chute (Locus 7); Lower Gallery is at the bottom left, and Chamber 2 in the upper right. View N.*

Among these newly observed elements is an ambiguous but potential pictograph. Faint discoloration, when enhanced into a false color image using the ImageJ plugin for DStretch, does not match the surrounding mineral stains. This potential pictograph is likely residual paint which was, in antiquity, applied to an ambiguously pecked area of approximately identical size and shape (Figure6. 24). Due to erosion, little can be conclusively said about this pictograph. In its present state, however, it seems to cover a rectangular to trapezoidal area, and contains a lower portion of parallel vertical lines. While this present form may be as much a product of pigments running in wet conditions as intentional, it nonetheless bears a striking resemblance to some Coso PBAs. Such a similarity, however, must be considered coincidental without completely clear visibility, and/or additional examples of PBAs on site (which have not yet been observed to date). Panel 43, at the base of the Third Chute, contains at least four small curvilinear elements with partial patinas. One of these small elements utilizes a small crack in the otherwise smooth rock surface, heavily battering the crack's terminus.

Another noteworthy element, a hand- or foot-hold, did not receive a panel number. At 10cm diameter, this is the most substantial such modified hold observed anywhere in the canyon. The hold sits in the lowest point of a small and shallow erosional recess towards the top of the third chute. This hold's position close to the ascending entrance to a chamber is comparable to the position of Panel 54's series of pecked steps/footholds ascending into Chamber 1. Despite the Third Chute's foothold's resemblance to a large cupule or shallow bedrock mortar (BRM), its surface lacks any evidence of abrasion from grinding use. This lack of abrasion substantiates the interpretation that this and similar elements function as climbing aids. The Third Chute foothold is the highest verified intentional climbing aid in the canyon, excluding a much less practical cupule in Chamber 2 at the lower outlet of the Slick Chute.

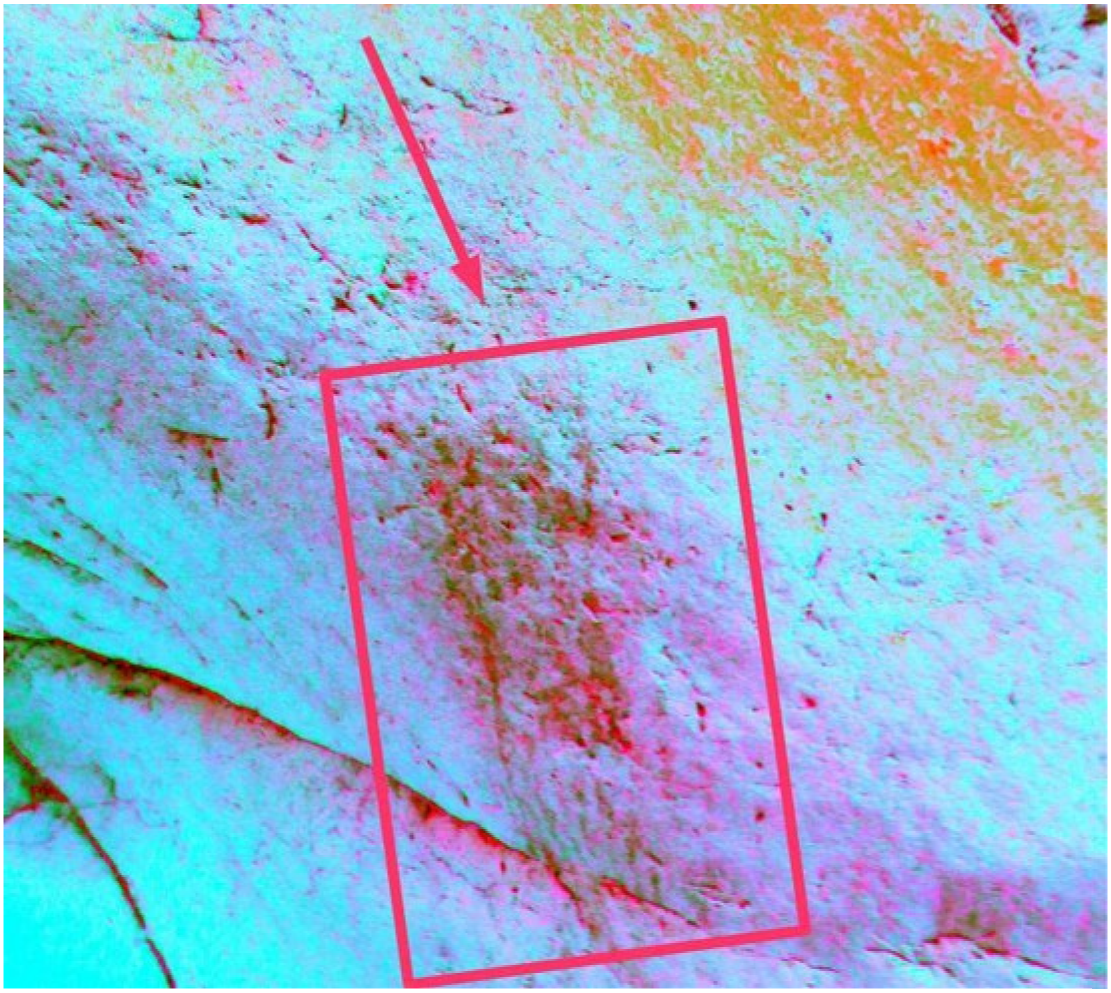


Figure6. 24: *Panel 42, false color enhancement of unconfirmed pictograph, as seen from photostation PS43. Notice, however, mineral stains leading in from above.*

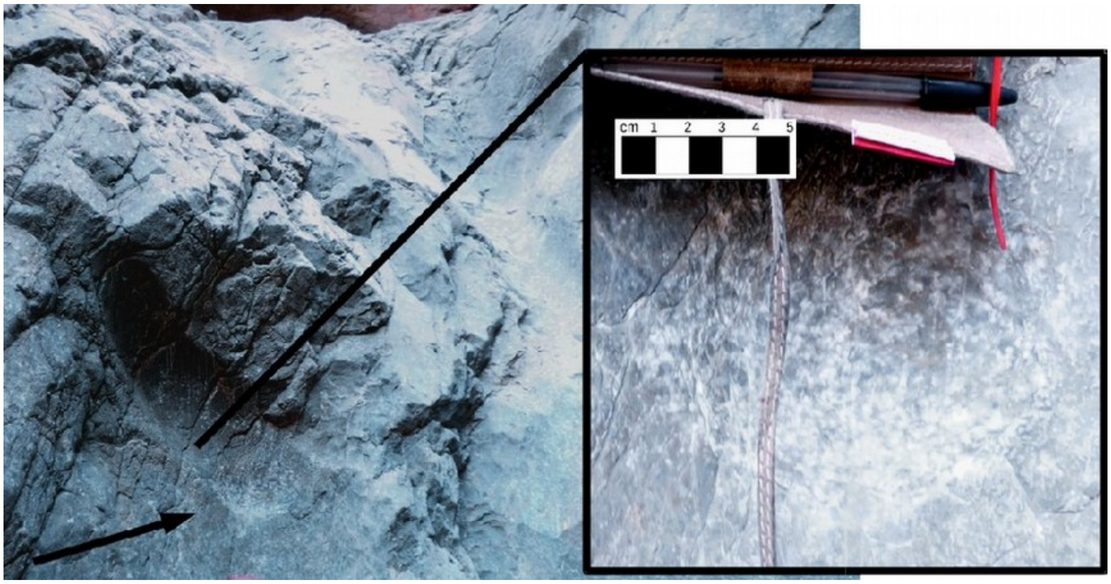


Figure6. 25: *Handhold/foothold in Locus 7 (Third Chute), with notebook and scale bar for size.*

Acoustics were not considered a high priority while documenting the Third chute. Its steep, narrow ascents left insufficient room to safely perform sound experiments. Few panels exist within the chute, and none of these have many elements. The narrow, irregular shape of the the chute was additionally anticipated to dampen sound. Given the lower likelihood of resonance, few indications of use for the purpose, and safety concerns working in the steep space, the Third Chute was deprioritized. Were future acoustic experiments to be carried out at this locus, attention would best be given to impulses originating from the abstract panel, and the climbing hold. Such future experiments, however, would likely be unnecessary, and have a low probability of producing any compelling results.

Locus 8: Chamber 2

12 The second chamber is located between two steep chutes, where gravel deposits have formed a level floor over a bowl at the base of the highest dry fall in the cultural section of the canyon (save the terminus of Grotto Gallery at the head). Locus 8 is fairly wide, with a substantial amount of surface area of smooth rock exposed. Because of its width, most of Chamber 2 receives at least a few hours of direct sunlight each day – or at least this is the case from July through November, the span of the year encompassing all field visits from 2010, 2014, and 2016. This feature distinguishes Chamber 2 from the next two loci below it (Third Chute, and beyond that, Lower Gallery), both of which were in perpetual twilight during the same span. Chamber 2's east, south, and truncated west (interrupted by the Third Chute) walls all exhibit more patina development than the north wall. The lack of patina development along the north wall is likely at least in part due to the overhang of a rock shelter shielding surfaces of this side from direct exposure to the elements. While still overall shallow, the Chamber 2 shelter is substantially wider and deeper than any others within this canyon, again save for the Grotto Gallery. Underneath the overhang, a low natural bench has formed to occupy the eastern half of the shelter. It should be noted that no clear fire staining was visible under the shelter roof, although the possibility for faint traces cannot be conclusively ruled out for the far western end (shadows and mineral staining were limiting factors). Chamber 2's east wall terminates at a dry fall, with a deeper north rut, and a shallower south rut - the latter of which is slightly more patinated. Foliage is entirely absent.

Chamber 2 holds by far the densest concentration of rock art within INY-3074, both by panel count (minimally 16, Panels 26 through 41), and by tallies of individual elements. These tallies remain incomplete, as numerous series of superimposition obscure or even obliterate the earliest elements, and obfuscate the boundaries and contents of others. Petroglyphs extend along most of the wall surfaces even beyond arm's reach, down below the current gravel surface. D'Ascenzo and Deal (1987:4) nicknamed Chamber 2 the "Shield-Lee Chamber" after two of the most prominent motifs. The "shield" references a large geometric design situated at the outlet of the Fourth Chute (Figure6. 27). Comprised of several vertical, horizontal, and diagonal lines, infixed within a large circle, it closely resembles a similar element at CA-INY-3826, Locus 7, Panel 88 (see Van Tilburg et al. 2012:77, figure 3.48). The second namesake is the lone known graffiti[88] comprised of the letters 'LEE' within a rectangular field of pecking (Liwosz 2017:180). Even the LEE motif (Figure6. 26) may be of archaeological significance, as D'Ascenzo and Deal (1987:2) connect the name with brothers Gus and Richard Lee, who held documented prospecting/mining claims in the north end of the valley.

88: Review of photographs has identified a possible set of serif font initials in Locus 12, in a short corridor connecting the Overlook with the Sixth Chute.

Figure6. 26: *"LEE" element in Chamber 2, likely attributable to one of the brothers Gus and Richard Lee, historic prospectors documented to have mining claims in the immediate vicinity*

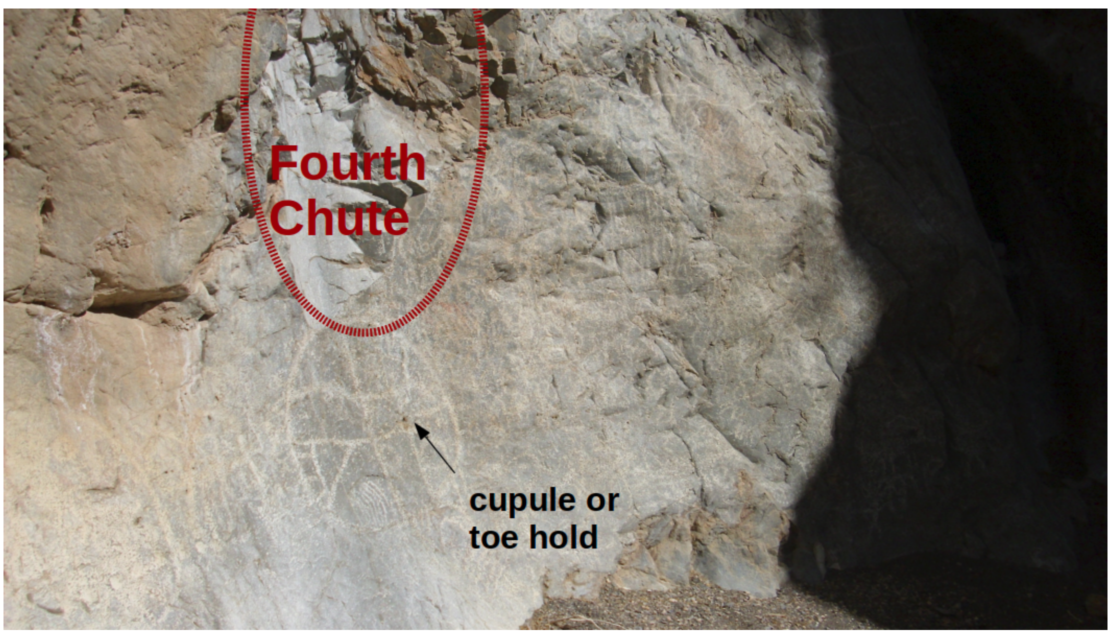


Figure6. 27: *“Shield” element, cupule, and Fourth Chute, seen from bench under overhang. View SE*

Given the number and density of petroglyphs in Chamber 2, it is neither necessary nor viable to separately report every element in conjunction with its designated panel.

To do so would be to distract from the continuous nature of the usage of the rock surface for carving, as well as the degree of obscurity earlier elements have developed as a consequence of repeated series of superimposition events. Nonetheless, this section attempts to describe the relationships between panels, their positions, and their contents (as well as faithfully represent motif ratios). Panel 42 begins this discussion, as it is located along the north wall where the Third Chute enters into Chamber. This panel contains chains of parallel bars, linked along a central line.

Continuing into the chamber along the same side, the rock face drastically curves under Chamber 2's shelter overhang. Again, the less exposed rock is visibly lighter. The shelter's overhang is deep enough to have substantially protected the surface from erosion, providing the best environment for preserving pictographs anywhere within the site. All of the pictographs are abstract forms, produced with red pigments. Unlike the suspected intentional pigment applications elsewhere in the slot canyon, most of the pictographs under the Chamber 2 shelter do not correspond directly with petroglyphs. That said, petroglyphs still share these surfaces. Panels underneath the shelter containing pictographs are numbers 37 through 39.

Beginning with Panel 39 (adjacent to Panel 42), this panel contains four petroglyphs and several pictographs. The petroglyphs are a pair of linear alignments of dots, a box bisected by a bar, a horizontal bar with two vertical bars over two dots, and a set of five parallel vertical bars. All of these show partial patinas. The pictograph on this panel is visible as an arc with tapered lines descending below it.

False color enhancement shows the central line continues past the intersection point with the outer lines, and continues through and bisects a pair of small arcs on either side. On the ceiling, Panel 39 includes a rectangle of applied pigment, featuring bars or tassels at its top, invoking either a “medicine bag” motif, or a pair of hands or paws.[89] This motif is known elsewhere, and is visually similar to an unfinished basket or textile. Panel 38 contains multiple pictographs. One of the clearer pictographs in this panel is a series of several deeply pigmented lines, oriented on converging trajectories; the effect implies that the element may have been made by directly applying a red ochre cobble abrasively to the limestone surface; alternatively, the result might also be achieved by first applying, then subtracting from the fresh pigment with a hard object (for example, fingernails, or a stick). Another adjacent pictograph is comprised of vertical bars, and at least one horizontal bar, applied over a pecked grid of incomplete patina development. At least one isolated bar and one isolated ovoid area of pigment are known. Similarly, an isolated bar is located underneath a long, linear pigment mark linking Panels 37 and 38, both of which seem to have been produced by directly applying an ochre stone to the surface. Similar streaks from abrasive application continue in criss-crossing lines into Panel 37. Below these, false color imagery illuminates four filled-in circular elements below the streak, one of which may be the equilateral cross infixed in a circle motif. These circular elements, arranged in a row, were not readily discernible to the naked eye but

89: While other researchers (e.g. Bretney 2012:103) have called these “paw” motifs, they virtually always feature too many linear fringes to depict digits.

were verified in false color enhancement using the DStretch plugin for ImageJ. Another pictograph on Panel 37 is a red field, with negative spots or holes arranged in a grid of dots. Enhanced imaging shows this field is in a palimpsest relationship with another pictograph element comprised of concentric circles with radiating lines, applied through a different technique (possibly directly abrading ochre on the surface). This pictograph is located adjacent to the natural bench, on abstract petroglyphs are dominated by a large circle. False color enhancement shows a series of six weathered circular pictographs overlapping part of this large element, each of which is composed of a pair of arcs on both the left and right, and possibly a central vertical bar.

Petroglyphs under the shelter are focused around the bench towards the end near the Fourth Chute. The most prominent is a large arc, which partially encircles indeterminate forms of more developed patina. Across the arc, there are open circles. On the arc's left end, there is a long bar (pecked), with what appear to be outstretched arms ending in fingers about three quarters of the way to its top (possibly D'Ascenzo and Deal's dendroglyph). Interestingly, the locations of the anthropomorphic dendroglyph's hands correspond with the locations of pictograph circles – as if the painted rosettes are growing out of the petroglyph's extended limbs. The palimpsest relationship clearly shows the anthropomorphic dendroglyph post-dates the concentric pictographs. Another such bar shows less clear modifications. Above and further to the left, a faint chain of intertwined wavy lines is also visible and adjacent to it. Zigzag lines of different proportions form diamond chains, which fill space while infixed in a faint pecked rectangular area adjacent to, and superimposed by, the pictograph field of negative dots; this patterned area resembles both “blanket” motifs, and a patterned-body anthropomorph (see Figure7. 35). Accompanying the diamond-chain-infixed figure is a slightly smaller “cryptic” anthropomorph to the upper left, with a simple stick figure design intersecting several uncertain or abstract lines. Adjacent, a large “phi” glyph re-uses a spiral for its circular component. Adjacent the larger prominent circle, there is a grid of lines. On the right side of the circle, there may be a boat-bodied bighorn with horns-side. Below said ungulate, there is a single row of seven deeply pecked dots extending outside of the circle. Further to the right, a chain of circles leads from the large encircling arc to the east. Two long, pecked lines lead towards the Fourth Chute. Below these, a moderately sized bullseye is above two lines which terminate in opposing curves.

Proceeding in a arc along the southern canyon from the top of the Third Chute to the foot of the Fourth, Panels 26 through 36 represent continuous and intensive use of rock surfaces for petroglyphs. The panel designation system adopted in Chamber 2 distinguishes petroglyph panels near floor level from those higher up. A pair of long irregular lines stretch horizontally around the room across the entire span from the Fourth Chute to the Third; these lines were selected as the division.

Figure6. 28: *Panel 37 bench, false color enhancement emphasizing petroglyph component (software: ImageJ, DStretch, GIMP)*

Below the horizontal lines that span the room, even numbered panels were assigned values from 32 through 36; above, odd numbers of 31 through 35 were used. Additionally, Panels 26 through 30 were designated as those in a groove or recess descending down the southeast corner of the room from a point higher up on the Fourth Chute. As the surfaces described are continuous, this entire set is reported together in the paragraphs below. Descriptions cannot at this time be comprehensive, because the palimpsests of petroglyphs obscure details of the earliest additions.

Beginning with Panel 36 (between floor level and the horizontal line, adjacent to the top of the Third Chute), there are numerous amorphous fields of pecking, three horns-side bighorn motifs (one with the boat-shaped body), a dorsal schematic of a lizard complete with long tail infixed in a rounded square or diamond, an equilateral cross infixed within a circle, meandering curvilines, a chain of bars each bisected by a central connecting line, a chain of linked circles, isolated circles, and motifs of indeterminate form. Directly above, Panel 35 contains meandering curvilines, five pairs of arching bars, an open circle, three boat-bodied bighorn with horns to side (see Chapter 7 on archaeoastronomy), and an element which is either a spread eagle anthropomorph or an avian zoomorph. Additionally, the large surface underneath these features more eroded and patinated pecking across nearly the entire panel, and sets of three short wavy lines seem to have been partially reused for the paired sets of arches.

Panel 34's elements with the least patina are a pair of bighorn with horns side, one of these standing on a pair of parallel wavy lines, an isolated wavy line, a filled semicircle with five lines radiating upward and out, minimally two equilateral crosses, and a set of parallel lines descending from a horizontal one. Above these, a large field of pecking near porous places in the rock has acquired streaks of mineral stains. Enhanced false color images reveal this area of the panel to be dominated by large abstract motifs with nearly to fully developed patinas. These begin with the more visible elements, including an equilateral cross infixed within a box, a chain of horizontal bars all bisected by an axial line, and either a chain of circles or an intertwined pair of opposing wavy lines. The chain of bars terminates with a boxy rectilinear form of unknown origin, reminiscent of a decorative weaving pattern. Mineral stains collected in the indentations of the older elements, improving false color visibility. These are abstract fields, mostly between the room-crossing horizontal lines above, and a set of straight, stair-stepped lines. The west-most of these is a rectangular box containing criss-crossing diagonal lines; to the east, a rectangular area composed of smaller nested rectangles of varying size and proportion descends from the stair-stepped line to just above a bighorn motif; above the irregular rectangles, a large (greater than $1m^2$) honeycomb design spans from the stair-stepped line to the room-spanning horizontal one. Finally, an element containing two sets of parallel diagonal lines converging on an axial line is found on the eastern end of the panel.

Panel 33 is highly visible and shows fewer phases of retouching than 34. The darker/less visible elements are dominated by a series of pecked lines that meet at very acute angles, extending along most of the panel. Other random pecking is also observable. A couple of spots show filled-in elongated ovoids with pointed ends. Elements with less patina are a set of four vertical lines, and three conventional (boat-bodied with horns-side) bighorn, one of which appears to be leaping up off the uppermost room-spanning line. Above these on a courser surface, small elements with little patina include two isolated wavy lines, a set of parallel wavy lines descending vertically from a horizontal bar, a long meandering line of dots, and a set of converging arches. Panel 31 (directly above Panel 34), contains only a few elements. These include two equilateral crosses, a set of three conjoined circles, a lone circle, isolated bars, and amorphously pecked areas. Panel 31 includes pecked lines and grids several meters above the chamber floor, deemed too hazardous to reach.

Panels 26 through 30 occupy a concave slide which is steeper, narrower, and generally more patinated than the Fourth Chute. This geologic feature is likely a relic of an earlier stage of the canyon's erosion, although it could also carry overflow from the Fourth Chute during heavy flooding. The dark patina increases visibility of the petroglyphs within this auxiliary slide. The elements include a mixture of figurative and abstract forms. Among the figurative forms are five conventional bighorn (again horns side), and an anthropomorph (adjoining a "waterfall" element). Simple geometric forms include isolated bars, a circle bisected by a bar, and a box bisected by a vertical bar. Redundant geometric forms repeat on this panel, including rectangular boxes filled with parallel lines, two curving rows of dots, and three elements of descending parallel wavy lines ("waterfall" motif). There are also meandering curvilines pecked alone and in tandem (similar to Snake Ledge), as well as infilled rectangular areas. A few dendritic elements with diverging sets of lines or curvilines radiating from a central axis are also present, including one added to the top of a much more weathered "waterfall" element.

Panels 32 and 41 are located at the foot of the Fourth Chute dry fall. Panel 32 includes a large circular design (the "shield" motif), in which several lines are wholly infixed; a subset of these lines comprise an equilateral cross, possibly connecting this element with the circle-and-cross motif. Alternatively, its relatively more deeply pecked lines and infixed cupule may (though less likely) make this an expression of the pit-and-groove tradition (see Locus 1 discussion for the possible significance). Other elements have been added as well, including a set of six curving lines, and a smaller circle. The prominent circular geometric design is superimposed over more darkly patinated curviliear forms, including wavy lines terminating at another small circle. To the south along the same surface, numerous carving events have nearly entirely covered the exposed bedrock from the gravel floor more than 2m up. Elements with negligible patina are an anthropomorph depicted with hair or a headdress, the "LEE" element, and an abstract design of an anthropomorph climbing. Other elements with marginal patina are a row of three conventional bighorn (horns-side), and several wavy/curving lines. With more patina, a row of four horns-side bighorn leads to the later/lighter set. Aside from these, the there are numerous geometric elements, including four series of several parallel lines each, a long horizontal pair of wavy lines (similar to the ledge in the Lower Gallery/Third Chute), three rows of dots, and minimally six sets of descending parallel wavy lines ("waterfall" motif). In the instances of the descending wavy lines, and row of bighorn sheep, it appears these have been added onto during multiple carving events. Finally, there is an element composed of concentric circles with sets of parallel bars radiating from the top and bottom.

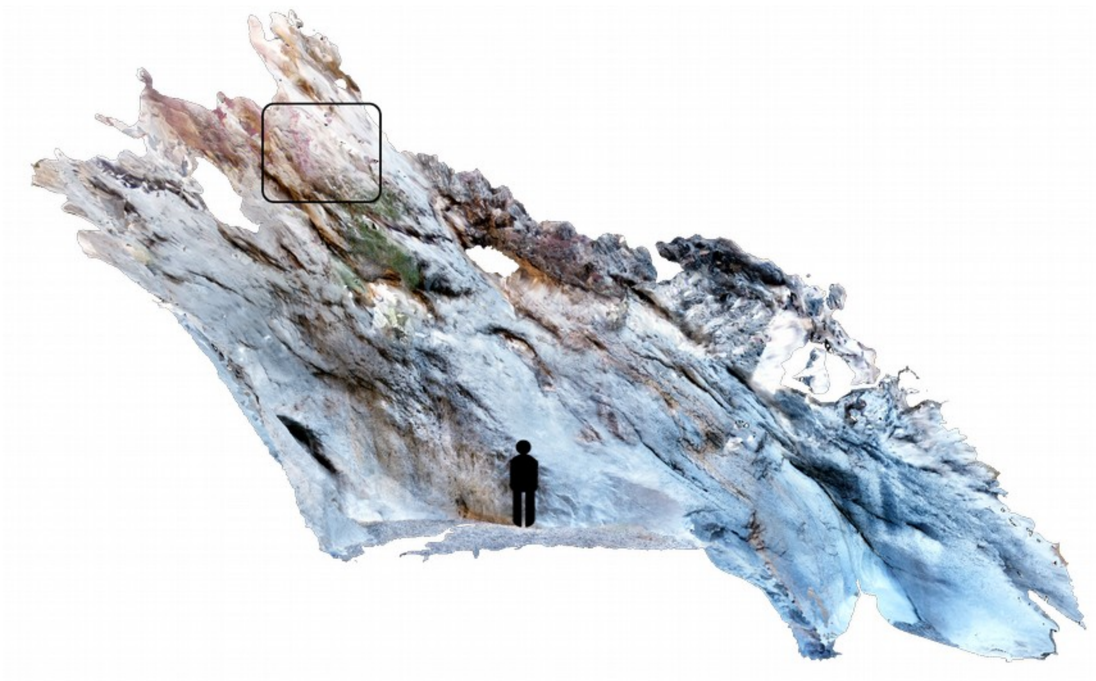


Figure6. 29: *Virtual cross-section of Chamber 2, with rectangular box indicating a cluster of some of the higher up petroglyphs. Silhouetted figure included for approximate scale. View S.*
**note: top of locus model only reflects bottom 20-30% of the full height of the canyon wall.*

With the overwhelmingly densest concentration of petroglyphs of any of INY-3074's loci, Chamber 2 was a prime location for anticipated acoustic phenomena. It received one of the most intensive batteries of sound tests for any locus on-site, as experiments compared variables for both recording station location, as well as impulse source position. The recording station was set up in three places: one position in the middle of the room, once at the chamber entrance at the top of the Third Chute, and one position immediately in front of the rockshelter's bench, at the foot the Fourth Chute. These positions establish sound profiles as heard along the east-west axis of room, which is also the major axis of the ascending route through this section. Percussion impulses were positioned to survey the extent of pecked areas. This was achieved by walking a semi-circle around the perimeter of the room, pausing at arbitrarily chosen focal points; specifically, pauses were taken at the Third Chute entrance (panel 35), the end of the "horizon" lines (panels 35 and 26), at the cluster of leaping sheep (panel 33), at the rut/alcove in the southeast corner (panels 26 through 30), at the "LEE" element (panel 41), at the base of the Fourth Chute immediately in front of the large circular "shield" element (panel 32), and at the bench inside the rockshelter (panels 37 through 39).

Results for Chamber 2 were variable, with some experimental combinations providing compellingly strong signals. Beginning with echo delay measured at that center of the room, the first sound reflections typically arrived at 8 ms after initial impulse, with subsequent echoes arriving at multiples of that interval (16 ms, 24 ms, etc.). This was reduced to 4ms intervals with percussion at the terminus of the "horizons," and 5ms intervals for the rock shelter bench. The repeating and enduring echoes at such regular intervals confirm strong reverberation in Chamber 2. Additional echoes at higher intensities than the room reverberation were recorded for the southeast rut and alcove; these varied in delay between 32 and 38 ms (averaging 35ms) and 40 to 44 ms. In some instances, the later echoes in the 35 to 40 ms ranges arrived at different times between right and left channels, and the signals sometimes overlapped too much to distinguish from each other.

Resonant tones also varied between sound samples within Chamber 1, especially for less intense frequencies. Fundamental tones for impulse experiments near panels

35 and 36 may be around 82 Hz, and between 100 and 110 Hz for those from the southeast corner rut. These signals however are weak, near the equipment's detection limits. Another inconsistent low frequency signal was identified in three recordings (panels 26-30, 37-39, and 41) around 122 Hz (with a range of 117 to 125 Hz). The strongest indications of resonant bands came from recordings with the sound source around the pictograph shelter's bench, extending to the circular element a the base of the Fourth Chute (panels 32 and 37). There, observed potential resonant bands showed a strong 3:4 (and weak 2:3) relationship, with consistent and organized integer harmonics. Cross comparison between proposed fundamental bands from all recordings in Chamber 2 with observed peak frequency ranges substantiates resonance. Specifically, higher frequency harmonizations were recorded for bands from 81-83 Hz, 90-94 Hz, 117-128 Hz, and 300-315 Hz (see table below).

Table 6.1: *Proposed fundamentals and initial overtones for Chamber 2 (column 2,bold), with observed harmonies highlighted. Each potential fundamental/overtone listed, and its observed higher interval harmonics, are assigned a single color.*

Signal #	freq (Hz)	2:3 ratio	3:4 ratio	2x	3x	4x	5x	6x	7x
1	**81**	122	108	162	243	324	405	486	567
1	**82**	123	109	164	246	328	410	492	574
1	**83**	125	111	166	249	332	415	498	581
2	**90**	135	120	180	270	360	450	540	630
2	**92**	138	123	184	276	368	460	552	644
2	**94**	141	125	188	282	376	470	564	658
3	**117**	176	156	234	351	468	585	702	819
3	**120**	180	160	240	360	480	600	720	840
3	**122**	183	163	244	366	488	610	732	854
3	**125**	188	167	250	375	500	625	750	875
3	**128**	192	171	256	384	512	640	768	896
4	**300**	450	400	600	900	1200	1500	1800	2100
4	**305**	458	407	610	915	1220	1525	1830	2135
4	**310**	465	413	620	930	1240	1550	1860	2170
4	**315**	473	420	630	945	1260	1575	1890	2205
		0	0	0	0	0	0	0	0
		2:3 ⟵ chord(s) from → 3:4				*divisions*			
1	**81**	54	61	41	27	20	16	14	12
1	**82**	55	62	41	27	21	16	14	12
1	**83**	55	62	42	28	21	17	14	12
2	**90**	60	68	45	30	23	18	15	13
2	**92**	61	69	46	31	23	18	15	13
2	**94**	63	71	47	31	24	19	16	13
3	**117**	78	88	59	39	29	23	20	17
3	**120**	80	90	60	40	30	24	20	17
3	**122**	81	92	61	41	31	24	20	17
3	**125**	83	94	63	42	31	25	21	18
3	**128**	85	96	64	43	32	26	21	18
4	**300**	200	225	150	100	75	60	50	43
4	**305**	203	229	153	102	76	61	51	44
4	**310**	207	233	155	103	78	62	52	44
4	**315**	210	236	158	105	79	63	53	45

Given speed-of-sound estimates for the environmental conditions (approximately 31℃, 1300 m elevation, resulting in a speed of approximately 350 m/s), 125 Hz is the frequency corresponding with 8 ms interval echo events as described in the paragraph above. Noting that in some samples these varied to even shorter intervals, rapid reverberations may thus also account for the possible 138 Hz reported in preliminary results (Liwosz 2017:195). Mathematically speaking, the strong and regular reverb in

Chamber 2 can itself be described as an audible tone around 122 ± 7 Hz. Given environmental noise and poor microphone sensitivity below 100 Hz for this locus, the lower sets can be dropped as potential acoustic artefacts[90] until further evidence is available. The stronger band peaking around 122 - 125 Hz closely corresponds with integer divisions of higher harmonics. Additionally, wavelengths on this frequency (2.8 m, using speed-of-sound estimates above) would repeat an integer number of times across Chamber 2's major and minor axes. Observed increased echo intensities at 32 and 40 ms correspond with an approximately 2.8 m wave propagating across Chamber 2's north-south minor axis of about 11.2 m, and east-west major axis of 14 m (respectively). As integer iterations of a soundwave in an enclosed space mutually reinforce each other to build a standing wave, Chamber 2's resonance can be confirmed confidently.

Locus 9: Fourth Chute

The upward exit of Chamber 2 is a nearly vertical (approximately 80° inclination) dry fall of some 18m (60ft) in height. This slide's steep pitch and smoothly polished surface has earned it the nickname "Slick Chute" (D'Ascenzo and Deal 1987; Liwosz 2010). The slick chute's 18m rise is broken up into two legs with a small level surface (only about 2m across) about two thirds of the way up. Although obscured from direct view of the valley, the slick chute is still a relatively exposed area,

90: I use *artefect* to describe distortion in digital data, usually as a result from compression, distinguished by spelling from *artifact*, in the archaeological sense of diagnostic material culture.

receiving daylight and exposure to weather. The top of the chute descends from Landing B (Locus 10), where walls close back in and the floor levels back off once again. Judging from petroglyph densities, verbal reports, and D'Ascenzo and Deal's (1987) site record, the Slick Chute has continually provided a barrier, impeding access to the higher sections of the canyon. A single potential climbing aid may be present in the form of a cupule infixed within Chamber 2's namesake "shield" design (Figure 5.17). This cupule, however, provided little practical climbing aid, beyond serving as a prompt to climb barefoot (which increases frictions) on initial ascent.

Continuing with panel inventories in order along an ascending route, Panel 25 is located to the climber's right (south) towards the lower third of the Fourth Chute. This panel contains two "bighorn" motifs with horns-side, one deviating in shape from the conventional style. Surrounding these ungulates are three spirals. Additional panel elements are a pair of curves, a meandering curviline, and two amorphous fields of pecking. A rectangular grid of perpendicular lines was likely achieved by use of an exceptionally fine implement, or (less likely) it may be the only documented scratched element in the slot canyon (observed in 2016, first identified during post-fieldwork photo review). Panel 24, also to the climber's right, includes a bighorn element, and a set of parallel lines, as well as amorphous pecked areas.

Figure6. 30: *Panel 23, located on left side in the Fourth Chute, approximately half way up.*

Panels 23 is located approximately halfway along the ascent up the chute. It occupies two adjacent surfaces, one a short vertical face with some natural patina on the unmarked portions of the surface. Elements are primarily abstract, including a spiral, three circles, a chain of three infilled triangles, a set of two horizontal wavy lines, two more unmatched wavy lines that interrupt where they would cross the paired wavy lines, and some small amorphous pecking. Additionally, a curious unconventional quadruped is show with horns-side on one end (without a clear head), and an opposing pair of similar arcs protruding from the bottom of the opposite end. On the less patinated surface above these petroglyphs, there are three independent wavy lines, and a “waterfall” motif (several parallel wavy lines).

Panel 22 is located at the head (top) of the Slick Chute dry falls. This simple panel contains few elements. Meandering/wavy vertical lines show variable patina development, from partial to nearly complete. Additionally, amorphous pecking observed may be a partially formed or incomplete quadruped, possibly a bighorn/ungulate motif, however it lacks the telltale horns.

Given the presence of petroglyph panels in the Fourth Chute, it potentially could have been used as a place from which to generate sounds. Although it was involved in the soundshed experiments, this locus did not undergo percussion tests. Its near vertical rise, few ledges on which to stand, and 18 meters of height make it the singularly most dangerous ascent inside the canyon. Leaving free-standing equipment on ledges near ropes, while taking both hands off the climbing line was determined far too risky for a solo climber to attempt in the backcountry.

Locus 10: Landing B

At the top of the exposed and steep Slick Chute, the canyon briefly closes in with high walls, but a more level floor. Landing B, coincidentally shaped like the capital letter 'B' when viewed from above, consists of a long vertical southwest wall, and two lobes along the more sloping northeast side. This mostly level area extends from the top of the Fourth Chute to the foot of the Fifth Chute. Foliage includes creosote and ephedra. Near the top of the Slick Chute, a large shrub has fostered a 2m diameter earthen hummock around its root ball, providing a potential natural anchor point for rappelling the Fourth Chute.

Several panels are located in the landing area between the Fourth and Fifth Chutes: Panels 17 through 19 on the southwest wall, with 20 and 21 on the northeast wall. Panel 21 contains a natural divot emphasized with pecking, and three elements of abstract curvilinear forms, one terminating in three linked circles. Panel 20 contains only two clear elements, a "double helix" of intertwined wavy lines, and a pecked rectangular field.

Panel 19, the largest in Locus 10, contains minimally 39 distinct elements, some of which are superimposed over older, less patinated ones. Curvilinear forms dominate, but other shapes are visible as well. More recognizable forms include an equilateral cross infixed in a circle, and two "bighorn" with horns side. Additionally, there is a chain of dots, a chain of linked circles, two sets of parallel curving arcs, a chain of bars linked along an axial line, four "waterfall" glyphs, four "fringe" designs, and the remainder are unidentified forms. Panels 18 and 17 each contain a few interlinked curvilinear and rectilinear forms. Additionally Panel 18 contains at least one equilateral cross.

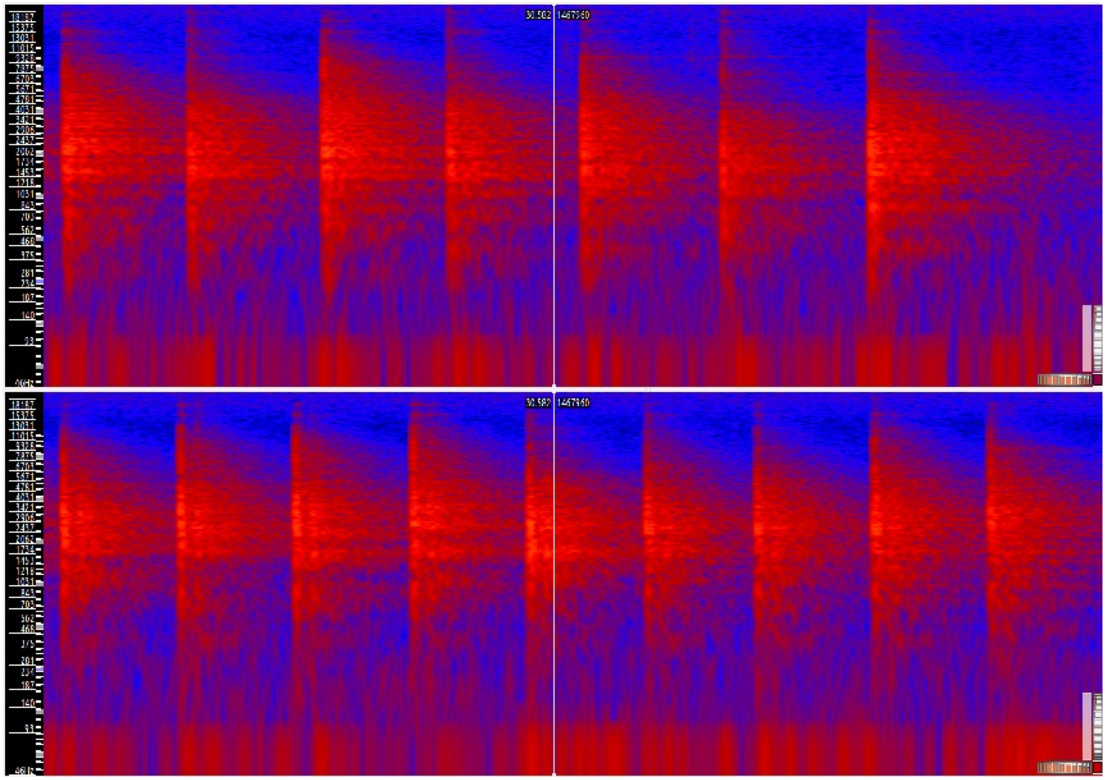


Figure6. 31: *comparison of logarithmic scale spectrograms from Locus 10, with sound impulses originating in front of Panel 19 (top) and Panel 20 (bottom).*

Initially, the landing between the Fourth and Fifth Chute was to receive little attention. Subjective observations, however, noted a potentially novel acoustic property of a “hooting” noise seeming to emerge from or near a small grassy crack near Panel 17. This observation led percussion tests at each of the small room’s five panels, with the recorder tripod standing over small boulder in the floor between Panels 18, 19, and 21. Initial echo delays varied from as short as 9 ms to as long 30 ms; the mean and mode for initial echo, however, was 28 ms - a near match to the roughly 10 m major axis. Interestingly (and likely a result of the relatively small space), most recordings showed a 1 to 5 ms difference between echoes in the left and right channels, depending on the impulse source. Somewhat surprisingly, Landing B showed weak to no clear reverb, and poor resonance in the vocal range. Recordings of impulses from Panels 17 and 19 showed small peaks around 400 and 500 Hz, but these were inconsistent and shared no strong mathematical relationships with other vocal range peaks. The lowest clear band consistent across all recordings at this locus ranged from 1,550 to 1,650 Hz, and markedly improved response for the higher peaks around 2.0 kHz, 3.0 - 3.25 kHz, and 5 Khz. Given poor response for the room below 1.5 to 2 kHz, the apparent lack of resonance can simply be attributed to this study's emphasis on tones in the human vocal range. It may well be that a constriction in the room between panels 18 and 20 contributes to the dampening effect on sound in the vocal range. Additionally, the subjective sound distortions observed may be described better through other psychoacoustic effects, perhaps related to the "precedence effect,"[91] rather than resonance.

Locus 11: Fifth Chute

Of the dry falls in the Death Valley slot canyon, the Fifth Chute is the widest, however measuring the widest part would have left the climber (me) too dangerously exposed to falling. Despite an overall gentler grade, the Fifth Chute presents nearly as formidable of a barrier to access as the Fourth Chute. The Fifth Chute's breadth precludes using certain climbing techniques. High canyon walls for much of the chute, and the southeast trending direction, combine to leave much of the Fifth Chute

91: Described more in Chapter 7, intervals separating the first echo (especially in a series) from the initial impulse by <50 ms may distort perception of the sound's origin and pitch.

in shadow (but not necessarily twilight) during late summer and autumn. The shadow effect is exacerbated by the vertical to concave southwest wall. In this southwest wall, there is a small shelter with fainter patina, but substantial mineral staining (Figure6. 32) as is characteristic of overhangs in Zone 2 (Bedrock Formation B). the Fifth Chute terminates at the bottom of Chamber 3, where the chute forks into two narrow slides which rise to meet the Overlook's floor.

With the D'Ascenzo and Deal expedition terminating in Chamber 2, 2010 field visits being closely constrained to the climbing route, and the 2014 field session focusing on numbered Chambers, no petroglyph panels were believed to be in the Fifth Chute. This was disproved in 2016, when a moderately sized panel was documented. Assigned number 65, this abstract composition is located in an alcove under a shallow overhang of approximately 4 m long, 2 m deep, and 5 m tall (exact measurements could not be safely taken by a single climber). This alcove is along Locus 11's southwestern wall, far to the right of the main climbing line. Sparse vegetation currently inhabits a cleft in the floor at the alcove ceiling's outer drip line. Additionally, review of photogrammetry models revealed another panel in Locus 11, now assigned the number Panel 73.

Figure6. 32: *Fifth Chute sheltered alcove with color enhanced inset of geometric pecking. View W.*

Like other panels under overhangs, the unmodified portions of Panel 65's surface shows less patina development, and increased mineral staining (see above). A discrete count of only six elements falls short of accounting for the visual complexities of this panel. In addition to a recursive heart shape, a set of bars, and three sets of parallel descending wavy lines ("waterfall" motif), a network of meandering curvilinear forms defines panel space and links is contents. Panel 65 is entirely abstract, however in the following chapter, cases for potential iconic readings for the abstract geometry are presented for the large area as a quail, an the recursive heart shapes as butterfly. Panel 73, situated on a much more exposed surface, contains three abstract meandering curvilinear elements. A short line segment is superimposed over one.

With no thoroughly documented panels prior to the 2016 field season, the Fifth Chute was originally considered a lower priority locus for sound experiments. Even after documenting panel 65, a percussion experiment would not be straight-forward. With sloping plunges and smoothly polished bedrock under foot, the chute's approximately 10 m rise can be somewhat treacherous. There were few clear spots where a tripod for the recorder could be positioned securely, and none were in view of any rock art (save for inside the overhang itself). Given the very exposed climbing route, with very poor natural hold points (and no human-made holds), attempting percussion tests was determined a risk too high for only one panel. It may be possible to place both recorded and source inside of the overhang in a future study.

Locus 12: Chamber 3

Whereas other loci are generally hemmed in by the tall canyon walls, nearly half of Chamber 3's perimeter is open. With one open area aiming up-canyon to the Sixth Chute, and another larger opening out over the Fifth Chute (and in fact Loci 6-11), Chamber 3 receives direct sunlight throughout much of the day, during much of the year. This open-area exposure earns Locus 12 its nickname, the "Overlook," as the opening out over the entirety of Zone 2 loci provides the only place from which the valley and next mountain range west can be observed from the canyon floor. Unfortunately, the Overlook's vista cannot be included in this report, out of respect for sensitivities concerning the slot canyon's exact location, expressed both by relevant federal and tribal governments. Suffice it to say, however, the view in question not only includes mountain peaks that could theoretically be used to locate the site, but also exposes the climber (present-day, and in antiquity) to viewers in the valley below. Between the level floor area and this opening, a large boulder-shaped outcrop of bedrock (hosting sagebrush rooted in its crevices) marks the chamber's northwest boundary, and divides the flow down to the Fifth Chute into the two aforementioned channels. Hydrologically, the Overlook is active. Despite lacking significant areas for water to pool, moisture was seen seeping through porous rock in the form of "weepers," creating streaky wet spots. This wicking action through bedrock may provide moisture to the brushes and grasses in the Overlook.

The Overlook's geomorphology is unique in the slot canyon, at least in part because of its position at the juncture of seams and fractures in the bedrock. The south wall is comprised (at floor level, at least) of the Formation B partially metamorphosed limestone presented throughout Zone 2. Opposite the center of the south wall, a wedge of Formation C quartzite (or metamorphosed sandstone) juts into the Overlook from the north. The primary erosion channel follows the tilted seam between quartzite and limestone into Chamber 3, where the quartzite deposits terminate and the channel changes course and pitch. In addition to the seam between deposits, the limestone features multiple fractures which channel ephemeral tributaries into the canyon. It is quite likely the chamber owes its width to this confluence of tributaries along seams, meeting at the juncture between bedrock strata. Chemical erosion has accelerated in these limestone fissures, leaving several cavities at discharge points greater than 5m above the chamber floor. Of note, at least one of these cavities is likely to have held symbolic weight: a natural circular cavity formed at a fracture in the limestone. This prominent cavity by happenstance resembles the bisected circle motif, some derivations of which have been termed “atl-atls” while others “yonis” or vulviforms (Figure6. 33; see also Figure7. 16).

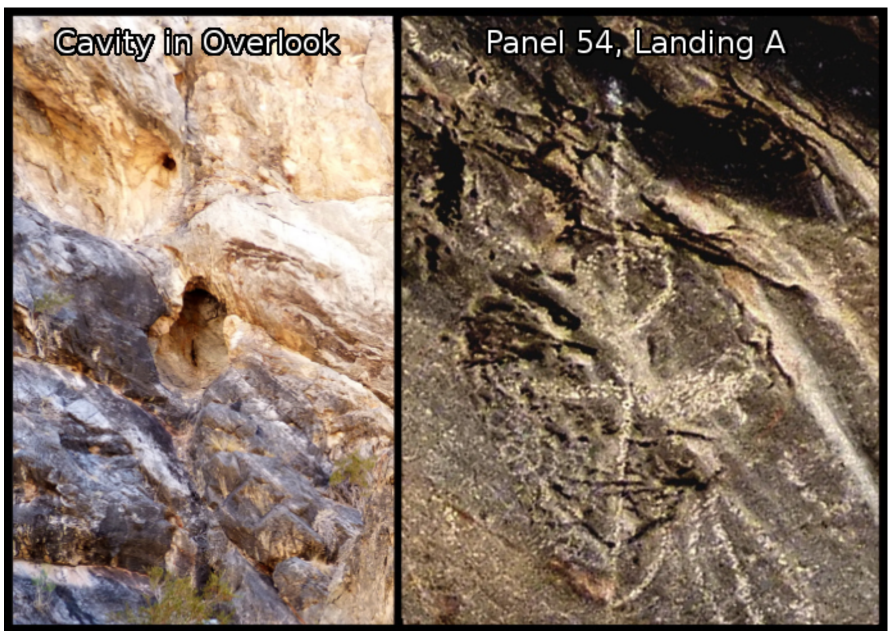


Figure6. 33: *Overlook cavity (left) bearing formal resemblance to depictions of both atl-atls and vulvas, such as that in Panel 54 (right)*

Three petroglyph panels, numbers 14 through 16, span from the roomy Overlook through a corridor linking with the Sixth Chute. Panel 16 is located in the back of the Overlook chamber, opposite the crest of the Fifth Chute, with a view over the valley beyond the canyon. All of the sixteen elements on Panel 16 are low on the wall, less than 1m above the floor. Panel 16 components are all well bounded discrete elements, with a mixture of figurative and abstract subject matters (see Error: Reference source not found below). These include two quadrupeds (no horns), a circle bisected by a vertical bar, three isolated vertical bars, a series of six vertical bars linked at the top by a naturally occurring horizontal line, one anthropomorph with exaggerated digits, an avian zoomorph, a zoomorph with a long neck and no limbs, a pair of arcs, a pair of pecked dots, a rectilinear box with infixed horizontal and vertical lines ("medicine bag" or "blanket" motif), and two infilled curved areas of pecking which may possibly be incomplete zoomorph bodies (or amorphous pecking). The low position of Panel 16 keeps it out of direct line-of-site of the valley viewshed window.

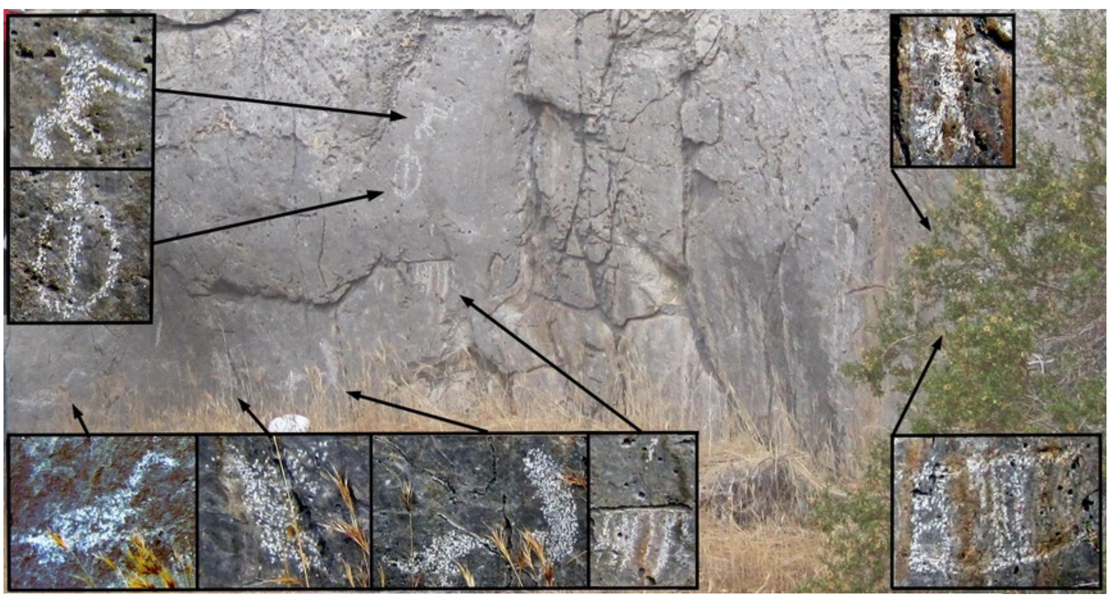


Figure6. 34: *Panel 16, with enhanced insets for select petroglyphs, and their locations.*

Panels 15 is located in a more shaded spot, in the northeast corner of Locus 12. Like Panel 16, Panel 15 are shielded from view of the window out onto the valley beyond the canyon. The two faces of Panel 15 join at an edge, and are thus reported together as a somewhat continuous use of smooth rock surface.[92] Petroglyphs on this panel are exclusively abstract, dominated by curvilinear forms with some rectilinear forms. The majority of these show substantial weathering and complete patina development. Numbering minimally 21 elements, this panel has a set of recursive arcs converging on a pointed end (retouched), three or more bullseye-like groups of concentric circles, two or more spirals, four or more wavy lines, paired arching lines ("rainbow"), an outlined equilateral cross,[93] and rectangular grids. Elements with less weathering and incomplete patina development include open circles, a set of six parallel lines or bars, an abstract pecked field, and meandering wavy curved lines. A vague element with negligible patina appears to comprise the initials "H.R." in serif font, on an abraded background. Age may not be the sole factor in the high rate of erosion on this panel, as it is located near a discharge point at the Sixth Chute's base.

Figure6. 35: *Panel 15, possible historic initials, reading "H.R." in serif font.*

92: There is some confusion over whether these are separately designated panels, or a single contiguous one. Resolving the matter by reporting both faces as one panel seems sufficient.
93: Grant et al. (1968:88) identify very similar deeply pecked abstract patterns – particularly the outlined equilateral cross – at R-25 as "among the earliest drawings in the Coso Range."

Figure6. 36: *abstract elements on Panel 15 with fully developed patinas (Liwosz 2016:19)*

Soundshed analysis was the only acoustic test carried out at Locus 12. The Overlook Chamber proper is open around roughly 40 percent of its perimeter, providing few reflecting surfaces. The sole panel inside of the chamber proper contains only a handful of relatively small elements with at most marginal varnish, and no palimpsests. With few indications of percussive sound-making, and the space not being utilized for this purpose through the deeper history of the site, Locus 12 was de-prioritized. Were further acoustic experiments to be undertaken in this locus, attention should be directed to panel 15. Located on one of two roughly parallel walls, in narrow corridor linking a chamber (number three) to a chute (the sixth), panel 15 is situated in a space sharing key morphological features with some of INY-3074's known firmly resonant spaces.

Locus 13: Sixth Chute

Beyond the upper exit to the Overlook, the Sixth Chute rises up as a series of slides and small pools in the Formation B limestone, immediately alongside a seam with Formation C. Locus 13 proper covers the series of slides and pools comprising the Sixth Chute, while Locus 14 (First Bypass) is as an adjacent low shelf of quartzite running alongside. While the slides of the Sixth Chute are passable without rope or other climbing aids, the quartzite shelf running alongside may well be the preferred ascent route through this section. Locus 13 begins at the top of the slides, and continues along a brief corridor at their base to the top exit/entrance of the Overlook, alongside the quartzite stratum. The slides terminate at a relatively flat platform, which extends back (in and up) to a very large chokestone boulder.

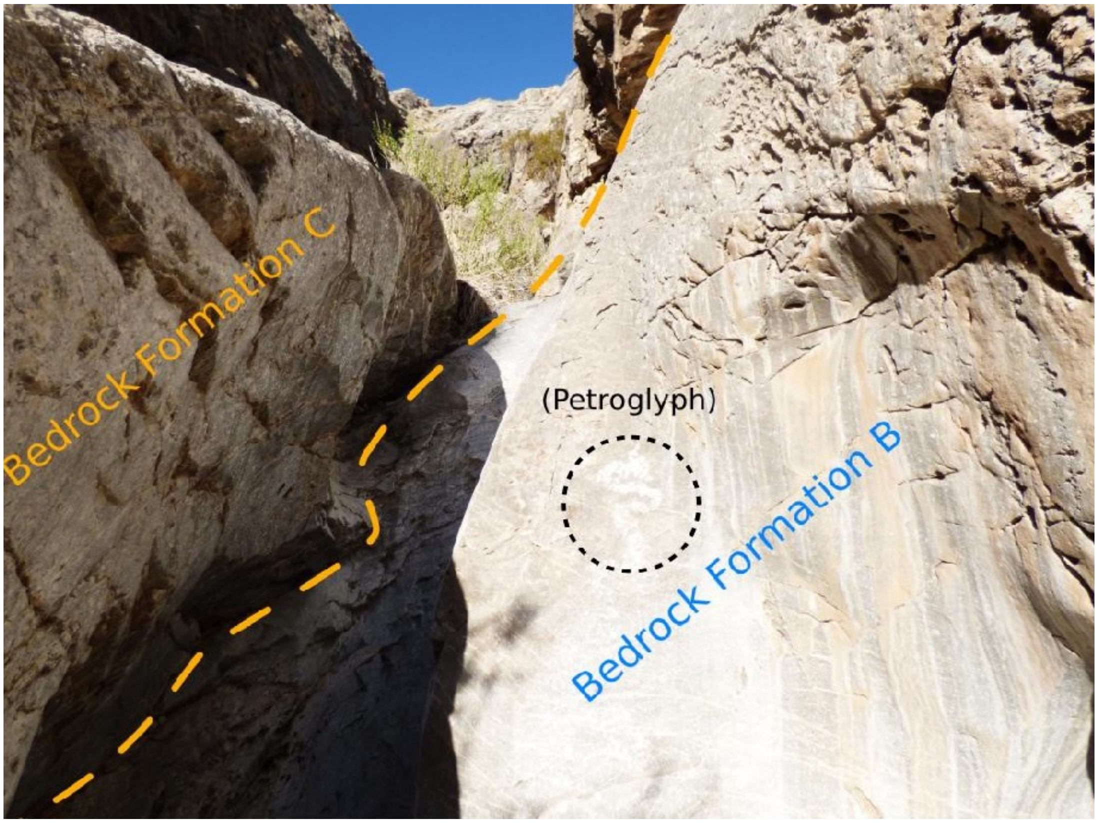


Figure6. 37: *View inside of the Sixth Chute, showing quartzite (Formation C) on left, and limestone (Formation B) on right. Indicated petroglyph is Panel 14. View ESE*

Locus 13 contains only a single recorded petroglyph. In the upper third of the Sixth Chute, a sole recurving line occupies a water-smoothed limestone face. This sole curving line comprises the entirety of Panel 14. No further petroglyphs are located in the upper portion of the canyon until Chamber 4 (Locus 17). A single element in a single panel did not seem sufficient evidence of acoustic activities, and sound experiments for this locus were deprioritized. Were such experiments to be conducted here in the future, they would contribute to a comparative dataset quantifying relationships between petroglyph and panel densities, and acoustic properties.

Locus 14: First Bypass

A quartzite shelf alongside the northwest edge of the Sixth chute is the First Bypass. As a locus, this area extends beyond the terminus of the Sixth Chute and its corresponding uppermost platform, bypassing a massive boulder/chokestone lodged in the canyon drainage. Locus 14 is the first (in ascending direction) of two such ledges in the uppermost Zone 3 of the canyon. Its continuous extent, and height rising above the canyon floor, both earn it a distinct designation from the seasonally dry watercourse below. The first bypass terminates just past the chokestone, meeting the canyon floor. Beyond the northeast and southwest ends of the bypass, the northwest quartzite wall is vertical, and otherwise lacks such shelves. Locus 14 is well exposed to sky, receiving ample sunlight through much of the day.

No rock art is present in Locus 14. The quartzite which comprises it does not develop dark patinas in the way the limestone layers do. Furthermore, the angular fractures in the quartzite further impede engraving by either percussive or other means. Erosion patterns above direct contact with the seasonal water flows produced rough textured surfaces, further discouraging petroglyph production. As previously mentioned, the Fourth and (to a lesser degree) Fifth chutes present barriers to accessing this section of canyon from below. The paucity of rock art throughout much of Zone 3, including its complete absence in Loci 14-16, may be attributed to all of these factors. The lack of petroglyphs led to Locus 14 being assigned a low priority for sound checks.

Locus 15: Landing C

A section of vegetated canyon floor exists between the chokestone adjacent to the First Bypass, and a prominent protuberance of stone effectively functioning similarly further up canyon. The gently sloping gravel floor of this vegetated section is wide. Vegetation is predominantly desert willow, creosote bush, some ephedra, and sparse native grasses. Due to a fair but variable width between the canyon walls, Landing C receives much exposure to sun and weather. Despite limestone along the southeast wall and comprising the protuberance, there are no petroglyphs recorded in Locus 15. Locus 15 includes and terminates at the aforementioned protuberance. Like Locus 14, 15's lack of petroglyphs led it to being deprioritized as a site of sonic experiments.

Locus 16: Second Bypass

Beginning alongside the northeast end of Landing C, a massive spalled surface on the Formation C quartzite forms a narrow lip or ledge. This ledge is substantially narrower than the First Bypass, and continues to narrow on approach to circumvent the bedrock protuberance. Locus 16 is this second bypass formed along the spalled surface. There is little room to retain cultural deposits, of which there are none in Locus 16. The locus contains sparse vegetation growing in cracks along the quartzite, including cottontop barrel cactus and ephedra. *Yucca brevifolia* grows at the canyon rim overlooking Locus 16, along the Formation C (northwest) side. Like Loci 14 and 15, Locus 16 features neither petroglyphs nor pictographs. A lack of petroglyphs, and the risks to body and equipment inherent on such a narrow ledge, discouraged acoustic experiments along the Second Bypass.

Locus 17: Chamber 4

Further up past the large protuberance obstructing the canyon, the Second bypass terminates by dropping again towards the canyon floor. Here, dense brush grows in gravel deposits. Locus 16 begins in these densely vegetated gravels, and continues through a short corridor into a wide chamber. Chamber 4 displays a complex system of seams between the silicate quartzite layers and calcium carbonate limestone layers. More minor tributaries join with the main canyon flow to form Chamber 4. Along the north edge of the chamber, a rock shelter sits high up. This shelter's overhang is comprised of the quartzite formation, where it shadows softer, more porous limestone eroding out from underneath it. The overhang area is minimally 20m along the long axis, and up to at least 5m on its minor axis. A narrow natural ledge (only 15-30cm wide) leads at a steep pitch up to the shelter. Surface examinations during all canyon visits in 2010, 2014, and 2016 failed to find any evidence of cultural deposits in the Chamber 4 shelter, and no fire stains were evident on its roof. Nests from owls and packrats top fragmentary stones and thin deposits of loose soil on the shelter floor. Although unlikely, there may yet be subsurface cultural deposits.

Chamber 4 hosts petroglyphs on the south limestone wall, which wraps around a corner at a nearly right angle into the corridor that meets with the northeast end of the Second Bypass. Panel 11, a single abstract element, is located on the east end of Chamber 4, between the exit of the Grotto Gallery and a rough erosion rut descending from the canyon head. Panel 12 is on the north-facing south wall. Panel 13 is on the same limestone surface, occupying the face where the limestone makes the 90° turn into Locus 17's terminal corridor. The north wall, dominated and capped by quartzite, contains no petroglyphs; this includes the area of the shelter overhang.

Panel 13 is along the southern limestone wall, in a heavily vegetated area. It contains a single element, a sweeping semi-circle. Panel 12 is located on the southern wall inside of Chamber 4, facing the direction of the shelter. It contains four anthropomorphic figures. Three of these anthropomorphs are linked, with the figures on either end depicted with filled in bodies and heads. The middle figure is comparatively of distorted proportion, with an exaggerated narrow and long body, and shares an arm with the leftmost figure. The rightmost of the trio utilizes mineral staining. The far right (fourth) figure is in an "action" or "leaping" pose. The action figure holds a long object in the left hand more than twice the figure's height, terminating with a pecked infilled circle near the top. The depiction of the figure to the far right reveals the possibility that the middle figure in the trio may have once been similar staff-like object, later retouched and modified to become an anthropomorph. I previously incorrectly reported (Liwosz 2017a:193) that Panel 12 was located in the Overlook, rather than in its proper position inside Chamber 4. Panel 11, like Panel 13, is comprised of a single element. This is a circular motif which does not fully connect, or a spiral which only completes marginally more than one rotation. All three panels in Chamber 4 show light, partial patinas, with petroglyphs very visible against the the darker rock surface.

According to the original 2016 field plan, percussion acoustic experiments were to begin on the third day, starting with Loci 17 and 18, then proceed down through the canyon through higher priority rooms, and later revisit lower priority locations as time permits. Despite suboptimal equipment performance (see methods chapter), experiments began as scheduled inside of the Grotto Gallery at Locus 18. During the recording session, however, rapidly diminishing light, dropping temperature, and increased wind signaled potential inclement weather. I regressed down the canyon with the equipment to the Overlook, in order to check on changing weather. At that point, I visually confirmed an unanticipated rain storm approaching from the west, already dropping rain on the western bounding mountains, and advancing across the valley towards the canyon. Concerned about the dangers of flash floods, I decided to abandon the Chamber 4 acoustic tests for that day, and to continue descending through the canyon several hours early in order to facilitate a quick exit at first sign of inclement inundation. Although precipitation in and above the slot canyon was in fact too light to produce flowing water, the acoustic experiments plan had to be adjusted. The time necessary to return equipment to Chamber 4 seemed better spent testing lower loci first, and working upward. Quantitative acoustic data for Locus 17 is thus not available, as the scheduled session concluded before Chamber 4 could be revisited.

Locus 18: Grotto Gallery

The uppermost and final locus in the slot canyon is a relatively narrow room, 18m long, with tall, nearly parallel walls on both sides. The towering walls retain a smooth texture over most of their surfaces. Opposite the entrance to this room from Chamber 3, the room terminates with a roof of lodged chokestones. Together, the lodged boulders and high walls shade the long terminal room comprising Locus 18 in perpetual twilight. Recreational visitors commonly refer to this part of the canyon as the "Grotto" due to the chokestone roof and perpetual twilight, and its tall nearly parallel walls emblazoned with petroglyphs give it similar character to the Lower Gallery, hence Grotto Gallery. A prominent stone equidistant between the walls juts out above the gravel floor about 6m from the entrance, and 12m from the far end.

Only two panel numbers are assigned to the Grotto Gallery, with Panel 10 encapsulating all elements along the north wall, and Panel 9 encompassing all elements along the southern wall. Neither of these panels are visible on approach from Chamber 4, although this is in part because the farthest extent of Panel 10 is currently obscured by vegetation. Of the two panels, number 10 contains fewer elements. All components of Panel 10 are abstract: three open circles, a chain of four infilled triangles, and either a grid or series of bars and equilateral crosses. All elements on this panel are interlinked and arranged in series alongside identical forms. Together, these can equally be regarded as a single abstract composition, with no components that do not repeat within it. No variability in patina was observed, with all components appearing to have incomplete development.

Panel 9 is located directly across from Panel 10, and immediately above a shallow and low recess. This panel bears numerous abstract elements. Although no pigments have been applied,[94] the position of the panel indicates intentional opportunistic use of heavy mineral stains. At least 32 elements have been identified, presumably all abstract forms. These include two "beehive" type latices, two rectangular grids, seven sets of dots arranged in parallel rows, sets of parallel meandering curving lines, two chains of filled circles, two equilateral crosses, chains of linked triangles, and three iterations of the "waterfall" motif. The vague resemblance between two motifs and headless anthropomorphic forms parallels "patterned-body anthropomorphs,"a point discussed in fuller detail in Chapter 7. Elements on this panel are pecked using instruments of varied fineness. The mineral stains index a relative sequence much in the way patina may, with the chains of infilled circles featuring less mineral accumulation, and the two equilateral crosses showing the least. Before concluding commentary on Panel 9, it may be prudent to note that part of the curving surface on which it was carved protrudes into a ray of direct light. This was observed on all field sessions which reached as far back into the canyon as the Grotto Gallery. While

94: Except for possible and ambiguous application of blue pigment – found nowhere else in the canyon – to a conventionalized "snake" diamond chain motif over a natural crack.

currently there is no clear evidence the petroglyphs were placed to interact with the light beam, future studies might give it attention, especially around key seasonal changes and dates.

Panel 10 is small, on a limestone wall opposite and facing Panel 9, in the eastern third of the Grotto. Whether it is comprised of a few simple geometric elements, or a single composite glyph, is debatable. Interconnected iterations of Class C conventionalized symbols converged into a single, contiguous Class A design. Component motifs are a filled chain of triangles (like Panel 9), three connected circles, two vertical bars, two overlapping equilateral crosses, and a horizontal line converting bars and crosses into a grid. Although surely a palimpsest, the exact sequence of superimposition is difficult to discern. The most probable scenario is that circles came first, then the rightmost cross, then the overlapping cross to the left and contemporaneously the triangle chain, followed by vertical lines and grid-completing horizontal line. All patina is partially developed only.

Figure6. 38: *Locus 18 Grotto Gallery Panel 9, view SE. Note opportunistic use of mineral staining for chromatic expression, and panel position over shadowed void.*
**adapted from same original field photograph as Liwosz 2017:204 figure 16*

Pilot study tests in 2014 recorded the clearest, most complex, and discernible qualitative sound effects in the Grotto Gallery (Liwosz 2015). I perceived these as humming or droning tones, which audibly gained octave overtones at regular intervals so long as percussion continued. Additionally, I observed subjective psychological effects as the pilot experiment continued, indicating the Grotto might possess psychoacoustic properties. Unfortunately, due to sudden equipment failure as the test began, audio was not captured, and could not be analyzed quantitatively. Consequently, this space was assigned the highest priority for 2016 acoustic experiments, with the planned course of action to begin recording here first, then record each of the other loci in descending order (although, as mentioned in the results for Chamber 5, the plan was altered). As it was the first space scheduled for recording, the Grotto Gallery also hosted production experiments (on portable, non-local substrates) that compared the visual and acoustic products of stone stippling on multiple candidate substrates. These experiments are reported separately in this chapter, however their audio was used to produce a rich dataset for Locus 18. For each experiment, the recorder/microphone was placed on a tripod, positioned to straddle a boulder protruding from the floor, roughly centered between both walls, approximately 6 m east of the entrance, and 12m west of the terminal falls. Percussion was undertaken 9 m east, from a position immediately between panels 9 and 10.

Echoes in the Grotto Gallery were consistent, with the first clear returns 9-10 ms after the initial impulse. Subsequent series of returns could not be distinguished in five of the seven sound samples, most likely because after that mark there were continuous echo arrivals. Such a scenario would indicate strong reverb, and can be demonstrated mathematically. At 18 m long, soundwaves propagating at estimated speed for the session (350 m/s) would take 51 ms to travel from end to end – nearly the same interval necessary to discern individual echoes from perceptually continuous reverberation. Reflections not taking this axial path, then, could arrive at any interval in between, after which another echo would be expected. As Díaz-Andreu and Mattioli (2014:1049) explain, due to the speed of sound "at typical temperatures and atmospheric pressures, the listener must be 17m (55 ft) from the reflecting surface to hear echoes." Summarily, the Grotto Gallery's dimensions emphasize the capacity for reverb for any observer not positioned exactly at either extreme end. With both far ends enclosed and the main entrance positioned off-axis to the north, the far walls ensure another set of soundwaves arrives.

Compounding reverb in the Grotto sets up near perfect conditions for standing waves and harmonic resonance, which are the phenomena presumed to account for the author's qualitative account of the 2014 pilot experiment. Analysis of audio files confirms not just presence, but an abundance of these resonant tones arising out of compounding reverberations from percussion in the Grotto, as demonstrated in the stereo spectrogram below.

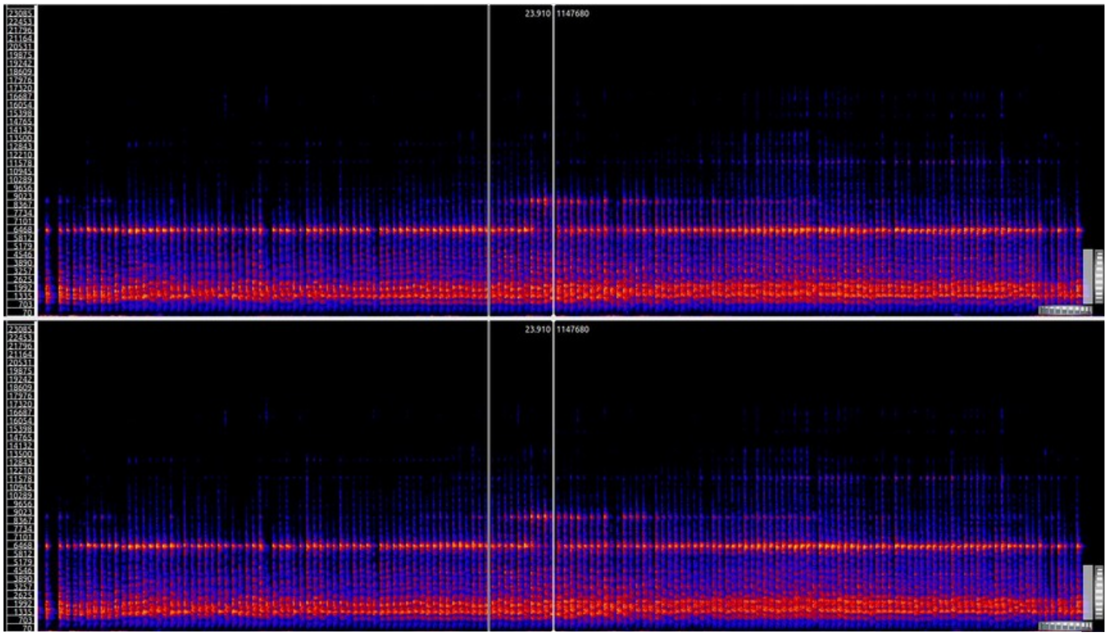


Figure6. 39: *Stereo spectrogram of building reverberation intensity in Grotto, over approximately 30 s. Notice brighter bands of higher frequency resonance intensify.*

As discussed in Chapter 5, resonant bands for the same space can vary somewhat between audio files, and the exact variables involved are unclear. For the Grotto Gallery audio, the ample amount of comparison data permitted establishing arbitrary “bins” - ranges into which frequencies of peak intensity from multiple recordings fit. Only bins substantiated by the majority of recordings are reported here. Equipment recorded some of the proportionally most intense peaks in higher registers, namely around 6,000, 9,000, and 12,000 Hz. As this study is oriented towards an emphasis on the human vocal range, however, bands or “bins” around 610 Hz, 435-450 Hz, 320-350Hz, 282-292Hz and 220Hz are of more interest. A weaker signal at 77 Hz is at the bottom end of a baritone singer’s vocal range, however the strong signal at 220 Hz provides the best candidate for the fundamental vocal tone.

Vocal range tones do not end the discussion on Grotto Gallery harmonics, however. In describing the acoustics and psychoacoustic effects of West Kennet Long Barrow, Marshall (2016: 46-50) describes the expected resonance of a an ideal chamber closed at one end. With one end nearly entirely closed, and the opposing end rough 50 percent open, Locus 18 may reasonably be tested on this principle. Under these conditions, the fundamental tone should have a chord at ratios of 3:4 (perfect fourth), 1:3, 1:5, and so on, but not even integer overtones (1:2, 1:4, etc.). For 220 Hz, this is partially true, as its odd multiples are within 10 percent of established bins, but some of the even multiples correspond with no bins. Spectrum peaks well below the equipment's standard detection limits demonstrate this even more clearly - including bins below audible range. Despite equipment limitations, the amount of audio data consistently showing sub-75 Hz resonance is compelling, if not conclusive: signals at 9-10 Hz, 12-13Hz, 20Hz, 27Hz, and upward into the audible range fit Marshall's model.

Referring back to the shape of the Grotto Gallery space, low frequency standing waves should be functions of the dimensions:18m long, and an estimated approximately equal height, with far narrower space between the walls. Using our estimate for the speed of sound (corrected for temperature and elevation), the threshold for reverb is itself the tone that defines the lower end of human hearing - 20 Hz. Echoes passed between the opposing nodes roughly 18m apart would consequently have a frequency of approximately 20 Hz, matching observations. End-to-end reverb can thus be described as a standing wave of 20Hz, for which the perfect fourth overtone of 26.7 Hz matches another observed peak at 27H (Liwosz 2017:203). The same ratio can be shown for the true infrasound (below 20Hz) bands, although their presence must first be explained. Marshall (2016:50) demonstrates that West Kennet Long Barrow's apparent infrasound resonance at 9Hz fits a predicted 8Hz for a fundamental wavelength four times the length of an ideal resonator that is open at one end. Enclosed spaces can also host a lower-than-length wave, as half-wavelength oscillations could build. Partially enclosed with nodes at both ends, the Grotto could be predicted to host a standing wave at approximately 9.7Hz. This, too, matches the spectral analysis, as all of the Grotto Gallery recordings (except for one compromised by mounting wind), result in signals between 8 and 10Hz, with peaks ranging from 9 to 10Hz. The 12-13 Hz band in some (but not all) of the audio snugly conforms to the predicted 3:4 overtone. Inconsistent results for even-multiple harmonics may simply result from this space not quite matching either an open-ended, nor a fully closed space.

Summarily, the Grotto Gallery naturally lends itself to strong reverberation and resonance, both because of its long, high, relatively flat and smooth walls, and because of its measured dimensions. Although data reported is consistent across several different audio files, results below 75Hz (and really, 100Hz) are beyond the current equipment's detection limit and thus can only be considered tentative. Mathematical predictions reinforce these observations, however, and they are consistent with both audible and psychological observations made during the pilot study, as will be discussed in the following chapter.

CA-INY-130?

Figure6. 40: *Rock shelters in igneous formation, believed to have been excavated by Meighan in the 1950's, and a part of the broader INY-3074 soundscape.*

A rock shelter noted by happenstance appears to match one excavated in July, 1951, during impact surveys for the establishment of a graded gravel road. Baumhoff (in Meighan et al. 1953:193) describes a northwest-facing two-room rockshelter, approximately "75 ft. above the floor of a small draw," with the reported designation INY-130. A cursory examination on a single morning in 2016 revealed three tiers of overhangs facing north-northwest, the lower two of which lead into a common chamber This would be consistent with Baumhoff's INY-130, reported to connect two levels through a shared interior passage. Aside from a branch wedged in the roof of the shelter, there were no surface artifacts by 2016, but a rock-lined hearth feature was still in place under fire stains (Figure6. 41). As Baumhoff and Heizer's excavation resulted in artifacts being curated (presumably through NPS), no artifacts would be expected to remain on-site today. The collection includes three willow basketry fragments, an arrow foreshaft, a green chert blade, Owens Valley utilityware potsherds, and wooden implements of unknown use. A stick similar to the one wedged into the roof of the second tier outlet is described at nearby CA-INY-222 as a "spirit stick" or ward (Meighan et al. 1953:175).

The reality of records in the region is not so straightforward, however. Whereas other sites in the 1951 project area were reported with reasonably accurate positions, no such record of a north-facing shelter is on file. A records request for INY-130 brought up an obsidian flaking station in the Coso area. No sites are reportedly located at or even very near the three-tiered shelter documented here, although other sites in the areas were recorded and excavated as a part of the same road survey. Whether the site is mis-identified, or mis-plotted, is uncertain.

The rockshelter is culturally linked with the INY-3074 slot canyon. The entrances to both subterranean sites are within visual range and direct line-of-site of each other. Acoustically, the lower third of INY-3074 shares a soundshed with "INY-130", as loud rapports at one can be heard echoing from the location of the other. Artifacts collected in 1951 indicate INY-130 is attributable to Numic peoples (Meighan et al. 1953:193-194).

Meighan's INY-130 is one of ten archaeological sites and isolates in the Death Valley project area visited in the course of the present study, aside from INY-3074. These are listed in Table 6.2 below. Sites believed to represent the period prior to sustained Euro-American contact are described in brief, in the following pages. Historic Period sites, and isolates, are omitted based on relevance to the project at hand. An isolated flake of marbled chert sits on desert pavement just above a discharge channel originating from the INY-3074 watercourse, and is thus believed to have originally been associated the canyon site, and since been displaced through alluvial processes.

Table 6.2: *List of sites and isolates in the Death Valley project area that were visited*

Designation	***Type***	***Description***
CA-INY-130	site	Multi-tiered rockshelter with hearth feature
"Campsite"	site	Habitation ring, groundstone, and petroglyph
"Cleared Circle"	site	Possible temporary habitation
"Three Cairns"	site	A series of three cairns close to a nearby playa
"Lonely Panel"	site	Petroglyph panel on a partially buried boulder
"Historic Scatter #1"	site	Historic debris scatter, mostly cans and hardware
"Historic Scatter #2"	site	Historic debris scatter, mostly cans and hardware
"Historic Isolate"	isolate	Single discarded can
"Marbled Chert Flake"	isolate	Single marbled chert flake just beyond INY-3074
"Millingstone Isolate"	isolate	Isolated millingstone slabe

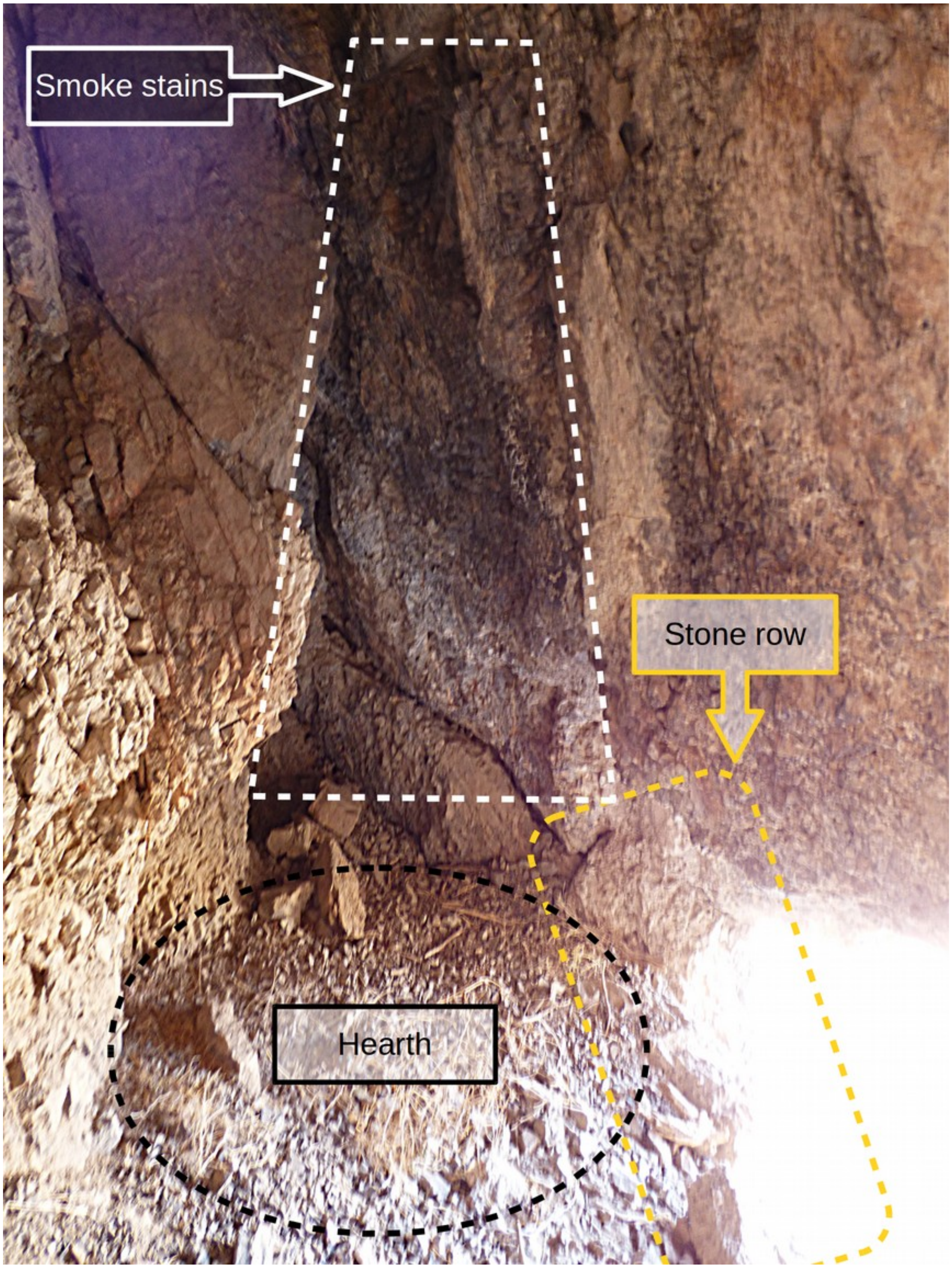


Figure6. 41: *Interior of "INY-130" rockshelter, indicating reinforced hearth feature and associated fire staining.*

New Sites

Although outside the scope of the project goals, other archaeological sites were observed in and around the immediate vicinity during the course of field exercises. These were cursorily documented, with photographs, field notes, and GPS coordinates were taken. Aside from the "INY-130" rockshelter (itself one of these sites), six other archaeological sites (four Precontact sites, and two Historic Period debris scatters), as well as three isolates (a historic can, a flake of marbled chert, and a millingstone) were recorded. Exact positions are a confidential matter, and certain data is currently being withheld until their records can be verified through NPS.

"Campsite" (2014)

Focusing on the Precontact period sites, one small habitation site was noted in 2014, and the remainder a mixture of small sites in 2016. The 2014 habitation site, documented at the conclusion of the initial acoustic pilot study, is comprised of three artifacts and a feature, located an estimated 1.5 km west of mouth of INY-3074, on the bajada. Artifacts are one portable-sized pecked petroglyph tablet of possibly quartzite/metamorphosed sandstone (Figure6. 42), a mano *in-situ* atop a re-worked triangular fragment of a rectangularly hewn slab metate, with both grinding implements of porous extrusive volcanics (Figure6. 43). The lone feature is a rock ring around a cleared sleeping circle. Interpreted together, these all indicate activities associated with the INY-3074 slot canyon. Despite concerted systematic efforts, this site was not relocated in 2016. As two similar features were later documented somewhat near the estimated position, it may belong to a denser cultural landscape than previously believed.

Figure6. 42 *(top left): 2014 "Campsite" percussed stone tablet*

Figure6. 43 *(top right): 2014 "Campsite" mano and metate*

Figure6. 44 *(bottom): 2014 "Campsite" cleared circle feature, outlined. notice reinforced doorway. View NNW.*

“Cleared Circle” (2016)

A lone cleared circle feature was briefly documented on the bajada 276 m due west of the canyon outlet in 2016. It does not resemble the one observed in 2014, nor were any associated groundstone or pecked stones identified.

“Three Cairns” (2016)

Located 7.2 km south southeast of the slot canyon are a series of three stacked rock cairns. Their relevance can be found in their context, where bajada meets a somewhat well-known playa, where stones appear to “race” of their own volition.

“Lonely Panel” (2016)

An isolated petroglyph feature is a partially buried in bajada soil 1.2 km due west of INY-3074, and only 44 m from the “Cleared Circle” recorded two days prior. It contains six Class A geometric elements (Figure6. 45). No artifacts were seen.

Figure6. 45: *Color enhanced image of 2016 "Lonely Panel"*

Fossil Falls Archaeological District

Introduction and cultural briefing

The Owens River gorge is a component of CA-INY-1634, one of numerous archaeological sites in the Fossil Falls Archaeological District and a fixture on the extended Little Lake Landscape (see Chapter 1). Its petroglyphs are rightly contextualized as an extension of the Little Lake Rock Art Complex, as documented by previous archaeologists (e.g. Harrington 1957; Garfinkel 1980; Van Tilburg et al. 2012). Archaeological deposits extend across both private land (Little Lake) and public land (BLM). The NRHP listed district is comprised of dozens sites as initially documented, key among which are those in Table 6.3.

Figure6. 46: *Obsidian reduction flakes recorded on tablelands immediately above Little Lake.*

Table 6.3: *Select archaeological sites of the Fossil Falls Archaeological District*

Trinomial	***Other #***	***Description***
CA-INY-23		"Painted Cave," now Little Lake Ranch Locus 3
CA-INY-182		"Stahl Site" early village; contiguous with INY-205.
CA-INY-205		"Stahl Site Cave," shelter w/ rock art; ~500 m E of gorge.
CA-INY-388, INY-389		"Pottery Slope," "Atlatl Cliff," respectively; contiguous.
CA-INY-1634	DA 3	Village site of rock rings, milling features, and midden.
CA-INY-1638	DA 7	"Little Fossil Falls" extensive village, ~500 m E of gorge.
	DA 8	One of numerous rockshelters continguous with DA7, 35
CA-INY-1641	DA 10	"Little Fossil Falls South" lava tube habitation cave
	DA 35	"The Maze" numerous rockshelters & rings; badly looted
CA-INY-1640	DA 9, 46	Rose Spring Complex rockshelter w/petroglyphs
CA-INY-1643	DA 43	"Harrington's Fossil Falls Site"
CA-INY-1648	DA 20	Historic "Little Lake Stage Station," ~1 km W of lake.
CA-INY-1651	DA 24	Pictograph rockshelter and open air habitation site
CA-INY-1655	DA 28	"Little Fossil Falls North," opposite DA 35 along channel
CA-INY-1660	DA 33	"Patterson's Petroglyphs," one of many rock art panels
**List compiled from Harrington(1957), Garfinkel (1980), and Van Tilburg et al. (2012)*		

Control test site

As described in the previous chapter, a control site was selected to be representative of the overall geology. For the Little Lake landscape, the criteria included shrubland vegetation and basalt outcrops formed of flows from the Little Lake vent. Additional consideration was made to minimize modern sound pollution from visitors and automobiles, however vehicles from the highway could still be heard. The control site provided an opportunity to calibrate equipment and coordinate both percussion and frequency sweep tests. These data present a baseline for echo, reverb, and resonance. The table below demonstrates that although some frequency peaks were recorded at the test sight, absence of solid mathematical relationships between these peaks refutes any harmonic resonance, substantiating our selection for a test site.

CA-INY-1634

Harrington (1957) and Garfinkel (1980:42) note that sparsely scattered obsidian flakes and milling equipment could be observed consistently throughout the area (Figure6. 46). Consequently, the present study treats the area as a continuous cultural landscape. Archaeoacoustic investigations, however, focused solely on the gorge channel of the desiccated Owens River – adjacent to, and bounding, the previously reported sites of INY-1634 and INY-1651 – as a geomorphological correlate to INY-3074. Due to proximity, the lowest nearby Smithsonian number, CA-INY-1634, is used here.

Geomorphological structure

Characteristic of the Cosos, the Little Lake landforms are dominated by volcanic features. Basaltic bluffs bounding Little Lake's east shore are extensions of the same lava flows that formed the gorge in the Owens River channel. This dark basaltic lava first erupted from the Little Lake vent (about 2km east of Little Lake, and 4km southeast of the falls) circa 140,000 BP (Glanzer 2012:5). Where the lava flow came into contact with the ancient Owens river, it explosively released gases and steam, rapidly cooling to form a undulating surface full of voids of various sizes. The river breached the lava damn, forming a series of falls that retreated upstream. By the time the falls dried and the Owens River dessicated in the late Pleistocene, between 13,000 to 15,500 BP (Liu and Dorn 1996:189), erosion had shaped the former lava dam into a collection of falls and potholes characteristic of humid regions (Clements 1957:83). The potholes and falls form the interior geologic features of a short but dramatic slot canyon, oriented nearly east-west.

Archaeological evidence in the Falls is dense and varied. Campsites, habitation structures, interments, lithic reduction debris, and milling features have all been observed above and reaching to the dry falls (Harrington 1957; Garfinkel 1980; Van Tilburg et al. 2012). During the three field sessions at CA-INY-1634 in 2017 as a part of this study, the author and crew members noted previously documented milling features above the gorge, and substantial quantities of lithic reduction debris descending into the falls. Given that the greatest concentration of rock art on the immediate landscape is below on the cliffs along the shores of Little Lake, substantially less attention has been paid to the canyon itself. With volcanic bedrock as the substrate, the patinas of the rock surfaces onto which petroglyphs are carved can properly be described as desert varnish. Although only a few panels are located within the canyon, the closely associated dense cultural landscape both above and below its falls lend more than sufficient reason to treat the entirety of the canyon as a singular site within a large and continuous cultural landscape. In addition to the Van Tilburg volume, publications from Harrington (1957), Kerr (1980), and Garfinkel

Gold (1980) apparently reference the gorge site by name, however Harrington *also* applied the name to another nearby site on the BLM unit shortly upstream in the dessicated Owens River channel while excavating at the latter. A petroglyph panel described in the Kerr (1980:31) manuscript to be at Fossil Falls appears, in fact, to be on a boulder on the tablelands.

The canyon containing the falls has been subdivided into interior sections for the sake of the present project. Because this study heavily emphasizes acoustic spaces associated with petroglyphs, these divisions do not correspond with previous researchers' (e.g. Harrington 1957; Garfinkel 1980) analytic units. Instead, areas of contiguous characteristics were lumped into loci, parallel to the system applied to the Death Valley slot canyon. Given the short span of Little Lake's canyon, only five loci were necessary. These are recounted under their own subheadings, below. Opposite the number system applied to the Death Valley location, the Little Lake canyon received locus designations in the order of a descending approach. The decision to number in this way was a pragmatic decision made in the field. Research permitted through the Bureau of Land Management was constrained to BLM boundariees. With the base of the falls on privately held land, fieldwork launched from a developed BLM parking area and campground above the canyon falls. Consequently, crew approached from above, rather than below.

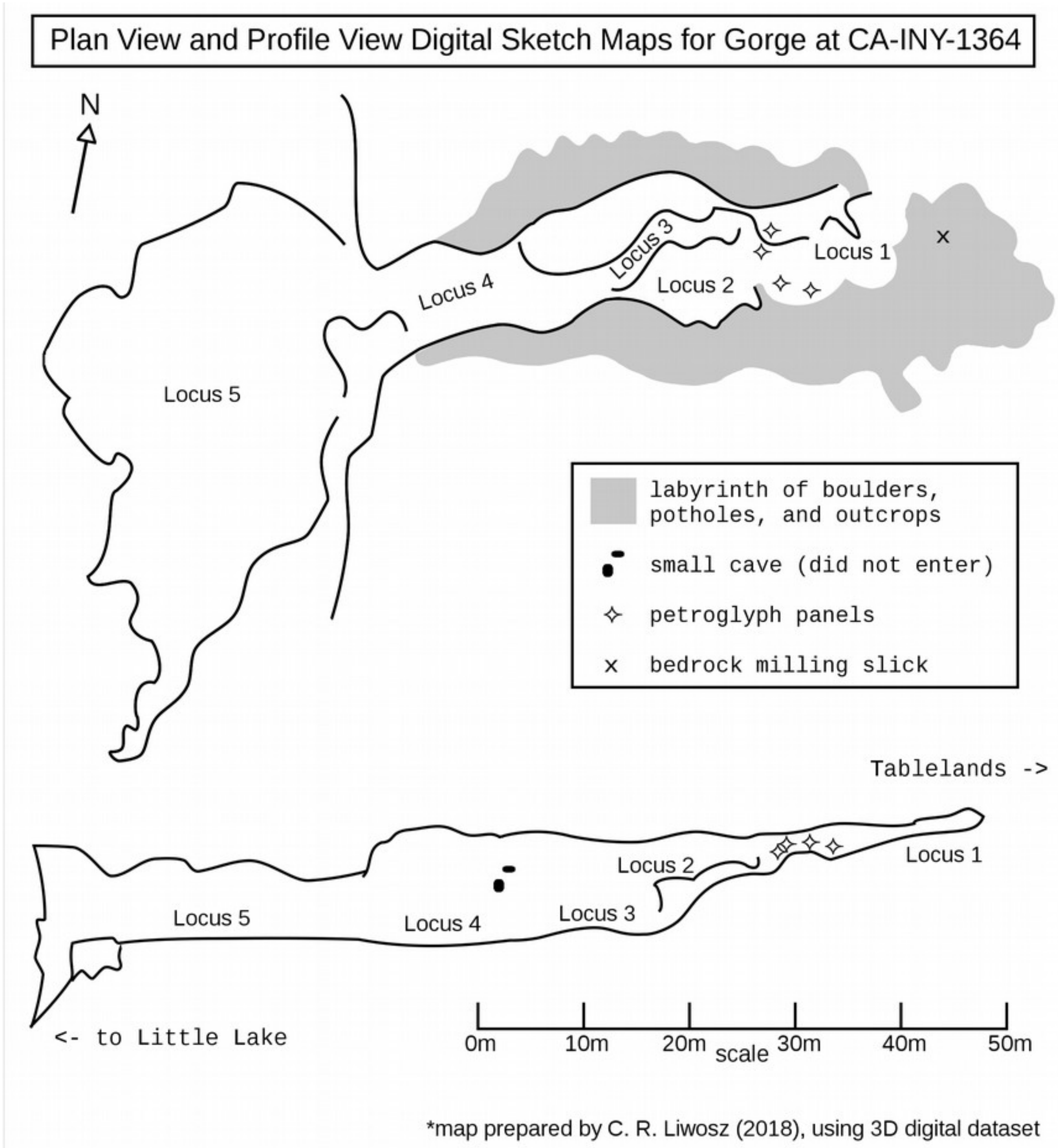


Figure6. 47: *CA-INY-1634, schemata of canyon loci defined for this acoustic study, with views from overhead (TOP) and vertical profile ascending to the northeast (BOTTOM).*

Table 6.4: *Little Lake landscape acoustic control site peak frequencies (left), and project harmonic intervals; few observed tones (highlighted cells) corresponded with peaks.*

Signal #	freq (Hz)	third	fourth	2x	3x	4x	5x	6x	7x
1	113	170	151	226	339	452	565	678	791
2	**154**	231	205	308	462	616	770	924	1078
3	**192**	288	256	384	576	768	960	1152	1344
4	**265**	398	353	530	795	1060	1325	1590	1855
5	**342**	513	456	684	1026	1368	1710	2052	2394
6	**520**	780	693	1040	1560	2080	2600	3120	3640
7	**642**	963	856	1284	1926	2568	3210	3852	4494
8	**972**	1458	1296	1944	2916	3888	4860	5832	6804
9	**1021**	1532	1361	2042	3063	4084	5105	6126	7147
		2:3 ←- chord(s) from → 3:4				*division*			
1	113	75	85	57	38	28	23	19	16
2	**154**	103	116	77	51	39	31	26	22
3	**192**	128	144	96	64	48	38	32	27
4	**265**	177	199	133	88	66	53	44	38
5	**342**	228	257	171	114	86	68	57	49
6	**520**	347	390	260	173	130	104	87	74
7	**642**	428	482	321	214	161	128	107	92
8	**972**	648	729	486	324	243	194	162	139
9	**1021**	681	766	511	340	255	204	170	146

Locus 1 - Honeycombs

The uppermost portions of the falls at the head of the canyon is also the most morphologically complex. Promontories and potholes produce a three-dimensional lattice of a landscape, with numerous small rooms, clefts, walls, and natural arches. The complex spatial organization proved difficult and confusing to map by hand, even with assistance. GPS proved inadequate to capture these complexities as well, as signal vanished quickly upon descent into any of the potholes (and the main canyon groove). As photogrammetry was the chosen mapping technique for this project, these issues could be circumvented. The author would recommend that future studies, however, include sufficient time and crew size to mobilize a digital transit to verify photogrammetry results, as the model shows signs of the software having difficulty resolving some of the complex shadowed spaces. The labyrinthine nature of the irregular surface has made this locus a popular tourist destination, and seldom during fieldwork were there not recreational visitors. Adults and children playfully interacting with the space offered an unexpected opportunity to observe unscripted behavior, which will be discussed in the following chapter.

Locus 1 is the only designated area at this slot canyon with clear petroglyphs of Precontact origin. The use of the head of the falls is curious, as the highly porous stone is not the most ideal for consistent carving. Nonetheless, three pecked panels are known, and a fourth panel with faint scratched designs has been tentatively identified. First, Panel 1 is nearest to the rim, in a pothole with a low natural bridge opening into the canyon. Panel 1 is confirmed to contain two bighorn elements, both with horns-side, and neither with a “boat” body. Both “bighorn” are lightly varnished (Figure6. 48). Above one of these elements, there is a small pecked circle. Additional lightly pecked or abraded elements are of questionable antiquity. These include a faint grid, and a faint box bisected by a bar. An isolated arcing line just outside of the pothole may be modern, prehistoric, or a natural alignment of porosities. Poor visibility of the questionable elements may have less to do with re-varnishing, and instead simply result from these glyphs never fully penetrating all of the thin laminations of varnish. Panel 1 also shows lichen growth.

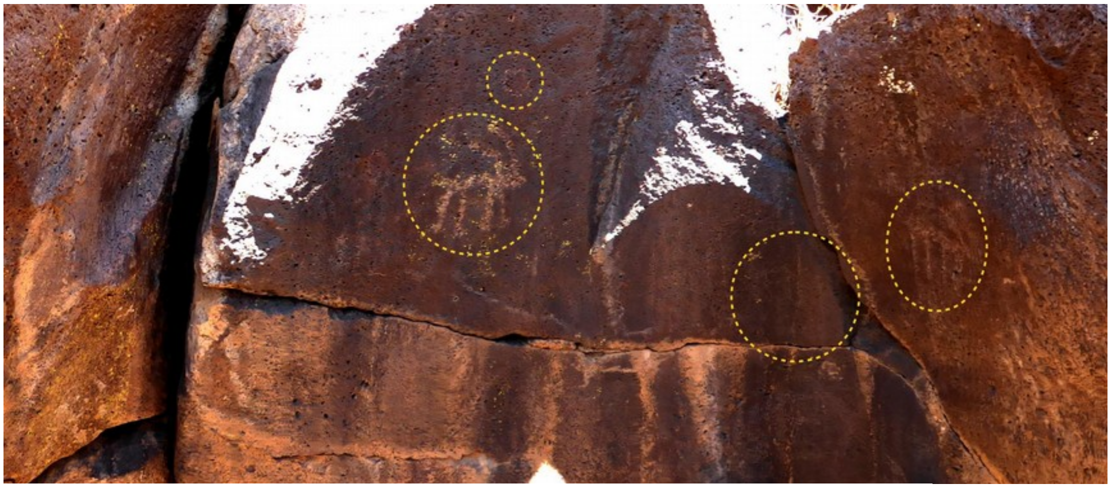


Figure6. 48: *CA-INY-1634 Panel 1 panorama, with petroglyphs circled.*

Panel 2 is inside of a void nearly 4m high, entered from a small opening at the bottom. Water and trapped debris eroded a swirling pattern in the inwardly curving walls as it descended from a small opening in the roof of the void, with a vortex-like form (Figure6. 49). Potential cultural significance of these qualities will be discussed in the following chapter. Petroglyphs inside of this unusual feature begin and end with an open rectangular box on either end. In between, curvilinear forms meander across lower portions of the walls mostly in pairs, remaining for the most part below a crack in the bedrock. Near the middle of Panel 2, the swept horns (horns-side) and outstretched legs of a possible leaping "bighorn" motif riffs on the paired lines meandering throughout the panel. Panel 2 is in perpetual twilight. Panel 3 is just outside the lower entrance to the "vortex," aligned with an acute edge on the other side of which Panel 2 begins. Panel 3 contains meandering, pecked curvilinear markings, and a boat-bodied quadruped with no horns. While I find Panel 3 to be consistent with Precontact petroglyphs, its authenticity cannot currently be confirmed. Panel 2, by contrast, shows some visible varnishing, as well as some lichen growth.

Figure6. 49: *Swirling eroding patterns inside void with Panel 2, looking upward.*

Figure6. 50: *INY-1634 Panel 2 color enhanced panorama for greater visibility*

Panel 4 contains a single element of questionable character. It is located in a pothole roughly 10m from the Panel 1 pothole. The lone element is an abstract rectilinear form, and is not etched to substantial depth. The thin lines and shallow depth suggest the use of the scratching technique. Lichen growth preferentially fills the etched lines, marginally improving visibility. The shallow nature of these lines kept visibility poor enough to frustrate my attempts to relocate the panel for photography later[95], confirming Reed's (2012:117) observation that "it is extremenly difficlut to relocate scratched panels."

Acoustically, Locus 1 of the basalt gorge provided mixed results. This would remain the prevailing theme throughout the gorge's acoustics tests. For Locus 1, three positions were chosen for recordings: one in the open-top pothole featuring the Panel 1 sheep, a second twenty meters away directly in front of the Panel 2/3 twilight void, and the recorder's on-board microphones midway in between in a fairly open area. Percussive impulse sources were made inside of each petroglyph void. Similarly, frequency sweeps were played with the speaker in the sheep void and immediately in front of (and facing) the "vortex" void, as well as in two positions in the more open space in between. Echo rapports were unclear in most of the recordings, however a delay of about 30 ms was observable in a single recording from the microphone inside of the sheep panel pothole. Resonance was detected, but not strong. The sheep void showed strong response around 2KHz, but not below. The large area in which the recorder was placed responded between 114 and 120Hz during percussion tests, although harmonics above that proved inconsistent (therefore resonance is plausible but not confirmed). The Panel 2/3 swirling void resonated in both the percussion and frequency sweep tests, with a fundamental at 107Hz, a 3:4

95: Despite the fact that I documented its exact location in field notes.

chord, and odd interval harmonics. Generally, sound throughout this upper end of the gorge was dampened, and resonances reported are weaker signals, with only the Panel 2/3 void confirmed.

Locus 2 - Pools

A dry fall separates Loci 1 and 2. Below this fall, the pothole formations deepen into plunge pools. While less topologically complex than the area above the dry fall, Locus 2 still features multiple plunge pool “rooms” in close proximity to each other. The curving walls separating these circular spaces from each other and the primary erosion path provide barriers to sight. How much these impeded sound was a matter for experiment. Plunge pools were observed holding stagnant water during fieldwork, and may have functioned as water storage in the past. No Precontact petroglyphs were identified, but the ample graffiti (especially inside the plunge pool rooms) makes determining the nature of the surface below layers of modern paint difficult. In addition to modern debris (especially broken glass), there are concentrations of lithic debitage in the plunge pools.

Percussion tests were not undertaken in the pools, as no unobstructed Precontact petroglyphs could be seen, although it is possible modern graffiti obscures some elements. The area was found to be within audible range of Locus 1. Frequency sweeps with microphones in choice plunge pools below a steep descent were carried out with the speaker in Locus 1 above, at the level of the pools in the main channel, and in each of the pools. Generally, resonance was suppressed, as vocal range spikes matched control recordings and were thus dismissed. Interestingly, evidence of infrasound was recorded both inside the pools and outside in the adjoining lower Locus 3; these potential infrasound signals were found consistent in recordings for which the speaker was placed in a plunge pool with the graffiti tag “Megan’s Hole,” wherein lithic debitage was present among modern broken glass. Infrasound frequencies were inconsistent, registering 12 or 15Hz.

Locus 3 - Narrows

Locus 3 is a winding corridor within the canyon, about midway vertically between the rim, and the wide, flat erosion plain beyond its bottom. The narrows feature high walls, and rubble piles obstructing line-of-site. This locus does not, however, have potholes or plunge pools. No significant amounts of cultural debris were noted. Little to no evidence of acoustical effects below 11KHz was documented for this locus, save for the aforementioned infrasound signal in a recording with the impulse source in the “Meagan’s Hole” plunge pool of Locus 2.

Locus 4 - Gallery

The Gallery is the fourth, and second-to-last, locus in the slot canyon at Little Lake. The narrows open up into this space, which is bounded by tall, parallel canyon walls. Although there are no pothole features at ground level, at least one was observed approximately midway up on the northwest wall. This pothole has formed a small shelter area, open on the side into the canyon, and narrowly open from the top at the rim. Descent would only presently be viable from the top entrance, using rope.

As no rope-aided climbing was anticipated at this site, this void feature was not entered over safety concerns. A rubble pile at the base of the void suggests that at some point, rocks were intentionally stacked to make reaching its lower opening attainable; presently, however, the rubble stack has deflated and this approach is no longer viable. No Precontact petroglyphs or pictographs were noted in the Gallery. Curious human-made features were, however, seen. Abstract forms have been applied to the southeast Gallery wall, using only clay mud matching that in the canyon floor. (Error: Reference source not found) The curious behavior also suggests that such ephemeral embellishments could have been done in the past, and consideration should be taken for how either material or oral evidence of similar practices might be recovered.

Frequency responses for the Gallery area were poor and inconsistent below approximately 500Hz, showing signs of an overall dampening effect. A possible infrasound signal around 17Hz was detected with the impulse source (speaker) placed up-canyon towards Locus 3. Wind interference compromised the recording at microphone 2, but is not believed to have interfered with either microphone 1 or the stereo microphone. Given the light wind entering the canyon from the west, infrasound both here and in the pools could result from this natural phenomenon, potentially having little to nothing to do with the experiment itself.

Figure6. 51: *Virtual cross-section of the southeast wall of the INY-1634 Locus 4 "Gallery," with insets of modern mud glyphs*

Locus 5 - Amphitheater

The Gallery opens out onto a wide, flat, stony surface. Walls extend outward in both directions from the outlet of the Gallery, as the slot terminates and widens into a gorge. This locus – informally designated the amphitheater for its stage-like character – terminates at the final dry fall, which spans an impressive breadth. As the base of said wide dry fall approximates the boundary between BLM and private lands, it was not evaluated during this study. The amphitheater also does not contain petroglyphs, and lithic debitage is negligible. Observations of modern behavior included tourists finding a descent route from the eastern rim, and evidence of a recent campfire ring during the second field session.

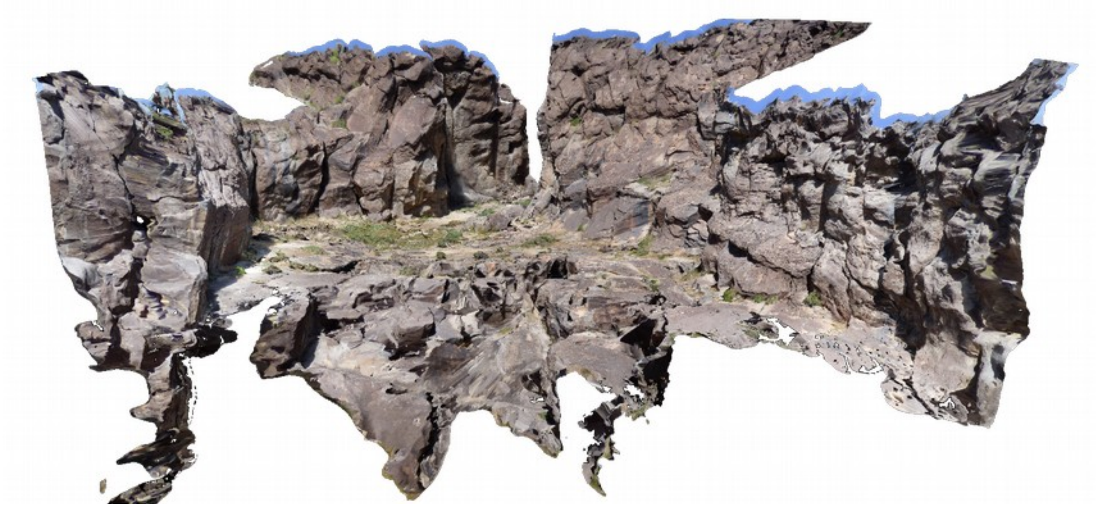


Figure6. 52: *3D model of Locus 5 (Amphitheater) in Owens River gorge; view NE*

Acoustic tests at the amphitheater area, where the canyon widens rapidly, also showed signs of infrasound, although not consistently between microphone positions. At the current time, these are believed anomalous readings for Locus 5, although the readings may also be from the conjectural wind-driven infrasound at up-canyon loci. Despite not having any evidence of human-induced infrasound, the amphitheater area does show signs of resonance. Both crew members reported a "ringing" sensation during frequency sweeps, around a change in the pitch-slope at 200Hz. This as verified in recordings, with strong peaks detected around 250 Hz, although the onset may be as low as 220 Hz. Interestingly, some recordings show this crest reaching 261Hz, or "middle C" in the western tonal system.

Findings Contextualized

This study documented a combined total of 80 rock art panels associated with two labyrinthine canyons, and their immediate surroundings. Spatial relationships were recorded with conventional and emerging digital methods, helping resolve mapping issues with GPS in enclosed spaces where signal is too poor to be of practical use. These rock art locations are both contextualized by surrounding cultural landscapes, the contents of which are matters of previous and potential future study. A limited amount of these neighbors are reported to provide context to the rock art images at hand. More importantly, a number of studies at, in, and all around the two project areas provide much needed chronological control to this project. Although dating by association must always remain somewhat tentative, the land-use patterns surrounding these project areas indicate frequent and continued use throughout much of antiquity, extending into the early Historic Period.

For the Death Valley area, points of comparison come from Meighan et al. (1953), Hunt (1960), Reynolds (1996), and Brosman (2012). The oldest of these studies is also the closest, a survey and salvage excavation of rockshelters along a planned gravel road through the very next canyon to the south (one which is in use today). Already, I have reported on one of these sites, designated CA-INY-130, as it faces, and is 0.5 km southwest from, INY-3074. It is one of several sites published in the same manuscript recapping the contents of cave-context artifacts, listed below:

Table 6.5 *Findings by Meighan et al. (1953) near Death Valley project area*

Designation	Contents and Comments
CA-INY-103	Small limestone cave, containing a small willow parching tray
CA-INY-130	3 willow basket fragments, chert blade, 3 Paiute Utility Ware sherds
CA-INY-217	5 metate fragmens, 3 crypto-crystallinate silicate tools, and midden
CA-INY-218	1 parching tray, 1 coiled basket, 1 scraper, 1 bone fishhook
CA-INY-220	155 fragments of cordage (incl. *Y. brevifolia*, Juniper, rawhide, and rabbit skin), two basketry fragments, 1 Paiute Utility Ware sherd
CA-INY-222 "Coville Rock Shelter"	354 artifacts including cordage, baskets, bone, arrow, slate tablet, grinding implements, sheephorn, & non-local quartz and pigments; multiple "house pit" and hearth features, with fire drills/bows

INY-222 is easily the most remarkable of this cluster of shelters, with all located in somewhat close proximity. What is important to note is that with similarities in hide and fiber materials, and even moreso finished products of basketry and pottery sherds, the material patterns for all six caves indicate approximately contemporaneous use in Late Precontact times by Numic people. Material was tentatively dated between 250 and 1,950 BP (Meighan et al. 1953).[96] Fibers used imply harvesting from the immediate vicinity, as well as uplands in the Cottonwood Range. Significantly, INY-3074 appears to be the one of closest significant sources of willow to these shelters. The forms of pottery – especially the *wosa* – not only match Paiute, Ute, and Panamint types, but quite notably have close parallels at Humboldt Cave, and similarly at Lovelock Cave. Complementary to each other, pigments for face paint, and a heavily battered quartz cobble were recovered in the 1950's. This caching of

96: Giambastiani et al. (2005:204) report occupation dates between 200 to 500 BP.

quartz cobbles outside of, but still in proximity to, a major rock art site (INY-3074) matches the pattern established elsewhere in the Mojave Desert (Whitley et al. 1999; 2005).

A long period of use is however indicated for INY-3074. Although the value of pit-and-groove petroglyphs as a chronological indicator has been challenged (e.g. Whitley 2000a), the weathering characteristics of the instances of these on Panel 1 do align with earlier conclusions elsewhere (e.g. Heizer and Baumhoff 1962; Dorn and Whitley 1984) that these may be among the oldest phase of petroglyph production in the region. For the pit-and-groove style specifically, and fully developed rock coatings generally, the several millennia necessary for the surfaces to redevelop these coatings are on the magnitude of several millennia or more. Although no exact dates can be definitively provided based on the methods used in this study, the fully repatinated petroglyphs at INY-3074 in Loci 1, 5, 6, 8, and 12 feature the same surface characteristics as other northern Mojave Desert petroglyphs dated firmly to the Early Holocene and Terminal Pleistocene (Heizer and Baumhoff 1962; Dorn and Whitley 1984; Whitley and Dorn 2010); these would imply dates from the Paleoindian, Lake Mojave, and Pinto Complexes.

Combining both the land use patterns and surface weathering properties, INY-3074 may be indirectly dated with a reasonable degree of confidence. Placing these inferences into the context of the region's archaeological chronologies, the upper and lower limits of site use evidently span the entire culture-historical sequence.

Shifting to the other project area, INY-1634's chronological controls are the works of Harrington (1957) at and around Fossil Falls and the Stahl Site and cave (CA-INY-182 and INY-205, just north of Little Lake), and Van Tilburg, Hull, and Bretney (2012) at *Pagunda* (CA-INY-3826) along Little Lakes shores. Occupation of Little Lake reaches back to Paleoindian ca. 10,000 BP (Van Tilburg et al. 2012:21, 26), although the first intensive use was at INY-182 and INY-205 during the Pinto Complex (Harrington 1957). Harrington (1957:76-77) associated petroglyphs inside INY-205 with a Basketmaker II-III deposit, which was immediately underneath the uppermost "Shoshone Phase" deposits. Although use of the north shore sites decreased, INY-3826 came to host its peak populations during the Newberry Period (Gold 2005:207-209; Van Tilburg et al. 2012:29). This is partially in concordance with Gilreath and Hildebrandt's (2008:17) assertion that Coso area rock art flourished under Uto-Aztecan Basketmaker, however their emphasis on "representational" style is inconsistent with Van Tilburg's team's findings. A full 81% of elements (or 4,019 out of 4901) are abstract designs (Van Tilburg et al. 2012:46, 55). These images are concentrated around the *Pagunda* village, associating them with the Gypsum Complex (Newberry Period) occupation, and on through the early twentieth century (Steward 1938a:92).

Given the Uto-Aztecan heritage of Numic peoples, the strong and consistent evidence of enduring continuity surrounding Rose Valley in the Inyo-White Mountains to the north (Reynolds 1996), Isabella Basin in the southern Sierra

Nevadas to the southwest (Garfinkel 2007:108-109), and Piute Valley to the east southeast (Brosman 2012), and an especially clear-cut continuum in Death Valley (Hunt 1960), it is more than reasonable to apply the Death Valley data to Little Lake. Doing so attributes to the Numic Panamint, Owens Valley Paiute, and Kawaiisu peoples, and their Proto-Numic ancestors, much of the INY-3826 rock art corpus from throughout the late Holocene (Gypsum, Rose Spring, and Late Prehistoric Complexes). These groups are also likely to have been the authors of Basketmaker II-III rock art at INY-205, associated with material culture which immediately preceded identifiable ethnographic patterns. All these pieces in place, the cultural affiliation of the panels at INY-1634 is most likely Numic, and produced during or after the Gypsum and Rose Spring Complexes (though not necessarily without disruption).[97]

Thus far, I have reported conprehensive inventories of the visual culture of two rock art sites in the Mojave Desert. These data were recorded in conjunction with acoustical experiments conducted in association with the panels. Both the densities of petroglyphs, and the acoustic results, varied between to the two slot canyon sites, with INY-3074 featuring a far greater density of images, and stronger acoustical effects associated with them, than INY-1634. The following chapter applies previously discussed theoretical models and ethonographic commentaries in order to interpret cultural significance for both sites, and their hosting landscapes.

97: INY-3826 obsidian production declines but rebounds (see Garfinkel 2007:118).

CHAPTER 7: DISCUSSION AND THEORETICAL APPLICATION

To summarize a few relevant points from previous chapters thus far, I have adopted new and emerging methods to undertake a non-invasive study of two Mojave Desert landscapes associated with slot canyons containing petroglyphs. Both project areas are located in geographic and cultural cross-roads between California, the Great Basin, and the American Southwest. With the two project areas flanking the Coso Range and China Lake rock art phenomenon, my Mojave Desert slot canyon project is ideally situated to directly engage with one of the most widely discussed and prolifically published rock art complexes in the Americas, perhaps even on Earth. At nearby sites of the Little Lake landscape's project area, and the Death Valley project area's focal slot canyon site, there is clear evidence the antiquity of human occupation and use for both extends for some ten millennia, from the region's earliest cultural complexes through the Historic Period and ethnographic "present." This extensive sequence allows me to apply linguistic evidence and oral traditions shared by the region's indigenous inhabitants with scholars, providing the necessary framework in which to propose meaningful emic understandings. Encouraged by cognitive theories of recent decades, I processs data collected using the above described methods through these linguistic traditions in order to empirically approach use of the human senses in the generative processes of non-Western ontologies. These interpretations include, and yet, go beyond a study of northern Uto-Aztecan religious iconography, extending across the suite of human sensations, into human-landscape engagements.

Briefing on Interpretations

This chapter expressly discusses my project's results in terms of theoretical models (as outlined in Chapter 3), ethnographically known cultural practices, and Numic traditional narratives (both covered in Chapter 4). In the interest of scholarly rigor, I attempt to address the results in terms of the suite of theoretical models compiled in Table 5.1. Building comprehensive understandings of symbolically loaded spaces requires multivalent approaches to unpack discernible behavioral and cognitive themes. Including linguistic and ethnographic evidence among these approaches promises to be of substantial interpretive utility. This project does not, however, remain neutral towards all theories, so the following weights discussion towards those theories and practices with strong correlates in the ethnographic and linguistic records, and away from those models with weaker connections to these records.[98,99] As an undercurrent to much of this discussion, the landscape context – ecological, economic, and perceptual – is integral to many of the points that follow.

This study recovers potentially potent ethnohistoric symbolism, while simultaneously contributing to a growing body of diachronic understandings of roots and changes to social structuring processes extending well beyond the confines of North America's intermountain deserts. In this pan-regional sense, my interpretations presented in this chapter implicitly utilize linguistic evidence and material culture reported by scholars over the last century to infer artists of the parietal images

98: It bears reieterating that I do not, however, deny culture-change over time.
99: Many archaeologists are rightly skeptical of direct ethnographic analogy, and oral tradition alone cannot always express either the antiquity or durability of ideas (Moyes 2009).

throughout the Death Valley and Little Lake project areas participated in expansive interactive networks.[100] Although the emphasis here is on ideology and iconography, symbolism and ideas are shared as their material manifestations through economic networks. Because any complete cosmology will include principles structuring the mundane as was well as the extraordinary (and even supernatural), this chapter's discussion covers the range from quotidian through esoteric topics, beginning with the former and building towards the latter.

For the discussion to proceed, therefore, it must initially consider the implications of Numic and pre-Numic hunter-gatherer subsistence. In opening with an evaluation of these human ecologies, I address head-on one of the most enduring rock art interpretations: the hunting paradigm. As demonstrated in the Death Valley project area, however (see "Findings Contextualized" in Chapter 6), canyons like the focal research sites host riparian zones with abundant botanical resources that are ironically overlooked in current ecological approaches to Great Basin rock art that emphasize hunting imagery. Nonetheless, there are numerous links between rock art motifs and the structures of, and designs on, Numic woven media (Van Tilburg 2012:162-172; LaPierre and Garfinkel 2013). These connections are reinforced both by the distribution of fragmentary finished fibrous goods in archaeological deposits of the immediate surroundings (see Table 5.5), and in the oral traditions, like the basket weaver in the rock parable (see also my discussion of gender, this chapter).

100: Loosely like Wallerstein's (1974) contentious theory of "world systems."

With economic productivity and exchange come power dynamics. Even in nominally egalitarian and largely decentralized Numic societies, rock art and its host locations seem to have directly mediated asymmetric power relationships between genders, and between individuals with differing levels of *puha* endowment (Whitley 1994). With access to significant rock art sites often exclusively controlled by the shamanic ritual adept whose cache lay within, the parietal art seems to have effectively privatized control over certain resources (c.f. Bettinger 2015). These entanglements between important resources and key individuals may well be reflected in rock art iconography, including headdresses of mountain sheep horns, anthropomorphic projectile points, and other such depictions of resources.

Other evidence suggests shamans typically orchestrated inter-community festivals, events which not doubt facilitated long-distance exchange of goods and ideas, and the movement of people (Driver 1937; Steward 1938a, 1941). As central figures in these events, these "doctors" were thus positioned to wield disproportionate influence over both economy and ideology. Although the exact mechanism by which rock art reinforced status remains somewhat debated (compare the principle of supernatural authority with the costly signaling model), it may, in any case, have been an expression of a "big man complex" that emerged in the Coso Range and China Lake area during the Newberry Period (Bettinger 2015). I argue that the principles by which the more elaborate motifs of this era and area were composed reflect the early stages of a craft specialization diagnostic of incipient social complexity in a nascent Coso polity that existed during the Gypsum and early Rose Spring Complexes.

Somewhat regardless of the degree of social integration or decentralization, the neuropsychology model stipulates that iconographic properties of both the specialized motifs, and the geographic region's more common styles, reflect a semiosis that built a visual lexicon over time out of images derived from visionary experiences. Not only does the neuropsychology model uniquely provide useful interpretive suggestions for the roughly 75 to 80 percent[101] of cataloged elements depicting various abstract geometric motifs, it situates the origins of these images within shamanistic cultural practices known among Numic peoples (see Whitley 1992a&b, 1994, 1998, 2000a, 2000b). Additionally, I extend the neuropsychology model's themes of creativity and meaning-making to the results of my acoustical experiments. In demonstrating these same semiotic processes for visual culture are present in audio perception and expression, I link this general cognitive theory back into Numic ethnographic practices, and specifically the role of song acquisition in power quests.

This phenomenological approach understands landscapes with natural novel visual and acoustic properties lend themselves to use as venues for a religiously motivated rock art complex. Spaces with dynamic and interactive perceptual phenomena therefor serve as sources not just of the *puha* socially influential individuals acquire

101: 74% of 417 elements at INY-3074, and 81% of 4,901 elements at INY-3826.

in the form of song, but by extension the most potent and enduring oral traditions at the very core of Uto-Aztecan religious practices (see Hill 1992).

These include songs sung by *puhakanti* and *pakwinavi* (doctors and orators) during dances at the heart of inter-community ceremonial gatherings. Following Miller's (1983:78) treatment of Great Basin rock art as a corpus of mnemonics, I explore the project areas' rock art motifs in the context of Numic traditions and Uto-Aztecan verbal symbolism. In identifying evidence for nonverbal vocalizations in contents of some of the oldest and most potent surviving religious song traditions, I conclude iconographically rich rock art locales grant (in a very animic away) the sounds *and* symbolism inspired by acoustical resonance and iconographic themes (respectively). Not only do these iconographies reflect identifiable themes from sacred song genres integral to ceremonial events, but at least some of the landscapes hosting these motifs symbolically situate them in the structure of the cosmos. Ultimately, I identify ideological continuities[102] between earlier Northern Uto-Aztecans (e.g. Basketmaker, Pre-Numa) and Numic peoples.[103] These interpretations carry many far-reaching implications for religious studies and Great Basin archaeology, but perhaps the most impactful conclusions are my challenges to prevailing archaeological discourses of heartland population movements (and social complexity), and the subsequent social and legal implications of said narratives for many living Numic communities today.

102: e.g. iconography of a cosmological topology, and the positions of ancestors within it.
103: Therefore implicitly equating the Proto-Numa with and as these earlier occupants.

Ethnogenesis Remembered

In order to evaluate theoretical models of rock art interpretation, it is impossible to circumvent to debate over attribution. The applicability of the ethonographic record – one of the key resources use – is only one of the factors at stake. Whether Numic groups developed in place, or displaced an earlier Pre-Numic population, has long been discussed. That population movements happened at all is not the debate at hand. Instead, it is the relationship of Numic groups to the ancient inhabitants of the greater Coso area, including Little Lake and Panamint Valley.

Sutton (1986, 1993, 2017) has long held that MCA-driven climatic, social, and economic pressures launched early Paiute, Ute, and Shoshone on the Numic Spread under violent conditions. One popular perspective is the replacement model (e.g. Bettinger and Baumhoff 1982), which posits complete replacement of precursors through indirect competition. On the far other end of the spectrum (with positions in between), *in-situ* development posits millennia of continuity. Ethical and epistemological issues arise from both extremes. The former model risks encouraging a problematic "lost civilization" trope. Conversely, instances disregarding change flatten the past; flat pasts not only erase indigenous histories, but operate to primitive enduring communities as "living fossils." Among the lines of evidence to attempt to settle the debate is oral tradition. In practice, models featuring abrupt discontinuity inherently discount the merit of oral traditions that would otherwise be mandated as legally admissible under NAGPRA (see Echo-Hawk 2000), invigorating colonial attitudes and undermining tribal recognition (Blackhawk 1997; Whitley 2013a:86). My study straddles key battlegrounds: Little Lake occupies the junction of Owens Valley's southern extreme with the foot of the Coso Range, while Death Valley features prominently in the debate over a Numic heartland or incursions.

In the ongoing decades-old discussion, entire dissertations are now dedicated to the Eastern California population dynamics (e.g. Gold 2005). Arguments have been concluded, overturned, revived, and ended again.[104] With the subject of the debate an over centuries-long migration and expansion process, carefully picked locations or collections can offset the dates of these events significantly.

Building on almost exclusively photographic data set (plus a hand drawn site map) from CA-INY-3074 only, the first derivation of this project began with quiet controversy at the 2013 Pecos Conference, and at the 2014 Society for California Archaeology Annual Meeting. Initial attempts to answer those fundamental culture-historical questions of "who?" and "when?" immediately antagonized established interpretations. On the culture-history point, my first attempt applied a common derivation of Heizer and Baumhoff's (1962) Great Basin typology to establish an age and a sequence failed to account for attributes of the INY-3074 motif assemblage, despite initial intuition it would be helpful. Rechecking against the more recent "rough-and-ready" index courtesy of Gilreath and Hildebrandt (2008), the 346 elements discernible in color-poor photos should have been an ample sample for the

104: As the process continues, the more that is added to the debate, the more opportunities to cherry-pick evidence to support any one "definitive" position become available

Great Basin typology's seven styles, yet doing so provided no discernible patterns. Developing an alternative semiotic classification system called into question logical fallacies in the Great Basin typology, which was subsequently dropped from my study. Influence from Lewis-Williams and Dowson (1988) and Whitley (1994) informed semiotic deductions, with "entoptic images" suitable for indexes (implicitly of altered perception). Applying the "rough-and-ready" index in a way it was not intended (with semiotics) finally produced clear patterns. Results demonstrate continuity-with-change, and a gradually expanding visual lexicon as opposed to replacement, positioning this project squarely on one side of a three decade long debate, and conspicuously not on the side of "conventional wisdom" (Liwosz 2014; see figure below).

In brief, the 2014 findings followed these points:

1) The Great Basin typology has no analytical value for age, attribution, or theme
2) The "rough-and-ready" index has utility, authors acknowledging known flaws
3) The semiotics classes, based on natural cognitive models, exceed expectations
4) Results show change-with-continuity through time, with an expanding lexicon
5) Oldest images were invariably recursive geometric, but not conclusively
6) Trends supported the neuropsychology model's stages of image acquisition
7) Conventionalized, simple abstract symbols increase in frequency over time
8) No abrupt discontinuity seen, historic tag as bright as pecked indigenous signs

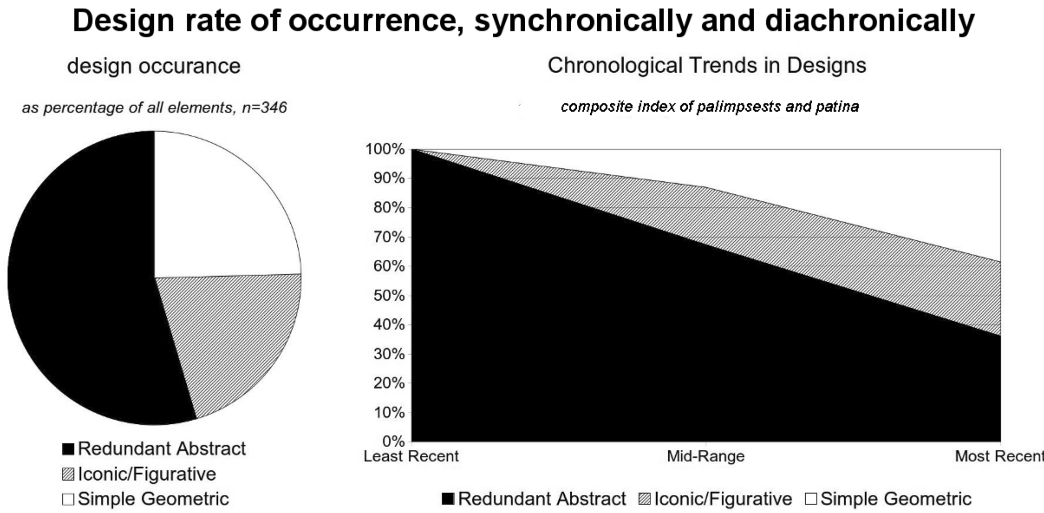


Figure7. 1: *Seriation results of CA-INY-3074, as reported by Liwosz (2014:432). Trends compensate for changes in production rates over time.*

Summarily, preliminary results in the Death Valley project area left me no alternative but to reject both the Great Basin typology, and the incursion/replacement models on which it was built, while specifying “this is not Coso” (Liwosz 2014:426). These data are consistent with the notion of a Numic Homeland, spanning Death Valley to Owens Valley, an area from which the later Numic Spread radiated (Miller 1983). This would also corroborate Hunt’s (1960) conclusion of relative continuity between Death Valley Phases II and III. Furthermore, I concluded evidence supports ever-more standardized conventions of symbol-making that favored abstraction over representation. Although not heavily emphasized, the Costen Institute’s Little Lake Ranch rock art project reached similar conclusions that much of the known Numic visual lexicon is found in patterns of rock art symbolism and sign-making can be demonstrated at CA-INY-3826 as early as 2,300 BP, and at region around Little Lake more broadly possibly as far back as 5,300 BP (Van Tilburg 2012:157).

Echo-Hawk (2000:269, 274) explains how the construction of "professional accountability" discourages archaeologists from linking present and past cultural units; these unconscious institutional biases manifest in a general silence or dismissal of oral traditions, exemplified by widespread reticence by archaeologists to interpret findings through the Numic Series I, Series II, and *especially* Series III origin stories, which have already been connected with the region's rock art traditions and material record more broadly (e.g. Whitley 1994, 2006). As these are covered in greater detail in Chapter 4, only key points relatable to ethnogenesis are outlined below.

Series I

- Coyote (often etiological metaphor for people) is the protagonist
- Journey of trials; may go to "big water" (a lake, or the Pacific Ocean)
- Cannibalism (empty quivers and *vagina dentata*; some versions explicit)
- Cannibalism stopped through culinary and sexual gratification
- Exogamous marriage emphasized
- Coyote releases Numa into the world, who then *spread out*

Series II

- Female protagonist breaks taboo to warn neighbors of danger
- Numuzoho The Cannibal slaughters festival-goers at Big Tule Camp
- Journey of five trials; includes reflections on mortality
- Journey ends when protagonist finds good food with a man she sought
- Exogamous marriage emphasized
- Children raised by the couple become the Numa, *who spread out*

Series III

- Coyote is the protagonist, becomes shaman, and is killed in trance
- Cannibalism (auto-) portrayed as sickening
- Coyote finds scene of slaughter at a lake/foot of Sierras/Pacific Coast
- Saves child by Caesarian section, adopting the child
- Endogamy/incest portrayed unfavorably (conflicting about offspring)
- Daughter births the Numa (some versions with sheep/man, some Coyote)

All versions account for a Numic Spread, with some periphery variants even indicating a source in the direction of the heartland (e.g. Sutton 1993:114-117). Most variants name neighboring groups, often even “explaining” the diversity (e.g. Stoffle et al. 2011:15-16). On this point, oral tradition is thus in-line with archaeological and biological evidence, namely ancient DNA for the latter. Specifically, genetic differences were found between ancient inhabitants of Pyramid Lake and Stillwater Marsh, NV, and modern Numic populations (Garfinkel 2007:109-110). Numic groups of the area remember a migration northward, away from aggression.

Other evidence for discontinuity has been reported in burial practices. Haiwee period flexed inhumations reported by Wallace (in Gold 2005:188-189; Garfinkel 2007:110) differ from Marana period cremations. These differences are not, however, irreconcilable, and the practices continued alongside each other. In Death Valley, rock burial mounds continued well into Death Valley IV,[105] and therefore were not unknown to Shoshone (Hunt 1960:111). As Hill (1992) notes, cremation in Eastern California probably spread among various ethno-linguistic groups along with the relatively late Chinigchinich syncretic religious movement.[106]

Inter-group interactions within each cluster and with its neighbors would be consistent with the waves of religious syncretism reaching back prior to substantial Euroamerican settlement in Eastern California, and with the ancient mtDNA haplogroup frequencies, *and* even the oral traditions (to which the discussion returns).

105: Equivalent to the Marana Period
106: With the growing influence of Patayan (Hakataya) in the sixteenth century, Southern California Uto-Aztecans contributed the flower-fire-bloom metaphor to Yuman cremations.

Application of origin narratives, it is worth noting, cannot be undertaken uncritically. Narrative devices to enhance memorability often simplify the complexities of wide scale social process over time, as in the case of some origin stories recounting societal movement with little culture change, when in fact modern tribal groups often emerged from several groups coming together throughout a region over time (Echo-Hawk 2000:272, 274). Such is the case of Numic origin myths, which also include necessary information to decode these abstractions. Two of the origin stories emphasize exogamous marriage, while the third discourages endogamy (expressly incest). In other words, Numic social identity is founded on marrying out-of-group. As Kaestle and Smith (2001) note, genetic distance among groups with low frequency alleles A and C[107] might reasonable result from random intermixing – which would be expected from a group spreading outward. Slight changes in the frequencies of B and D, and the shift introducing a marginal amount C are therefore within the range of expected results from known marriage and residency practices (see Bettinger 2015:77-80).[108]

The Gypsum Complex Coso culture seems to have participated in establishing these practices of intermarriage, and if so, must have been party to Numic development. As I suggest later, the stylization in Coso rock art at peak production suggests emerging craft specialization; this usually corresponds with emerging social stratification, one strategy for which is endogamy. An emerging class of

107: Groups B and D, on the other hand, are comparable, showing some commonality.
108: Exogamy and oral tradition of round-trip excursions over the Sierra Nevada as far as the ocean also seem to account for the Northern Uto-Aztecan similarities with Northern Hokan.

supernaturally endowed families, keeping power in-group, could be culpable for a small amount of genetic drift. Series III Coyote, with rocks in his head, both has an incestuous relationship, and auto-cannibalizes: a potential social memory of the problems of incest (Myers 1987). Allele A's absence among Numa today could well result from the loss of an already small inter-marrying subset of lineages were they carrying that allele,[109] as might happen from well-documented cultural responses to failing doctors[110] known in later periods (e.g. Carroll et al. 2004:139).[111] Given references to Ubehebe Crater, the Inyo-White Mountains, and Little Lake, oral traditions would support the heartland hypothesis. Cannibals – metaphors for violence, overconsumption, and endogamy – record social strife during a period of rising inequity, with successful reproduction (and thus ethnogenesis) only possible once characters form inter-group alliances through exogamous marriages (Myers 1987:131-132).[112] In sum, Numic ethnogenesis remembers landmarks of the heartland as ancestral – but *defines* Numic identity as distinct through moderated consumption and exogamy, patterns which are supported by the mtDNA studies. Rock art design frequencies over time strongly indicate in-place cultural development for Owens Valley, Death Valley, and their counterparts in the Coso style.

109: Alternatively, progenitor pluvial lakes groups might have never carried it, save for those in the Tahoe-Carson Sink area, also explaining its absence among Washoe and Fremont.
110: Who, as discussed later in terms of political economy, were typically group leaders.
111: To be clear, I am suggesting a failed attempt at class segregation, as opposed to an ethnic group's extinction.
112: The mtDNA, it should be noted, only tracks women's postmarital residency as a component of a complex social strategy that builds resilience through blurring the lines between languages, between lifeways, and between lineagesThese studies do not capture male post-residency patterns, which may have differed.

Ecology and Economy: Resource Acquisition

Game fauna

Theory-informed interpretations for CA-INY-1634 and CA-INY-3074 begin with the twentieth century's dominant narrative in rock art research: big game hunting magic. Such a magico-religious explanation resolves the apparently paradoxical relationship between fixed (untradeable) visual culture and economy: only the investment and technological machinery of game procurement is immobile, while the return is subsistence and the social benefits of hunting prowess.

Figure 7.2a (left): degrading ungulate skull fragment, INY-3074, Locus 6, 2016.[113]

Figure 7.2b (right): *Ovis canadensis* (bighorn sheep) ewes, as seen about 1 km from INY-3074

Despite assertions that rock art sites frequently correlate with game trails and hunting blinds (e.g. Heizer and Baumhoff 1962; Grant et al. 1969), the few spatial studies to date that present quantifiable data (e.g. Hockett et al. 2012) demonstrate very little correlation between these features (Liwosz 2014:427-428; Liwosz

2017:178-179). Nonetheless, both the INY-1634 and INY-3074 research locations each exhibit one of these features. For INY-3074, the stacked stone ring of Feature 2 is consistent with constructions commonly identified as hunting blinds in the Great Basin. The fact that stone rings are also the architectural residuum of camping, domestic, and storage features does not negate their usefulness as blinds; instead, the equifinality of the evidence for each use converging only serves to suggest that sub-surface testing generally may help clarify the matter. Additionally, a pair of live bighorn ewes were observed approximately 1 km south of INY-3074 in 2016, and a modern ungulate skull fragment inside of the canyon has been documented repeatedly from through 2016 as it degrades on its several-year-long journey downstream (Liwosz 2016:7; see Figure 7.2 and 7.2b above). Brush fence corrals were used for game drives here as well as in Rose Valley, especially of *Antilocapra americana* (pronghorn or American antelope), are not only well-documented ethnographically (e.g. Kroeber 1925; Steward 1941) and archaeologically (e.g. Heizer and Baumhoff 1962:211, 216-219; Hockett et al. 2012), but also appear to be the subject matter of a several-element-scene in Panel 49 at INY-3074 (see Figure7. 3 below), as D'Ascenzo and Deal (1987) also noted. There is thus potential to connect hunts with scenes depicted on-site.

At the edge of an escarpment above lacustrine resources, INY-1634 is reasonably close to at least one route animals might take to approach the oasis at Little Lake. In fact, the canyon is situated in the midst of animal and human movements not just along some trail, but to a wide and continuously trafficked landscape. Although stacked stone circles are found at it and neighboring sites within the immediate vicinity of the canyon at Little Lake, many of these are previously interpreted as house rings. Hunting parties from *Pagunda* are known to have preferred gathering several kilometers at the north end of Rose Valley (Harrington 1957; Grant et al. 1969:4-6; Garfinkel 1980; Van Tilburg et al. 2012). Despite all these qualifications, blind areas, invisibility of both canyons at a distance, and steeply dropping walls of both canyons could nonetheless offer substantial strategic advantage to individuals or hunting parties using ambush and game jump strategies during collective drives. Summarily, utilizing some part of either petroglyph canyon as a strategic hunting focal point is potentially supportable.

For INY-3074, this statement should be qualified as most applicable to half or less of the canyon. As the Fourth Chute presents an enormous challenge even for a skilled climber, removing spoils of hunting from above, successfully and without injury, seems an unlikely risk. Beyond the midway point of the Fourth Chute, bighorn motifs cease (but not quadrupeds). The most likely scenario seems that any proposed hunting activities would have been constrained to the lower half of the canyon. From Locus 8 downward, and possibly including ambush points in the wash. No artifacts or faunal remains are presently available to corroborate this.

Figure7. 3: *Panel 49 corral hunt scene, Chamber 1, INY-3074. notice differences in water erosion of base rock (upper right); also note Ephedra nevadensis (lower left)*

Ethnobotany

As discussed in earlier chapters, Gilreath and Hildebrandt (2008) systematically demonstrated a correlation between the presence of scratched rock art designs, and pinyon nut (*Pinus monophylla*) gathering. The reality seems to be that spatial correlations between rock art and resources is not exclusive to hunting big game. Incised stones, modified with similar marks to the so-called "Numic scratched" style, and bearing designs known to gender cradleboards (one of the media to which these slate tabs might be affixed) seem to be spatially correlated with pinyon harvesting, as well (Thomas 1983; Reynolds 1996:54, 65). Not only is the presence of rock art sites at known pinyon camps consistent with my own observations at sites elsewhere in the region, but as discussed in previous chapters, it opens up the conversation about gendered tasks. Van Tilburg (2012:162-172), as well as LaPierre and Garfinkel (2013) present supporting information that certain common motifs reflect designs and structures of baskets and cradleboards - media well documented to be frequently made by women. Wheat (1967) corroborates this gender scheduling, while simultaneously recognizing men sometimes shared in weaving some items such as duck decoys, tule boats, cordage, blankets, tule bags.

Given the evidence presented, a concordance between the “feminine” designs Van Tilburg (2012:162-172) and LaPierre and Garfinkel (2013) list – namely, grids (e.g. Figure7. 7), linked diamonds (e.g. Figure7. 36), spirals, bands, opposing half-circles, Y-shapes (e.g. Figure7. 11), ovals or rectangles enclosing lines, “hourglass” or “butterfly” designs (Figure7. 14), outlined diamond-crosses, and bisected circles (e.g. Figure6. 7)– fiber sources would be expected. Motifs made with the scratching technique as categorized by Reed (2012:109) for CAIN-INY-3826 correlated with numerous pecked designs of the same geometric forms at CA-INY-3074. Several of the mentioned motifs, however, have been reported to denote other objects (such as atl-atls, medicine bags, stylized snakes), or have been implicated in visionary experiences (especially grids and spirals). Despite these confounding and conflicting interpretations of individual motifs, a test for connections to fiber sources should be simple. In oral tradition, Paiute George Collins’ story as recounted to Steward (1936) specifically describes basketry being made inside of a rock. Consequently, not just motifs, but fiber sources may be of relevance. According to Wheat (1967), riparian and lacustrian zones provided fibers known useful for weaving include willow (*Salix sp.*), cattail (*Typha sp.*), and tule (*Schoenoplectus acutus*); in dryer mid-elevation areas, Joshua Tree (*Yucca brevifolia*) frond and root fibers oxidized different colors, useful in basket embellishments. *Y. brevifolia* logs additionally may have been complimentary to hunting, as exemplified by the "noisemaker" device described in previous chapters (Driver 1938; Steward 1941).

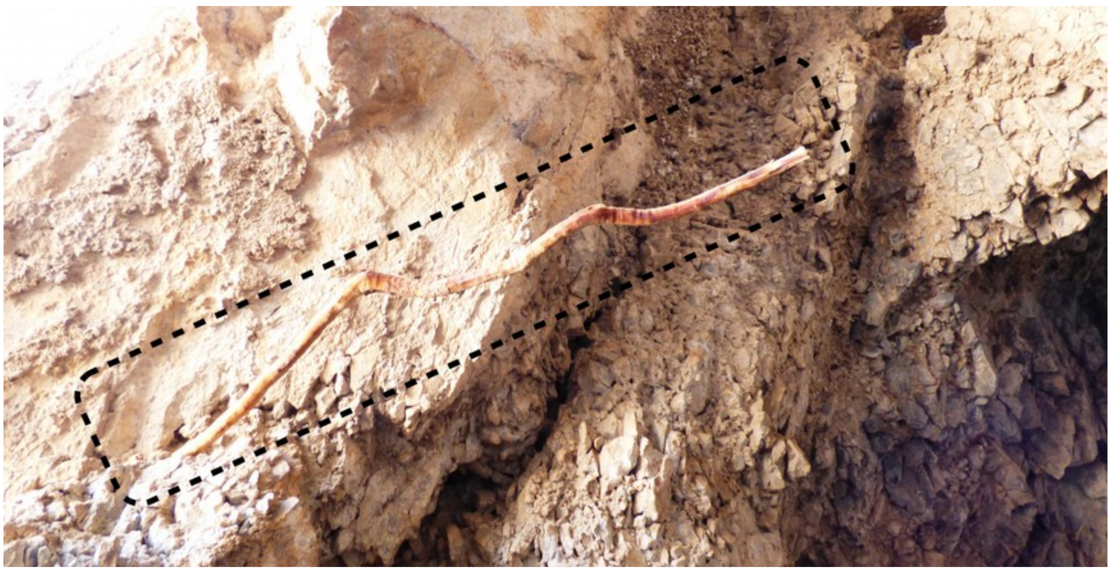


Figure7. 4: *INY-130, "spirit stick" in shelter roof, similar to one D'Ascenzo and Deal (1987) noted in INY-3074's Chamber 1 shelter.*

Other plant matter also seems be relevant. *Ephedra sp.* (usually *E. nevadensis*), for example, was known to be used both as a tea, and medicinally. Additionally, sagebrush (*Artemisia tridentata*) was known to have symbolic uses, such as for "spirit sticks" (Figure7. 4) as used by pubescent girls, and as an incense. Cactus spines, especially from cotton-top cactus (*Echinocactus polycephalus*), were used in basket-making and weaving (Finger 2012:189). Beavertail prickly pear (*Opuntia basilaris*) retained moisture and could be eaten. For all botanical resources - culinary, fibers, or of other use – due credence should be given Reynolds' (1996) findings that habitats such as pinyon-juniper treelines have shifted over time. Beyond the pinyon-juniper treeline, contentious evidence of Protohistoric Eureka Valley (north of Death Valley) irrigated horticulture would nonetheless have Numic precedence, as documented in Owens Valley and Death Valley (e.g. Coville 1892; Liljeblad and Fowler 1986; Reynolds 1996:49; Zedeño et al. 2003:69-71; Giambastiani et al. 2005; Huffman and Early 2017:3). With or without irrigation, the practice is highly indicative of strategies blending foraging and habitat management (c.f. Thomas 1983; Hughes 1994; Stoffle et al. 2011).

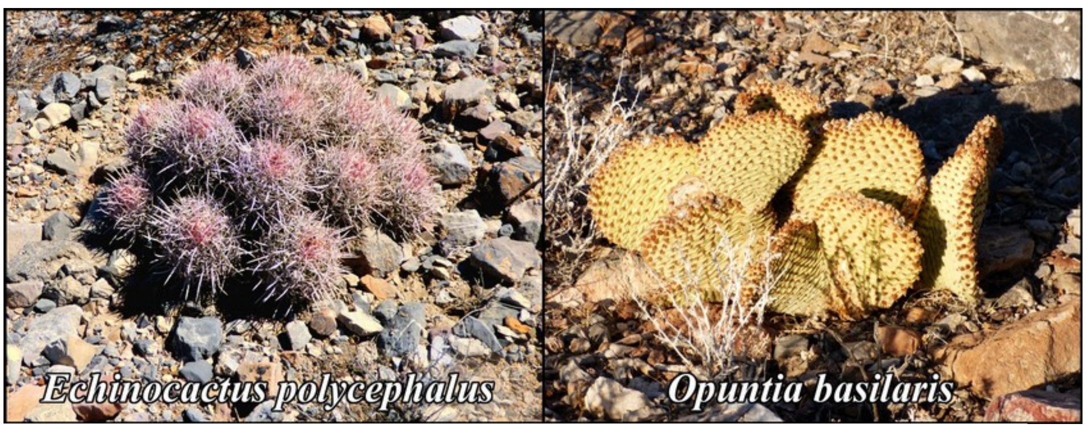


Figure7. 5: *Examples of traditional plants in immediate proximity to INY-3074.*

Substantial depressions (and formerly fairly substantial waterways), chambers, plunge pools, and gravel deposits within each of the research sites collect and store water well after rainstorms. Seepage through porous rock during the dry season at INY-3074 suggests its water supply may even be marginally replenished while the surrounding desert landscape desiccates. Mountainsides, alluvial fan, and the canyon itself at INY-3074 host a relatively abundant diversity of flora, given the aridity of the region. Densest vegetation in the canyon can be found in Zone 3, where well-established shrubs obstruct corridors and may even somewhat dampen sound. Sagebrush, creosote bush, ephedra, and limited amounts of native grasses all colonize the interior of the canyon, as well as the aforementioned adjacent landforms. The densest vegetation, however, seems to be desert willow, which is present in small patches in Zones 1 and 2 (especially near curvilinear abstract panels), and dominates Zone 3 vegetation. Meighan maps pinyon nuts as an important upland resource in the Panamint Range[113] in the immediate vicinity above INY-3074 and the Coville Shelter; crucially, incised slate was collected during data recovery at INY-222 (Meighan et al. 1953:170, 154-155, 220).[114] *Yucca brevifolia* flourishes along the alluvial fans, and sprouts from the mountainside just outside the canyon. Additionally, Joshua trees proliferate along the alluvial fan, and up the mountain side. Beavertail and cotton-top cactus also grow in the area. For INY-1634, the much younger rock offers fewer gravel pits and rock crevices to colonize. Nonetheless, fairly dense brushland abounds around the tablelands leading right up to the canyon rim. Within the canyon, vegetation is nearly entirely grasses colonizing cracks, although a few shrubs have established themselves in or near Locus 5. Perhaps more relevant, INY-1634's proximity to Little Lake strategically places it not only close to amble fibrous and

113: the Cottonwood Mountains are the half of the Panamint Range north of Emigrant Pass.
114: according to Meighan's map, a major pinyon camp may have been the site CA-INY-225.

lacustrine resources, but also in a strategically beneficial position to potentially be involved in both orienteering and managing approaches from the north.

Inorganic Natural Resources

It should go without saying that anywhere, and especially in the desert, water is itself an important resource (Miller 1983:78). Standard archaeological practice includes identifying the nearest water resource. In this section, practical concerns alone are given attention. In the section covering iconography and symbolism, its conceptual nature will be addressed (e.g. Huffman and Early 2017).

Mineral and lithic resources also held practical importance. The Coso Range (close enough to have spewed the lavas comprising the walls of the canyon and Little Lake's east shore) is well regarded as a source of high quality obsidian for much of antiquity. Giambastiani and Bullard (2010:51, 55) place the earliest Lake Mojave style projectile points of Coso obsidian at easily greater than 10,000 BP. Gilreath and Hildebrandt (2008:13) use obsidian hydration dating to graphically illustrate not only continual use through prehistory, but also to indicate exploitation sharply peaked during the terminal Newberry Period (3500-1350 BP), continuing through the first half the the Haiwee Period (1350-650 BP). Although most attention to obsidian's use has been given to highly diagnostic projectile points, it was also instrumental in harvesting, food processing, and preparing non-culinary materials for spinning and weaving. With lithic debitage still carpeting the Little Lake canyon's plunge pools Numic peoples, and the tablelands above, evidence strongly indicates obsidian from the Cosos was reduced *en masse* on site. The Little Lake landscape, then, likely served as an important hub from which to obtain (and restrict) access to not only the raw sources in the mountains just beyond, but also cores, "blanks," and finished tools of the material.

By contrast, INY-3074 has no observed surface lithic tools, debitage, or blanks. An isolated chert flake roughly 70m from the site, however, may have originated there and washed downstream. This marbled chert flake seems like to be from the "Willow Chert" source Meighan et al. (1953:170) map to the foot of the Cottonwood mountains, apparently inside of the 0.5 km range between INY-130 and the mouth of the canyon at INY-3074. Steward (1938b; in White 2008:98) maps trade and routes of seasonal movements between Saline Valley and Beatty passing through the section of the Cottonwood Range hosting the sites of the Death Valley project area. These historic ethnographic documents thus situate INY-130, INY-220, INY-222, and INY-3074 (for the complete listing of sites in the project area, see Tables 6.2 and 6.5) in relationship to the movements of key goods through northern Death Valley.

Other minerals are also a point of consideration. Previous studies have concluded that the percussive instruments most often employed in the "pecking" technique of hard stippling were composed of quartz, or sometimes quartzite (e.g. Whitley et al. 1999). This preference is ethnographically substantiated, as in the case of late Numic rain-shaman Bob Rabbit, whose weather-control ceremonies relied on these specific crystalline rocks which themselves were seen as animate (Whitley et al. 1999:235;

Lewis-Williams 2002: 176; Whitley et al. 2005). Symbolic and religious significance covered by Whitley and Lewis-Williams will be addressed later. The economic component, however, is relevant to the current resource discussion. Results recounted in the previous chapter regarding experiments I conducted in the course of this study confirmed the tempo and time data acquired experimentally by Busby et al. (1978). Furthermore, at seven on the Moh's Scale, quartz is the hardest common mineral in the region. My experiments demonstrated its robustness as a stippling tool, confirming the conclusions of both the Busby et al. (1978) and Whitley et al. (1999) studies regarding pecking cadenence and tool materials.

As quartz does not readily form in extrusive igneous rock (preferentially forming in intrusive plutons and siliceous metamorphics), Fossil Falls does not provide an adequate source for this stone. The same cannot be said of INY-3074. As shown in the previous chapter, a massive geologic stratum at INY-3074 is composed of quartzite, having apparently deformed metamorphically from sandstone. Although to date no evidence of quarrying this resource has yet been intentified inside the slot canyon, cobbles eroding into the drainage along the canyon's floor would have readily supplied more than adequate quartzite to peck the petroglyphs – that is, if local on-site stones were used at all. Inquiry into the acquisition process for this minerological resource may also be advisable, as the different fracture patterns from harvesting would necessarily be distinct from more ideal toolstone such as obsidian and crypto-crystalline silicates. Alternatively, quartz is known at a nearby spring (D'Ascenzo and Deal 1987).

Alternatively, sources providing large, high-quality quartz in the forms of both mineral stones, and macrocrystal persist in neighboring mountain ranges (Reynolds 1996:65). Whether or not quartz *acquisition* was directly linked with either research site, however, is probably a moot point, as it could potentially travel far. During trials in 2014, I prepared several test hammerstones of various size, shape, and weight. Accuracy and ease-of-use of course vary with individual anatomy, however I achieved fairly ideal results with shaped cobbles around 5 cm wide and 10 cm in length. The "ideal" percussor was, in other words, only slightly large than my first. These dimensions are consistent with an example at CA-SBR-4895, which measured 12 cm long (Whitley et al. 1999:226), and multiple quartzite hammerstones at pictograph site CA-INY-134 (Ayers Rock, in the Coso Range) measuring 5-7 cm wide by 10-11 cm long (Whitley et al. 2005:174; 207). For indirect percussion, the chisel component could be even smaller,[115] and the hammer impacting it cruder. It can be concluded that the portability of a sufficiently large enough piece of quartz was not an impediment to long distance movement, however further research cross-comparing weight and dimensions of this mineral in existing collections should be undertaken.

115: Like the 7 cm by 3 cm by 2 cm quartzite hammerstone at INY-134 (Whitley et al. 2005).

Social Status: Costly Signaling

As covered in *Chapter 3*, many human behavioral ecologists in the Great Basin ascribe to the theory that magical thinking to improve hunting success was evolutionarily selected for by social pressures, despite optimal foraging predictions (Gilreath and Hildebrandt 1997, 2008; McGuire and Hildebrandt 2005). From this perspective, the production of "representational style" pecked petroglyphs is interpreted to be a ritual technology for *Ovis canadensis* hunting. This model correlates bighorn population decline long indicated for Newberry Period Coso Range (e.g. Heizer and Baumhoff 1962; Grant et al. 1969; Bettinger and Baumhoff 1982; Hildebrandt and McGuire 2002; c.f. Allen 2013 for climate factors) with individual "show-off" hunting social strategies (McGuire and Hildebrandt 2005:697-698) aimed at elevating status. The show-off strategy is thus believed to be the motivation for the production of bighorn rock art motifs (e.g. Figure6. 48), and "hunting scenes" in which they sometimes appear (e.g. Figure7. 3). Recent models emphasize the "costly" behaviors communicate information in way that mitigates an otherwise higher energy cost of impending inter-personal conflict. The "cost" of both the real hunt, and the symbolically depicted one, thus elevated or reinforced the individual's social status sufficiently enough to discourage direct conflict. The individual involved need not be aware that their behavior is having this impact, as the point is that the behavior – here hunting above carrying capacity – is selected for regardless of whether or not the motivation to do so is consciously recognized. Over multigenerational time, over-exploitation of *Ovis canadensis* is credited with bighorn herd declines,[116] initially boosting the prestige acquired with each kill in a positive-feedback loop, but eventually crossing a critical threshold beyond which returns were not only insufficient to maintain the behavior, but the human population.

No faunal remains or obsidian were collected as a part of the present study, however a modern ungulate cranial fragment was observed at INY-3074, and obsidian debitage is common at INY-1634. The research presented here is thus ill-equipped to directly address costly signaling, although some relevant data is still available. First, as mentioned above, INY-3074's Feature 2 might be consistent with a "hunting blind," which would presumably be placed at the exit of the canyon to ambush emerging prey. I previously reported 24 elements depicting the bighorn motif, or at least, big game[117] motif, at INY-3074, making it one of the two most common *figurative* motifs, matching anthropomorphs in frequency (Liwosz 2014:433); the revised total increases the count to 28 instances. Although INY-1634 has far less rock art, the bighorn motif manifests in at least two, and likely three or four elements. Both the Death Valley and Little Lake canyons, as discussed, could be used as dead falls for game drives, and INY-3074 may depict a scene of scenes of hunting. Unfortunately for this model, residuum of such activities is presently lacking (limiting factors include seasonal flooding, shallow bedrock, visitor use, and poorly documented previous investigations). The sole constructed hunting feature at INY-

116: Often omitting Medieval Climatic Anomaly (MCA) extreme environmental fluctuations during the same period of time.
117: Words for bighorn in Numic languages are often categorical for *all* large game.

3074 has only abstract elements. If we expand costly signaling beyond game, using other risk-taking behaviors as a proxy, then there may be more evidence. Not only is the main climbing route in both locations obstructed by potentially lethal dry falls, but carving difficult to reach petroglyphs such as those of INY-3074's Panel 31 high on the south wall of Chamber 2 (see Figure6. 29) necessarily involved a substantial risk to life and limb (see also position of Panel 71 in Figure6. 16).

While not inconsistent with costly signaling, none of this evidence requires the hunting cult feedback mechanism, as direct associations (projectile points, faunal remains) are absent. Furthermore, with natural landforms restricting access, the audience to receive to the signal seems less public, and more to do with some interior or subterranean inhabitant. This is not a universal pattern, to be clear, as the hunting-imagery laden "Atlatl Cliff" (INY-389) on the escarpment above and to the north of Little Lake could be quite publicly visible. Consequently, costly signaling cannot be wholly rejected, nor confirmed, by this project.

Socializing the Landscape and Social Boundaries

One of the first attempts at regional analysis of the distribution of petroglyphs was the Nevada and Eastern California inventory undertaken by Heizer and Baumhoff (1962). Although this scale of analysis did not immediately catch hold, the dataset existed in a public enough form to facilitate future undertakings. Schaafsma (1985), as well as Quinlan and Woody (2003) have all touched on the notion of regional variation in rock art motif distributions. To consider these theories, both the visual contents and regional contexts of both resaerch locations should be taken into account.

Initially, research locations may seem to reinforce conventional wisdom that Coso-style rock art marked the territories of a Late Archaic (Newberry/Gypsum) culture living there. Scratched designs at Little Lake, for example, might be read to indicate a Numic incursion obliterating this Gypsum Complex "Coso Culture." Other instances, however, show scratched marks enhancing or contributing to pecked designs, and at least fourteen motif types appear in both manufacture techniques at INY-3826 (Reed 2012:114-115). Reed concludes that these associations are not consistent with the proposition that scratched elements were intended to obliterate pecked ones, nor is the obscure nature of these often faint designs consistent with public or communal ceremony. At INY-3074, no scratched designs have yet been documented. As I have previously pointed out (Liwosz 2014), the lack of scratched images at a site containing many pecked elements of negligible patina is wholly inconsistent with the prevailing wisdom Numa obliterated pecked images by scratching over them. Given evidence from INY-1634, INY-3074, and INY-3826, I have little recourse other than to conclude the data refute the role of rock art in establishing territorial boundaries in the northern Mojave Desert.

Conflict and Warfare

Employing Clemmer's (2006) reading of cannibals in Numic myth as metaphorical violent aggressors, the prevalence of the theme in all three series is a social memory strongly recalling a period of such social strains and overt violence at the moment of ethnogenesis.[118] Both Series II and III record the event of a violent attack on large group of people.[119,120] Little Lake, as it turns out, fits every description of the violent scene in Series III. As a lake and wetland, wedged at the foot of Coso Range to the east and Sierra Nevada to the west, it is well within the former range's sphere of cultural influence. The potholes (e.g. INY-1634, INY1638, INY-1641) and lava flows of the tablelands host numerous rock shelters (e.g. INY-205, INY-1635, INY-1638, INY-1640, INY-1641, among several others) may be excellent places into which a residential populace could retreat. Although the bodies of water in myth may not be entirely location-specific (intended to match events multiple places), there seems enough evidence at least to entertain the notion of an outbreak of violence.

Presently, however there are no direct apparent material indications of interpersonal violence at either the Death Valley or Little Lake landscapes. It is striking, though, that both dry canyons constitute natural highly defensible positions. While the hunting magic model relies on the ability to ambush game, the ability to hide from and ambush an enemy incursion could equally apply to much the same natural features. Synthesizing material and oral evidences, it seems worthwhile

118: A Pyramid Lake Paiute variant of Series II origins portrays the Paiute progenitor protagonist being pursued by cannibals as she escapes to the north (Myers 1987: 109-112). Pyramid Lake is virtually due north of the Owens Valley to Death Valley heartland.
119: In Series III, after killing Coyote, the geese slaughter a village near a large body of water, (lake or ocean), in the Ash Meadows variant expressly at the foot of the Sierra Nevada (Myers 1987:235-238)
120: Series II's lead villain, Numuzoho (lit. "People Pounder") slaughters hand gamers during festivities at "Big Tule Camp," implying a lacustrine setting.

suggesting the proposition future archaeological research at Little Lake Range and the Fossil Falls Archaeological District test sometime shortly after 1,350 BP, increased social tensions across the region played out as overt conflict at Little Lake, and likely elsewhere throughout Coso territory. Expanding the scope to the cluster of rock shelters immediate south of INY-3074, several of the shelters are in defensible positions on steep rock walls well above the drainage floor below: INY-220 at 11 m above, INY-130 estimated 10-15 m above, INY-218 at 15 m above, and INY-222 no less than 30 m above a canyon floor (Meighan et al. 1953). In addition to the obfuscating nature of its rocky walls, INY-3074 has multiple fully sheltered areas at substantial height above the valley bajada outside; measured from the site datum at the canyon mouth, the Chamber 1 shelter is 30 m higher, Chamber 2 at 50 m higher, and the Grotto Gallery is a remarkable 135 m higher.[121] Even without direct signs of violence, the idea of defensibility during conflict remains plausible but unconfirmed.

Political Economy

The political economy of rock art was unequal, and much of what can be inferred ethnographically remains archaeologically speculative. Numic economy was found on asymmetric gender scheduling, obligation, ritualized communal gambling, and by late Precontact, it incorporated shell bead money (Whitley 1994; Bettinger 2015). On the immediate household scale, male hunters faced uncertain returns, and successful hunters were nonetheless compelled to share successes with the camp (Whitley

121: There is also a low, wide shelter in Chamber 4 6 to 10 m above the chanber floor and 136-140 meters above datum, but thus far no material culture has been found in it.

1994:364). Unmarried women could thus provide adequate sustenance for themselves, but unmarried men accrued debts (Whitley 1994:365). Obligations reversed at marriage, however, as women would be compelled to provide seed and nut foods to an additional person, while married men no longer accrued food debts.[122,123] On the community level, more reliable small game (such as that caught as a part of a rabbit drive) could be used to “purchase” nut or seed foods, rather than accrue debt (Steward 1933:254; Bettinger 2015:72). Presumably, a similar communal exchange system was also employed at the well-documented pronghorn (“antelope”) drives.

Harvests and game drive organizers were not simply randomly chosen. Only small subset of any group[124] was qualified to orchestrate inter-community festivals, which was both the privilege and obligation of *puhakanti* (Panamint), *pohagant* (Paiute), or *huuiyagadi* (Kawaiisu) (Giambastiani 2005:89, 92-93). (Miller 1983:79; Whitley 1994:366).[125,126] Among Panamint (Timbisha) Shoshone, an alternate title and office of *pakwinavi* could be bestowed up skilled hunters (Giamabastiani 2005:87), and orators. Essentially, although all community members participated in

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122: Native Californians did not favor accruing debts over longer periods, and one strategy some women used to alleviate marriage obligations was sororal polygyny. Some men might prefer a polyandrous marriage over the debts of bachelorhood (Whitley 1994; Bettinger 2015)
123: Nonbinary expressions could also be economic strategy, as expressed by a parable in which Coyote and Fox, out of food, dress as women and take husbands (Ramsey 1980).
124: And sometimes without an appropriate local, a person from a neighboring community might be paid to come lead a ceremony or drive
125: Also in part due to a taboo considering menstrual flow incompatible with *puha*, often excluding women between puberty and menopause (contentious, and addressed later).
126: Bettinger (2015) makes no such distinction.

these events, the public sphere and supernatural authority were *usually* under the authority of men and ritual adepts (c.f. Crum et al. 2001:151; also, discussion on gender).

That accessing caches containing rock art was reserved for ritual adepts was no accident (e.g. Keyser and Whitley 2006). To approach the petroglyphs was domain of those with *puha*, and chiefly among them *puhakanti*. Through taboos on handling *puha*, shaman community leaders could assert and reinforce their authority over any range of otherwise public spaces. Were a communal big game drive to utilize either of the canyons at INY-1634 or INY-3074 (or the famous petroglyph Big and Little or Renegade Canyons in the Coso Range) for an ambush, corral, or game jump, only the shaman whose cache occupied it would have the authority to organize the event. To hunt there without the shaman's express authorization would be to risk death (see Gayton 1948, in Whitley and Whitley 2012:260). In light of the inherent *social* power in staking supernatural claim to exceedingly convenient landforms for game jump and corral style hunting, we see an alternative connection between rock and hunting images. Hunting magic, relying on *correlation*, might erroneously reverse the *causal* connection: to monopolize an *artiodactyl* trap reifies authority, and thus the game drive instead increases the power of the *puhakanti* (shaman), as opposed to expending this supernatural energy to improve success.

Petroglyph producers at INY-1634, might well then have exerted some authority over those participating in ethnographically documented game drives above in Rose

Valley (see Kroeber 1925, Steward 1941). This extends beyond drives, as it can also act almost as a tollway between the tableland village above, and Little Lake and *Pagunda* below. Elsewhere, petroglyphs might regulate access to raw materials, such as an important obsidian source. Thus, a cache of 26 obsidian bifaces at Little Lake[127] dated using the obsidian rim hydration method to the Haiwee/Marana period interface at 650 BP (Garfinkel et al. 2004) could provide evidence for this sort of resource control being enacted over Coso-sourced obsidian.

Obsidian overproduction at Little Lake and elsewhere in the Coso sphere seems to have enabled economic participation in inter-regional trade systems (Van Tilburg et al. 2012:29-30). As resonance was demonstrated in at least two spots, the paucity of petroglyphs in the canyon at INY-1634 may indicate percussive rhythm, (if carried out at all), was done through an industry of lithic reduction and crafting. In southern Oregon, lithic debris concentrations on opposing shores of Petroglyph Lake (35-LK-36; see Daehnke and Raymond 2008) may well indicate this sort of rhythmic reduction. With a petroglyph cliff near the shore midway in between taking on animic, musical properties during any discursive session in which knappers are active at each of the opposing scatters. A similar reduction process utilizing the the sonic qualities of spaces in the Owens River gorge is possible but unconfirmed at INY-1634.

127: The site number is not reported, only the context of “Little Lake.”

For INY-3074, however, one of the resources being regulated seems to be *puha* itself. The canyon is not a convenient through-way, but it is located along an import exchange and seasonal migration route extending across the present-day state line (Steward 1938b; White 2008). Its continuous iconography speaks of *puha* mnemonically.[128] Esoteric wealths of information in the iconography are consistent with points I make later on the distinctive acoustical properties of the Death Valley slot canyon (see sections on neuropsychology, phenomenology, and Uto-Aztecan symbolism, and also Figure7. 8), and compliment more concrete forms such as apparent privatization (after Bettinger 2015) of a hunting location, or pinyon stand, or other such resource. The regional network along which INY-3074 sits places it in an ideal location to regulate toolstone blanks for both the Saline Valley sources, and the closer proximity Willow Spring chert source.[129] In addition to the passage of minerals like toolstone and salt, INY-3074 fosters stands of ephedra and desert willow, with Joshua trees immediately outside and growing along the rim. The basketry fragments scattered the the nearby rock shelters conspicuously use willow and Joshua tree fibers, leading me to conclude that the possibility that the slot canyon at INY-3074 – especially the upper half, with particularly dense *Chilopsis linearis* in Loci 10, 12, and 14 through 17 – was involved in the production and regulation of basketry fibers is highly likely. Intriguingly, this bitartite economic split also works for corral and game jump hunting strategies, with 25 of 28 bighorn elements in Loci 1-8.

128: in the sense of “knowledge is power”
129: Possible blue-green pigment on Panel 9 may reinforce connections with this network.

Neuropsychology Model

For the Mojave Desert slot canyons project, elements of the neuropsychology model were initially adopted to overcome an interpretive impasse: the standard Great Basin typology provided no analytic help for abstract, recursive geometric forms, which make up the bulk of the INY-3074 visual assemblage, at 74 percent (see also Liwosz 2014). The following analysis uses the theoretical tool as it was intended: a compliment to the semiotics based approaches shared under the umbrella of a cognitive archaeology. My application of the neuropsychology model is some concluding, all-encompassing explanation on its own. Instead, it assists in shifting object of study the the *process* of image acquisition, as opposed to the inferred contents. On its own, it does not provide a conclusive and monumental iconographic platform upon which to stand ruminating solely upon who altered their chemistry with intent. Instead, it opens up a conversation for exploring the construction of a culturally significant visual lexicon, one which I root back into both the corpus of parietal images in my project areas, and in culturally relevant verbal symbolism.

In critiques that the neuropsychology model over-emphasizes altered states of consciousness, pundits miss two of the three steps in image acquisition Lewis-Williams and Dowson (1988) introduced. Integral to the neuropsychology model after the Stage 1 "entoptic images" are first generated is Stage 2, the "Construal Phase," and Stage 3, with mixed entoptic and iconic images. Stage 2 is the point of the experience during which originally abstract indices of abnormal experiences acquire iconicity through invoking some quality(-ies) of (a) culturally recognized sign(s). Finally, in making sense of the experience, and subject's own iconic recollections become entangled in, and conflated with, entoptic images (Lewis-Williams and Dowson 1988:204). At this point, such iconic hallucinations may be perceived to have animacy, or personhood, much as the experience of a young Wind River Shoshone who met *puha* personified (Hultkrantz 1986:38). This ultimate but not inevitable outcome of the experience – outside of indigenous American contexts, might at times be called "entity contact" to those who have been involved in the electronic music scenes, and is an articulation point with aforementioned specific alterations to consciousness (restrictive, rather than exhaustive, emphasizing key points only).

Table 7.3: *select alterations to consciousness and links with religious experiences*		
Alteration	***Experienced as...***	***Example relevant context***
Ecstatic Experience	Includes high energy, exhilaration, profound emotion, and sexuality	Feasting Ceremonies (Durkheim's "collective effervescence" for instance
Dissociation	Distance from sensations and settings; in extremes, extrasomatic (out-of-body)	Exhaustion, sleep deprivation of crisis quests; meditative discourse with other-than-human agents
Disinhibition	Reduced reservations; extreme emotions (playfulness, but also aggression	Experimentation; expressing entoptics, but also vocables (glossolalia)

The above listed “states” are not mutually exclusive, nor exhaustive. They are included to de-mystify the notion of altered to the uninitiated reader. Additionally, while ASCs is technically accurate, to many in is received as clinicized, pathological, and deviant. What is more useful to pursue here – just as in the application of each of the other included theoretic frameworks – are express and widely comprehensible ways of communicating between (in this case) cognitive sciences, and (as with those other theories) commentary in ethnographic practices. That is to say, theorized human “universals” presumed as links are expressly explored in the grounded framework of written, oral, and material culture. Evidence for these altered states, and the stages of image acquisition, are evident at INY-1634 (Panels 2 and 3) and INY-3074 (throughout the site). Iconography includes entoptic images, jimsonweed, and ritual paraphernalia. Later, I argue the psychoacoustic effects aid in this process.

Shamanism in the Americas

Before delving into the esoterica of ruminating on cognitive process, it is helpful if not outright essential to ensure there is at least some evidence upon which to begin building the larger argument. Above, this false-color enhancement of INY-3074’s Chamber 2 south wall, is a modern chromatic embellishment and practical analytic aid in sorting the sequence from onset of the visionary experience through and into a realm culturally significant symbolism. As demonstrated in the Ford seriation diagram below (Figure7. 6), the sequence of images at INY-3074 began highly variable and ornate, dominated by creative expressions consistent with entoptic images of the neuropsychology model's first stage, with iconic forms gaining more prevalence.

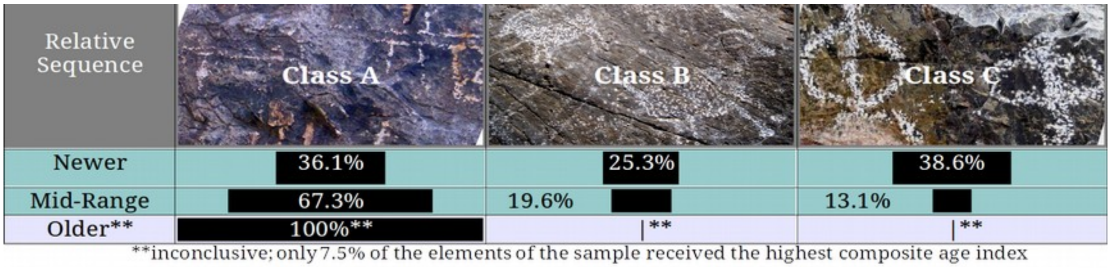

Figure7. 6: *Ford seriation diagram of relative sequence using "rough-and-ready" index to seriate each element by semiotic class, with examples provided (Liwosz 2015, 2017)*

In the following, I discuss iconography of my project areas in terms of the three stages of image acquisition. The example given below is neither the only example at INY-3074, nor unique to the area. Other clear examples of the transition from entoptic to iconic images, or conflations of both motif classes into a compound element, include instances at INY-3074 in Panels 5, 9, 15, 24, 28, 32, 37, 39, 65, and 72, INY-1634 as Panel 2, and numerous visible examples in previously published works on the rock art of the Coso Range, China Lake, and Little Lake areas. Understood through the neuropsychology model, the social and cognitive processes in which these images came about were discursive engagements, a process described in the following example from INY-3074 Locus 8 Panel 34.

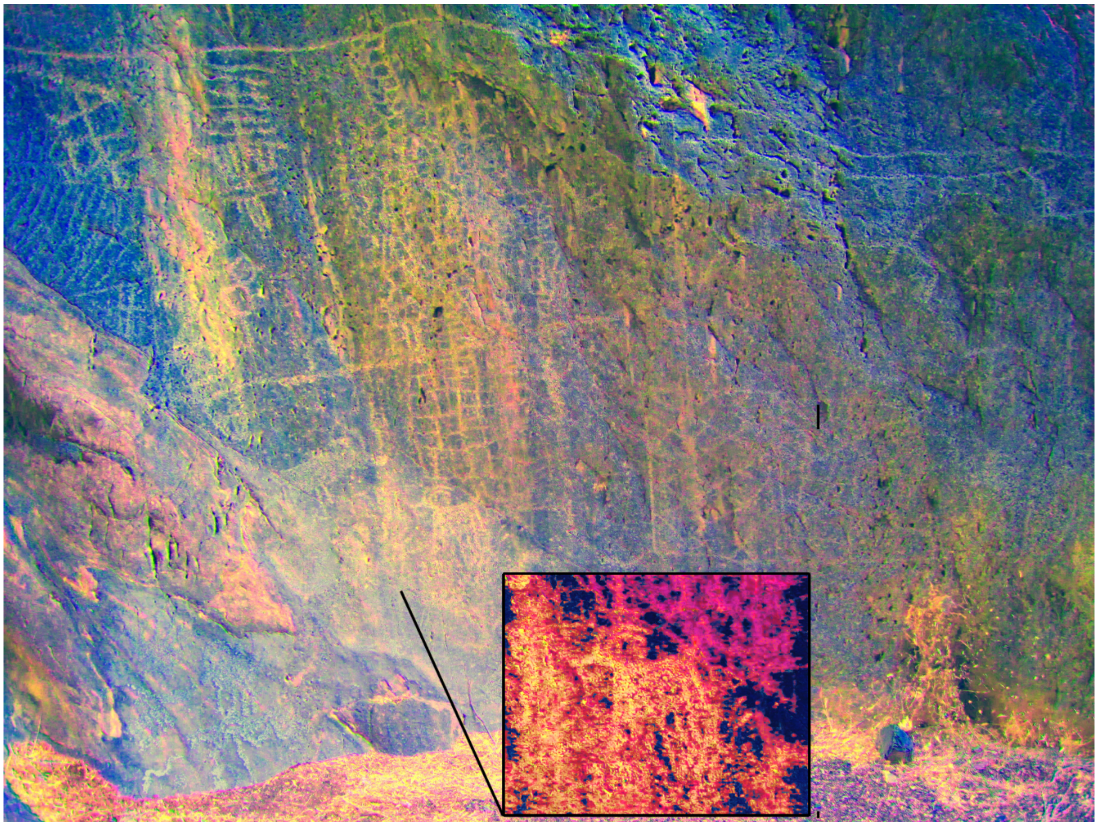

Figure7. 7: *INY-3074, Chamber 2, Panel 34. Background: False-color emphasis of difficult to discern large geometric forms, which fit Lewis-Williams and Dowson's "entoptic images." Inset: 7-legged ungulate in processes of "becoming," in palimpsest emerging from abstract geometry (software: Dstretch,GIMP).*

Here Chamber 2 records the moment a carver transitioning from the abstract to more iconic but still unnatural seven-legged ungulate (horns-side), emerging from abstract concentric forms (inset of figure above; compare with 7-legged patterned-body bighorn at Little Petroglyph Canyon, illustrated in Whitley 2000a:122, figure 110). Several principles of traditional visual culture practices, and related theories, seem to apply. The discursive nature of parietal art, manifests in a multi-layered motif which has managed to negotiate form in between its originals and intended result. By capturing the moment of meaning-making in action, this also records the shared intellectual heritage of the neurological and semiotic approaches. Similarly it illuminates commonality between "older" and "mid-range" indigenous ontologies,[130] as the antelope/sheep emerging out of concentric entoptic through utilization, rather than obliteration. In addition to here at Locus 8, this ungulate-out-of-abstraction also occurs at INY-3074 in Locus 1, and Locus 6, and the gorge above Little Lake in Panel 2. This patterned conjunction recurring throughout site scale, *and* regional scale, may be a material correlate to the suggestion that sheep and to kill a sheep was a metaphor for trance (e.g Whitley 1994).

One of the most useful applications of the neuropsychology model in the Americas has been in regards to both shamanism *sensu stricto*, and shamanistic practices beyond and apart from from the formalized social institution. Lewis-Williams (2002) and others (e.g. Lewis-Williams and Dowson 1988) applied to the entoptic imagery concept in the Coso to propose the first serious suggested understanding of ubiquitous recursive abstract geometric forms. Prior, little attention was minded to these motifs, as the more readily recognizable iconic bighorn, atl-atls, and anthropomorphic forms drew researchers to ignore the bulk of images and concentrate on hunting implements. Instead, the neuropsychology model applies cognitive archaeology's foundational statement by Lévi-Strauss (1963) that parietal images of large game were not just "good to eat," but more importantly "good to think," in order to posit on just what those thoughts might be. In the context of Coso, this fundamentally shifted

130: See Echo-Hawk 2000:271-272 for Vansina's "three-tiered hourglass" of the oral preservation of historical information focus away from bighorn towards aforementioned entoptic images, inferring the latter indicated altered states of consciousness.

Weather control

Whitley (1992; 1994), inspired by Lewis-Williams and Dowson, linked ethnographic documentation on Great Basin social structure and shamanism (e.g. Steward 1929; 1941; Kelly 1938) with petroglyphs. Whitley identified evidence of metaphors for altered states of perception, and practices to induce them, in the rock art. Significantly, revisiting the ethnographic record yields previously unrecognized metaphorical references to trance in rock art, as well as clear documentation of shamanic and shamanistic practices – including the hallmark signs of trance-inducing practices (e.g. Whitley 1994; 2000). Ethnohistoric period practices, petroglyph manufacture tools and techniques, and conspicuous visual culture iconography all consistently combine into a suit of metaphors invoking stormy weather and its ecological benefits (Whitley 1992b; Whitley et al. 1999; Lewis-Williams 2002:176-177; Waller 2012).

Weather control shamanism is at the center of (but not sole purpose for) the case for Numic and Proto-Numic suite of religious symbolism attested to (largely in brief passing) by early twentieth century ethnologists. This religious complex contains mutually referential metaphors founded upon empirical observations of the natural world, and expressed through religious acts. In brief, the successful weather shaman could bring back nourishing rainstorms by taking forays into otherworldly realms

(Whitley 1994; Stoffle et al. 2000; Carroll et al. 2004; Whitley et al. 2005). Core to this system of metaphors is the coincidence of annual monsoons from the south with *Ovis canadensis* rutting season (Kelley 1936:138-139; Steward 1941:262, 259; Whitley 1994:362-363). Global patterns in the archaeoacoustics of rock art and religious beliefs a frequently express a sort of syllogism entangling hoofbeats and thunder; thus thunder is an implicit subject matter of depictions of large mammals in parietal art, ranging from Upper Paleolithic European caves such as Lascaux, to North America's Great Basin (Waller 2012). In this context, ram rutting competitions between bighorn males acquire extra meaning, as sonorous crashes of horns would herald thunder,[131] which, by expension, symbolized the onset of seasonal rains.

Many of the same material metaphors would be shared between weather control and seasonal fertility and renewal ceremonies, and so the evidence of rain-related visual and audible symbolism is covered in brief here, and revisited under later headings. The links between shamanism and world-renewal should be no surprise, as *puhakanti* had an obligation to wider communities to help orchestrate such events (see also political economy).

For the rain-shaman, whose caches were known to be rock art sites (Gayton 1948:207), a bighorn sheep *nagual* would impart the ability to bring rain (Whitley 1992b:98; 1994:363-363, 368; 2000:112, 117; Lewis-Williams 2002:175; Whitley and Whitley 2000b:112, 117). This was especially true among Coso, Kawaiisu,

131: As may be the case for the log device Steward (1941) observed (mentioned in Ecology and Economy); If intended to drawing sheep by mimicking the sounds of mating competition, this device would also invoke thunder, summoning the rain-bring bighorn herds.

Panamint Shoshone, whose weather shamans were recognized throughout the area as particularly effective (Kelly 1938; Whitley, Simon, and Dorn 1999:11-12).[132]

Rock art of the western Great Basin and northern Mojave features into the world renewal complex for more than just bighorn depictions.[133] Ronald Dorn, Whitley, and others (Whitley et al. 1999) concluded microscopic quartz embedded in petroglyphs was consistent with battered quartz at CA-SBA-4895. Quartz will flash when struck or cracked, making pecking/pounding petroglyphs a simultaneous production of thunder *and* lightning a potent component of the symbolic complex of weather, renewal, and etiology.

My experiments reproduced quartz's triboluminescent flashes, confirming this property. Rather impressive sources of large quartz crystals are known in the Numic heartland, and were a conspicuous component of last rain shaman Bob Rabbit's ritual toolkit (Whitley et al. 1999:235; Lewis-Williams 2002:176-177; Whitley et al. 2005); additional ethnographic and archaeological support abounds (Miller 1983:81; Whitley 2011:63; Waller 2012). This seems as good of a place as any to indicate activating quartz is inherently a multisensory experience – or "no lightning without thunder," in this case. Later, I explore additional evidence that butterflyimages functioned as powerful metaphors for gender identity, sexuality, fertility, and lightning (see disuccssion of initiation rites).

132: Notably, Southern (Pahrump?) Paiute sought out Panamint Shoshone for a doctor skilled in weather control
133: Ss noted, bighorn's recognizability contributes to over-representation of the real about six to seven percent of elements – at least at Little Lake and Death Valley.

Although these flashes are surprisingly eye catching, their attested significance on that principle implies engaging with these practices at least in part at nighttime, dusk, or dawn, and a number of cognitive factors come with darkness and night hours. With INY-1634 mostly comprised of pitch-black basalt, and INY-3074 housing seven loci in near-perpetual twilight, a moonless night inside either slot canyon would push from disorientation into sensory deprivation – another means to alter the consciousness (this genre perhaps akin to floating in darkness), – becoming caves without roofs (Moyes and Montello 2012:394). Experiences of so little of one's accustomed breadth and detail of sensation engages more imaginative thinking to restore the full breadth of sensations, and all this within a highly ritualized religious framework (e.g. Moyes 2006, 2009). This is the point where the power of the neuropsychology model in the context of shamanistic practices truly reveals its potential, and thus the discussion will return to imagination as a cognitive response to sensation and setting.

Acoustics plays an integral role in the religious act of rain-bringing. Between the two study areas, percussive tests revealed that there is a fairly strong correlation between densely filled petroglyph panels and stronger unusual acoustic properties. , and the gorge's overall apparent sound-*dampening* effects rule out much of it as an focal point for "thunder." The story at INY- 3074 is quite different: (Figure7. 8). Future fieldwork to ton the Death Valley area slot canyon to measure RT60 values would be helpful in the future.

In evaluating the two slot canyons, I explicitly tested the for reverberation as a meaningful symbol in the fertility/renewal complex, these focal sites performed vastly differently. At INY-1634, percussion and frequency sweep results showed some measurably positive results around the swirling void where the most extensive pecking in the gorge is found. Overall, the area's size and effect were still fairly small. Overall, the Owens River gorge section of INY-1634 responded surprisingly poorly to percussive impulses, with some sound samples possibly evidencing a small dampening effect.[134] By contrast, six of INY-3074's loci (or one third the total) demonstrate measurable reverberation. Loci 2, 3, and 10 (the First Chute, Landing A, and Landing B, respectively) can be described as responding with weak and/or inconsistent reverberation, as opposed to consistently stronger responses from Loci 6, 8, and 18 (the Lower Gallery, Chamber 2, and the Grotto Gallery; see Figure7. 8). Iconography in strongly reverberating spaces is consistent with above outlined expected themes: herds of sheep signs assemble on the Lower Gallery walls, "waterfall" motif rain signs (and possible PBA, see Figure7. 36) are shown in the Grotto Gallery, and Chamber 2 displays sheep herds (e.g. Figure7. 17, Figure7. 40), and the raining motif (Figure7. 9), plus another PBA (Figure7. 35), *and* a rain specialist wearing diagnostic quail topknot headgear (Figure7. 27).

134: Some resonance at Panel 2 and echo signals at Panel 1 may imply at least some highly localized reverberation, however until a re-evaluation quantifying consistent RT60 values can be done, there is is not sufficient evidence for any significant reverberation.

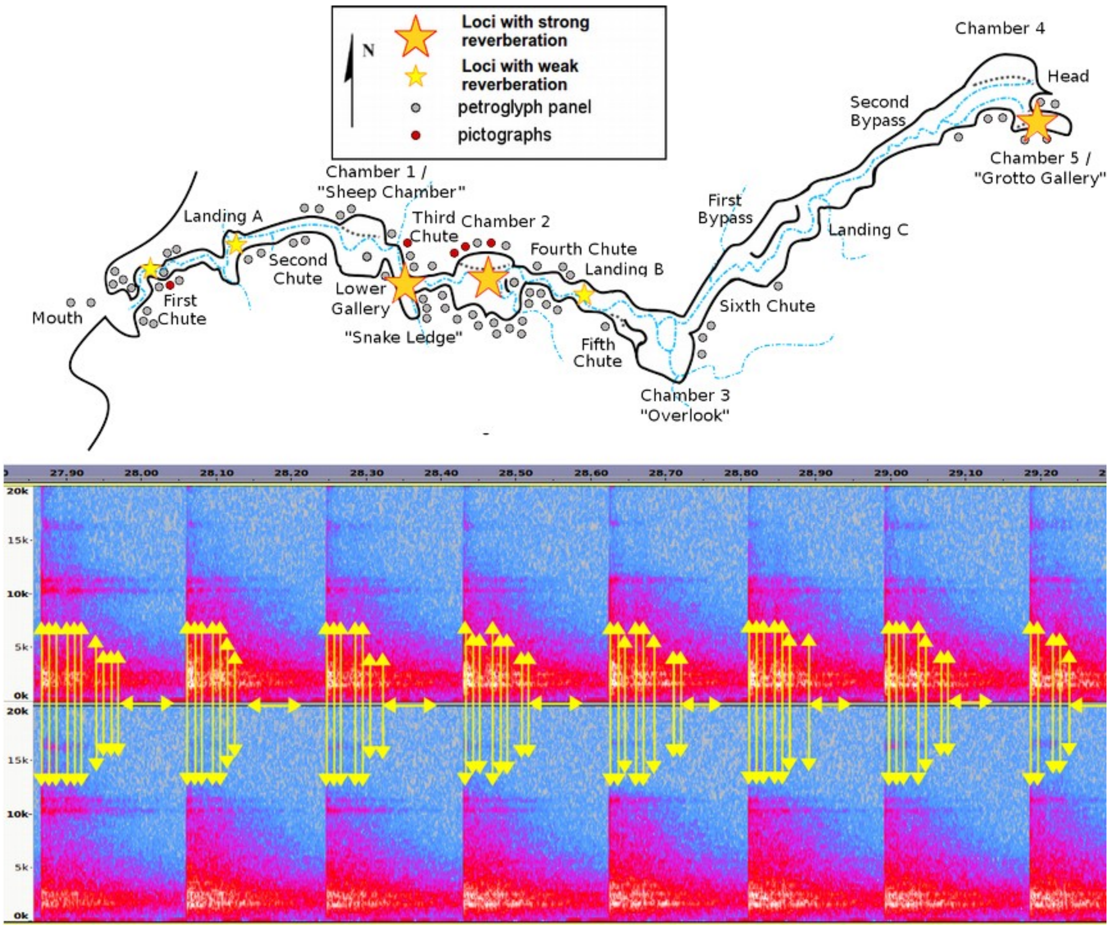

Figure7. 8: *TOP: map of strongly (big stars) and weakly (little stars) reverberating loci at CA-INY-3074. BOTTOM: Accompanying stereo spectrogam (example from Chamber 2) demonstrates "many rapid echoes" signature of reverberation during slow-cadence percussion tests; vertical arrow sizes approximate apparent magnitude of each echo event.*

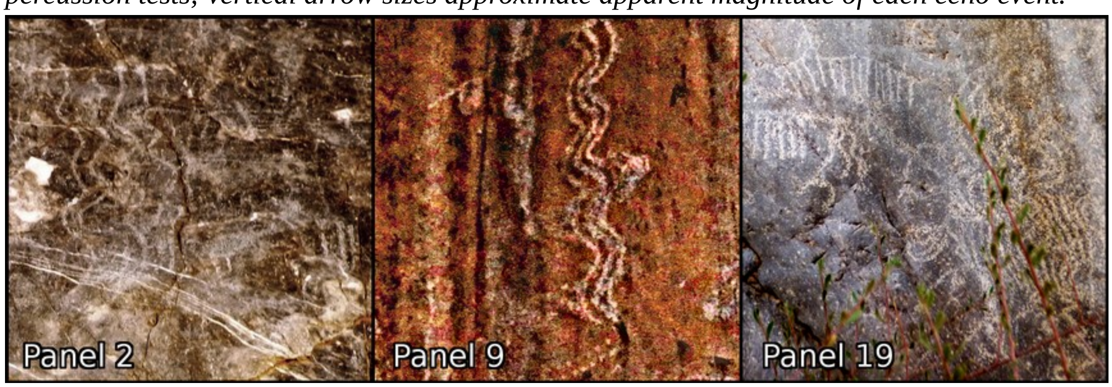

Figure7. 9: *Examples of "rain sign" or "waterfall" glyphs from INY-3074, Panels 2, 9, and 19. Notice repeated use of natural cracks and mineral stains.*

Identity

Before delving more deeply into the subjective experience of engagements with place, it is helpful to propose just who might be doing the experiencing. Given the agential nature of "power" places in animic ontologies, identity expression is potentially in an ambiguous or tripartite state: ego or subjective self, predecessors whose visual or material culture remains evident, and the place or space itself. In the following comments on cradleboard imagery, it is fruitful to remember these both index the community of practice of the maker, and express in culturally codified symbolism the (once) child whose property the cradleboard remains so long as it is not deteriorated. Secondary use of the same symbolism in rock art motifs, therefore, record a series of human-thing-entanglements through which identity-shaping attributes of sign and memory[135] have endured (via Ian Hodder 2011).

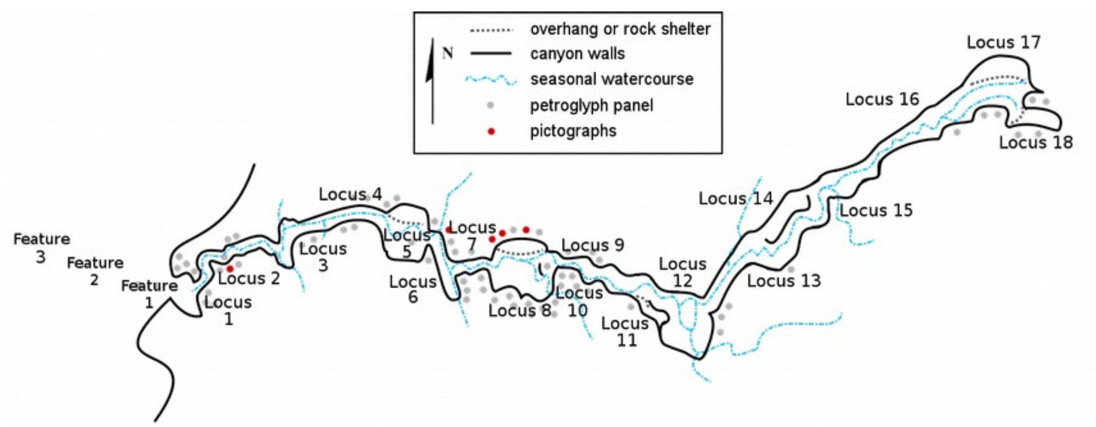

Figure7. 10: *INY-3074 overhead schematic displaying feature and locus numbers (compare with locus names, as in figure on previous page)*

135: although my suggestion may at first seem paradoxical, Hodder (2011:154) specifies, "things fall apart." Here we cannot confirm the state of the physical cradleboard, but whether or not it is whole, or dust, its conventions that helped shape individual identity endure.

Gender

As implied by the notion of socializing the landscape, group identity can be simultaneously forged and expressed on cultural modifications to fixed features (e.g. Quinland and Woody 2003). As discussed earlier, one of the better supported connections to rock art motifs in other media is that of cradleboard frames (Van Tilburg 2012:162-167) and decor (LaPierre and Garfinkel 2013). Group identities may well correlate with frames, as is the case in Van Tilburg's (2012:165-167) interpretation that oval and rectangular motifs represent the frame styles Owens Valley Paiute shared with Fremont and Ancestral Puebloan ("Anasazi"), while Y-Shaped petroglyphs reflect the frames of Pamanint (Timbisha) Shoshone, Yokuts, and Tübatulabal. Aspects of individual identity, however, may also be expressed in cradleboard motifs, as embellishments are thought to indicate the gender of the child. Mono Paiute cradleboards including repeating diagonal lines on the sunshade (e.g. LaPierre and Garfinkel 2013) would indicate a boy, whereas diamond-chain perhaps a girl (Whitley 1992b:1010; Van Tilburg 2012:166). Following Joyce's (2007) indexical approach to visual culture, cradleboards themselves signal women's work, as LaPierre and Garfinkel (2013) conclude one of the infant's grandmothers typically made the cradleboard.

Figure7. 11*: INY-3074, Locus 5, Panel 72, on shelter roof; color exaggerated inset shows Y-shaped cradleboard motif, considered to be highly diagnostic of Timbisha Shoshone identity.*

Few Y-shaped motifs are found at either of the research locations, with one notable exception on the shelter ceiling in the north end of CA-INY-3074's Chamber 1. Oval and rectangle motifs are found at INY-3074, including Feature 2 (Panel 69), Locus 1 (Panel 8), Locus 2 (Panel 52), Locus 8 (numerous), Locus 12 (Panel 16), and Locus 18 (Panel 9) (for examples, see Error: Reference source not found). By contrast, Van Tilburg and company (2012) report at least one Y-motif at each of six out of the seven loci along Little Lake's west shore, and additionally at CA-INY-388 and CA-INY-389 (located midway between the lake and the canyon).

The series of diagonal lines, sans a cradleboard's sun hood as a frame of reference, might be indistinguishable from a simple series of short parallel lines. These sets of parallel bars, as it turns out, amount to one of most common motifs at INY-3074, present at nearly every locus containing petroglyphs, as well as on Feature 2 outside of the canyon. Diamond chains are less common at the Death Valley canyon, but may be similar to the interweaving wavy lines. Treating these two motifs as if they were one, they appear in INY-3074 at Loci 1, 3, 10, and 18. This reading of the aforementioned bars/lines motif, however, is speculative.

What is more important than interpreting motifs element-by-element are conceptual links. The concordance of specific designs with scratched techniques which also appear on both fixed and portable visual culture (e.g. “charmstones,” LaPierre and Garfinkel 2013), in the immediate area of fiber sources used to produce the material culture incorporating not just comparable motifs but the material embellished pendants, all mutually support the cradleboard and weaving connection. As mentioned in previous chapters, oral tradition also links basket weaving and the beings behind the rock surface (e.g. Van Tilburg 2012:162). This strongly supports the involvement of mature women in petroglyph production, at least by the Late Precontact and latter part of the Rose Spring Complex.

In fact, the notion that portable incised charmstone designs bridge between womens’ tasks and immobile rock art was introduced decades earlier (Thomas 1983; Reynolds 1996:41), although it has unfortunately received little attention since. Citing geographic evidence from studies in Monitor Valley, Nevada, Thomas (1983:351) suggests the incised stones contexts strongly correlate with pinyon gathering and processing locales, expressly paralleling Heizer and Baumhoff's (1962) proposed linkage between "non-portable wall art" and hunting features. Despite Bettinger's (1989) qualifying partial agreement by asserting this pattern is true after 1,350 BP, closed context deposits from Gatecliff Shelter demonstrates its antiquity reaches to that cave's earliest occupation ca. 5,250 BP (Thomas 1983:255; Reynolds 1996:41). The case of incised stone correlates to "Numic scratched" style brings to light enduring gender biases in Great Basin archaeological research. With literature abounding about the male hunter and rock art connection,[136] at least equally strong material correlates with female subsistence tasks have gone ignored for decades. Denial of the antiquity of Numic subsistence patterns[137] and contributions to regional visual culture are a lasting relic of the institutional disenfranchisement of these peoples and ongoing denial of their history.[138]

Cognitive models, namely the neuropsychology model (shamanism), also imply gender differences in rock art production, as covered by Whitley (1994). Developments in the dynamics of identity within ritual arise out of evidence for a religious system operating on a series of symbolic inversions not too unlike those Moyes (2009) observes for Classic Period Maya use of Checham Ha, wherein ritual specialists descended into the earth during drought to recharge the heavens with rain.

136: And the emphasis on predominantly male shamans, as Rogers 2007 indicates
137: To be clear, I am arguing that the mosaic of cultural traits which eventually coalesced into the classically "Numic" traits we are familiar with began developing slowly earlier.
138: It is quite remarkable that the earliest evidence at Gatecliff Shelter of "Numic style" (perhaps early Proto-Numic?) visual culture follows on the heals of spreading stands of *pinus monophylla* from their evolutionary cradle in the Inyo-White Mountains between 8,800 BP and 6,300 BP (Reynolds 1996:29;Kelly 1997:12; Cole et al. 2013:103).

In California, ethnographic evidence suggests another such inversion existed partnering place with person, in painting or pounding gendered designs, and possibly between puberty initiates on power quests and their personal helper *naguales* (Whitley 1998, 2000a; Hayes-Gilpin 2005:212-213).

Referring to oral histories, the female "Water Babies" or "rock babies" to whom petroglyphs might be attributed could themselves be believed to be the origin of the sign marked on the stone surface (Gayton 1948; Hultkrantz 1987; Whitley 2000a:75; 2000b:113), inhabiting locations like *genii loci* (Liwosz 2017:198). Often gendered as female, these other-than-humans index expectations for how a typical set of Western Shoshone remembered derivations of the "Water Babies," "dwarfs," or rock people by the name of *Tso'apittse*, to whom at least four stories are ascribed by Smith and Hayes (1999:82-84, 137-139, 154-155). Although *Tso'apittse* seems to inhabit many overlapping roles with "Water Babies" and "rock giants," the name is also used for the selfish antagonist and origin of echoes in the Western Shoshone version of the "Teugai and Togoav," implying *she* might the other-than-human waiting and mocking from just the other side of the rock surface membrane.

As the Water Babies demonstrated their presence by depicting themselves (although *Tso'apittse*/*Teugai* could simply endlessly mock intruders from just out of sight), the cradleboard frames and decor could have been understood to be conventional symbols of Water Babies. As the actions of an entranced visionary were understood as those of the spirits, a water baby symbol would implicitly index that person's encounter with sensations which their cultural knowledge led them to conclude was such a being. The identity of the entranced person, in this case, is of secondary concern, and it would be that of the other-than-human entity which was recorded.

This is not to say that the regional variations in motifs which some (Gilreath and Hildebrandt 2008; LaPierre and Garfinkel 2013) correlate with activity areas for gendered tasks is negated (e.g. CA-KER-226 in Allen 2013:31-59). It still remains though, as Gayton (1948:113, in Whitley and Whitley 2012:260) notes, "...in fact, any rock with pictographs was thought to be a cache." Both INY-1634 and INY-3074 meet this simple criteria[139] (however so do two boulders and a rock ring in the Death Valley project area, and numerous small panels near the Owens River channel at the Little Lake project area) The institution of shamanism was typically occupied by males (c.f. Hultkrantz 1986:34), with a taboo separating *puha* from menstrual fluid often cited as the reason for precluding women (e.g. Whitley 1994). Rogers (2007:97) objects to the supposed "polluting" power of menses, indicating Isabel Kelly's (1936) documentation of female shamans among Chemehuevi. Unfortunately, the remainder of Roger's critical discourse is, to say the least, unhelpful. While Numic, and broadly Native Californian women were not expressly prohibited from becoming practicing shamans, as exceptional cases they could be perceived as challenges to social norms and thus feared as dangerous (Whitley

139: We should remember, however, that this is a perception, and use could be discontinuous.

2000a:29). When women assumed the role of doctor, it was typically postmenopausal, and acceptance was not guaranteed. A rockshelter I evaluated for the State of California in spring of 2011 in the Tehachapi Mountains (near Back Canyon in Figure1. 1 and 4) was connected with such an ostracized, older female *huuiyagadi/pohagadi* (shaman).[140]

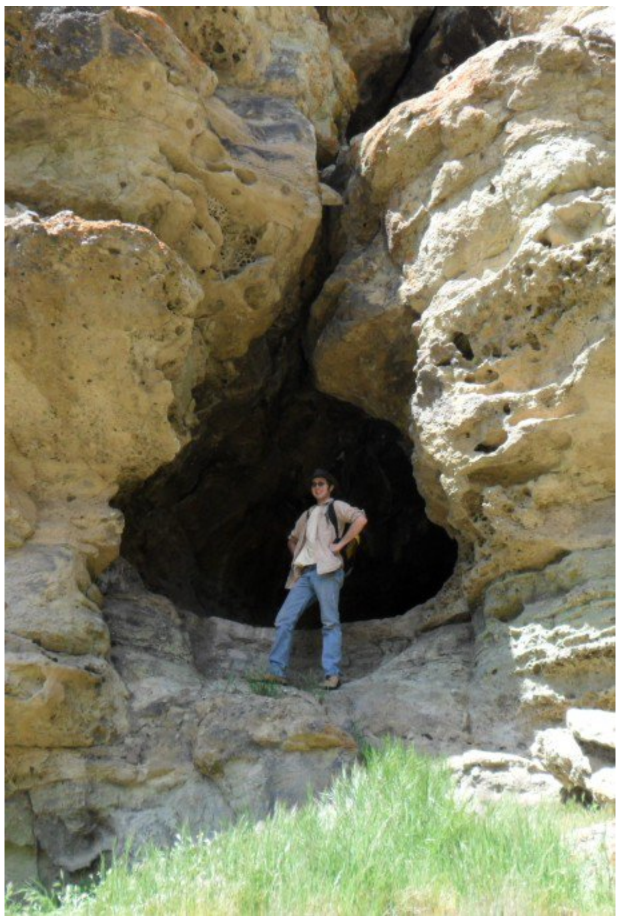

Figure7. 12: *Author standing in front of a shelter purported to be the cache of a late female pohagadi, Tehachapi Mountains, 2011. Notice geomorphological cues: concealed interior space, opening from a narrow crack in bedrock.*

140: According to modern verbal lore, her spirit (or her spirit helper) sits or stands upon a boulder outside the shelter, especially around the hours of dusk and dawn.

The *Teugai* (or *Tso'apittse*) myth tells of a "witch" hiding behind the rock membrane symbolized by the shed snakeskin (Smith and Hayes 1993; Waller 2000, 2004). Speaking from just behind the stone's surface, *Teugai*/*Tso'apittse* is the source of echo, and thus central to interpreting acoustic results of INY-1634 and INY-3074. Her context is, in fact, exactly the setting as would be expected for a shaman's cache. Furthermore, behind the metaphorical snakeskin, she is symbolically entranced in the underworld. Although translations brand this character as a "witch," the western audience should be reminded of the loaded English word's history with the repression of paganism during Christianization.[141] *Teugai* and *Tso'apittse* are not simply variants of a warning story of women becoming shamans, however they might well represent desperation from marginalization out of the fear their breaking the norms evoked.

Yet, there are more neutral (even positive) examples of female inhabitants of places behind the rock surface. Such is the case for Paiute George Collin's story, in which a beautiful woman with a cache of beautiful baskets inhabited a cache behind a stone's surface (Steward 1936; Van Tilburg 2012:162). More overtly, Shoshone author Crum (1980:151) describes the healing powers of her own great aunt, who was an actual *puhakanti* (doctor) with healing powers.

Here we must discuss the nuances of gender construction and my selection of certain gendered words. Ethnographers (e.g. Driver 1937; Steward 1941) describe a

141: An equivalent reading expressly stating these implications would be "Teugai, the sorceress who used her powers nefariously," or simply malevolent shaman.

practice among the Numa for an occasional individual to adopt some combination of dress and/or role typical of that of the opposite sex: in current politically correct parlance, "two-spirit." The degree of this non-conforming gender expression was usually individually negotiated, but could range from simply engaging in "women's work" like weaving and seed-and-nut gathering, to fully committing to living as a woman and taking a husband. Creativity is a necessity to negotiate a non-normative role among kin and community, so we can briefly weave that underlying theme back into the conversation, before tucking it away again for later points. Two-spirits may have been shamans (Kelly 1938; Rogers 2007:96), possibly because the dual nature of their sex and gender expression placed them straddling two worlds to begin with - a position likely useful in crossing the membrane between the mundane world, and the underworld and celestial realm. Unfortunately, Rogers' politicized appropriation of religious discourse entirely misses these potentially powerful metaphysical mechanisms.

Returning George Collin's story of the weaver inside the rock, we know the rock inhabitant's gender *expression* (for this specific instance), as she looks and labors as a woman. Her biological sex, however, is not specified (Unlike *Tso'apittse*, who may have given birth to the child of her captive). Briefly digressing to ground the gendering to a research locale, the Death Valley project area's INY-3074 exhibits masculine tasks seem referenced in the Feature 2 "hunting blind," an atl-atl on Locus 3's Panel 45, and a corral-style sheep hunt scene in Locus 5 Panel 49, feminine expressions are found in the Chamber 2 shelter's iconography, small desert willow (*Chilopsis sp.*) utilizing the riparian zone's moisture to grow in Loci 10 and 16, and even a preference for resonance in the female vocal register in Loci 8 and 10 (not precluding Loci 3, 6, and 18). half a kilometer from the INY-3074 mouth, at the purported "INY-130" rockshelter indicates masculine tasks through an arrow foreshaft, but feminine tasks through the willow-warp basketry found fragmentary here, and as complete, fragmentary, and *as raw materials* at nearby shelters.[142] Thusly expanding to nearby sites, much of the cave context basketry recovered by Meighan et al. (1953) featured Joshua Tree (*Yucca brevifolia*) fibers – an endemic species thriving on the bajada right up to the mouth of the slot canyon, and on the mountainsides right up to the precipice of the canyon ram. Whether this shows duality, inversion, or non-binary expression, is vague. While Whitley's (2000a) approach emphasizes inversions that include pairing opposite gendered other-than-human *naguales* with ritual practitioners, LaPierre and Garfinkel's (2013) approach links female motifs with women withoiut inversion. Both Whitley and Garfinkel-Gold have suggested a symbolic union expressed by males entering female gendered spaces, yet non-binary and non-conforming gendered expressions remain laregely unexplored.

142: Namely INY-103, INY-217, INY-218, INY-220 and INY-222, all within 2km.

a: Desert Willow (*Chilopsis linearis.*)

b: Joshua Tree (*Yucca brevifolia*)

Figure7. 13 a & b (ABOVE): notable flora at, in, and around CA-INY-3074, commonly used as fiber sources for basketry recovered from the immediate vicinity.

It was in the Series III origin story that Coyote decided to become *puhakanti* (Myers 1987). Interestingly, it is also Series III which demonstrates the most gender fluidity: Coyote becoming a woman to raise the child, and the female child being raised as "Son." Opening lines of this myth foreshadow Coyote's later gender-flipping, beginning with him collecting willow (either *Chilopsis linearis* or *Salix lasiandra*) and twining baskets. This would seem to substantiate a higher rate of fluid gender expressions among *puhakanti/po'hage/huuiyagadi* than in the general populace at large. To date, I have yet to find an express reference as to why this might be, although admittedly the ethnographic record is impacted by decades of Euro-American contact prior (Rogers 2007:94-95). Roger's postulations, unfortunately, are ultimately ethnographically unfounded.

In the origin stories, both the Series I Coyote, and the Series II protagonist (whose name is unfortunately not typically recorded) are pre-occupied with "marriage" (often an ethnographer's euphemism for intercourse) and pragmatic matters: water, bedding, food, and escape from danger. Series III's rendition of Coyote, however, thinks independently and, especially, creatively: deciding to become *puhakanti* without prompting, flying, crafting breasts of clay, even performing an apparent Caesarian section both to deliver and to save the adopted daughter/"son." Creative thinking, additionally, is instrumental to song acquisition, perhaps one of the most core elements in obtaining *puha.* In the same vein, visual cues of altered states are expressed with high degrees of creativity, and moreover keeping *naguales* integral to the Spirit Helper Complex requires constant creative thought beyond the normal bounds of vision/dream/song. Periodic or enduring fluid gender expressions may serve already creatively minded individuals in exploring experiences and expanding their minds by considering alternate (as opposed to ascribed) conceptualizations of the body.[143] This is not to suggest *all* shamans were two-spirits, nor that individuals did not negotiate social-context-specific boundaries (e.g. "just in private").[144]

143: Bodily transformation, after all, is a common theme in Basin rock art, especially PBAs.
144: To add another note on the two-spirit topic, creative transgressions of social norms are compelling and empowering precisely because there is a social structure from which to break. Series III Coyote does not set out to undermine Series I Coyote's game-changing hunt, nor disrupt the Series II protagonist's quest for a husband. Coyote's Series III quest was for self-expression and self fulfillment, not as an iconoclastic dismantling all structure.

Initiation

Rock art not only served as an medium in which to express gender, it often played a role in shaping it. During the early historic period, the pubescent boys in the C*hinigchinich* cult in Southern California underwent an initiation ceremony involving injesting the entheogens jimsonweed (*Datura inoxia*) and painting rock art at the conclusion of a foot race (Shaafsma 1985:260; Hill 1992:130; Whitley 1992b:108; Garfinkel and Yohe 2012:212). Scholars regard the *Chinigchinich* initiations as a manifestation of an enduring and broad reaching tradition of puberty rites, one which involved ceremonies for both girls and boys. After killing his first big game, a southern Numic boy would change name (Myers 1987:83). For a related archaeological example, CA-RIV-16 includes a number of intricate geometric elements painted during girls' puberty ceremonies (Whitley 1992b:95). Notably, motifs include zigzag lines and diamond chains, conventionalized abstractions of 'rattlesnake," which adolescent Luisēno and Cupeño girls painted in red (Kroeber 1908:174-176; Shaafsma 1985:260; Whitley 1992). Red pictographs are also connected with girls' puberty ceremonies for Chumash, Kawaiisu, Paiute, and Shoshone, among others (Steward 1929:207; Van Tilburg 2012:255-256).

Hopi clan sign petroglyphs discussed later in this chapter under ceremonialism were also produced in this context (Shaafsma 1985; Whitley 1992b, 2011; Garfinkel et al. 2016). Adolescents' initiations were not exclusively, or even necessarily, totemic ceremonies, however. Reasonably safe *Datura sp.* preparation requires experience, and this was but one of the many contributions made by shamans who instructed initiates through the experience (Whitley 1992b:94; Lewis-Williams 2002:119). In instances of the shamanistic puberty practices, pictographs depicted spirit helpers Numic initiates received in these visions, rather than a totem of a clan or moiety. Like the prospective use of rock art locations for hunting, access was overseen by a practiced these shamans. It should also be noted that although *Datura* is most often mentioned in research (usually by common name), tobacco (*Nicotiana sp.*) was used more widely and frequently, both alone and as a compliment to other ethnomedicinal plants; both plants may be subjects of rock art (e.g. Figure7. 15 Panel 39 element upper right corner for the former, linked chevron "centipedes" in Panel 34, upper left corner of Figure7. 7 for the latter).

While the initiates may have made the rock images themselves, thematic contents may well relate to instruction by the supervisory shaman. In this manner, widely shared myths such as the Series I, II, and III origin narratives, might manifest among the motifs. Myers (1987:82, 105) discusses several such puberty themes in Series I. First, Coyote's path from hunting rabbit, to marriage (or at the very least, coitus) requires him first to make a bow and successfully hunt a series of animals ending in bighorn. Second, the isolation of the woman Coyote pursues, and her mother, parallels the isolation a girl undergoes during her first menstruation (Myers 1987:93-94); similarly, the breaking of the *vagina dentata* also may also represent first menstruation (Myers (1987:96). It is on these grounds I have argued (Liwosz 2017:201) male initiates might embody Coyote, implying mythographic themes. For girls, the protagonist of Series II suggests this may be the more appropriate storyline, and both cases are discussed later; This is not to say, of course, that puberty-related rock art *must* demonstrate such themes, only that it might. INY-3074 shows evidence that would be consistent with this interpretation, with male puberty themes in Feature 2, Locus 3, and Locus 5, and possible femail puberty themes in Locus 8.

Hill (1992) reports on a nineteenth century manuscript by Nevada historical figure Sarah Winnemucca Hopkins (1883:46-47) as related to gendered floral imagery. According to Hopkins, a Spring Festival of Flowers included spotlighting Paiute girls named after flowers, and who were said to be “Seeing themselves in bloom” (Hill 1992:132-133). In addition to gifting actual flowers in the festival, hairstyle might also invoke flowers - as in the example of the Hopi “squash blossom” or “Lorentzen’s butterfly” whorl, for which references during Basketmaker III prior to 1000 BP have been established (*ibid*). Hopkins’ account of the Spring Festival of Flowers, although a distinctly seasonal ceremony, incorporates elements expressing fertility/fecundity similar to those Hill (1992:13) notes in Northern California.

As a side note, Hunt (1960) held parallels between Late Newberry/Early Gypsum Period assemblages for Death Valley III (ca. 2000 - 1000 BP) and Basketmaker II and III (spanning 1950 - 1250 BP) were more than superficial; if so Hopi and Numic gendered floral symbolism may not be unrelatable. References to the whorled hairstyle as butterfly, then, are probably not simply incidental. *Naraya* often invokes the green of pine trees (implicitly linked with femininity through pinyon), and in at least one instance is celebrated through “Pine tree butterfly” (Hill 1992:127). Butterfly’s colors are the dominant chromatic theme of a “prayer song,” belonging to the distinct genre of *puha hupia*, or “power songs” (Crum et al. 2001:148). In this instance, the Creator has become a white butterfly, implying the song invokes themes of death, the celestial Spirit World, and possibly by extension ancestors. Butterflies may also be represented as vertical zigzag lines or hourglass shapes, and in both instances the sign may double for lightning (Finger 2012:193). Revisiting commentary from Crum and Hill, this butterfly-lightning connection may be indicative of a chromatic conflation. Hourglass-like “Lorenz” forms comprise focal components of elements in Panels 15 and 65, in Loci 11 and 10, respectively (figure below). Butterfly iconography can thus be read as manifestations of weather control and celebrating the rainy season in the fertility sytem, and veneration of the Creator.

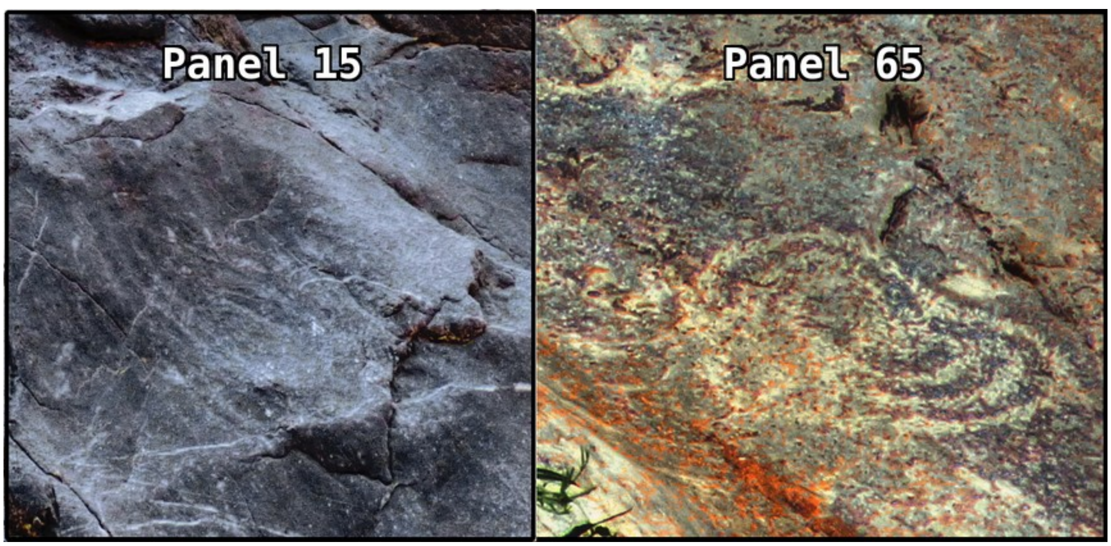

Figure7. 14: *Proposed butterfly iconography at INY-3074, Locus 12 (left) and Locus 13 (right), likely derived from patterns generated within the nervous system.*

On the criteria of red pictographs, INY-3074 features several in sheltered areas; in fact, it is the only pigment color known to have been used in the canyon. Thanks in part to a higher quality camera, and false-color image enhancement using both GIMP and DStretch (ImageJ) editing software, 12 new elements can be appended to the previously reported three (Liwosz 2014:429). In the Lower Canyon (Zone 1, Loci 1 - 6), a pictograph is documented for Locus 2 Panel 62, and another on Locus 6 Panel 47. Similarly, image enhancement has revealed another such pictograph in Locus 7 Panel 42. By far the densest concentration of painted images, however, is associated with Chamber 1's rockshelter. Including the three previously reported, at least 12 pictographs are found in Locus 8 (Chamber 2), all associated with the rockshelter. Whether the association is symbol, a preservation bias, or both is uncertain. Shelter area pictographs all are comprised of elaborate geometric forms (see Figure 6.5), similar to (but stylistically distinct from) those in Whitley's (1992b:94 figure 4) example of CA-RIV-16.

Previously, I have postulated the redness of the pictographs, and the isolation of the sheltered area paralleling isolation huts, connects Chamber 2 with girls' coming-of-age rites (Liwosz 2014:434). Petroglyphs may corroborate this, as there is also an element of intertwined wavy lines similar to the "rattlesnake" diamond chain. Acoustically, resonance in the female vocal register supports this interpretation (Liwosz 2017:201). Previously reported at 311 Hz, more in-depth analysis demonstrates the resonant band spanning 300 to 315 Hz is strongest when observed from the vicinity of the shelter's natural bench. This further refines the link between female register harmonics and the pictograph shelter. Despite the seemingly strong link, however, caution should be taken. Red pigment stones are also an important symbol group identity, and the namesake for both the immediate area's Timbisha-Shoshone tribe, and the root of the Timbisha name for Death Valley. Consequently, girls' puberty rites may not be the only reasonable explanation for the shelter's red pictographs. Like the cradleboard frame design in Panel 72, the pictographs may express femininity, or just Timbisha identity, or both.

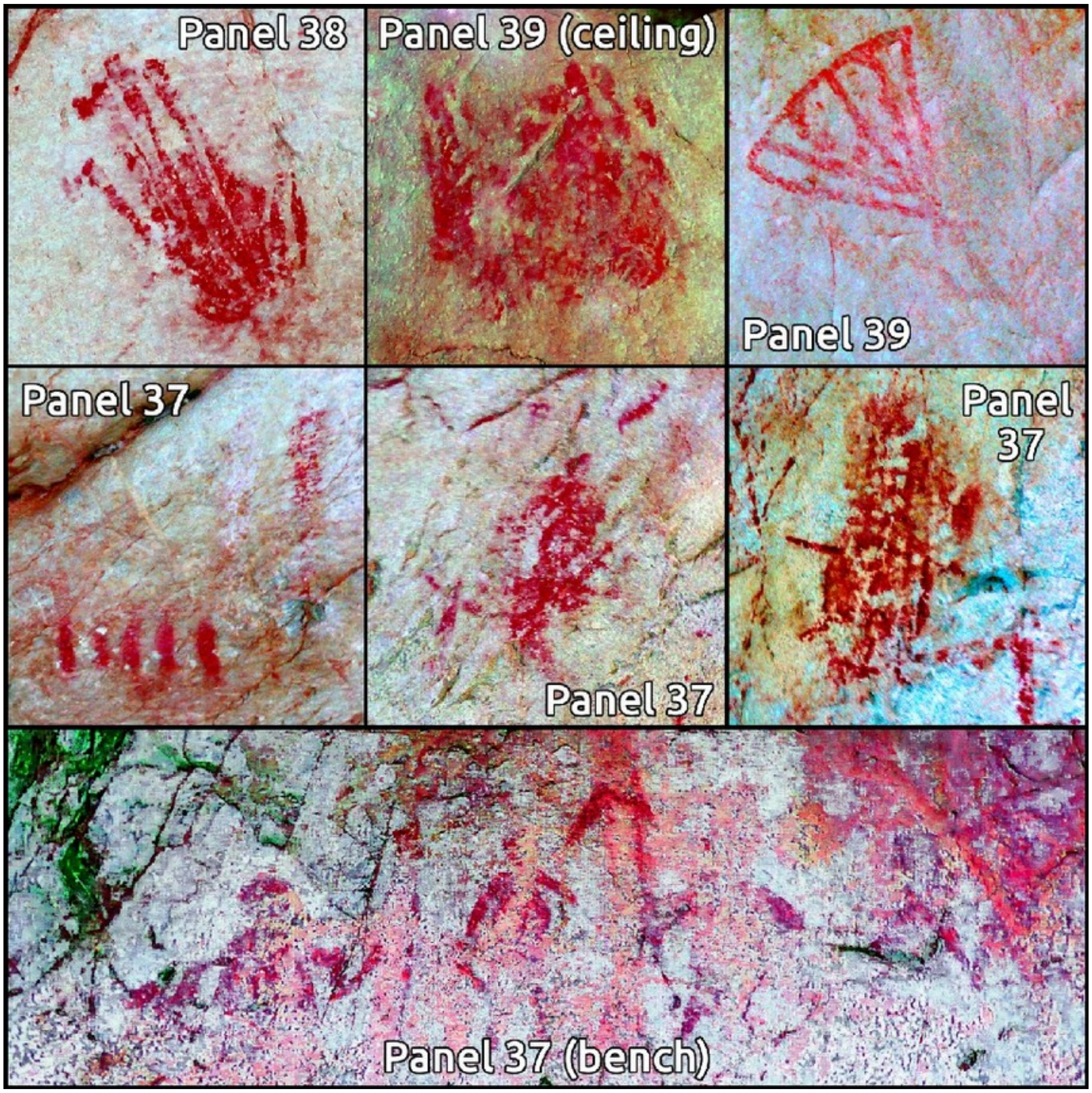

Figure7. 15: *False color images of select pictographs in Chamber 2 (Locus 8) rockshelter; images have been adjusted to try to preserve original redness of pigments, at the cost of distorting the limestone's color further. (software used: ImageJ, Dstretch, GIMP).*

Sexuality

Sexual maturity and virility inherent in adolescence ascendancy into adulthood also arise in concepts of world renewal. It is also a hallmark of ecstatic states of mind, entwining sexual arousal with the ASCs used ritually in the California shamanism (Whitley 2000a). Fecundity of people was symbolically tied to that of the surrounding habitat. Abundance directly impacts personal and group vitality, and this understanding is seen in both ceremonialism (e.g. Garfinkel et al. 2007; e.g. Garfinkel and Austin 2011; Garfinkel and Yohe 2012; Garfinkel et al. 2016) and shamanism (e.g. Lewis-Williams and Dowson 1988; Whitley 1992b, 1994; Lewis-Williams 2002; Keyser and Whitley 2006), both sharing the same set of religious metaphors.

Ceremonies celebrating seasonal observations would have highlighted these fertility themes, as proper weather would be required to ensure the next season's yield was to be sufficient. *Ovis canadensis* in particular played important symbolic roles. Firstly, the act of hunting was conceptualized not as *taking* life from the animal, but of *nurturing* life for those fed (e.g Whitley 1982; 1984; 1994; 2006). Moreover, Rutting season not only brought about dramatic displays of masculinity while rams competed for access over mates,[145] but also coincided with the coming of the rainy season (Myers 1987:96; Gilreath and Hildebrandt 2008). Area inhabitants noted these coinciding events codifying them into their religious systems (Whitley 2011:104-105).

Animal fertility themes are known in the region's rock art. Garfinkel and Austin (2011) interpret bighorn fertility is indicated as sexual receptivity in upturned tails, and as pregnancy in palimpsests wherein a more recent bighorn is infixed within a previously carved one. Infixing bighorn recursively is not one of the palipmsests seen at either INY-1634 or INY-3074, however sexuality is among plausible metaphors

145: and, implicitly, conspicuous displays of bighorn sheep sexuality immediately following.

implied by depictions of artiodactyl groups in both of this study's project areas.[146] Like for Coyote in Series I, hunting bighorn may be a symbol of male virility (Whitley 1994).

With neuropsychology formally connecting physiological manifestations of human sexuality to shamanistic elements in Numic religious practices, and informed analysis suggesting animal (*Ovis canadensis*) sexuality served symbolic significance in an overlapping indigenous fertility and renewal complex, the sexuality of other non-humans (express *naguales, genii loci*, and mythical progenitors) is also fittingly attested to manifesting (e.g. Allen 2011, 2013; Liwosz 2017). While inversion principles make congress with helper and place spirits not unlikely, agency inherent to *puha*-rich landscapes not just enchants, but animates land. INY-3074's Overlook feature boasts a natural ovoid void formed of moisture emerging from a fissure in the sedimentary substrate. With precedence for significance ascribed to landforms' genitalia (e.g. KER-508 in Sutton 2001; Lyon's Peak in Hayes-Gilpin 2005:203), the Overlook's dual invocations of both vulva in a wet recess, and phallus as atl-atl including the crack is still remarkable (see Figure6. 17, Figure6. 33, and Figure7. 16).

146: For the Little Lake project area: INY-1634, INY-1660, INY-3826, possibly others. For the Death Valley project, INY-3074 Panels 25, 33 – 36, 46, 49, 62, and 63.

Figure7. 16: *Cut-away view, INY-3074 Overlook 3D model, denoting vulvic void. View SW.*

Ideology, Iconography, and Symbolism

Ceremonialism, World Renewal, and "Increase" Rites

Numic and Pre-Numic rock art also at times expresses enactments of ceremonialism (e.g. Garfinkel et al. 2007, 2016; Garfinkel and Austin 2011), as defined as a theoretical model in Chapter 3, and as previously described from ethnographic, archaeological, and oral tradition records in Chapter 4 (see also Driver 1937:126; Steward 1938a, 1941; Miller 1983:79). As previously discussed in terms of political economy, the dual privileged and dutiful obligation to organize ceremonious inter-village events fell upon not any or everyone, but typically prominent and *puha* possessing community members like *puhakanti* (Shoshone), *pohagant* (Paiute), *huuiyagadi* (Kawaiisure), and non-doctor *pakwinavi.*[147,148] Poetry and songs *Pakwinavi* and *puhakanti* possessed were in fact central and essential to the success each gathering's dance. These events in part functioned to keep time in a calendar which was marked by annual circuits of mobile groups (Matheny et al. 1997; Brosman 2012), developing cohesion between inhabitants of adjacent rangelands. Dramatic collective experiences including these sorts of festivities have long been recognized to produce a shared sense of ecstacy Durkheim (1959[1912]) termed *collective effervescence* – an important mechanism in totemic religious practices that will be also be discussed.

Archaeological evidence of these gatherings often takes the form of rock alignments and geoglyphs of Eastern California's Earth Figure Tradition, the northernmost consistent expressions of which are in Death Valley (Whitley 2000a:48, 66-68). Features used for small-game trapping often would have been perishable material, so little material remains. For communal big game drives, however, evidence abounds – such as the the more than 100 corral and fence structures addressed by Hockett et al. (2012). These communal hunts would be preceded by the Round Dance, as known to have been the case at the Little Lake village of *Pagunda* (CA-INY-3826) prior to antelope drives a few kilometers north in Rose Valley.

147: A prestigious title awarded distinguished hunters or orator corresponding with the Uto-Aztecan traditions valuing poets and lyricists on a tier comparable to that of warriors (Hill 1992; Giambastiani et al. 2005:87).
148: Given the power of song, and event organizer's master-of-ceremonies role obliging oration and leading song, these titled positions may have had considerable overlap.

In Death Valley, the moniker “Kitchen rock” has widely been given to a boulder in Furnace Creek festooned with numerous unusually deep bedrock mortars (presumably from generations of re-use). Up into living memory among Timbisha Shoshone elders in 2010, this sacred stone was once the site of an annual ceremony celebrating the mesquite bean harvest. Although the development of tourist lodging and roads for the National Park have unintentionally redirected arroyo outflow and runoff to bury much of this central feature in alluvium, recognition of its importance (probably also by park staff and visitors, as well as Timbisha) can be observed by the nearly continuous replenishment of mesquite pod offerings.

Repeated reuse of dance venues during these gatherings – as would be expected for those linked with village locations and seasonal camps – may be responsible for some intaglio geoglyphs, such as the unusually dense clustering in Death Valley (Giambastiani et al. 2005). Just south of the transition between the Mojave and Colorado (River) Deserts, Altschul and Ezzo (1996) argue geoglyphs – Including the Blythe Intaglios (CA-RIV-13) and Pilot Knob (CA-IMP-6950) – served as stylistically self-identifying territorial markers and ceremonial focal points in a Yuman religious complex (including Kumeyaay, Mojave, and Quechan) whose landscape features facilitated integrating captives of conflicts into community building events during times of peak conflict. (Altschul and Ezzo 1996; Whitley 2011:128). If Numic ceremonialism included comparable components, then the geoglyph complex sprawling across Death Valley may have been integral in regulating conflict and developing Panamint Shoshone (and possibly Kawaiisu) identity circa ethnogenesis. Rock art, too, may have functioned in this way.

Comprising the western margin of Death Valley proper, the Panamint range hosts at least one rock art site believed to have hosted such ceremonial events during the Ethnohistoric period. CA-INY-1378 features a collection of highly iconic pictographs on a rockshelter panel, argued to depict a scene from – or (re-)enactment of – the 1890 Ghost Dance religious movement (Garfinkel et al. 2007).[149] Born out of the aforementioned Round Dance, the Ghost Dance movement occurred in two waves: the Ghost Dance of 1869-1870, and the Ghost Dance of 1889-1890. The 1889-1890 movement began during a shamanistic vision Paiute prophet Jack Wilson (*Wovoka*) had of the restoration of Americas (and expulsion of Euroamericans) during a solar eclipse in the late nineteenth century. Through its performance as a variant on the Round Dance, the Ghost Dance spread *Wovoka's* visionary message among Native communities throughout North America – including yet well beyond traditional Numic territories. Communicated through integrating participation of leaders and elders of other communities into performances, the syncretic Ghost Dance movement rapidly gained a following because it emerged on the heels of mid-eighteenth century devastation of Native American communities (and the natural resources upon which they relied) from foreign disease, displacement, encroachment of Euroamerican industries (e.g. mining, farming, forging), and outright violence (Carroll and Stoffle

149: For Ghost dance of 1869-1870, see notes on Wodziwob in Garfinkel et al. 2007:86-87

2003). Visible public expressions of the Ghost Dance ceased rapidly in tragedy, after a unit of the U.S. Army massacred almost 300 Lakota-Sioux (many among whom were Ghost Dancers) at Wounded Knee in December 1890, when deaf man Black Coyote could not hear federal agents' commands to surrender firearms (Kehoe 1989:23). Although the Wounded Knee Massacre is popularly believed to be the causal event in the waning of the Ghost Dance, Carroll and Stoffle (2003:149) assert the its abandonment was simply the result its prophesy not coming to fruition by spring of 1891. Evidence for Round Dance and Ghost Dance connections is briefly summarized here. Motifs connected with its expression are discernible in at INY-3074, especially in Loci 8 and 18. The significance is described in verbal symbolism.

Totemism

Ceremonialism in Mojave, and especially around Coso Range and Death Valley, seems to have grown out of an old and enduring religious tradition involving the Round Dance/Circle Dance, sometimes held in conjunction with (among other occasions) essentially a send-off for communal hunting drives. To recap the concept as discussed in Chapters 3 and 4, the specific case for totemism in the Southwest Great Basin examines connections between petroglyph production rituals, a split-twig figurine from CA-SBR-199, and supported evidence of the development of a hunting moiety in aboriginal Arizona's Grand Canyon area between 4100 BP and 3100 to 3000 BP, calibrated (Coulam and Schrodel 2004; Garfinkel et al. 2016).[150] Whether

150: Bettinger (2015:125) observes that for instances in indigenous California in moieties developed, they did so with a stronger preference for patrilineal-patrilocal groups with a motivated by game population decline (as long proposed) due to the the introduction of the bow-and-arrow encouraging overhunting (e.g Gilreath and Hildebrandt 1997, 2008), or from climate fluctuations during the MCA, several research consider Coso Rock art intensification as a possible outgrowth of fertility ceremonialism adapted to petition an Archaic Animal Master predecessor to current Kawaiisu *Yahwera,* then manifested as Bighorn sheep,[151] to restore fertility to game and the world (e.g. Garfinkel and Yohe 2012; Van Tilburg et al. 2012; Garfinkel et al. 2016; c.f. Whitley 2011:122).

One of the benefits of Garfinkel and associates' (2016) adaptation of Coulam and Schroedl's totemism proposition is that is explores the Mojave Desert-Puebloan interactions often overlooked. It would superficially seem to support Hunt's (1960) propositions. Unfortunately, the path is not so direct, and Newberry Cave is far enough south that an exchange route would likely bypass Death Valley entirely. [152]

Although the Death Valley slot canyon's secluded and restricted access suggests it is unlikely to be compatible with the magico-religious totemism of Coulam and Schroedl's identified case in the Grand Canyon, the Owens River gorge's Amphitheater (Locus 5 for photogrammetry and acoustical survey) would be the more public of the two places (a criteria discerning magico-religious moiety from

predilection for inter-group raiding, effectively mediating conflict. only the Goshiute Shoshone of Utah are known to have regularly followed the post-marital residency pattern, and Numa invariably prefer bilateral reckoning to either paternal or maternal unilineal descent (Bettinger 2015:89).

151: Presumably in the proper-noun sense, as with animal-people from the time before *Newe*.

152: However the southerly route brings the SBR-199 figurine near or into traditional territory of Cahuilla, who did have moieties, at least millennia later (Bettinger 2015:124).

secular kinship and clan). If the INY-1634 canyon's "Amphitheater" area access and ingress were not as much of a hindrance as in reality, its audible resonant band of between 220 and 250 Hz (just below the western scale's "Middle C") would likely readily welcome harmonizing with virtually any singer's vocal range.[153]

Founded upon arguments derived from cultural materials and expressly visual cultural representations in animal iconography as opposed artistic verbal expression, however, the "increase totemism" model lends itself more to iconography-based evidence than to acoustics. Locus 1 appropriately contains at least two, and likely three "bighorn" or other ungulate elements, confirming imagery of big game. Such a ceremonial venue, however, need not be at the falls itself. Already in this section, the discussion has covered evidence confirming Little Lake's village *Pagunda* hosted Round Dance gatherings prior to hunts further north up Rose Valley. Combining data for all loci at Little Lake sites INY-182, INY-205, INY-388, INY-389, and INY-3826, bighorn sheep elements account for 246 (250, if we are to add in the gorge) of the 4,901 documented elements (Van Tilburg et al. 2012:45, 55) - or about five percent.[154] Similarly, 24 bighorn and/or ungulate motifs have been reported among the 346 distinguishable elements the INY-3074 slot canyon (Liwosz 2014:432-433), accounting for seven percent of total rock art corpus. Revised with data from 2016, 28 ungulate images among 417 elements amount to the same percentage (6.8%). This

153: Presuming the proposed hunting moiety expressed its role in the cross-cultural fertility complex in some musical manner recognizably relatable to ethnographic patterns at all.
154: Discounting scratched and painted designs, only counting pecked petroglyphs, this changes slightly to 6% out of the 4,112, much closer to the INY-3074 figure.

proportion is smaller than what would be expected for an institution that might dominate up to have of ritualized practices.

Figure7. 17: *Series of leaping sheep in Chamber 1, Panel 36. Note lizard motif (middle) infixed in a rounded square box at a diagonal angle.*

Although moieties and totemic rock art are known among Uto-Aztecan Hopi and their predecessors in the Colorado Plateau and its famous canyons, (e.g. Coulam and Schroedl 2004), Whitley (2011:106, 122-131) remains critical of its application to the Numa and the Coso region, not finding sufficient evidence of a requisite second moiety to engage in this formal system of obligation and interdependence. Yet, even closer totemic neighbors, Yokuts of the Sierra Nevadas, sustained cultural exchange with Numic Mono and Owens Valley Paiute. Interestingly, members of Yokuts society also practiced shamanism and produced shamanistic rock art (Steward 1929; Whitley 2000b; Keyser and Whitley 2006; Whitley and Whitley 2012). Hypothetical

Parallels to Yokuts implicitly gendered moieties in which *tokelywich* is associated with snakes, and *nutuwich* with grizzly (Whitley 1992b:102; Whitley 2011:106). Both schematic and stylized snake imagery are ubiquitous,[155] but bighorn as as grizzly substitute would need to compete with Coyote as the current-day Numic animal-person progenitor (e.g. Myers 1987, 1997). Even if increase totemism fails to find in the Northern Mojave the wealth of evidence it is reputed to possess in the Colorado Plateau, the moiety-as-mediation concept offers opportunity to explore and improve as yet underdeveloped areas of inquiry into Eastern California's interplay between mobile groups and a propensity for successive waves of syncretic religious horizons.

Phenomenology

Vision and optical illusions

The neuropsychological approach encourages considering a full suite of sensory phenomena, and so this section delves into the interactions between natural and cultural properties of the research locations. Both canyons studied conspicuously deviate from the ordinary, and the psychological implications of these differences are likely to have resulted in them accruing cultural significance. Upon entry into each of these canyons, towering bedrock walls occlude the more ordinary landscapes beyond, functionally separating them from the mundane in the same way as a cave. As discussed in the ethnographic commentary chapter, caves were the setting of many oral traditions (e.g. Lowie 1924; Whitley 1992b, 2000b, 2004; Smith and Hayes

155: An exact count is uncertain, however, as interpreting all meandering curving lines as snakes is not presently an adequately supported inference to make.

1993; Waller 2000, 2004; Garfinkel et al. 2009; Garfinkel and Waller 2012). Entry signal a departure from the mundane world and transportation into a realm inhabited by malevolent sorceresses, powerful personifications of water and stone, and beings like the Animal Master. To exit is to again be transported, and several of these oral traditions specify that the person's place of emergence may be seemingly impossibly far from when they entered.

Both the Death Valley and Little Lake landscapes hosting the study sites operate to give this effect. For the INY-3074, the canyon floor is entirely obscured from the valley (except for the Overlook). An observer approaching from the bajada might not even be able to discern any shadows on the canyon walls after early morning, as if the mountainside closed back up on passage, or as if there was never a canyon there at all. Even at the canyon mouth, the entrance is not visible until the observer stands almost immediately in front of panels 1 and 2.

Similarly, to approach the INY-1634 from the north, or following the dessicated Owens River, is equally misleading. Basalt ridges on the order of 2 to 5 m tall stretch lengthwise and adjacent to the riverbed for kilometers leading up to the canyon; an even denser multicursal labyrinth of spires, boulders, and pits dominate the dessicated riverbed towards the head of the canyon. The obstructed view is compounded by brush and other vegetation. A hiker unaware of the presence of the gorge will not be able to discern it until only a few dozen meters away. This effect is magnified at nighttime, when the background foothills of the Sierra Nevada disappear into shadow, and the loss of resolution and color perception commensurate with very low lighting makes resolving brush from basalt monoliths nearly impossible at a distance. Under these conditions (tested and verified during the course of this project), the protuberances at the top of the first locus blend in with the camouflage of brush, and it is surprisingly easy to unwittingly enter the voids at the canyon head before realizing that one is entering a gorge. For someone unfamiliar with this spot, the illusion could well invoke a massive rocky mouth engulfing the observer, like *Togoav* the rattlesnake swallowing *Teugai* the *tsoavwits* (*tso'apittse*) (e.g. Powell 1881; Lowie 1924; Smith and Hayes 1993; Waller 2000, 2004).

Figure7. 18: *Recreational area on tablelands above the Little Lake gorge in the low lighting of dusk, demonstrating the landforms and vegetation which contribute to optical illusions.*

In both instances, the ways in which landforms seem to open to reveal, and envelope to conceal the canyons indicates these places elicited the perception of their animacy, thus granting them agency. As observed from different perspectives, the canyons aren’t just *there*, static as the rest of the rocks, but they *do*, both in motion and by deception. As I have previously argued (Liwosz 2017:198), the indigenous attribution of *puha* (or *poha*) at particular places is equivalent to agency. Hultkrantz (1983, 1987) informs us ‘spirits’ are other-than-human embodiments of this *puha* revealing itself. Whether crying *po’ohmaa*, dangerous *pandzoavits*, taunting *Teugai*, wiley *Itsappü*, or revitalizing *Yahwera*, voices, noises, and actions of these other-than-humans from apparently the other side of stone surfaces personify the agential landscapes of waterways, which received their animacy (according to Huffman and Early 2017) from the Sun Spider, when it distributed *puha* by weaving a web at the time of creation, before humans walked the earth.

The causality of landscape animacy, it must be concluded, is not so much brought about by humans socializing the landscape, as it is granted by nature prior to people. Petroglyphs may indicate - even reinforce - the animacy of place, but only in so much as they explicitly reveal what has been implicit and inherent since time immemorial. Before the first petroglyph was placed, each of these canyons already acted, already inhabited by some resident other-than-human agent.

As beings associated with rock art sites, Water Babies overtly personify both *puha* and the presence and actions of water, the most obvious expression being in the surface water at pools and potholes that turn both canyons into oases, even well into the dry season. Perhaps one of these supernatural agents is responsible for an optical illusion at INY-3074’s Locus 1, where marbled, colorful patterns in Formation A’s metamorphosed matrix look like shimmering reflections off some rippling water surface (see Figure7. 19). Advertising standing water (presumably in the plunge pools of the First Chute), the canyon pulls a hat trick to reveal only dry stone and dusty gravel in opening its mouth as the observer arrives.[156] Conversely, a person emerging from the canyon mouth out through the First Chute would seem to emerge from a spring of water without getting wet, as in ethnographic reports of power quests at the Animal Master's house (e.g. Whitley 2000a:79). At this point, one can almost hear some shaman's spirit helper, or perhaps *Tso'apittse* herself cackling with laughter at such a deception. Repetition of the wavy line "waterfall" or "rain" motif here on adjacent panels 2 and 4 further emphasizes a connection with conjuring water[157].

156: Deeper inside, however, water might actually still pool, as was the case in the Third and Fifth Chutes in both August 2014 and early September 2016.
157: Perhaps also the product of some shaman's sense of humor, aiding INY-3074 in luring strangers with unfulfilled promises of pools

Figure7. 19: *INY-3074, Locus 1, canyon mouth, with arrow indicating the illusion of reflections off standing water. View ESE.*

Petroglyphs and pictographs themselves, it would seem, were neither unimportant nor entirely inanimate. Ethnographic evidence from all around central, southern, and eastern California nearly invariably correlates rock images with shamans' caches (e.g. Gayton 1930, 1948; Driver 1937; Kelly 1938; Whitley and Whitley 2012:259-261). Much as the INY-1634 and INY-3074 canyons open or conceal themselves, Gayton (1948:113) reports that a shaman's cache might be inside a crack in a cliff, and that the shaman could command it open. Petroglyphs are among the attributes that shape the sociality of the rock formations, and contents; they mediate between people and place, establishing expectations and constraining actions of shamans and non-shamans at these places.

By invoking extraordinary other-than-humans of oral traditions, parietal art of the Mojave and Basin separate the quotidian world of desert pavement or brushland outside with religiously significant spaces (see Carroll et al. 2004:134).

Figure7. 20: *Proposed labyrinth motif (notice fringe and feather below)*

In light of this ethnographic evidence, we have sufficiently supported grounds on which to propose an approximate reading of INY-3074's prominent panel 1. A labyrinth design (see Figure6. 11, Figure6. 12, Figure7. 20, and Figure7. 25) immediately to the right of a prominent crack is the most visible element on a prominent panel, which itself is immediately to the right of the opening leading up into the canyon. In popular non-fiction (e.g. Least Heat-Moon 1982), a remarkably similar motif is identified by a young Hopi man as symbolizing a spiritual journey. Matching recursive cartographic and micro-cartographic contexts of this element at the mouth of the Death Valley slot canyon correspond with the start of such a journey.

The labyrinth element explains through its connection with the crevice, that an adjacent crevasse is the start of such a journey into the physical labyrinth stretching for another half a kilometer deep into the mountain. Immediately below the labyrinth-crevice sign, a variant on the fringe motif waits where a central wavy line exits the labyrinth's vortex-like recurving layers. Following the cue of the fringe to wait and meditate (see Miller 1983:78; Huffman and Early 2017:17), the following explores implications as suggested by oral tradition, before delving yet deeper into Uto-Aztecan cosmology.

To understand the association comprising the crack-labyrinth relationship with the illusion of the canyon opening is to possess the power of which Gayton (1930, 1948), Whitley and Whitley (2012) reported shamans possessing – to command the crack to open up the slot which itself only becomes apparent at close enough proximity to resolve this panel's imagery. Canyons, as an *agential* features of nature, inherently have the capacity to engage socially. The social interaction between canyon and climber is mediated by signs, and at INY-3074, the introductory sign is comprised of the natural fissure and artificial labyrinth element. For those initiated into the relevant symbolic system, the crack-labyrinth-fringe conflation abducts a bit of agency in order to communicate the complex suite of implications: "Pause and reflect. This opening leads to a disorienting, subterranean world, inhabited by dangerously powerful beings."[158] Past this sign are *anits* – other-than-human agents

158: "Here there be monsters"

personifying *puha* – capable of harm (although not necessarily truly malevolent) would be anticipated: *po'ohmaa*'s cries might lead a person to drowning during a flash flood, *pandzoavits* might pummel the climber who slips and smacks solid stone,[159] *Tso'apittse* might even mock the injured climber's cries of pain, or some unknown shaman's *naguales* might manifest to punish the trespasser. All of these other-than-humans potentially personify the same agency and animacy of the canyon interior; they are candidate minotaurs (metaphorically) that the visionary must be both bold enough and adequately equipped to face, according to the labyrinth design.

Sound Shaping Perceptions

Acoustic effects are another expression of this apparent landscape agency and its personified projections in a context of discursive sociality, and Numic oral tradition provides ample references to infer its recognition and personification. Additionally, shamanistic practices within public (ceremonial) and private (puberty and crisis rites; power quests) spheres lend precedence to the application of the neuropsychology model. Beyond the by now obvious ascription of perceiving distant echoes as a voice at, inside, or beyond the reflecting surface, psychoacoustics establishes that echoes separated from the impulse by an exceptionally short period of time – 50 ms or less – result in the 'precedence effect,' which can confuse the perception of the direction and source of the sound (Litovsky et al. 1999, in DÍaz-Andreu and Mattioli 2014:1049). Echoes under this threshold are recorded for virtually every tested

159: Like the head injury Coyote suffered during magical flight in Series III.

interior locus at INY-3074 with petroglyphs, but was not indicated at the Owens River gorge, thereby correlating the more dense distribution of drawings with places possessing more disorienting sounds. Direct echoes, alone, are just the start of the search for spirit voices.

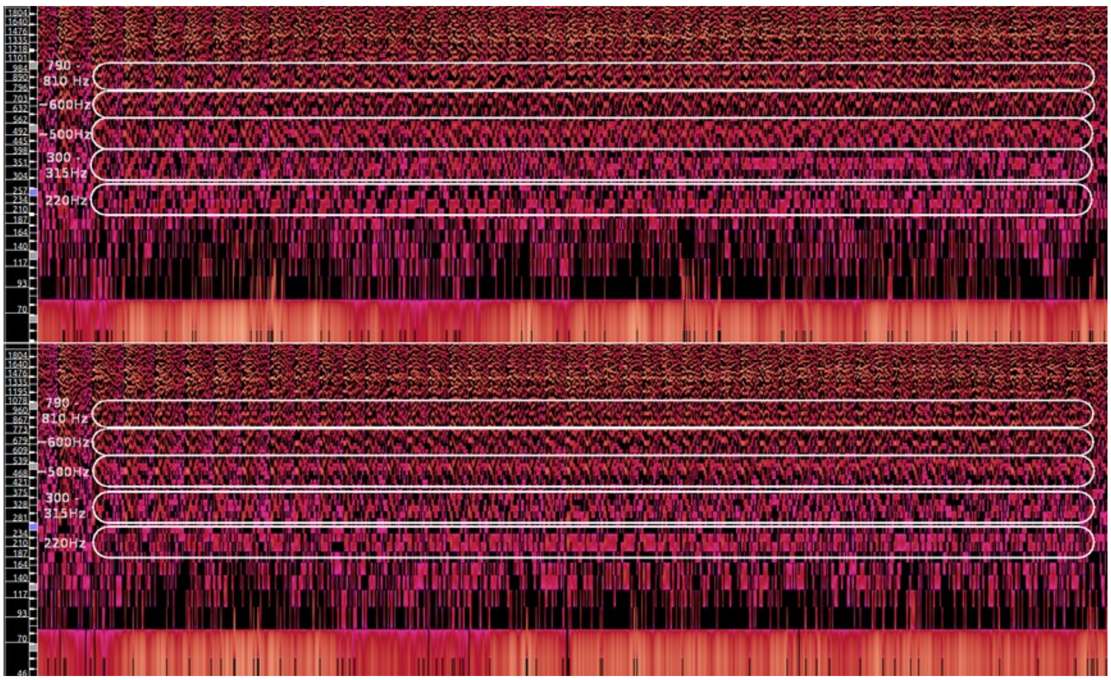

Figure7. 21: *INY-3074 Chamber 2 (Locus 8), stereo spectrogram emphasizing select peak harmonic bands in the vocal range (220, 300-315, 500, 600, and 790-810 Hz).*

Continuous sound impulses can build reverberation, turning sound perception into a synesthetic sense of haptic audio (Conkey 2009:188); spectrograms from INY-3074 visually demonstrate this in action (e.g. Figure7. 21, Figure7. 22). In addition to percussive pounding, both shamanic and ceremonial expressions relied heavily on song as a medium of expression and communication. Whether the initial sound is rhythmic percussion, singing, or musical instruments, some closed spaces (either fully or partially) will preferentially emphasize harmonic tones with wavelengths that are integer functions of one or more of the enclosed area's dimensions. In an animic ontology, this could well be perceived not just as a reply, but as if something in the location is singing back – much like *Tso'apittse* and the basket-maker in the rock. These other-than-human *puha* personifications may grant song on the 'vision' quest through harmonizing with a singer. From the best observation point the INY-3074's Chamber 2 – right in from of, or perhaps seated on the shelter bench – a singer should hear extra harmony for notes around 220 Hz, 300-315 Hz, 500 Hz, 600 Hz, and 790-810 Hz (Figure7. 21). Similarly, the Grotto Gallery's harmonic bands include 220 Hz, 350 Hz, 435-450 Hz, 610 Hz, 750 Hz, and others (Figure7. 22).

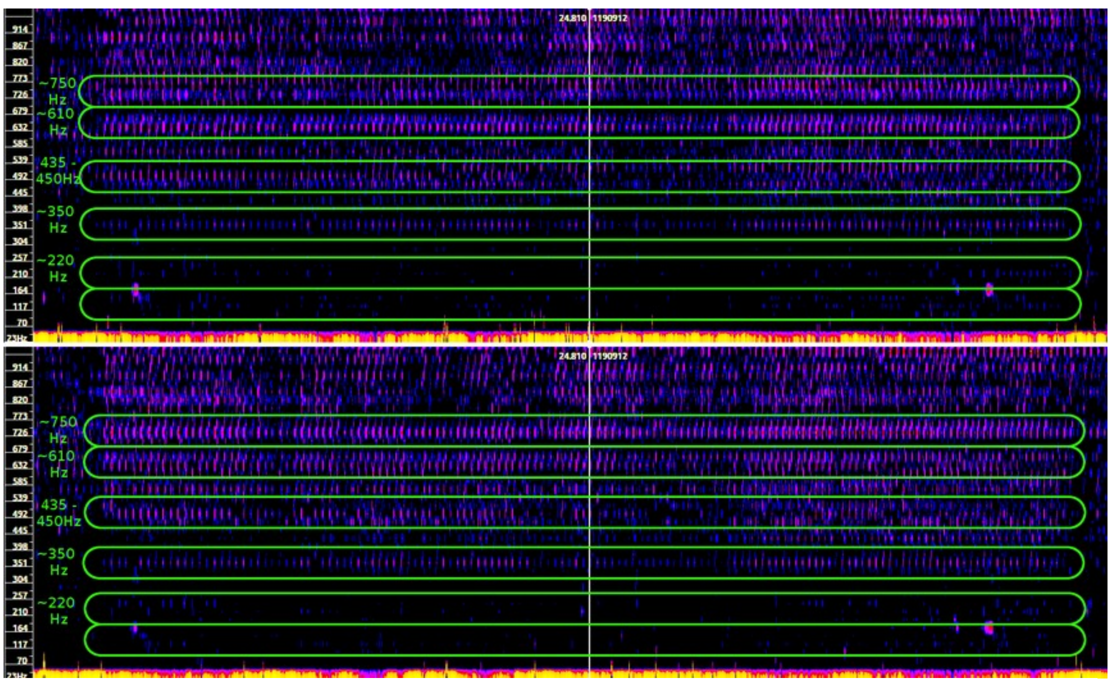

Figure7. 22: *INY-3074 Grotto Gallery (Locus 18), stereo spectrogram of select peak harmonic bands in the vocal range (220, 350, 435-450, 610, and 750 Hz).*

The Grotto Gallery's properties even more explicitly emphasize the implications of a synesthesia integrating sound with haptics and vision. Experiments using only audio driving from rapid percussion produced the above demonstrated audible resonance. The organizing effects of standing waves seem also to have brought about infrasound well below human hearing at 9-10Hz.[160] At this level, sound is a perceptible vibration, an accompaniment to the vibrations running up the arms from the pounding. Ongoing sensation with signals between 8-13 Hz has the ability to resonate with brain activity, (particularly Alpha Waves), which have been suggested to be involved in visual perception, as well as creativity (Marshall 2016:50).[161] Disinhibited altered states increase the likelihood of sensory cross-talk of the kind suggested. Combined with the precedence effect of sound reflections in almost all directions, and spending much time in an actively resonating place like the Grotto Gallery has the demonstrable capacity to confuse orientation, impress a sense of another presence sharing the space (or just behind the “snakeskin” of the rock surface), and even alter the visual field. In short, it is powerful to experience.

Extrasomatic experience

Beyond bodily experience, alterations to perception can extend proprioception well beyond the limits of limbs, inducing out-of-body an experience. Whitley (1994; 1998) has indicated signs of it in Coso rock art, via criteria also related by Lewis-Williams (2002). Sometimes called “magical flight,” extreme dissociation can lead to a sense of separation from one’s body (Lewis-Willams 2002). Iconographically, this

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160: 2016 Locus 18 percussion experiments were repeated seven times, and analysis detected an infrasound signal between 8 Hz to 11 Hz in six of the seven.
161: For more information on neurological mechanisms for synesthesia, see Sagiv and Ward (2006).

may be identified, as Whitley (1994) indicates, in the frequent bird feet of Coso patterned-body anthropomorphs, as a metaphor. The trance-is-flight metaphor is recorded in the Series III origin, when Coyote uses goose feathers to take flight. It may be difficult to unambiguously identify, but given the prevalent use of feathers for Numic rain rites and chromaticism, it certainly bears considering. This should be considered another possible of implication of feathers, discussed below.

Immediately following the magical flight, Coyote goes through another signature metaphor for altered states of perception: out-of-body experience as death. This, too, is a known metaphor for trance, and a common theme in California shamanism (Whitley 1998; 2000a:109-111). It is implicit in the story of the crisis quest to see *Yahwera*, and symbolized in several ways, beginning with entry into the underworld. In Numic iconography from the Tehachapi Mountains (hosting Back Canyon in Figure1. 1) through the Coso Range, death and death-as-trance are elaborately symbolized by imagery paralleled by the *Yahwera* crisis quest oral tradition. This informed understanding of patterned-body anthropomorph iconography, discussed later, identifies iconographic markers as darkness, the color black, and snakes (especially as doorways or portals). To this list, lizards could be added, as they appear shuttling an entranced figure out from one crack and into another, alongside a snake, as CA-INY-282. These are sub-headings under the next topic, Uto-Aztecan Verbal Symbolism, where the visual (especially chromatic), auditory, and extra-somatic aspects are related in terms of song and song acquisition.

Uto-Aztecan Verbal Symbolism

Narration, oration, and song

Valued highest among verbal art forms, song was central nearly all Uto-Aztecan individual, shamanistic, and collective religious practices (Hill 1992:120). Songs may be learned and recited, or acquired spontaneously through dreams and visions, especially when granted by spirits (Gayton 1948:168-169; Whitley and Whitley 2012:261). The case of a First Nations man, Isaac Tens, who recounted an event in which the "chants forced themselves out," demonstrates the utility of disinhibition in song acquisition (Lewis-Williams 2002:273). This experience would be consistent with the glossolalia phenomenon, a behavior linked with disinhibited and ecstatic states in which a person vocalizes fluidly without intending to form specific or recognizable words. Evidence of glossolalia may be encoded in Numic songs as vocables - sequences of sounds and syllabus filling out rhythmic expressions rather than communicating through words (Hill 1992:123). Vocables may consequently increase in frequency within more newly acquired songs, indexing age in inverse proportion to the time since the moment of creative innovation - a moment which seems most likely to have coincided with a shamanistic experience during *puha* acquisition.

Naraya (*Natayaa hupia* or *Nua hupia*) songs, by contrast, are dominated not by vocables, but by richly developed imagery (Hill 1992:127; c.f. Crum 1980; Crum et al. 2001). These poetry songs belong to the Round Dance tradition, but variants upon them spread among many indigenous North American communities during the Ghost

Dance movement (Crum 1980; Vander 1996; Crum et al. 2001). Elaborate verbal symbolism in *Naraya* is inferred indicative of refinement with age, and links with an old tradition which has over time acquired the layered symbolism. As covered in the ethnographic commentary chapter, the *Naraya* genre of Round Dance song was among the most potent, containing allusions indicative of an enduring tradition grown out of Old Uto-Azteca (Crum 1980; Hill 1992:127; Vander 1997). Because of the enduring roots of *Naraya*, its rich symbolic contents, and implicit associations with rock art sites in the general vicinity, this body of oral traditions is useful in establishing a symbolic baseline spanning from the Historic Period back to Old Uto-Azteca. It is evident in the INY-3074 canyon, where Chamber 4's Panel 12 (Figure7. 23) demonstrates remarkable similarity in composition and style with a more elaborate Shoshone/Kawaiisu scene established to portray Ghost Dance themes and performance at CA-INY-1378, in the Panamint Range (Garfinkel et al. 2007). This does not necessarily mean INY-3074 hosted events, as alternatively it may have granted the *puhakanti* or *pakwinavi* the inspiration for the songs performed at other venues. Gayton (1930:68) describes a a central pole used in the Round Dance functioning as an *axis mundi*. While Van Tilburg (2012:172) suggests the bisected circle motif represents this I disagree. Instead, the anthropomorphic dendroglyph in INY-3074 Chamber 2 Panel 37 (Figure6. 28) demonstrates the required principles of linking multiple cosmological strata; With its feet grounded on the bench, its appendages hold blossoms of the heavenly Flowery Path (see upcoming discussion of the Flower World Complex), thereby transiting through the cosmic tiers. It is accompanied by a similar yet more vague element next to it, arguably of the same function. The form of the anthropomorphic dendroglyph can be extended to Chamber 4 Panel 12, where the elongated anthropomorph can be interpreted as the same sort of pole, further reinforcing connections between INY-3074 and the Panamint Ghost Dance Scene at INY-1378. The Round Dance pole – and perhaps its Great Plains synchretic Sun Dance iteration (e.g. Hultkrantz 1987) – is indicated to be an animate *axis mundi*, an iteration of the personified *puha* Hultkrantz described, and and index of people perceiving the power of collective effervscence during dance. The Death Valley slot canyon is thus directly connected to the *Naraya* tradition, whether the source of the song or the hosting venue, is thus highly supportable.

Figure7. 23: *INY-3074 Panel 12, with similar composition (grouping and spacing of anthropomorphs) and style (elongated body) to Ghost Dance scene at nearby INY-1378. Originally published in Liwosz (2017:193, figure 11), reproduced with permission by author*

Chromaticism: metaphors for flowers, feathers, and flames

Allen (2011:19) observes, "the archaeology of color is yet in its infancy." In pioneering this chromatic archaeology for Mojave Desert landscapes, Allen (2011:20) applies Kawaiisu oral tradition to Red Rock Canyon, Sage Canyon, and Pilot Knot. Similarly, suspected ceremonial sites offer excellent opportunities to test chromatic connections. As organizers in the ceremonial complex, *pakwinavi* and *puhakanti* performed obligatory songs during communal dances. Songs ranged from deep-running traditions like the Round Dance's *Naraya/Natayaa/Nua hupia*[162], to newer lyrical innovations.[163] Mutable, songs evolved over time, as exemplified by the historic Ghost Dance movement emerging out of the Round Dance's *Naraya*.

Flower World Complex, and possible influences

One of the broadest patterns across Uto-Azteca (and along many margins of significant cultural exchange with neighboring ethno-linguistic lineages) in chromatic signification is that of the Flower World Complex. Hill (1992:122) specifies five discrete criteria to distinguish Flower World *sensu stricto* from floral symbolism more broadly, as related in the table below.[164]

For northern Uto-Aztecan margins, and Southern California generally, the Flower World Complex is indicated but incomplete (Hill 1992:137). Common floral

162: *hupia* meaning song
163: Although any particular recurring festival was likely to replay core song(s) from the same tradition(s) iteration upon iteration, traditions such Round Dance songs did not necessarily belong exclusively to one specific ceremonial genre.
164: Although Hill (1992:125-126) specifically addresses verbal traditions, Flower World symbolism is also substantiated in visual culture (e.g. Hayes-Gilpin and and Hill 1999)

metaphors in the complex may not all be present, however the structure of metaphors may yet be present. This is especially the case Numic and Takic traditions.

Table 7.2 : Discrete criteria for instances of Flower World Complex symbolism (Hill 1992:122)

Criterion	Qualities
1	Song are the most appropriate verbal genre, but oration also occasionally qualifies
2	Flowers and the act of flowering invoke the Spirit Land[165], and especially a Flowery Path (or trail), and floral architecture
3	Biologically, flowers may represent literal flowers, human hearts, vital fluids or force, and organs of perception
4	Flower-fire connections, e.g. fire "blossoms," flowers "burst into flame," etc.
5	Flowers express gender identity, fecundity, beauty, strength, and spirituality

For the second criterion, Numic songs generally give little reference, however floral imagery is most present in the *Naraya* tradition, where flowers bloom in the spirit world[166] (e.g. Crum 1980; Liljeblad 1986; Crum et al. 2001; Vander 2006). Based upon Flower Trail expressions in northern Uto-Azteca,[167] and a Wintu (north-central California) dream song, Hill (1992:125) suggests Nicols' (1981) concept of "Old California" fits an earlier expression of the Flower World complex proliferating among ancestors of ethnohistoric peoples, whose religious symbolism differed.

165: Implicitly as a celestial realm, rather than underworld
166: Hill (1992) does not consider *Naraya* truly a Flower World Complex expression, although he allows it might have grown out of one earlier.
167:Pima and Tohono O'odham express the Flower World and Spirit Land in allusions to a Flower Trail or Flowery Road, especially when used to name the Milky Way (Hill 1992:121).

These changes in symbolic systems likely occurred in conjunction with the *Chinigchinich* cult, which supplanted floral with astronomic chromatic metaphors, emphasizing an anthropomorphic Milky Way (Hill 1992:130).[168] Consequently, *Naraya* references to the Milky Way as the ancestral road are not circumstantial.

INY-3074 chronicles this shift constructing galactic chromatic metaphors, most overtly in Chamber 2. The Chamber's rockshelter preserves red pigment on white limestone (Figure7. 15) as color compliments to white stippling on patina-darkened symbolically black exposed substrates. Chamber 2's long linear bands terminating in an astronomical reference as the Milky Way (explained in fuller detail in the later archaeoastronomy discussion) contextualize this connection. The bench's Panel 37 linear arrangement of floral rosettes[169] marks continuity in understanding between the Archaic Uto-Aztecan Flowery Path, and later Numic celestial chromaticism. Both the row of rosettes, and the Milky Way bands join into a faint natural porous line along a fine fissure[170] in the bedrock between the shelter bench and the Fourth Chute (Figure7. 24), blending between, and linking together, natural with cultural elements, as well as time periods.

168: Another syncretic event seems to be a Native Californian cremation cult spread by Yuman influence between 650 and 750 BP. A Takic Cupeño "Death Song" tells of Old Coyote taking the heart of Mukat from his funeral pyre as the fire "was blooming" (Hill 1992: 131-132). Possibly multiple crossovers, see footnote #106 in ethnogenesis remembered.
169: The namesake for this dissertation
170: Tangentially, this same fissure as it extends east out of Chamber 2 seems to have played a direct role in the formation of the Fourth Chute.

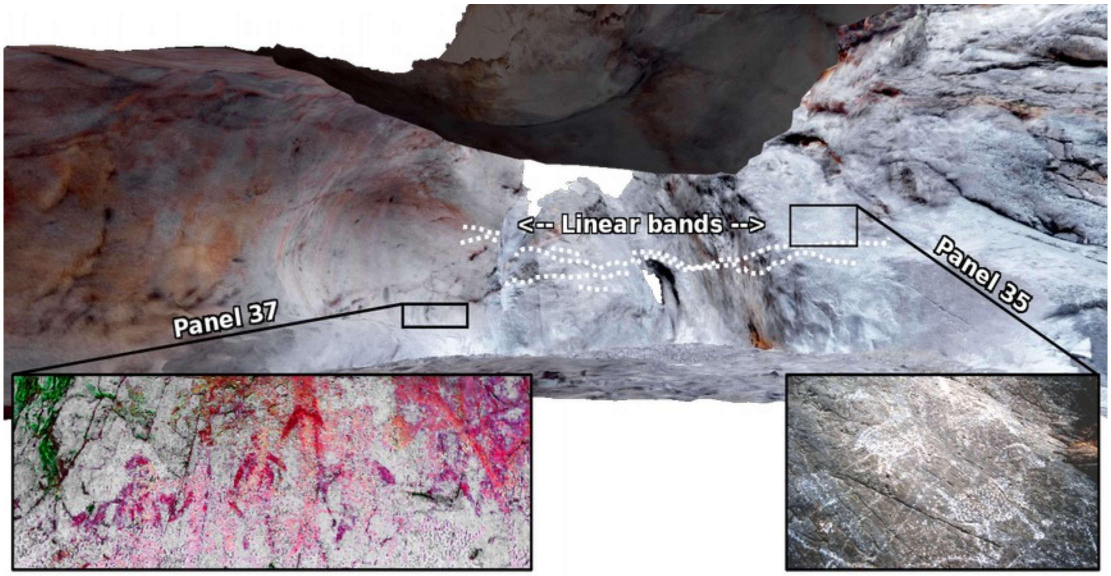


Figure7. 24: *Virtual panorama of Chamber 2, illustrating linear bands linking Panel 37 floral bench rosettes (left inset, DStretch) with Panel 35 constellation (right inset). camera positioned at west end of shelter, in front of fire staining, view ESE.*

Outside of inheritance from the Flower World *sensu stricto*, Numic floral chromaticism is conspicuously enhanced by use of the entheogen *Datura inoxia,* which is likely the "medicinal root" referred to in at least one *Naraya* song (Hill 1992:127). Blooms viewed from the side have a trumpet or bell-shape, and the flower buds have a distinct spiral pattern piror to opening. Chamber 2's pictographs may depict highly stylized renditions of jimsonweed, as shown in Figure7. 15. Panel 38, and more likely Panel 39 (upper right corner) both show distinctive bell shapes. Where the lower portion of Panel 37 meets the shelter's bench (bottom), concentric round shapes with opposed openings on their margins have some resemblance to the closed or partially opened *Datura* flower, viewed from the top.

Other native flora may also feature in the images at the research sites, and in particular among INY-3074's pictographs. Pima of central Arizona express Flower World imagery in a hunting song, wherein the prototypical game, deer, is heralded by the hunter observing red ocotillo flowers in one verse, and yellow chamiso (saltbush) flowers in the following (Hill 1992:134). For Numa, bighorn, not deer, was the categorical game animal (Goss 1972; Dayley 1989), but hypothesizing a parallel with this substitution may be useful (c.f Crum et al. 2001:55-59 for a *Naraya/nua hupia* hunting song). In Figure7. 15, the middle left pictograph from Panel 37 shows a set of red bars, with an arrangement not wholly unlike the clusters of small flowers of blooming ocotillo. In the upper left of the same graphic, fanning lines in Panel 38 could also capture ocotillo imagery.

Naraya employs a number of other natural phenomena for chromatic elaboration as well (Hill 1992:127; Vander 2006). As discussed previously, and elaborated upon later, Numic and Yuman Southern California groups derive colorful descriptions from the sun, stars, and heavenly bodies – especially Orion, the Milky Way, and Venus as Morning Star – In many contexts where other Uto-Azteca groups use floral references (e.g. Fowler 2006). The nature of *pecked* petroglyphs, as light points on a dark surface, should be considered significant. Crucially, light play off running water is mentioned in *Naraya*, and its connection with *puha* makes it a talking point on the topic of animacy; other water related images such as fog and snow, often associated with the color white, may invoke the Spirit World (Hill 1992:127). Trees and lush vegetation are especially appropriate *Naraya* topics (Crum et al. 2001; Vander 2006), and flower-inspired pictographs on INY-3074's Panel 37 bench appear to sprout from petroglyphs with dendritic appendages superimposed over them (see Figure6. 28). Red ants also feature in *Naraya* (Hill 1992, Crumb 1980) and Kawaiisu *Yahwera* (Garfinkel et al. 2009) narratives, but may present some obvious problems in discerning in stylized images.

Feathers

Northern Uto-Aztecans, and especially those whose roots lie in California, supplant flower-world like chromaticism systematically with feathery symbols. The substitution is systematic in the sense it preserves many of the Flower-World complex chromatic metaphors (Hill 1992:127). Numic *puha hupia* (power song) about golden eagle feather allude to the weight and power. (Crumb 1980:150). A Shoshone song refers to drifter feathers on the Colorado river (Hill 1992:118), implicitly linking watery reflections with iridescent feathers. For Hopi, prayers rise like a feather, and for Shoshone as well as Hopi, it is an image for the soul (Hill 1992:131). Feathers were named contents of Yokuts and Mono shamans' *pa'čki* (inherited caches, see Gayton 1948:168-169). They were also expressions of wealth, and so feather imagery at INY-3074 (e.g. Figure7. 25) may indicate the economic value of *pa'čki*, their contents, and the contexts in which they are cached. Another consideration to make is that feather imagery at the entrance to these locations, like at INY-3074 Locus 1, could indicate feathers as a resource lay beyond, perahps in bird nests.

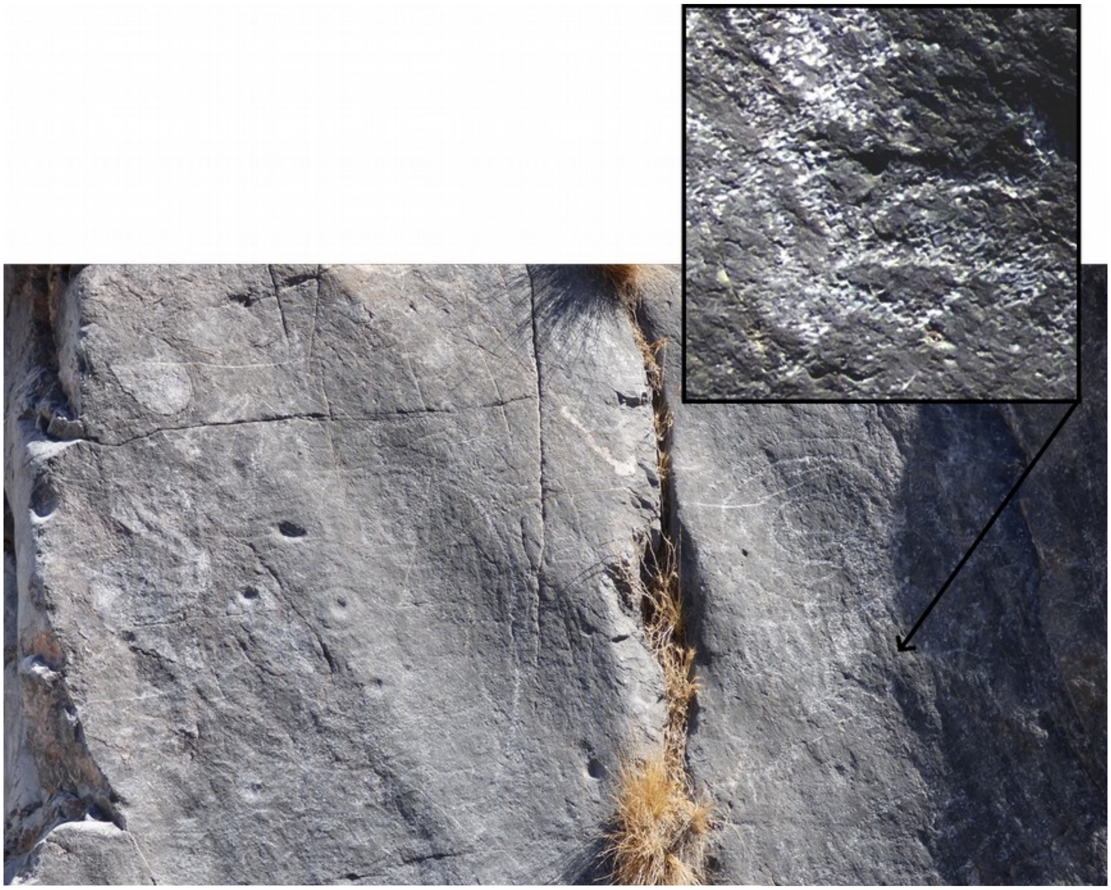


Figure7. 25: *Feather imagery, INY-3074, Locus 1, Panel 1*

Arguably the singularly most symbolically significant Numic feather is that of the quail topknot. Live quail featured prominently in Aztec *Toci, Tomantzin* (see Chapter 4 on chromaticism) where the context positioned it intimately close with wealth, celebration, and implicit fertility (c.f. Hill 1992:118-119; Basset 2015:206). Contextually, the topknots of *Callipepla californica* and *Oreortyx pictus* are connected with themes of fertility, rain shamanism, and *Yahwera*. Topknots were added to a cap of mountain-sheep pelt as a ritual object for *puhakanti* specializing in rain and weather control (Kelly 1936; Steward 1941; Zigmond 1977; Whitley, Simon, and Dorn 1999:12; Lewis-Williams 2002:175). In a single account of a crisis ritual in which a man met Yahwera in the underworld (Garfinkel and Waller 2012:42-45, 47), quail, quail feathers, and objects made from them are mentioned no less that 13 times. *Datura* infusion used a basketry bowl called “quail,” and the song of a quail flute opened the door to the underworld (Whitley 2000a:115). They even appear to have been an important resource for at least one site in Piute Valley (Brosman 2012:101). Given prevalence in narratives and religious practices, quail imagery may be particularly salient, although no quail imagery was noted in INY-1634.[171]

INY-3074 features at least three references to quail, as identified by the topknot. Additionally, I propose two depictions of quail themselves: Panel 65 in the Fifth Chute, and Panel 16 in the Overlook (Figure7. 26). Both panels contain images comparable to a bird, in profile, with a distinctive topknot feather. Following the stages of image acquisition, these would appear to have been in dialog with each other: first, non-figurative abstract designs on Panel 65 converged to provide a quail-like form (see also Figure6. 32); second, at some point later, another person using the canyon observed Panel 65, and made a simplified silhouette of the same form on Panel 16. Additionally, with oral history connections, a striking anthropomorph wears a quail topknot headdress, on the east end of Chamber 2 (Figure7. 27).

171: I suspect a review of comprehensive motif inventories for Little Lake Ranch and the Fossil Falls Archaeological District would likely reveal different results.

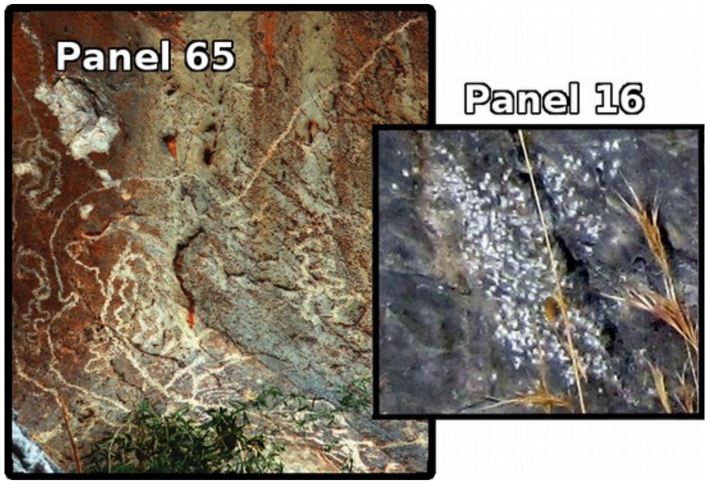


Figure7. 26: *Proposed depictions of quail, Locus 11 (left) and Locus 12 (right); notice the use of natural divot/crack as an eye in Panel 65.*

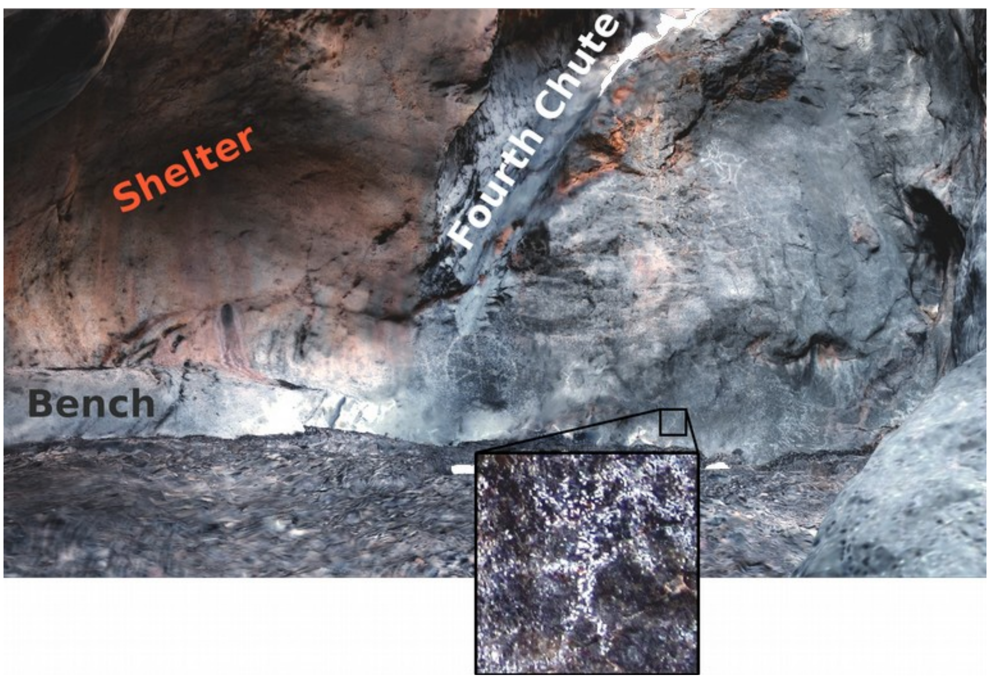


Figure7. 27: *Digital model of Chamber 1, with position and inset of anthropomorph wearing quail topknot feather headdress, color enhanced. View E.*

Chromaticism in the Multi-tiered Cosmology

Mutli-tiered cosmology attested to in Numic oral tradition is generally agreed upon in principle, however discrepancies exist between number of tiers and symbolism. Recently, conflicting reports between three (Huffman and Early 2017) and five (Garfinkel et al. 2016) are at odds of divisions of the middle areas. Unlike the three tiered cosmology, the five tiered Charleston topology is color-stratified. In turn, the dominant coloration of each tier cue expectations for cosmological processes associated with a given stratum (Goss 1972; Vander 1997). This is especially true in *Naraya,* wherein rich chromatic descriptions carry sometimes yet loaded association.

Applying these topological models to INY-1634 and INY-3074 would seem a suitable test to identify the more consistent model. Results of this application, however, are mixed: INY-1634 seems only to have the three tiers of upper, middle, and lower, with the underworld's blackness from the basalt bedrock the only clear color significance. By contrast, structure and iconography at the INY-3074 canyon seems to substantiate numerous connections with the Charleston topology.

At INY-3074, the metaphorical journey in the following explores this sequence of chromatic experiences that the canyon imparts upon an observer entering. Beginning with the illusion of watery iridescence at the canyon mouth, the lower section of the canyon remains largely lit with much the same illumination as the areas above and outside, until the hand-hold ascent into Chamber 1. The imagined canyoneer is disciplined by the sequence of holds here and in Panel 61, with the canyon determining the when and which foot is placed. The second series of holds lets out into Chamber 1, which as the starting point of an *ascending* chromatic of the journey, is also appropriately connected to the lowest cosmological tier. Darkness and the underworld are invoked expressly, as a parade of several bighorn sheep in Panel 49 emerge from the blackness of the low long void underneath Panel 48.

Figure7. 28: *Chamber 1, with inset of Panel 49 corral scene (left), in which bighorn process out from the direction of an long, low void underneath abstract Panel 48 (right inset).*

Just beyond, the path turns to directly behind the void wall of Panel 48, where towering walls create perpetual twilight in the Lower Gallery. Panels extend continuously along the northeast wall to the base of the Third Chute. Blackness is emphasized by accelerated bio-geochemical crusts and lichen. Underworld themes are expressed, with curvaceous forms of the aptly named "Snake Ledge" Panel 44 invoking the snake door frame at the portal to *Yahwera*'s house (e.g. Whitley 1992b;

Garfinkel and Waller 2012). Like *Teugai* into her snake familiar's skin (see Powell 1881; Lowie 1924; Waller 2000, 2004), and *Tso'apittse* into a cave fleeing justice and Coyote (from Smith and Hayes 1993:62, 137-139), the canyoneer's journey begins by going into the underworld through *togoav*/*tokowa*. A similar recess expressing such snake symbolism is found at Zoo Cave (CA-INY-11689), south of Panamint Valley near Indian Spring and Pilot Knob (Allen 2011:18).

Figure7. 29: *Entrance to Third Chute from Lower Gallery, with inset of Panel 44 "Snake Ledge."*

After passing through the underworld-invoking wall via a snake-like doorway, the next stage is, fittingly, the next chromatic level. Chamber 2 provides a place for respite with a well-proportioned natural bench among blooms of red paint (Figure7. 30). Botanical and floral imagery dominates, recalling the Flower World Complex.

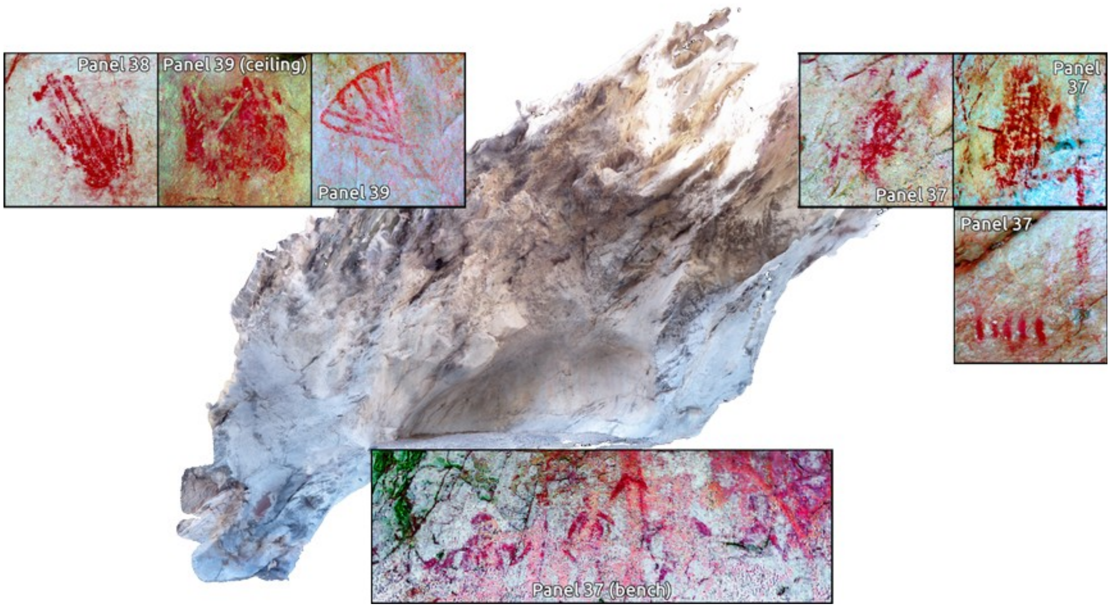


Figure7. 30: *Virtual cross-section of INY-3074 Chamber 2 (Locus 8), looking towards the shelter, with enhanced and false-color insets of red pictographs. View N.*

As covered under chromaticism, several of the abstract pictographs somewhat resemble stylized ocotillo, bells, and perhaps *Datura sp.* Petroglyph density and ubiquitous fringe designs suggests this location was a common end-stage to many journeys, and its iconography may also invoke the iridescent chroma of celestial metaphors (see archaeoastromy, and earlier Flower World Complex commentary). For those who decrypt the stemming-climber glyph (Figure7. 31) and ascend to the next tier via the Slick Chute, the references become somewhat obtuse. With increased abstraction above, cues come from the increase in flora, starting on Landing B topping the chute, and blue-gray hues of the bedrock.

Figure7. 31: *"Stem-climbing" anthropomorph ascending abstract rendition of Slick Chute. Originally published in Liwosz (2017:192, figure 10), reproduced with permission by author.*

Helpfully, the Panel 65 in the Fifth Chute, and Panel 16 in the Overlook, give more insight. Mountain quail (Figure7. 26) and butterflies (Figure7. 14) are sung of in *Naraya hupia*, as inhabitants green pinyon forest (Crum et al. 2001:148-149). From the area inhabited by forest creatures and vegetation (especially willow) occluding panels, the next zone up needs no painted or pecked images – yellow quartzite lines the northwest wall to the climber’s left for the entire extent between Locus 12 and Locus 17. Sparse panels in Chamber 4 are placed on either side of the entrance up into the Grotto Gallery; these panels indicate powerful events and religious practices, alluding to the *Naraya* tradition, and depict an *axis mundi*. To enter the Grotto, then, is to enter another world. Towering walls enclose the long and narrow space with long stripes of mineral stains. Petroglyph panels placed far enough back as to be unseen from the gallery's entrance index profound psychoacoustic effects. There is little need to further detail this last locus' expressions of the heavens through white coloration. These connections were already expressed in the iridescent entrance, celestial references in Chamber 2, a floral path along the shelter bench, the "magical flight" of ascending the Slick Chute, and in the discursive sonic and embodied processes[172] along the route culminating in the Grotto.

Other symbolism

Concentric Circles

There are currently four proposed interpretations for concentric circles. Apodaca (2001) proposes an iconic or representational reading in the Sonora Desert as cactus sections or cogged stones. Whitley (1994, 1998, 2000a) considers them entoptic imagery invoking trance and its connections with death and whirlwinds. Huffman and Early (2017) connect these designs with Sun Spider's web, while Mukhopadhyay and Garfinkel (2016) contend it is a pan-Uto-Aztecan apotheotic eye, or *nierika* in Huichol.

Despite a superficial lack of consensus, enough overlap between the above interpretations allows a proposed common resolution with a nonetheless still narrow reading. Three of the four above interpretations proposed for the eastern California

172: "It was in you all along."

deserts overlap on common themes of creation, the spirit world, and *axis mundi* to that realm. Including variations of concentric circles, spirals, and circles with radiating lines (both conventionally understood to be synonymous), and excluding single and linked chains of circles, INY-3074 contains 38 elements of this iconographic cluster (9 percent of the total), plus one at the "Lonely Panel" site. INY-1634 may not have clear recursion among its few simple circles, however Little Lake Ranch (including INY-389 and INY-3826) features 144 such designs (only 3%). At present, the implications of the differences of these designs as a proportion of the assemblages remains unexplored.

Sun Spider

Huffman and Early's (2017) discussion of Sun Spider, seems more relevant to reading "cogged" concentric designs, however. As focal points along the web of *puha*, INY-3074 (e.g. Locus 4 Panel 54, see Error: Reference source not found below) and *Pagunda* (INY-3826, Locus 6, Panel 127; see Van Tilburg et al. 2012:72 figure 3.42; pp. 176 spread) provide evidence for a contextual reading of concentric and spoked designs. Additional arachnid imagery on the margins of INY-3074's Chamber 2 and Slick Chute may allude to *Sun Spider* (Huffman and Early 2017), or Coyote as transformed into a water spider in origin narratives (Miller 1983; Stoffle et al. 2011:15-16, 44). 24 cogged and concentric designs are recorded for INY-3074. The *Tümpisa* word *wana* means net, web, screen cloth, and weaving, especially when making nets, and to describe spider webs. Following this terminology, rectilinear grids and “honeycomb” shapes would be added, raising the total substantially, conservatively doubling the total web references for INY-3074 and INY-3826, as well as roughly 20 percent of the few elements at INY-1634. Themes of adoration for creation are shared between the *nierka*, Palongoawhoya, and the Numic Sun Spider.

Figure7. 32: *Color enhanced concentric circles with spokes, suggested to portray Sun Spider’s web of puha. INY-3074, Locus 4, Panel 54.*

 **Figure7. 33:** *INY-3074, Panel 30, boundary of Locus 8 and Locus 9, possible arachnid imagery.*	 **Figure7. 34:** *INY-3074, boundary of Loci 8 and 9, bighorn retouched into spider spinning web (large figure at center), with silk-wrapped prey to far right.*

Patterned body anthropomorphs

Much of the contents, implications, and critiques of "entoptic images" – both as a subject of Mojave Desert rock art, and as an analytical category – has by this point been addressed. What is important to emphasize here is that by name (entoptic images, Turing instabilities, or even "sacred geometry" to contemporary New Age spirituality), these visual patterns originating within the nervous system are only the first stage in a process of meaning-making (Lewis-Williams and Dowson 1988:203-204). Subjects experiencing these would elaborate on their depictions of them to bring the images into a familiar system of meaning, and it is these culturally-meaningful marks which are the subjects of the following commentary. A very limited range of manifestations of this process are "patterned-body anthropomorphs" (PBAs), which are nonetheless one of the most widely discussed motifs from the Coso Range after "bighorn sheep". Despite a high degree of internal variability, this classification is nonetheless compositionally distinct from other anthropomorphic representations, in that PBAs are comprised of angular (or less frequently, ovoid) bodies in which their namesake elaborate geometric embellishments are inscribed, have clearly depicted heads with internal markings yet no recognizable facial features, usually wear a "headdress," their hands are often laden with various implements, and feet are sometimes of novel form. These attributes distinguish PBAs from other anthropomorphic forms with filled bodies and heads (no infixed elaborations on either), and simple as well as self-descriptive "stick figures." The following relates PBA discourse to elements at INY-3074 Locus 8, and Locus 18.

From the theoretical models previously discussed, three dominant interpretations have been proposed; others have subsequently enriched understandings. Initially, researchers concluded that context and design were consistent with successful hunters, costumed ceremonial leaders, and shamans - with an emphasis on costumed leadership (Grant et al. 1968:40-42). Lewis-Williams and Dowson (1988:211) propose these are indicative of entoptic images and bodily hallucinations conceptualized as the body being charged with power, which remained consistent with shamans. Whitley (1994, 1998) confirmed quail topknot caps on some PBAs are consistent with ethnographically known weather shamans. Quinlan and Woody's (2003:385) broader proposition of Coso-style being indicative of a distinct ethno-linguistic group during the periods of fluorescence has been more palatable to an audience uncomfortable with shamanism. Adding in Kawaiisu religious commentary, a re-visitation of the Grant team's proposal suggests the iconography invokes *Yahwera* the Animal Master (c.f Garfinkel and Waller 2012:41 figure 5), who may be commemorated (or even embodied) by shamanic *huuiyagadi* (Garfinkel et al. 2009). Mukhopadhyay and Garfinkel (2016)'s cross-cultural analysis of iconography of the Southwest, North and West Mexico, and Mesoamerica (together including Hopi, Huichol, and Tohono O'odham) suggests concentric rings replacing Coso PBA faces represent a supernatural being's all-seeing eye and passageway into the spirit world. For Eastern California, they expressly name *Yahwera* as the the all-seeing deity.

Although dominantly rectangular-body PBAs are often assumed male without clear anatomical markers (Rogers 2007:96), female figures with round patterned bodies and pendant labia are known but rare (Whitley 2000a:64). Elaborations on the otherwise extremely rare PBA depictions (all kinds) are by consensus *some* form of ideological symbolism. To effectively address *implied* gender, an investigation into conventionalized signs incorporated (chevrons, diamond chains, zigzags, grids, etc.) would be warranted given known gendered associations. This iconographic reading of PBA content, however, is outside the scope of the study at hand.

Many of the qualities proposed are not mutually incompatible; as Whitley (2000b:117-118) demonstrates, emphasizing shamanistic elements of PBA iconography does not negate these persons were *also* local leadership, and that ritual intensification occurred at a specific moment in time. Along these lines, I add to the conversation another layer of iconographic analysis regarding social stratification indicated by this motif class (c.f. Bettinger 1995, 2015 re: "big man complex"). To expand upon my earlier points addressing political economy, emergence of the PBA class and its proliferation especially in the Coso area, patterns in the body of evidence are consistent with increasing craft specialization typically coeval with incipient social stratification, during the time of proposed ritual intensification. The suggestion of a link between PBAs and social stratification seems to be at odds with social systems and material culture generally throughout the Great Basin, were it not predicated upon exponential peaks in obsidian procurement and petroglyph production (Hildebrandt and McGuire 2002:242; Gilreath and Hildebrandt 2008:13). Specifically, such peaks in obsidian output suggest intentional overproduction as a component of an economic engine. Early in this chapter, the discussion on political economy emphasized means by which leadership might exert control over resources. During the period of intensification, those whose supernatural power manifested utility as social power over such features as oases, hunting spots like game jumps, and other resources (possibly obsidian sources) would gain economic leverage and others' obligations. As shamanistic power granting control over places of *puha* was often (though not exclusively) known to be heritable (Whitley 1994:367), ongoing exercises in resource control would result in persistent disparities. Regulating access, and prohibiting it entirely, are distinct.

The producer of these specialized images may not need be the relevant central authority figure. Specialized artisans, as elsewhere, could well have been family and affiliates, whose close proximity to advantaged individuals both granted access to that which was otherwise restricted, and most importantly reduced the burden of economic obligation – freeing these individuals to diversify interests. By developing a specialized image acquisition process, an emergent, elite-affiliated community-of-practice was postured to distinguish their visual culture from less specialized carvers and painters (e.g. puberty initiates), innovating upon imagery informed by renditions of their specializing peers. This scenario is consistent with the scenes seen, wherein variable design and innovating ornament fits into an ever-standardizing structure – headdress/ritual objects, trance-metaphors for a face, human-animal conflations, and one or more stylized geometric motifs in the body.[173] Standardizing the process, rather than the product, would maintain the system's adaptability in face of trends towards plastic ideologies in the region (later examples being the *Chinigchinich* cult, and Ghost Dance movements). More conventionalized imagery would be expected afterwards, but the patterned-body style does not survive the period of innovation.[174] It can thereby be assumed that Coso's population crash and political crisis[175] occurred before that stage of standardization could be reached. By ethnohistoric times, egalitarian patterns re-established, and petroglyph specialization diminished.

Compared with other anthropomorphic representations, PBAs are exceedingly rare. None are located within the confines of INY-1634. Although present, patterned-

173: There seems to be some evidence these patterns appeared on ceremonial shirts, however the origins and implications remain the same across media of the same ritual complex.
174: Historic elements at INY-134 condradict conventional wisdom PBA production ceased.
175: Or, at the very least, population diffusion and socio-political de-centralization

body elements are extremely rare on the Little Lake landscape - among 4,112 *pecked* elements between all documented shore area sites, only five, or 0.1 percent, are patterned-body anthropomorphs (Van Tilburg et al. 2012:55). Despite rarity, mere presence alone would be insufficient to support the proposed socio-political associations. To remain consistent with the craft specialization proposal, these few elements would be expected to occur in conjunction with places of restricted access. Although exact locations for each panel at not reported, the Little Lake Ranch report provides useful spatial context in narrative. At CA-INY-3826 Locus 5, along the lake shore, at least one PBA is on a panel adjacent to the opening of Locus 4, the latter location being a lake-facing cove the authors note having discernible unusual echoes likely significant to Numic animism (Van Tilburg et al. 2012:65, 70-71). The remaining three Little Lake PBAs occur at Locus 7, a cliff face at a break in the basalt flow. While the discrete locations of the PBAs within the locus is not given, the researchers report the shape of the landform, as serpentine to be symbolically significant of *tokowa*, rain, and the underworld – despite an otherwise paucity of anticipated snake-like images (Van Tilburg et al. 2012:75-77). With Locus 7's panel facing inwardly towards the rock, and Locus 5's PBA adjacent to an opening for a secluded and acoustically novel space, the associations are consistent with multi-layered restricted access at the threshold to iconographically rich *axis mundi*.[176] Very low rates of occurrence also distinguish these images from those acquired during

176: Consistent with the Coso Range PBA contexts described by Garfinkel et al. (2009:11).

boys' or girls' puberty right, also suggesting social separation. Of course, a sample size of five is nowhere near sufficient to make any statistically-supportable claims.

Given the rarity (1:1000) and range (e.g. Gold 2005:168), patterned-body anthropomorphs would not be anticipated within an assemblage as small as the 417 elements at INY-3074. Data reported for Little Lake suggests the Death Valley slot canyon should have only 0.4 glyphs of this nature. It would be spurious, however, to claim there were no iterations of this theme, and the two strongest candidates at INY-3074 imply the site itself is significant by appearing at 500% the expected frequency.

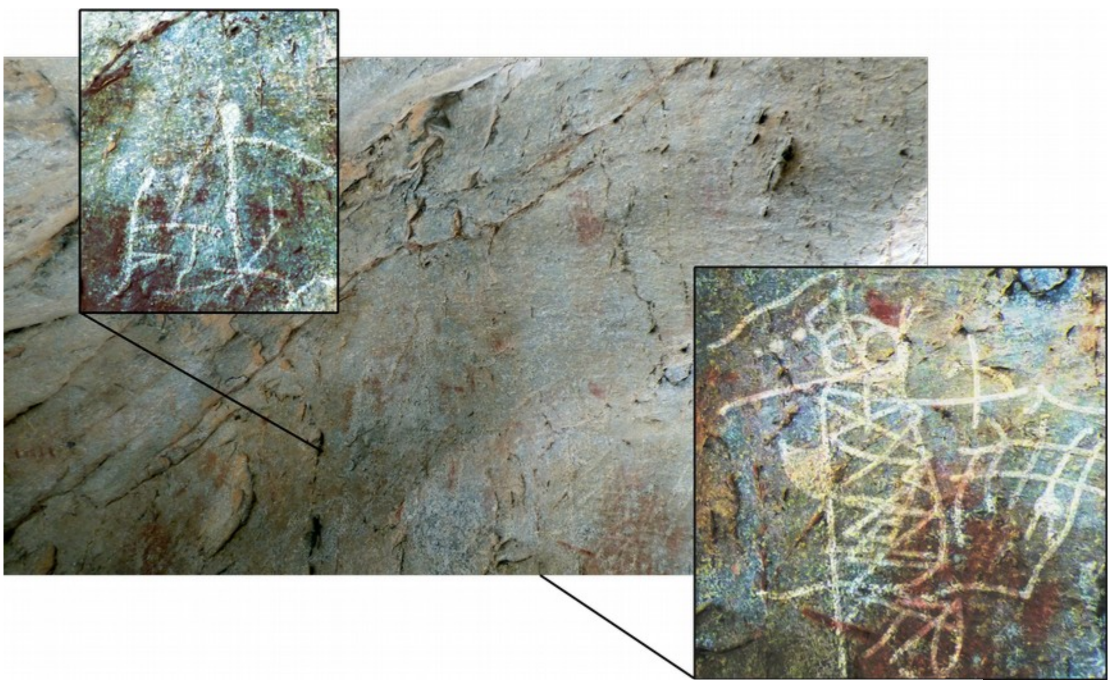


Figure7. 35: *INY-3074, Locus 8, Panel 37, enhanced illustration overlay of candidate PBA (lower right inset) and companion figure (upper left inset).*

One likely correlate to the PBA motif is in Chamber 2 (Locus 8), Panel 37, west of and above the level of the bench (Figure7. 35). This potential PBA is accompanied by a smaller “cryptic” stick figure anthropomorph. Correlates to the Panel 37 patterned figure with infixed diamond chain can be found elsewhere at Coso sites INY-5, INY-9 (Sheep Canyon), INY-39, INY-271, INY-281 (part of Little Petroglyph Canyon), INY-282 (P-9), and temporary site numbers R-25, R-35, and P-4 in the same area (Heizer and Baumhoff 1962:355, 361; Grant et al. 1968:38, 67, 69, 86-87, 98; Whitley 2000a:64, 91; Garfinkel et al. 2009 figures 4, 6, and 7); a non-anthropomorphic example is also found at CA-INY-271. The Panel 37 infixed diamond chain element is accompanied by a series of dots, and a curving triangular infilled embellishment on the left side, reminiscent of a shark fin. The Panel 37 possible PBA is unusual in that it appears to depict large round eyes, similar to those of figures at Ayers’s Rock (CA-INY-134) (e.g. Whitley et al. 2005:2, 52, 231).

A focal point of Panel 9 in Locus 18 shows an almost-patterned-figure with infixed circles; true PBA correlates elsewhere include INY-281 (Little Petroglyph Canyon), INY-282 (temporary number P-9), and temporary site R-25 (Heizer and Baumhoff 1962:361-362, 366-367; Grant et al. 1968:38, 63, 86-87; Whitley 2000a:64; Garfinkel et al. 2009 figures 3, 7, 8, and 12), and as far as Winslow, Arizona (e.g. Grant et al. 1968:123). Although it bears certain formal resemblances, execution either deviates from convention, or is incomplete.[177] Where a head with concentric circles would be expected, the “body” and “bighorn headdress” are separated by a natural crack (Figure7. 36). This crack has been transformed through embellishment, with a short

177: Nonetheless, conventional signs conflated to form this composite image are derived from the same standard corpus or visual lexicon.

arching diamond chain. The diamond chain may be embellished with blue-green pigment, tentatively substantiating economic exchange of a blue-green pigment source in the Amargosa Desert end of Steward's (1938b) reported network, and known to be used at pictograph sites in the area (Stoffle et al. 2011:16, 23). Like Panel 37, Panel 9 shows a precession of dots leading either towards or away from the spot where a head would be expected.

Widely recognized as a rattlesnake motif (Kroeber 1925:233; Whitley 1992b:101; Van Tilburg et al. 2012:77, 166), the diamond chain component of the composite signs brings up a point. Coso style PBAs are never depicted alone, and the vast majority of examples are accompanied by a snake sign to the side, and one or more smaller figures adjacent. Taking the route of trance-is-death and enter-underworld-through-snake-portal, this is an indication that the Panel 9 figure (through its crack apparently named *tokowa*), and the Coso and Back Canyon examples all use this device to communicate ASC passage into the spirit realm.

Figure7. 36: *INY-3074, Locus 18, Panel 9, with inset of "non-PBA;" notice expression of chromaticism through use of mineral stains, and possible pigment application to snake/crack.*

The smaller figures, it seems, are “helper spirits,” *anit* or *naguales*. At other sites, these are lizards, bighorn, or other anthropomorphs (e.g. site 35-LK-36 Panel 58, in Daehnke and Raymond 2008:33, figures 33). Both INY-3074 examples have candidate correlates. For Panel 9, a headless pseudo-figure is located left, above a chain of triangles (Figure7. 36, between triangle and diamond chains, top of inset). For Panel 37, companions may be the cryptic stick figure (Figure7. 35, upper left), and or the anthropomorphic dendroglyph on the bench below. If there is any intervention to be made (regarding PBAs), it is that so far insufficient effort has been make in the region’s rock art studies to contextualize co-occurrence of conventionalized images – somewhat like trying to read a book by tallying up the words and simply choosing the recognize the most frequent and familiar.

Fringes, Rakes, and Prayer Knots

Moving on to the last of potential conventionalized signs to list, Huffman and Early (2017:17) provide a clear visualization from a place of pilgrimage in Colorado of what is described as a "fringe" motif. This simple design is comprised of a horizontal line with descending short vertical segments. The "fringe" indicates knotted string, like one of the "mneumonic" [sic] devices Miller (1983:78) describes, objects that accompany prayers meditating pilgrims offer to the Animal People. If the intentions and offerings were accepted, the pilgrim could continue. According to Paiute elders, knotted string fringes kept time and marked place (Huffman and Early 2017:17), not wholly unlike Inca *quipu*. At INY-3074, this fringe motif occurs at Locus 1 Panel 1,[178] Locus 8 Panel 34 and 37, Locus 10 Panel 19, and Locus 12 Panel 16. Interpreting the knots as mnemonics, these fringe motifs mark the Canyon Mouth, Chamber 2, Landing B, and the Overlook as places to pause and reflect.

178: Notably, the Panel 1 fringe petroglyph (connected with the labyrinthine composite sign in Figure7. 20) is also identical to a pictograph at Rocky Hill (CA-TUL-326, -998), identified as a "bridge to the supernatural (Whitley 2000a:76; Robinson 2011).

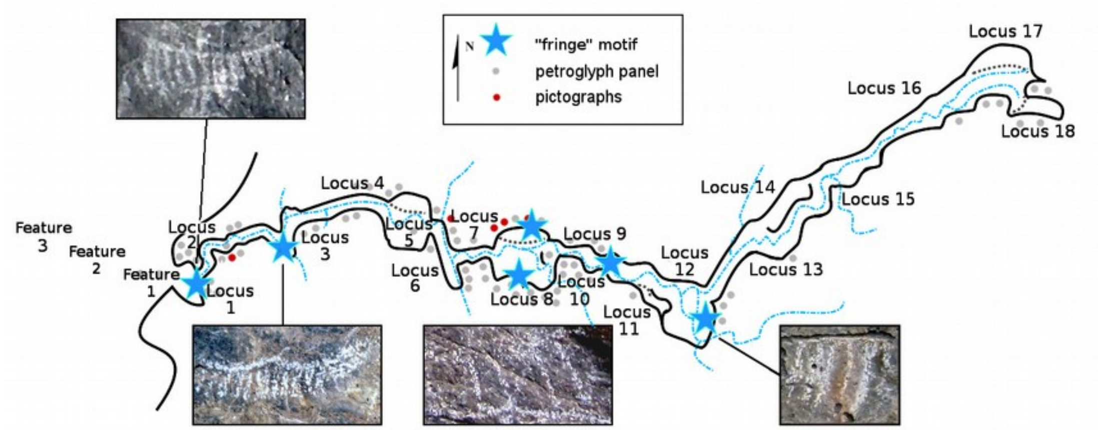


Figure7. 37: *Map of CA-INY-3074, indicating locations of "fringe" or "prayer knot" motifs, with examples.*

All four loci appear to be turning points of the Death Valley slot – first the entry, then a resonant room with pictographs marking a natural bench inside of a rock shelter, and the room with the view. In all instances, obstacles in the canyon just beyond hint these might be good spots to turn around – first by opening from seemingly nothing (discussed later), the second at the foot of the difficult ascent up the Slick Chute, third before the very exposed Fifth Chute, and fourth at the entrance into the upper acoustic Zone 2 – demonstrated beyond hearing range of Chamber 2 in 2014 (and again in 2016). Beyond the fringe motif itself, mnemonics should be considered for the bulk – if not entirety – of visual culture at parietal sites (Miller 1983:78; Carroll et al. 2004:133). Numerous connections with oral histories, origin stories, and sacred song traditions have substantiated using a mnemonic approach. Rather than a linear play-by-play account of reading or listening to oration (the original mythograms concept), mnemonic mythography of sacred sites permits recombinant interaction, writing memories of new and personal experiences weaving in and out of significant symbolism.

Lizard motif

Although not a very abundant motif, the lizard appears to have a certain amount of symbolic significance in Numic and non-Numic religious systems. Lizards elements are frequently adjacent to, emerging from, or entering cracks. Northern Paiute commonly viewed them as spirit helpers, with their emergence from, and disappearence into cracks a sign of their ability to traverse in and back out of the other worlds (Daehnke and Raymond 2008:38). both INY-3074 and INY-3826 feature a handful of examples.

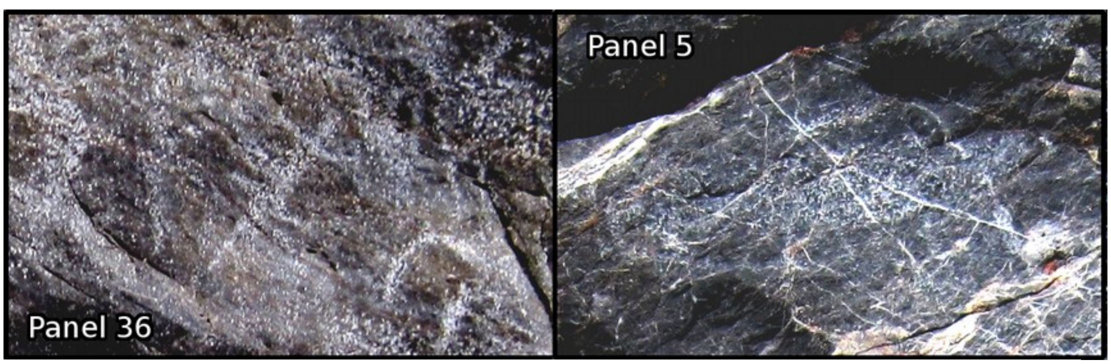


Figure7. 38: *Examples of lizards from INY-3074: lizard infixed in a rounded box in Locus 8 Panel 36, and lizard emerging from a crack in Locus 1 Panel 5.*

Archaeoastronomy

Archaeoastronomical investigations in the area almost invariably ignore oral tradition, fixating on the ahistorical conjunctures of solstice sunlight and shadow (Whitley 2011). Instead, investigating astronomical and navigational allusions in oration, poetry, and song should be a prerequisite to project design. Professedly "agnostic" tones exemplified by Raven are not echoed by everyone, but clearly well-deserved. In order to meaningfully discuss the INY-1634 and INY-3074 slot canyon data in these terms, this section outlines a new approach to the topic for Great Basin rock art, developed from successes in other cultural regions.

Exemplary archaeoastronomic expressions are known among earthworks in the greater the Mississippian River drainage, where a handful of once numerous Adena (and its cultural zenith, Hopewell) earthworks have survived over two centuries of intensive farming and development in between the tributary Ohio River to the south, and Lake Erie to the north. Initially erroneously attributed by Euroamerican settlers to some mythical other-than-Indian lost civilization[179], the archaeological features have become emblematic of Manifest Destiny attitudes of othering. The moundbuilders myth exemplifies encroachment erasing Native Americans out of the continent's history through primitivising narratives, despite overwhelming landscape evidence – much like the misapplication of rock art research over the last 75-80 years in the Great Basin has done to Numic inhabitants (Blackhawk 1997; Whitley and Whitley 2012; Whitley 2013b).

Contrary to the colonial myth, Turner's (2011) three decades of Adena/Hopewell archaeoastronomical research focused on modeling various sensory interactions of Hopewell earthworks, studying both existing and destroyed-but-documented mounds.

179: Including, absurdly enough, one of the so-called Lost Tribes of Israel.

Architectural alignments did not just solstice/equinox solar conjunctions, but also subtle observations of longer-period lunar events, and other fine-grained potential observatory applications, all adjusted for the unique view of each earthwork's latitude (e.g. Turner 2011:107, 311, 316). These alignments likely aided plant cultivation.

Archaeoastronomical research into solstice sunrise/sunset observations Mangareva in French Polynesia's Gambier Island (Kirch and Conte 2009) are relevant precisely because ethnographic and ethnohistoric records cement use and significance (Ruggles 2015:2239). Loosely comparable to Hopewell integrating astronomical observation into architecture, ceremony, and horticulture, Native Hawai'an temples expressed through architecture associations for deities[180]. For a sea-fairing civilization spanning thousands of Pacific Islands,[181] applied indigenous astronomy far exceeded agriculture and seasonal observation.[182] For Polynesians, celestial reckoning (specifically including at relevant *heiau*) complimented a suite of non-instrument navigation skills, instrumental to population expansion and migration over vast distances for centuries to millennia. These are emphasized here because I propose some of the same principles may apply to Numic overland navigation, especially with considerations that rock art and geoglyphs likely function as mnemonics.

180: With war god Kū facing North, fertility god Kāne to the East, and god of dryland agriculture Lono towards *makali'i* (the Pleiades) in the East-Northeast (Ruggles 2015:2238)
181: from Aotearoa (New Zealand) to the Hawai'ian Archipelago, to Rapa Nui (Easter Island)
182: Temple platforms, or *heiau,* were each dedicated to one of many possible services, including navigation, medicine, and agriculture (Ruggles 2015:2238; Liwosz et al. 2017). Where platforms may have been impacted or destroyed, *mo'olelo* (oral traditions) often still recall place, purpose, and related events (Liwosz et al. 2017)

Anthropologist Ben Finney contributed significantly to the revitalization of Hawaiʻian non-instrument (including celestial) navigation and trans-oceanic sailing. Partnering with Polynesian artist and sailor Herb Kane, Finney and Kane launched the non-profit Polynesian Voyaging Society (PVS), that itself operates the *waʻa kaulua* (traditional Polynesian ocean-crossing canoe) Hōkūleʻa (Finney 1994:41-42, 51, 67). The nearly 19 m double-masted catamaran owes its hulls and sails to illustrations from Cook's ill-fated 1779 voyage, and depictions of *waʻa* among indigenous *kiʻi pohaku* (petroglyphs). Broader impacts of Finney and Kane's experiment, and the efforts of many PVS volunteers, have made Hōkūleʻa emblamatic of the Hawaiʻian cultural renaissance. First voyaging from the Hawaiʻian archipelago to *Kahiki* (Tahiti) in 1976, and still sailing today, Hōkūleʻa and the PVS crew operate as an international icon.[183] The society has spurred revitalization of cultural knowledges including Polynesian non-instrument navigation.[184,185] Although not strictly "authentic" in the historical sense, the specially developed navigational astronomy star charts server as a better model for developing meaningful ways of engaging with non-western ethnoastronomy.[186]

183: Still sailing today, Hōkūleʻa recently returned from a three year Mālama Honua (Take Care of Island Earth) voyage in June 2017, raising awareness for sustainable energy, indigenous empowerment, and cooperative scientific engagement

184: Native Hawaiʻian PVS member Nainoa Thompson trained under Melanesian *Pwo* (master navigators) to develop a system using Hawaiʻian words and concepts.

185: Currently, University of Hawaiʻi Mānoa offers courses on Nainoa Thompson's navigating practices, which integrate observations of sea, sealife, weather, and of most relevance, astronomical observation

186: Thompson's star chart - although not strictly "authentic" in the historical sense - is nonetheless a functionally accurate and culturally appropriate knowledgebase using traditional celestial names. *Moʻolelo* remain a resource for academic inquiry, especially for

Having now witnessed (and myself participated in) ongoing contributions of anthropology, experimental archaeology, and rock art research towards empowering collaborations with indigenous communities and cultural revitalization, it is now possible to return to the Great Basin with some propositions to begin broadly beneficial research – an area where archaeology has historically done the opposite (Blackhawk 1997; White 2003, 2008; Whitley and Whitley 2012; Whitley 2013b).

Figure7. 39: *Hōkūle'a arriving at Kaua'i's Hanalei Bay on 24-Sept-2017, to celebrate completing the Mālama Honua voyage. Notice upturned bows and stern, and sail shapes – designed from depictions in ki'i pohaku (inset). [credit: author]*

narratives where allusion to celestial objects, reckoning, and *heiau* observatories might be referenced.

From the now broadly covered considerations globally, and dominant themes in Numic cosmology, a short list of proposed lines of inquiry can be assembled. Most conspicuously, of course, is timing seasonality with harvests and communal ceremonies – although researchers should be reminded that as Turner (2011) demonstrates, solstices and equinoxes might not coincide with these dates. Similarly, systematically ignored but archaeologically and historically established horticulture (e.g. Coville 1892; Liljeblad and Fowler 1986; Reynolds 1996:49; Zedeño et al. 2003:69-71; Giambastiani et al. 2005; Stoffle et al. 2011; Huffman and Early 2017:3) could require as fine-grained calendric observations as those Turner (2011) expounded upon in Woodland Ohio. Although the Numic Expansion has been suggested to be visible in rock art, no published study to date seriously considers rock art as instructive of astronomically aided navigation. Within north-south trending valleys throughout the Basin, stellar assessment of some latitude-like measure would be a highly useful complement to finding eastings by bounding ranges, both on the scale of annual cycles, and on far less frequent Basin-crossing journeys. Archaeoacoustic corroboration of rock art's role in both song acquisition and mnemonics can be used to propose that songs and narratives referencing star names and constellation stories might also be expected iconographically. Similarly, pan-Uto-Aztecan chromaticism expressed by Californian groups including Numa (Hill 1992) suggests that color metaphors may be expressed as stellar objects; references to heavenly bodies and/or constellations might indicate this. Specific celestial descriptions known important in *Naraya* and other oral traditions are the Milky Way[187] (Hill 1992:125, 130), warrior/hunter in Orion (Crum et al. 2001:68-69), Mountain Sheep or three sheep in the sky (Fowler 2006), the Pleiades as Coyote's Seven Sisters (*ibid.*), concentric circles (Mukhopadhyay and Garfinkel 2016), *Datura sp.* (Hill 1992:130), and Venus as morning star, possibly drawn as an outlined cross (Whitley 2006:120; Garfinkel et al. 2016:201-202).

D'Ascenzo and Deal (1987:2,4) proposed stellar alignments for Chamber 2 be tested. While no lasting record of their specific musings remains, the criteria above capture qualities of numerous such elements already known and documented both in Locus 8/Chamber 2, and elsewhere in the canyon. Archaeoastronomical alignment tests have in the past been notoriously intensive, but software advances such as Stellarium (see following paragraph), and the suggested narrative-iconographic approach above, promise to improve efficiency and intelligibility of this sort of study. One example case is given, contextualized by adjacent and also astronomically relevant elements – all as related to above few references. Fowler (2006) assembles fragmentary reports of "Mountain Sheep in the Sky" among numerous southern California and Nevada speakers of both Numic and other languages. Common elements place Bighorn (*Naga, Nagau, naagangw*) in conjunction with the three stars of Orion's belt; in *Tümpisa*, the constellation is named *Wasüppin* (Dayley 1989:379).[188] An arrow or a dart pierces the sheep, and prominent stars surrounding

187: Ancestral Road to Numa, Flowery Trail to more southerly Uto-Aztecans
188: Commonly, w*asüppin* means bighorn sheep, and categorizes all big-game.

the scene are named as hunters, or sometimes Coyote. Two key variants from immediate neighbors to Death Valley Timbisha Shoshone and Kawaiisu – Chemehuevi to the south, and Southern Paiute to the east in Las Vegas – describe the belt as three sheep, one at each star (Fowler 2006:46-47).

As I have suggested elsewhere (Liwosz 2017:201), a cluster of three leaping boat-bodied bighorn Locus 8, Panel 35 invoke this imagery (Figure7. 40). To support the connection, additional celestial inferences can be made reasonably – using digital planetarium program Stellarium. Hill (1992:125, 130) identifies the Milky Way as a broadly universal Uto-Aztecan path to the celestial spirit world, also known as the Ancestral Road, and at times (as previously discussed) Flowery Path. Facing Orion rising, the Milky Way will rise just to its left, and dip below it to the right. For the Panel 35 sheep, the long room-crossing horizontal line (see also my discussion of evidence for the Flower World Complex, and Figure7. 24) approaches from the left, and dips below. Using a screenshot from Stellarium, it is simple to demonstrate the same relationship, with the Milky Way the light patch in the second image's lower left corner (Figure7. 41). It would seem the hunters, and/or Coyote, would be among stars Bellatrix, Betelgeuse, Rigel, and Saiph. Stars of Orion's belt and dagger can be seen to align exceptionally well with the leaping sheep of Panel 35. Implicitly, this extends another layer of religiously symbolic metaphors to the mountain sheep, with the astronomical connection implying bright chromatic scintillation, with a potential reversal into the blue or black of the surrounding interstellar void.

Figure7. 40: *Three sheep in Panel 35 proposed indicative of constellation Naga in Orion. Note "horizon line" approaching from left the descending below. Figure originally published by Liwosz (2017:201, F12), reproduced with permission by author.*

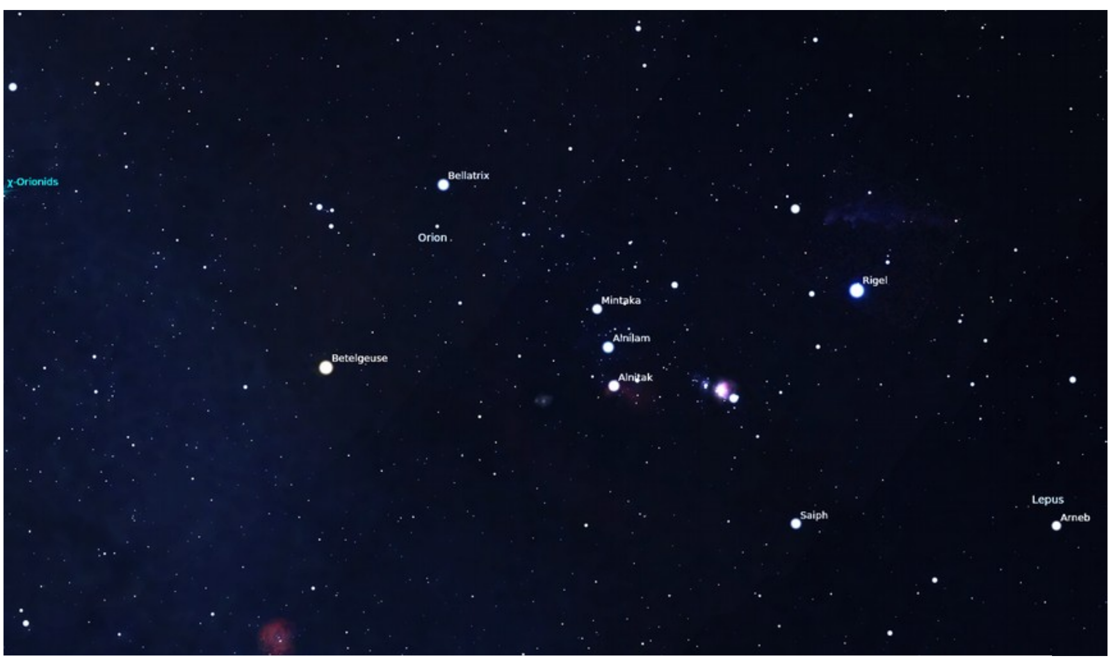


Figure7. 41: *Stellarium screenshot of constellation Orion rising ("Western" star lore), with Milky Way as light area descending from left edge to the bottom of the frame. Note other bright stars, Bellatrix, Betelgeuse, Rigel, and Saiph.*

Summary of Findings

In this chapter, I have synthesized data reported in Chapter 6 with archaeological and ethnological data, with an effort to restore indigenous voices by rooting interpretations in oral traditions. My field and analytical methods exemplify approaches to harnessing some of the potential for digital heritage management, without restricting accessibility to community archaeology endeavors through costly equipment or programs. I have at times integrated, and at other times offered alternatives to, existing interpretive frameworks for rock art studies of relevant and neighboring regions. Together, my methods, theories, and interpretations advance understandings of landscape phenomenology for animic ontologies, provide evidence for dynamic diachronic processes shaping indigenous religions, expand the knowledgebase of Great Basin iconography, demonstrably improve archaeoastronomical research for the region, reproducibly quantify ethnographically-informed archaeoacoustics data, and enrich theories of political economy as it is connected with the region's religious beliefs and practices. My findings show that Mojave Desert rock art did not always function in a homogenous way, yet broad patterns in its contents and social functions remain evident.

Research locations at INY-1634 north of Little Lake, and INY-3074 of the Death Valley area, contrast remarkably with each other. Labyrinthine layouts – multicursal for the first, and unicursal for the second – appear to have both utilitarian potential for hunting and/or defensive positions, as well as cognitive implications for religious practices. Moreso than the hunting, it is the religious practices which appear most closely connected to the interior iconography. This is less true for INY-1634 when evaluated alone, but is the pattern seen when that site is situated in context with the visual culture of its surrounding landscape. Acoustic phenomena overtly described as the actions of other-than-human inhabitants of these spaces are strongly correlated with dense concentrations of petroglyphs, which are often attribute to said kinds of agents. It is from these other-than-humans that song – essential to personal *puha* – is granted. Synthesizing oral evidence with acoustical data, I have offered suggestions for who these beings might be, including mythological beings, personal *naguales*, and evidence suggest possibly even ancestors. Going further, quantifiable resonance for at two loci at INY-1634, and three loci at INY-3074 (see Figure6. 22, Figure7. 21, and Figure7. 22) may well characterize the qualities of how these entities' voices sounded, and registers in which they sang.

The antiquity and relevance of ethnographic patterns has featured heavily in the debate of rock art interpretation. Yet the results of my study, in conjunction with previous literature, find ample evidence to support using Numic religious beliefs and oral traditions in interpreting the rock art. Cultural disruptions suggested for Little Lake are in discord with the archaeological record, do not have any such correlate in Death Valley or its regional neighbors (Hunt 1960; Reynolds 1996; Brosman 2012). Iconography at Little Lake, and the Death Valley project area, do not significantly deviate from each other, and both suggest continuity-with-change since the end of the

Middle Holocene (see also Van Tilburg 2012:157). This suggests ethnographic patterns developed out of ancient systems over time, thereby substantiating the interpretive value of northern Uto-Aztecan cosmologies, including but no constrained to Numic beliefs. Only in a model of continuity-with-change can sense be made of patterns such as in Chamber 2 (Figure7. 24), where both an old Uto-Aztecan Flower World chromaticism, and Numic celestial chromaticism integrate into a large layout. Arms of the Milky Way Galaxy link the Flower World with Coyote hunting bighorn in Orion, and with the Numic *Naraya* tradition of sacred songs.

Chiefly among these Numic religious beliefs is the role of the ritual adept: shaman, doctor, *po'hage, puhakanti, huuiyagadi*. These spiritual and community leaders enjoyed exclusive access to rock are locales, they may have granted temporary, partial access for certain rites. Evidence at both INY-1634 and INY-3074 is consistent with male and female puberty rites, as the canyon structures and iconography lay out the passage into adulthood, especially at the latter. Similarly, adult crisis rites would also have involved temporary venture in, and INY-3074 in particular is very consistent with the oral traditions of these rites. Iconography reflects ritual technologies, but it is likely portions were never fully open access, and much of the use may well not have been for puberty or crisis rites.

With *puhakanti* not just enjoying, but obligatorily filling the focal role as *pakwinavi* at inter-community festivities, it was essential these supernaturally endowed persons be able not just to recite sacred narrative, but to lead songs.

Iconographic cues clearly identify the parietal images as mnemonics, prompts for narrative recitation. It also thoroughly demonstrates references to multiple genres of Numic oral tradition, and in addition to the creations series as a part of the traditions from the "time when animals walked like people," deeper traditions are also present. Repeated visual references to *Naraya* indicate songs these places granted – especially INY-3074 – illustrate words, roles, and structures of events in which it would be performed. These companion instructions to the *Naraya* tradition indicate *puhakanti* acquiring song here also acquired instructions for how to integrate it into these ceremonies, namely occasions for the Round Dance.

As both *Naraya* themes, and Round Dance occasions relate directly to the fertility/world-renewal complex, there remains little ambiguity as to the convergence of images and phenomenological experiences. Petroglyph production reproduced thunderous reverberation, lightning-like flashes in the crystalline quartz tools, and resulted in a corpus of images that (when weighing together all cultural and naturalistic metaphors for rain, water, and storms) dominates the majority of INY-3074's visual culture and landscape symbolism, especially from Chamber 2 upward. A shamanic weather control model is thus not only consistent with, but also a powerful descriptor for, much of this canyon. Linguistic evidence suggests that by fulfilling these obligations, ritual specialists diminished chances of marginalization. Taken together, rain shamanism and world-renewal ceremonialism maintained the fertility cult inherited from an ancestral Uto-Aztecan Flower World Complex.

Deeper reaches of INY-3074 reflect not just altered states, but religious iconography from the core of the deepest rooted traditions, and visual and auditory psychological effects far from daily experiences. The transportation into an apparent religiously charged realm is facilitated by removal from the quotidian, and a re-construction of the entire cosmic topology contained with this specific slot canyon. Disorientation from labyrinthine switchbacks, and the vertigo of a long and steep ascent between high, narrow walls not only impacted the minds of past people, but have previously confused archaeologists and impede the function of modern equipment (GPS). These places remain powerful, and continue to act with agency. By removing all points of orientation for the observer, the canyons transport the observer from the quotidian world into the spirit world on the other side of the snakeskin-like membrane of the rock surface. Expressions of cosmological tiers seem richest at the INY-3074 slot canyon, which reproduces the entire Charleston topology. In doing so, it clearly demonstrates Numic origins of rock art, a powerful axis mundi anchoring these beliefs in the Numic heartland, and its role in a trade network from at least the foot of the Inyo-White Mountains in Saline Valley, across to the opposite side of the Amargosa Desert at Charleston Peak. It is integral to this larger landscape.

Petroglyph landscapes express not just one subsistence task, but entire worldviews, providing knowledge and resources to live, aid in healing, guidance to grow, stories of origins (and the life lessons therein), and connections to ancestral times. This summary cannot conclude, however, without revisiting the evidence for hunting. In both petroglyph canyons, bighorn imagery is one of the more common motifs, even though it only represents six to seven percent of the overall content throughout the related landscape. Hunting big game was typically a gendered act of not just subsistence provisioning, but also a symbolic act of fertility and virility. It was deeply ingrained in a political economy of food and toolstone trade.

Hunting alone, however, was not the sole economic driver, and its over-emphasis has caused clear signs of other economic activities to go ignored. At INY-3074, botanical resources including ephedra, Joshua tree, and perhaps most importantly willow may well have outweighed periodic use of a hunting feature. The material culture constructed of these fiber sources appear to be evident in an unusually dense cluster of rockshelters located in the immediate vicinity. Furthermore, at least one shelter is directly acoustically connected to the canyon, reinforcing the proposed economic ties. Taboos restricting access to these locations granted ritual adepts economic power to regulate these resources, and because the agents within were conceived as the shamans' helpers, even in his (or her) absence appropriate offerings as payment for using the resources would be left to appease them. After the *puhakanti's* departing, their *nagual* becomes a *genius loci*, continuing to inhabit and oversee these otherworldly places of their caches, and manage the *puha* therein.

Regardless of scholars' theoretical frameworks, or agreement with my interpretations, the above discussion calls for reporting rock art more thoroughly in its spatial and iconographic context. It is only in the application of thorough, multiscalar reporting that the depth of analysis here has been possible. I have demonstrated the efficacy of 3D photographic models, and archaeoacoustics, as means of adding dimension – even giving voice – to the data and its context. These tools, when used in a manner acknowledging indigenous oral traditions, have enable me to advance even archaeoastronomical study. Most importantly, the ethnographically informed approach is necessary not only for interpretation, but for developing socially relevant questions to drive ethical research in the future.

Future Directions

Archaeoastronomy

Because of the highly detailed landscapes captured and reconstructed in 3D digital modeling, and thorough inventories, spatially specific propositions can be modeled for later ground truth testing. There are numerous likely candidates among these few suggested iconographic clues. Once potential celestial iconography is identified, the 3D models can theoretically be checked in digital planetarium software (although the exact process is not yet fully developed). Currently, Stellarium is the lead candidate planetarium program, with tools to adjust viewing position to any latitude and longitude position, and usable data values far exceeding the full range of human habitation of the western hemisphere. Of much potential utility, its producers launched a companion project "Skycultures," which accepts submissions of starlines and star lore from cultures around the globe. Many of its ethnoastronomical libraries, however, are incomplete. Although these Skyculture libraries exist for other living groups in the United States (e.g. Dakota/Lakota/Nakota, Navajo, Hawaiian), none have yet been undertaken for Numa (or, for that matter, Uto-Azteca). Here is an opportunity for positive community engagement projects like those still on-going in Hawaiʻi. Building a more thorough ethnoastronomical database for Timbisha, Owens Valley Paiute, Mono, Kawaiisu, or other communities would itself help to record, preserve, and share these traditions for years to come, at no added cost.

With only some small amount of imagination, the utility of a digital heritage database like tailored Skycultures can be enormous. By ensuring end-product datasets of 3D models, and this proposed astronomy project, are open source, a major socio-economic hurdle for descendant communities to access these data has been overcome. Accessible open-source data opens new ways of engaging with cultural heritage, and this accessibility is instrumental in engaging current and younger generations. Moreover, it will likely be a cornerstone in maintaining subject matters such as visual culture, song, and astronomic lore as active (and interactive) features of *living* culture, spanning the past, present, and accelerationist future.

Some technical adjustments, however, still stand in-between the models and their use in a digital planetarium, but it does appear feasible. In the interim, side-by-side model interaction should be more than sufficient.–Certainly the list of topics and suggested tools is not even close to comprehensive, and input from future collaborations will doubtless take an astronomical heritage project in directions not yet imagined by the author. It is a project which can begin with no additional data collection from archaeological sites required, at no added cost beyond labor. This proposal extends the mission of the current concluding project's goals to explore new, informative, and non-invasive documentation methods, if appropriate members of these communities are interested this manner of heritage project.

As an interesting addendum, these tools can be used by scholars to investigate diachronic changes in religious metaphors, such as those discussed with *Chinigchinich* influences on conceptualizing the Milky Way. Although there are alternate considerations, late additions of the equilateral cross "+" motif at INY-3074, especially on Panel 9 (see Figure6. 38 and Figure7. 36) could correlate with with historic period indigenous movements. Using Stellarium, it appears Venus was morning star (as opposed to its other role as evening star) during significant events around December 1890.

Horticultural Landscapes, and "Resource Markers"

Given evidence previously covered, it is guaranteed Numic ceremonies, and likely Numic horticulture, played a more pivotal role in lifeways than previously acknowledged; consequently, fine-grained measures such as Turner's exceptional observations are more likely to find Numic correlates than typical solstice-equinox types of archaeological tests, the latter of which lack ethnographic foundations. Turner's (2011:12) complex models integrating observation and ceremonial processions into rigorous horticulturist routines of the Ohio make an informative model for future Great Basin applications. Based on Brosman's "resource markers," suggestions, a project evaluating rock art as distributed through the scale of the Piute Valley's circuit might examine resource seasonality as an inspiration for rock art. Not dependent on the panels themselves having horizon alignments, oral tradition and iconography can test cultural knowledges of the kinds demonstrated in Polynesian astronomy, including depicting seasonal constellations as mnemonic devices. Among the landscapes under consideration are those of the Inyo-White Mountain Range, and its flanks of Saline Valley to the east, and Owens Valley to the west.

Archaeoacoustics at the Landscape Scale

In the Amargosa Desert north of Pahrump Valley, south of Beatty, and east of Death Valley, Timbisha Shoshone and Pahrump Paiute identified a stable sand dune as a major point of cultural concern for future proposed development of the area. Commonly called "Big Dune," the 100 meter tall sandy mound is a key landmark of a landscape referenced in traditional songs (Stoffle et al. 2011:25, 37). Along with Dumont Dunes just south of Death Valley, and Kelso Dunes in Mojave National Preserve, Big Dune contributes to these traditional songs by singing itself (Stoffle et al. 2011:27). Landscape acoustics of Big Dune and its counterparts, consequently, directly contribute to the power of place, and increase the likelihood it hosted ceremonial gatherings (Stoffle et al. 2011:46).

An archaeoacoustics assessment of these and other area sand dunes would need no further investment in equipment, utilizing what I already have on hand. Experimentally, there would be little need for any human generated sound impulses, instead recording a contrast between background sounds near dunes, and away from them. The current equipment allows a microphone array to record multiple positions simultaneously. A systematic test surveying sand dunes would use both empty areas and non-singing dunes as controls. It appears the mechanism has previously been studied (e.g. Haff 1986; Nori et al. 1997) and so the goal of this study would go beyond simple confirm-refute. Instead, a comparison between "singing" (e.g. Big, Eureka, and Panamint Dunes) and "non-singing" (e.g. Mesquite Dunes in Death Valley) would attempt to correlate tones and cadence with both oral tradition (especially song, including but not limited to *Naraya*), and with archaeological evidence of ritual landscapes.[189]

Iconographic Inventory

Although not an express goal of this slot canyons project, one of the somewhat expected directions in which it has grown is that of iconographic analysis. Working from existing literature, oral traditions, and outgrowths of semiotic discourse, interpretations for a number of simple and compound motifs have been proposed throughout this chapter. In the near future, this should be assembled into a systematic volume cross-referencing motifs, variations, known occurrences, and relevant ethnographic and archaeological citations. The proposed iconographic inventory project is inherently archival, organizing datasets from existing "collections of

189: See Carroll et al. 2004 for criteria specific to the cultures and region.

documentation. Its products should be shared with the UCLA Cotsen Institute's Rock Art Archive, as well as state and federally authorized information centers.

The inventory project can be considered as already under-way. Several new interpretations have been suggested in the present project, and more remain yet unexplored. For just one example, the elliptical "rugby ball" motif has yet to be decrypted. Following evidence by Hunt (1960) and others following her lead, pottery evidence for the Death Valley-Basketmaker connection places could open the door for Timbisha, Kawaiisu, or Southern Paiute ritual adepts participating in Puebloan ceremonies during which cacao beverages were ingested.[190] Research into other lines of evidence could provide insight both into the "rugby-ball" motif as a possible cross-section of a cacao pod (Figure7. 42). Cacao fertility symbols known elsewhere would integrate well into Numic religion, adding additional layers of meaning to the mythography of Series I origins – as exemplified by the conflation of the "rugby-ball" design with the head of a Coso-style bighorn at INY-3074 Panel 2 (see Figure6. 13).

190: Much in the way new doctors traveled to train under *Wovoka* during the Ghost Dance.

Figure7. 42: *Cross-section of a desiccated cacao pod. [photo credit: author 2018]*

Photogrammetry and Archaeoacoustics

There is no reason the 3D modeling and archaeoacoustics techniques demonstrated in the Mojave Desert slot canyons study need remain constrained solely to rock art research. These tools might prove particularly useful in assessing locations known in oral tradition to have been associated with power workers (doctors/shamans), or supernatural encounters with other-than-humans, yet lacking significant surface level material culture. Performing signal-sweep archaeoacoustics assessments, and contextualizing results with landscape-scale 3-D models such as those generated in the slot canyons project (see also Appendix A and Appendix B) can now be demonstrated a viable alternative to significance assessment using sub-surface testing. Among research locations under consideration are the Tehachapi Mountains rock shelter in Figure7. 12 (near known acoustic site Back Canyon), already excavated Coso area site Ayers' Rock (CA-INY-134), and others not yet mentioned in-text.

Concluding comments

An overabundance of evidence inextricably links petroglyphs with religious expression, although this statement in itself is empty. Simply to proclaim "religious" or "ritual use" has long been a worn out trope for archaeologists – if not an outright source of mockery. For the Great Basin, a protracted debate over the exact nature of that religious expression has spanned decades. Complicating matters, our earliest ethnographic evidence either did not or could not deal with symbolic complexities.[191] Classically, petroglyph discourse has charted two primary lineages of western academic reasoning in use, and although both claim to be derived at least in part from the same ethnographic works of Julian Steward, Harold Driver, and Isabel Kelly, among others, their conclusions are vastly different. As both Chapter 3 and Chapter 4 underscore, however, numerous scholars' thorough and novel attempts to complicate the debate have unfortunately gone largely ignored.

The Big Game in the Room

Perhaps as much to avoid this research from subsiding into the shadows of the same obscurity, as to also address the proverbial "elephant in the room" straight-away, it seems prudent to summarize how the above exposition addresses each

191:It is little wonder these points were missing, as among many contributing factors were cultural and linguistic barriers, Great Depression era economic hardships in marginalized communities, and the ever pervasive research bias with which all scholars struggle.

interpretive model prior to proceeding beyond. Primarily, the intellectual bout pits a hunting cult ceremonial system (usually stuck in a positive feedback loop with negative consequences) defending against a weather-control-oriented shamanism surmised through neuropsychological readings of radically altered modes of perception. As if the rift separating the two interpretations was not abyssal enough, epistemological differences within anthropology manifest in the modes of reasoning employed – exemplified by the former school's continued positivist-implying brand of "hypothesis" for propositions, while the latter (to expose my own biases) prefers "models." Bypassing the concern over primacy for either falsifiability or plausibility, the bulk of incompatibilities would seem to disappear with the modern Western episteme removed. Based on the metaphorical mountain of evidence, both communal ceremonialism rich in fertility themes *and* shamanistic search for spiritual potency to achieve weather control (among other such seemingly supernatural abilities fit for Xavier's Institute for Higher Learning) are not only substantiated, but unequivocally confirmed. The linchpin act of slaying the symbolically laden mountain sheep is only secondary supporting evidence for each, and truly a side point. As I have demonstrated, the motif for the animal (allowing for all variants on big-game, whose categorical name was that of bighorn) occurs at identical frequencies to a rainfall motif. Research in the vicinities of Death Valley and Little Lake substantiate a sheep-rainstorm connection through multisensory metaphors. Suffice it to say, difficulties the evidence at hand has with discerning between the two is because *both* ceremonialism *and* shamanistic rites (including a socially-sanctioned shamanic institution) coexisted within the same overarching religious complex. That both should mobilize comparable metaphors of hunting, rain, and fertility highlights an indigenous ontology predicated upon an empirical episteme - one in which correlations between peak herd fertility, flora-nourishing seasonal patterns, and sensory similes bridged natural causal processes and projections of human agency.

Whether weather-summoning or status-signaling rites employed sympathetic magic to improve the outcome of the hunt is both difficult to determine and largely a moot point. The successful hunt was demonstrably a symbolic act (in addition to subsistence), one which projected human agency to shape outcomes on the *natural* world on at least a superhuman, if not wholly supernatural, scale. Conceived animacy of the landscape – such as the purported opening of cavernous places from cracks – may well have been useful in game jump hunting strategies, but this was a property of place since the storied pre-human age, not merely the projected will of hunting parties (or even shamans) who later utilized it. Whether or not to employ sympathetic magic is either a decision of whether or not to hit the "easy button," or possibly merely a conceptual artefact of western scholars' arbitrary distinctions between categorical boundaries of magico-religious versus pragmatic and mundane. Seeming somewhat laden with binary oppositions reminiscent of structuralist thought, distinguishing whether or not magic ensured a necessary step in an already supernaturally potent act smacks more of Descartes and Levi-Strauss than it does of animistic ontologies.

Creativity

It is more than somewhat incongruous that proponents of evolutionary models would continue to ignore and implicitly dismiss one of the hallmark traits of humanity: behavioral plasticity. While the treatment of behavior patterns such as subsistence as under evolutionary pressure may well be both accurate and appropriate for certain research questions, the implicit assumption that ethnolinguistic groups were constrained to either success or extinction by these pressures on behavior is ultimately fallacious. In less-than-lifetime scales, humans are capable of remarkable changes to behavioral patterns and habits because of neuroplasticity: the capacity for the brain to wire new connections, and old habits to atrophy, as necessary. Not exclusive to the realm of cognitive approaches, neuroplasticity has even been used *in expressly ecological* approaches to argue for *H. sapiens sapiens'* advantage over *H. s. neanderthalensis*.

For those seeking empirical evidence of such mental flexibility, this study's *ethnographically-informed* approach yet yields empirical evidence for such etic understandings. Indeed, the neuropsychology model's adaptation of semiotics highlights creative processes in action. Above, these processes originally employed in visual culture are adapted to bridge between other sensory expressions. The discursive process of meaning-making is inherently one of rewiring by temporarily externalizing cognitive processes into the environment – using the human sensory apparatus as synaptic relays. Occurring across multiple senses, there are consequently *multiple lines of evidence* of active intentional re-wiring. In other words, the acquisition of images (demonstrated by Whitley 1994; Lewis-Williams 2002; and the data above), metaphors (demonstrated by Whitley 1994; Lewis-Williams 2002; and the data above), and songs (demonstrated by the data above, and implicit in Waller 1999; 2000; 2002; 2004; 2012; 2016) within religious practice maintain adaptive flexibility. These practices continued into the historic period, contextualizing Wodziwob's 1870 and Wovoka's 1890 Ghost Dance movements as intentional and rational shamanistic engagements with the mechanisms of neuroplasticity in direct response to times of selective stress in the face of devastating Euro-American encroachment. The lasting legacy integrating "positive" and rejecting "negative" aspects of Euro-American culture (Carroll et al. 2004) has impacted indigenous acculturation – and demonstrates behavioral plasticity as an adaptive response.

While positivists' antiquated reliance on either unequivocal confirmation or falsification will ultimately leave them dissatisfied with the evidence for behavioral plasticity, this study will not pander to such stubbornness. The current state of the philosophy of science (e.g. Whitley 1992a; 2011) highlights a need for a post-positivist approach in the social sciences. Fixating on formulating hypotheses for which contrary evidence is possible but unlikely selects for low-risk propositions with little analytical potential. Many extant models therefore gets us no closer to understanding cultural significance, histories, social structures, personal experiences, or regional and inter-regional patterns of interaction.[192] In a post-positivist approach, stronger propositions need not be bullet-proof against outlier cases, and instead are selected for the ability to accommodate new data, and crucially *to generate new insights and avenues of research* (Whitley 2011:95; see also Chapter 3). Much like the Numa and their ancestors who repeatedly faced social and environmental pressures, it is entirely within the realm of each researcher's capacities to demonstrate agency over their continued survival in the competitive academic sphere by adapting to new ideas and approaches. Selective pressures for conservative behaviors in times of stress (Bettinger and Baumhoff 1982) amount to back-loading labor (in HBE terms), and the time to invest the energy in updating the theoretical framework and its contributions to the broader discussion is nigh. Whether the state of HBE will advance and adapt to integrate cognitive, feminist, and neo-Marxist advancements in post-processual (and post-positivist) archaeology, or whether it will languish in increasingly outdated and over-simplified models to explain complex social and symbolic behaviors, is in the hands of its current behaviorist practitioners. Movement towards more productive behavioral models has already begin, as hybrid cognitive-ecological approaches are developing into theories of "deep ecologies."

Archaeoacoustics

Regarding the archaeoacoustics experiments at these locations, a few key conclusions can be visited. First, strong reverberation and resonance does seem to be

192: For example, while it may be demonstrable in *some* Great Basin parietal art, virtually all symbolic behaviors can in fact fit within "costly signaling," achieving no deeper insight.

more common at enclosed loci with extensive percussively stippled panels. Second, sound dampening effects should be tested in future studies. Third, specialized equipment will be needed to measure infrasound. And, most importantly, the significance of acoustic properties must be attested to by *both* the material evidence *and* cultural knowledge (i.e. oral traditions).

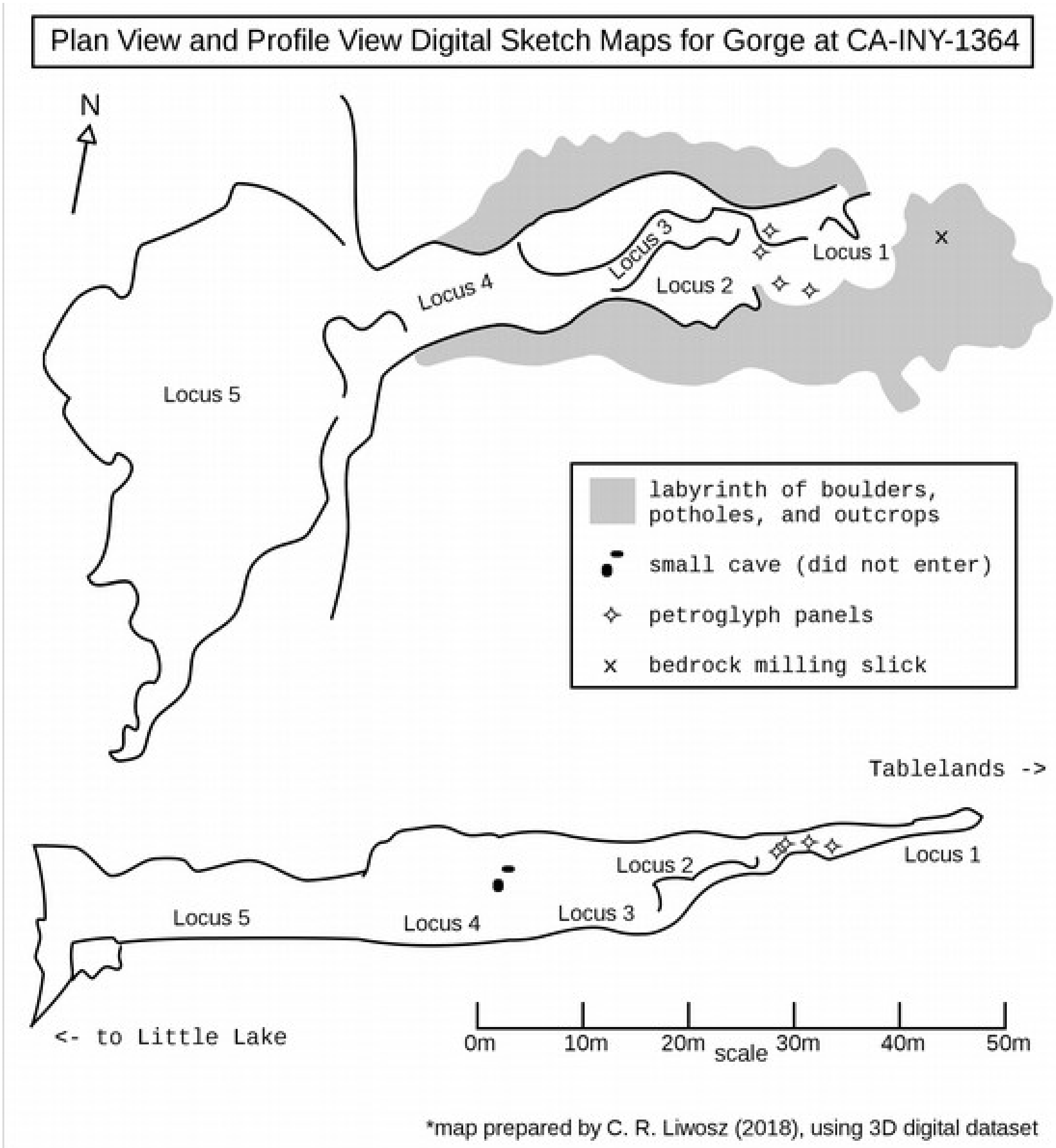
The Owens River gorge descending from tablelands to Little Lake is demonstrably distinct from INY-3074's longer slot canyon. At the onset, I intuitively anticipated both canyons would perform similar audio tricks; conversely, hypothesized petroglyph-echo correlations would predict the exact opposite, with the much denser petroglyph assemblage at INY-3074 implying that it, and not INY-1634, had the higher propensity for psychoacoustic effects. As the results show, my intuition was wrong, and the model remains correct: while the tableland basalt of the Owens River gorge apparently absorbs sound, certain spaces in the Death Valley slot canyon reinforce it well. The correlation between dense rock art and compounding sound reflections is consisted both on the site-scale, as well as between sites. This is not to say, however, that no acoustic surprises means no rock art.

As I have argued above, the culturally appropriate concept is the perception of agency through sensory engagements, with sound among them. Its significance is also culturally valued, and a codified central element to religious expression. Others (e.g. Van Tilburg et al. 2012; LaPierre and Garfinkel 2013) have attempted to explore other Numic visual culture for rock art's iconographic baseline. Sound adds another dimension where such parallel symbolism can be encoded. In places packed with traditional symbolism, mnemonic motifs lend the stories and symbolism to subsequent person-place social interactions, facilitating intergenerational discourse. Oration and song are no doubt bodies of traditional cultural knowledge, but not necessarily so dogmatic or canonical as a westerner might expect from religion. In the above discussion, I elaborate on how a neuropsychology reading of vocables (in context) reveals a symbolic correlate between iconography and archaeoacoustics. Creative processes expressed as vocables in song acquisition index similar creative thinking to the recursive abstract images of dreamers' fascinations.

Final Summary

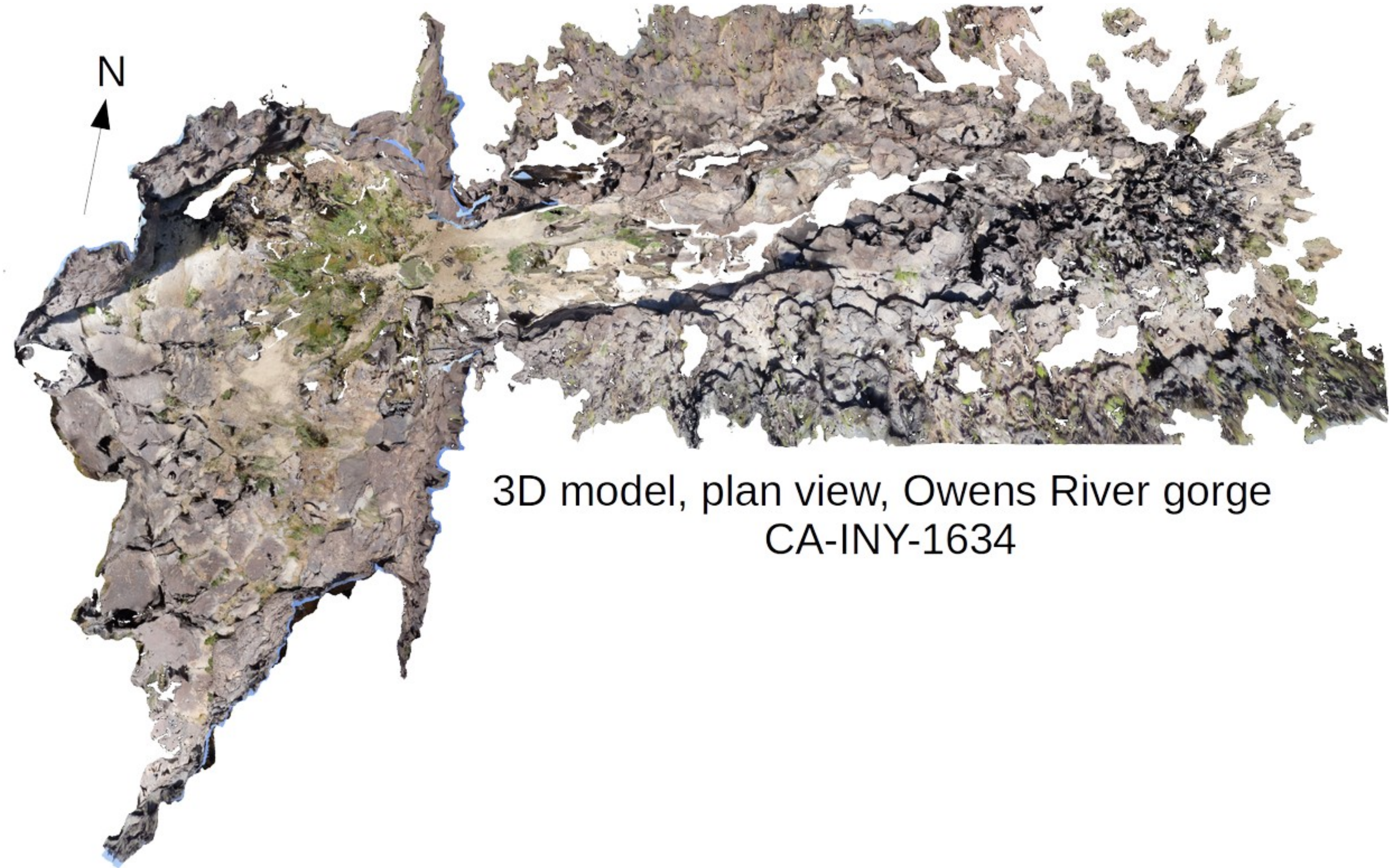
The preceding has summarized several years of intensive study of a limited scope of parietal art, situated in over a century's discourse on that visual culture genre. The extensive knowledge base employed spans published works of several generations of scholars, through theories only beginning to find their corresponding methods in emerging practices. It is an unfortunate reality that anthropological and archaeological research of the region has mobilized rock art in legal battles that have disenfranchised Native American groups – particularly modern Numic communities – leading to the denial of land claims and tribal recognition, among other social matters. I have molded my methods and theories to help put into practice a new code of ethics, one which does not reproduce these same grave consequences of an all-too-recent past. It is thus a move towards "decolonizing" archaeology, a philosophy implicit in employing accessible methods, not just interpretations. I hope these efforts are not in vain, and that they will help to rebuild trust between archaeologists and local communities, both indigenous and settler. I am deeply grateful for the opportunity to undertake this project, and hope these places inspire the readership to reflect upon, and to further explore, their senses.

APPENDIX A: CANYON STRUCTURE AND 3D MODELS, CA-INY-1634



(Top) CA-INY-1634 and Owens River gorge, northwest wall photogrammetrty profile

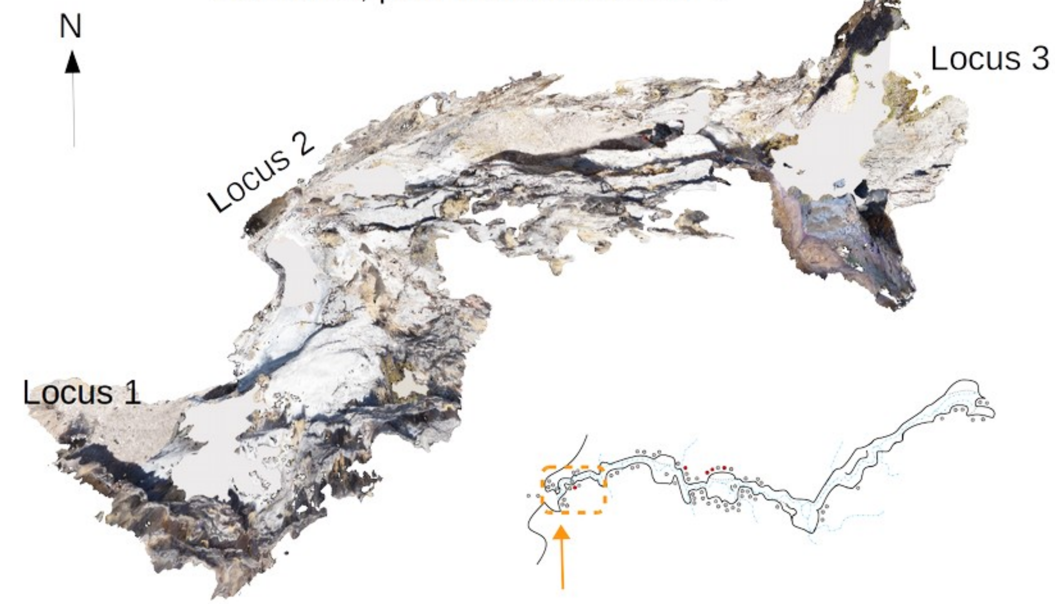
(Bottom) CA-INY-1634 and Owens River gorge, southeast wall photogrammetry profile

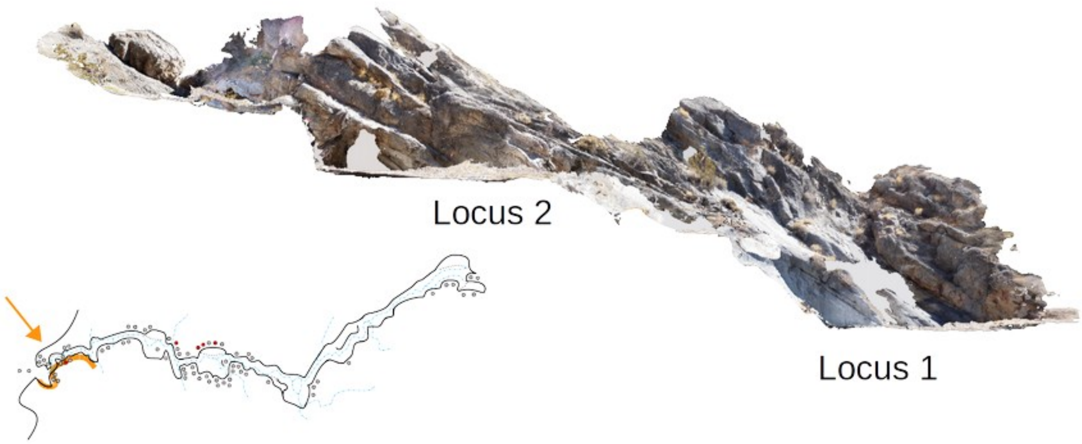


3D model, plan view, Owens River gorge
CA-INY-1634

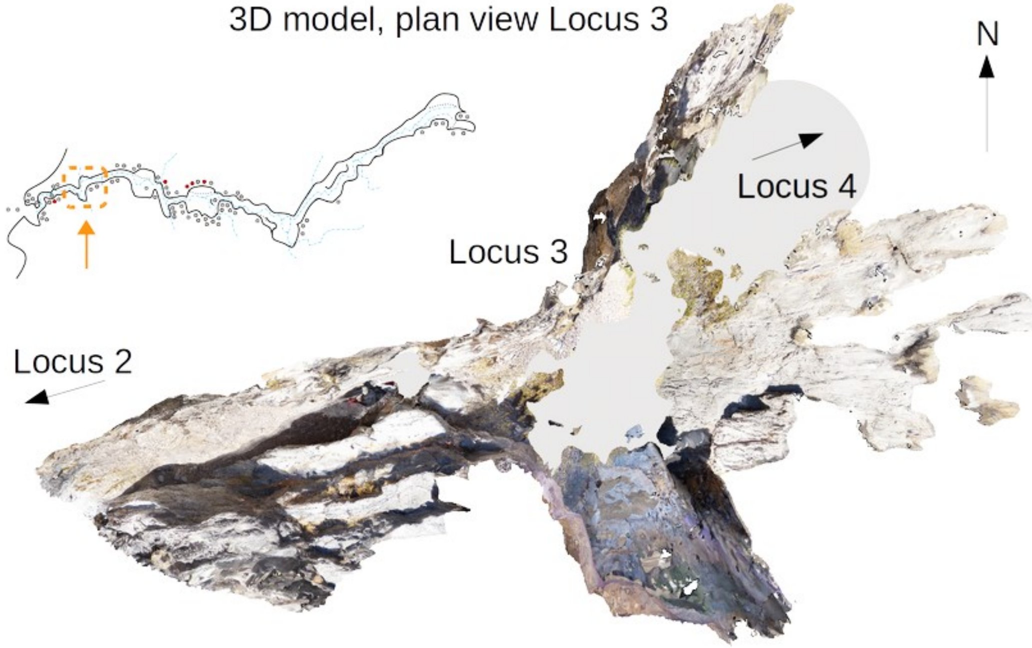
APPENDIX B: CANYON STRUCTURE AND 3D MODELS, CA-INY-3074

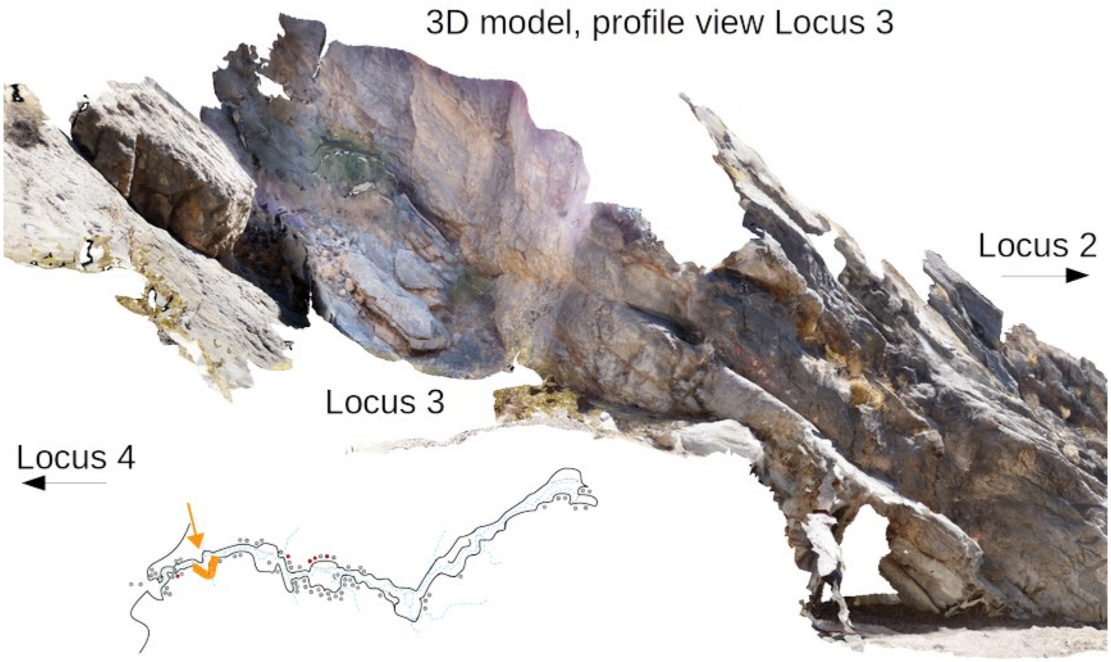
3D model, plan view Loci 1 and 2

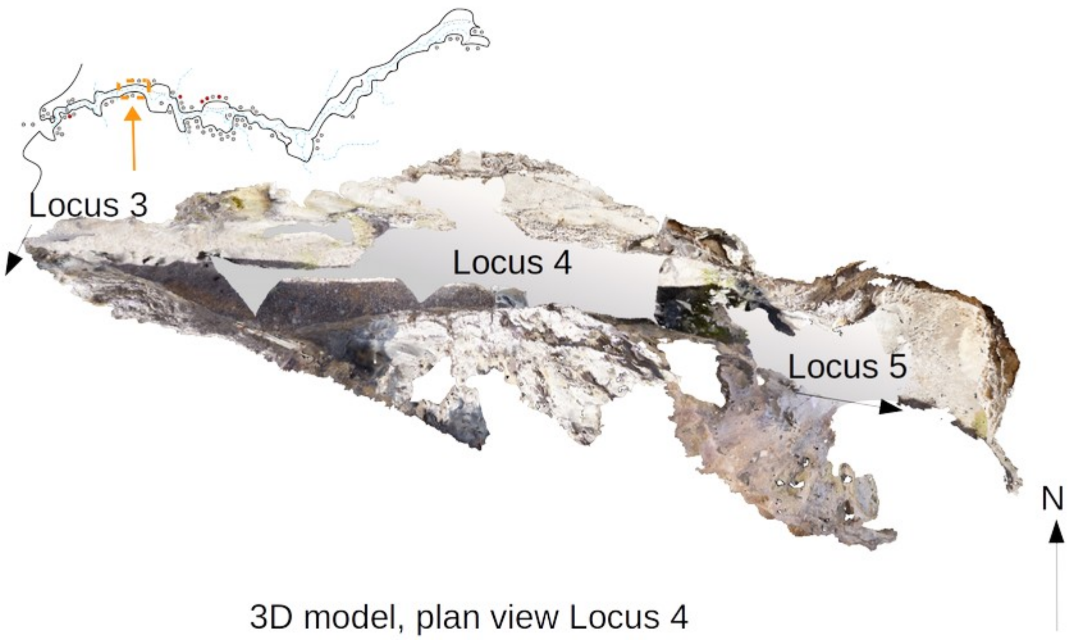




3D model, Profile view Loci 1 and 2

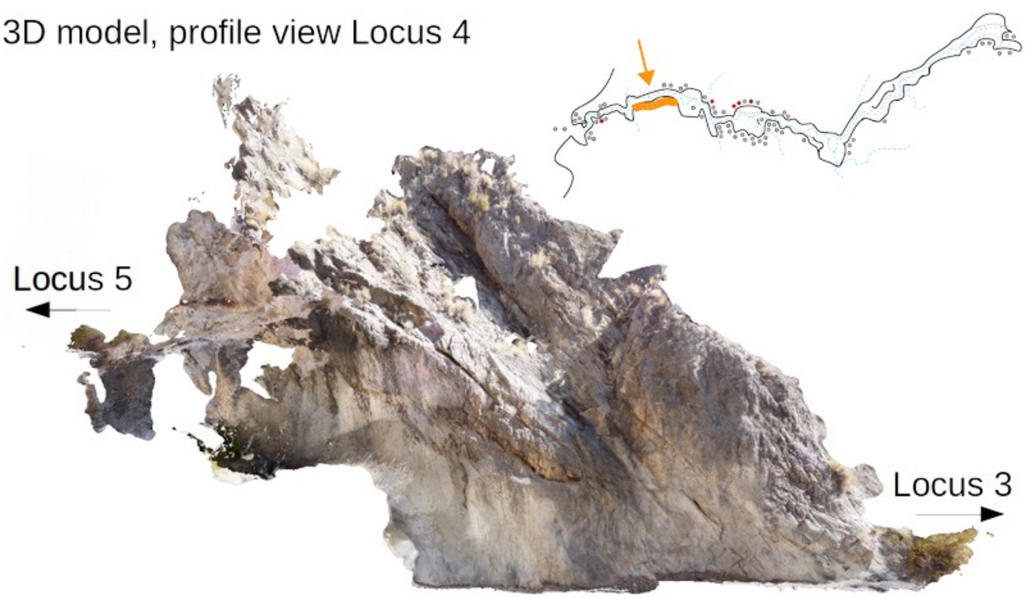

3D model, plan view Locus 3
N
Locus 4
Locus 3
Locus 2

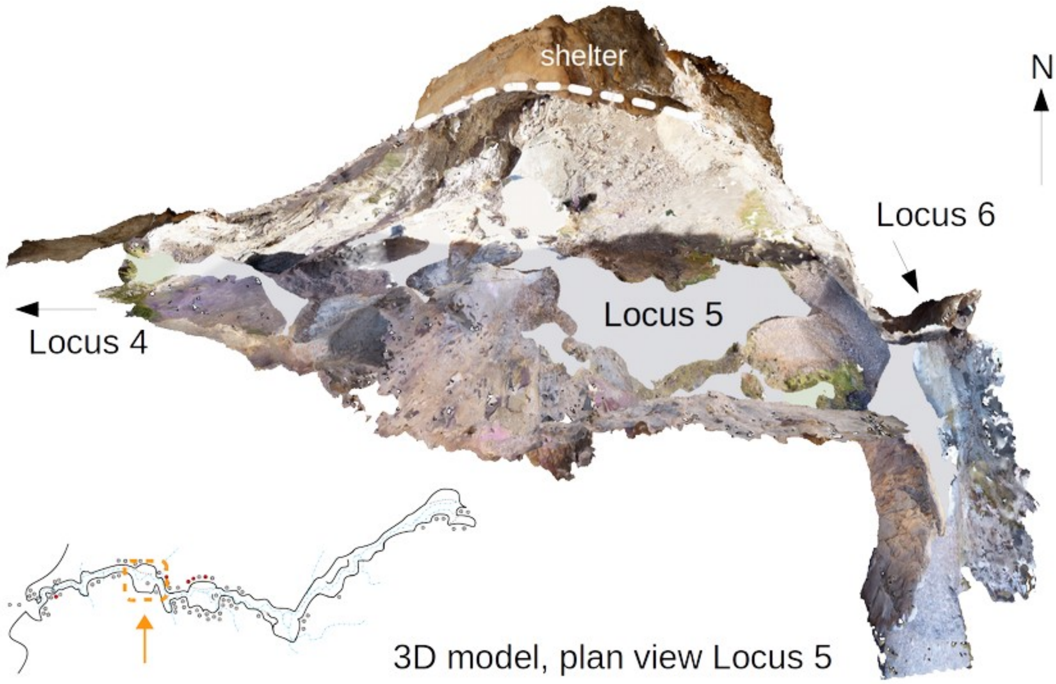

3D model, profile view Locus 3
Locus 2
Locus 3
Locus 4



3D model, plan view Locus 4

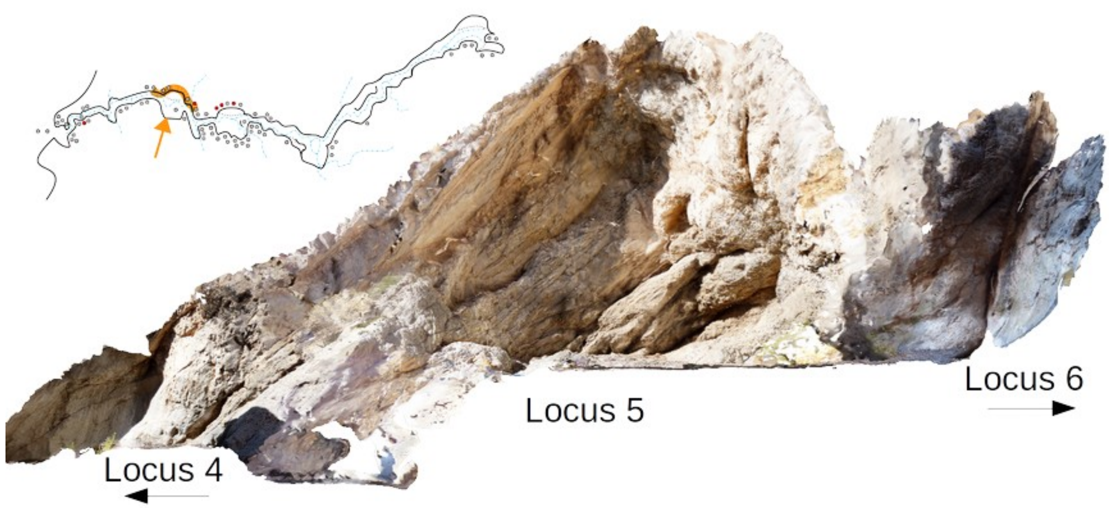
3D model, profile view Locus 4

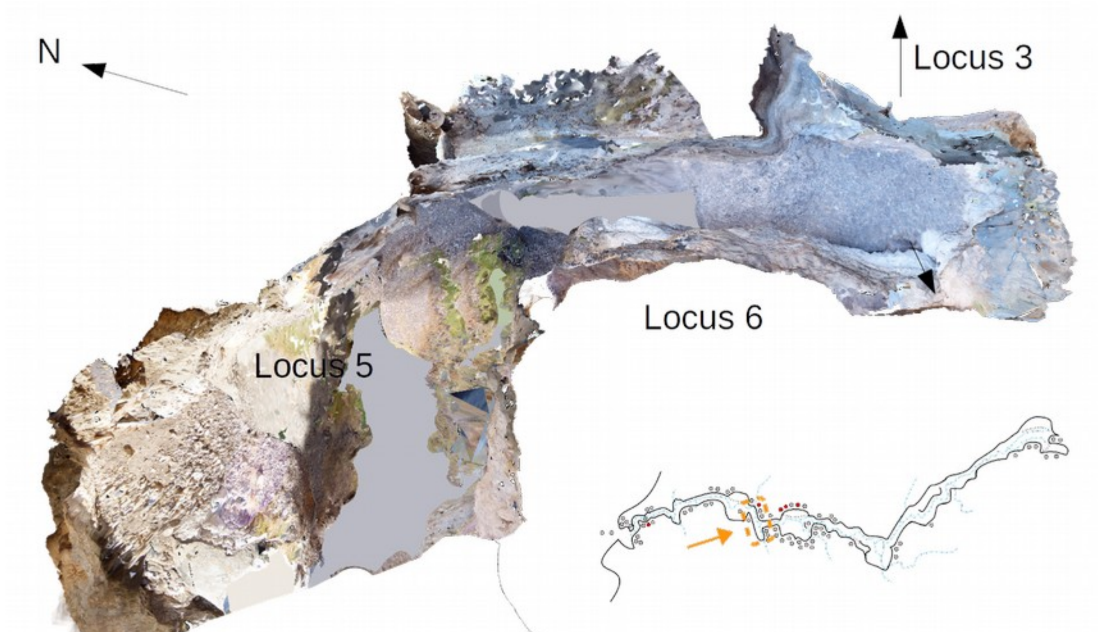




3D model, plan view Locus 5

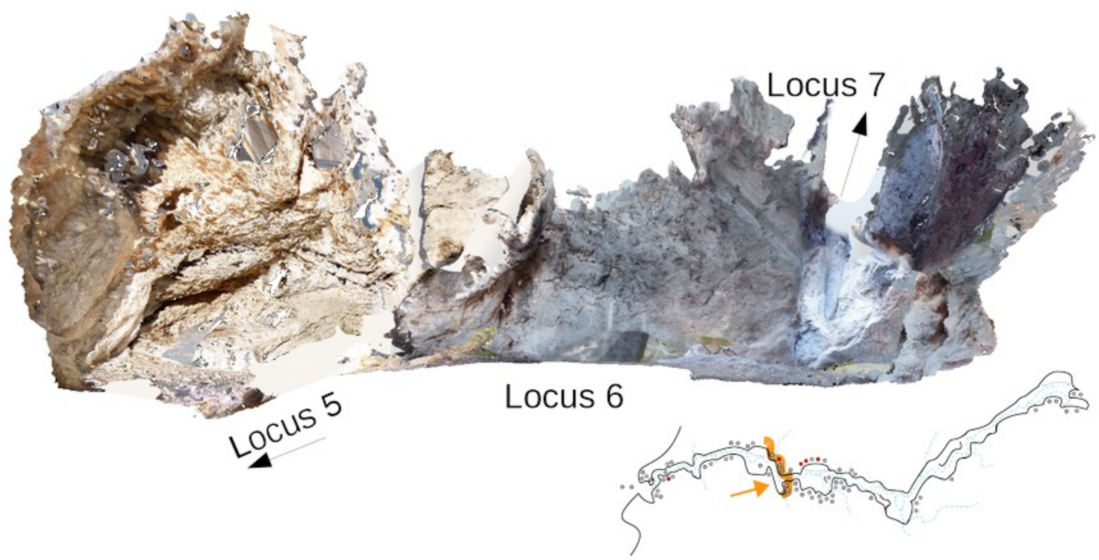
3D model, profile view Locus 5

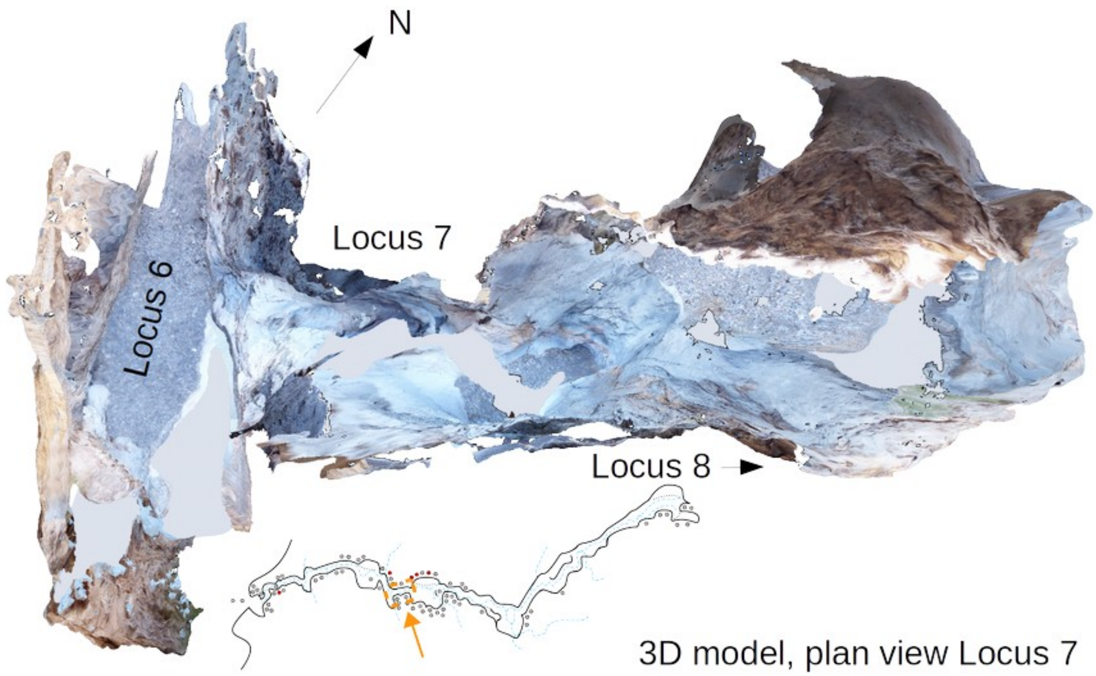


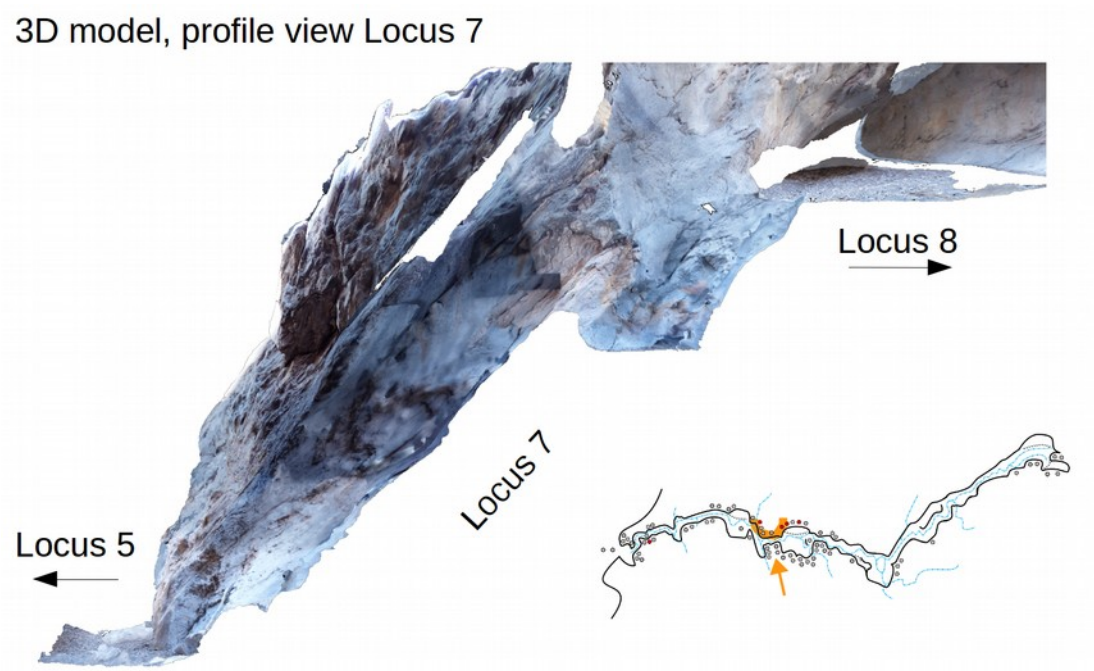


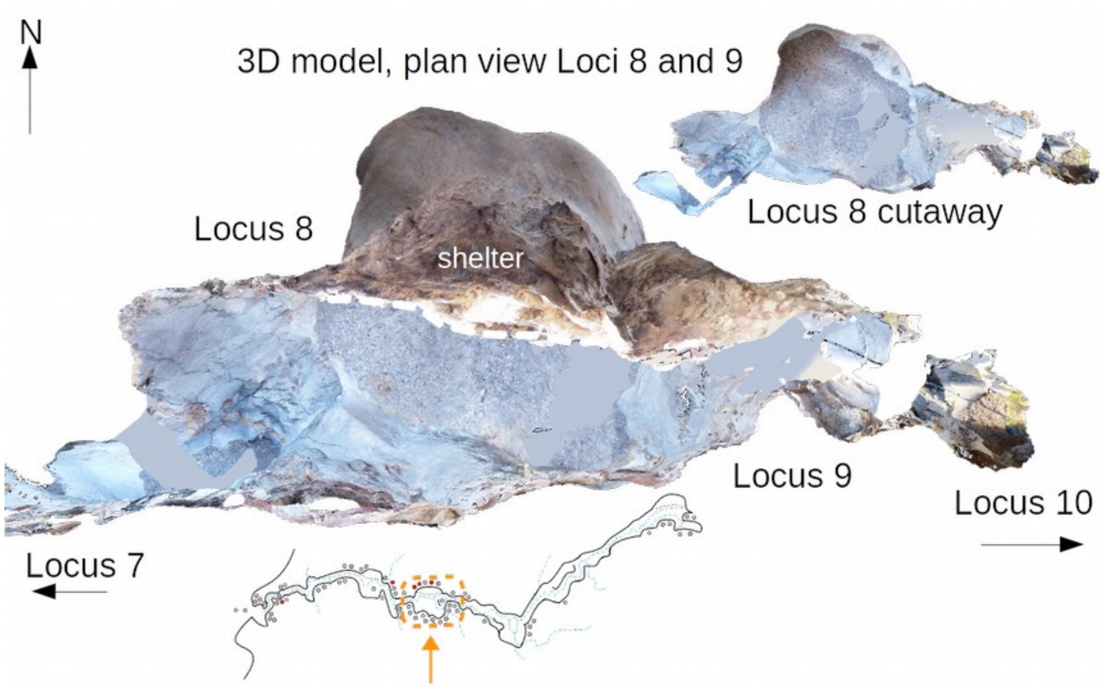
3D model, plan view Locus 6

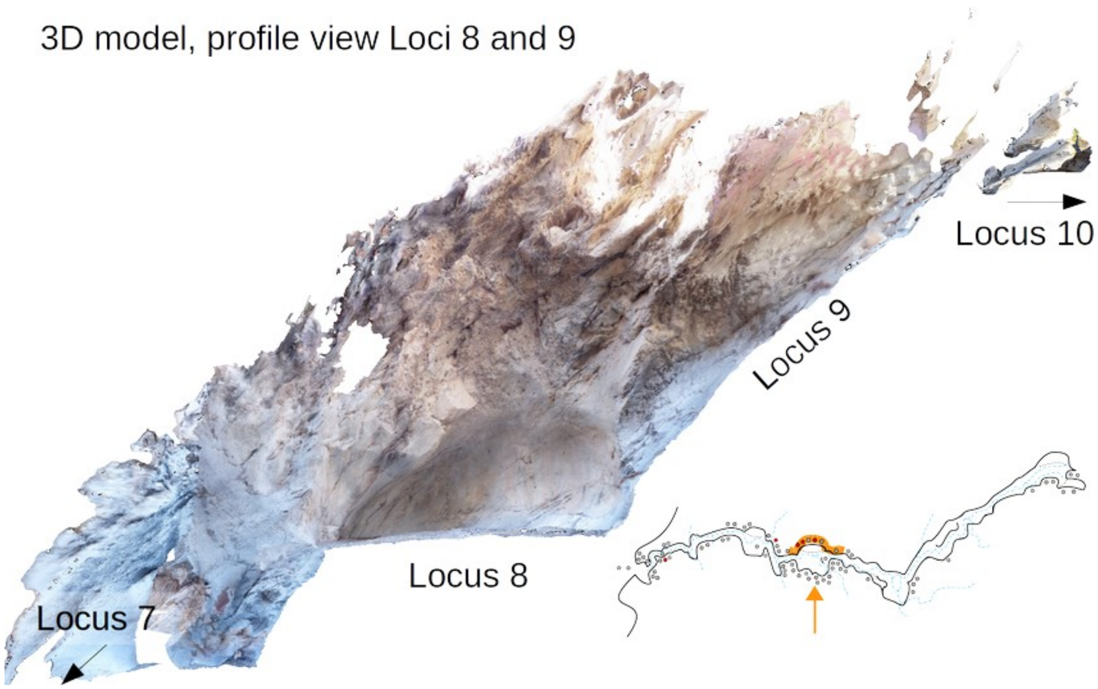
3D model, profile view Locus 6

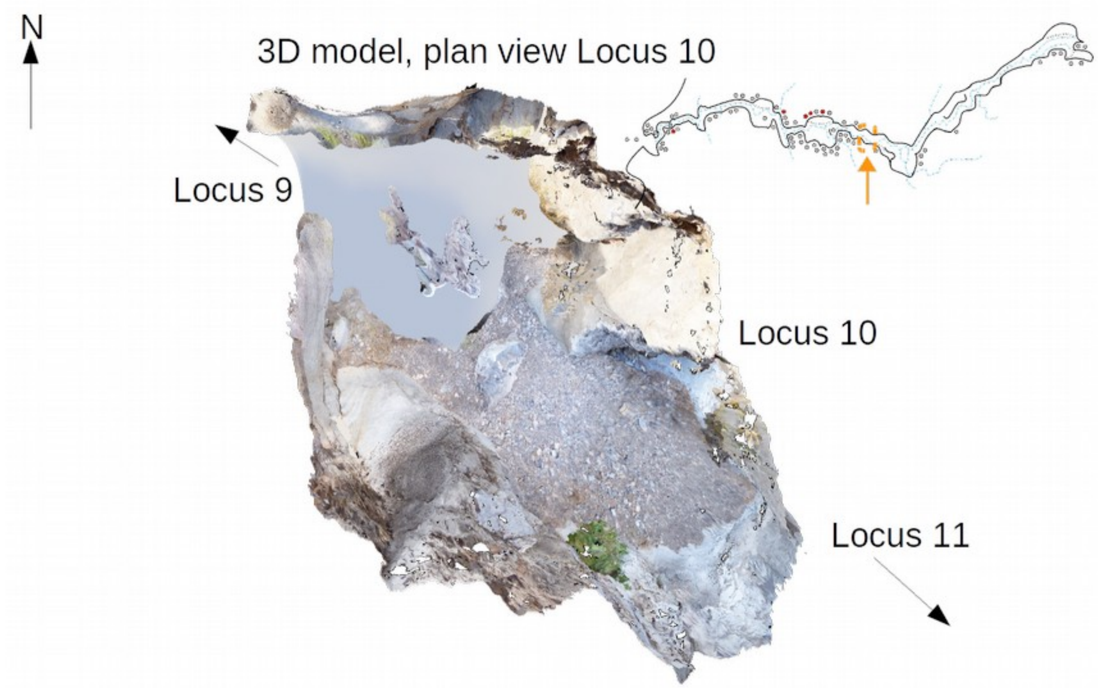


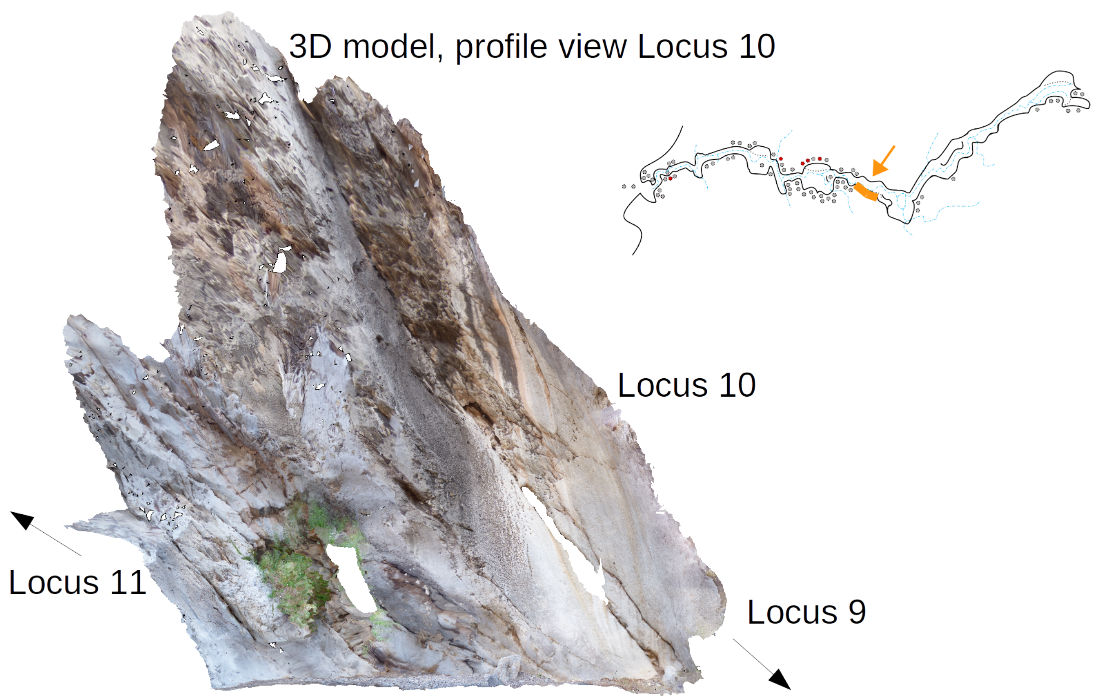

N
Locus 7
Locus 6
Locus 8
3D model, plan view Locus 7

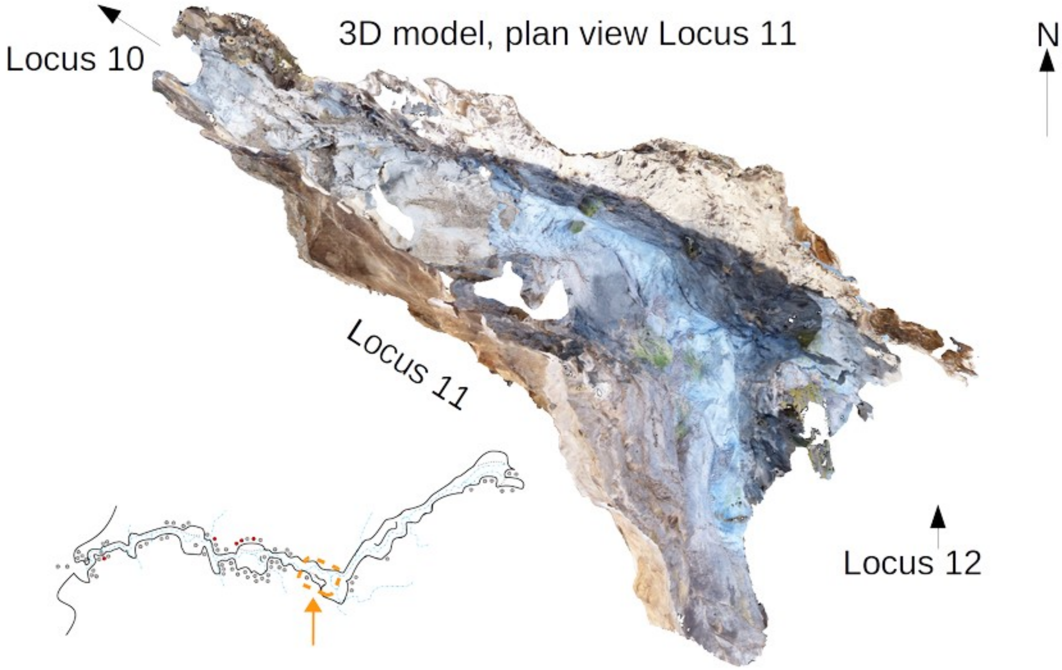

3D model, profile view Locus 7
Locus 8
Locus 7
Locus 5

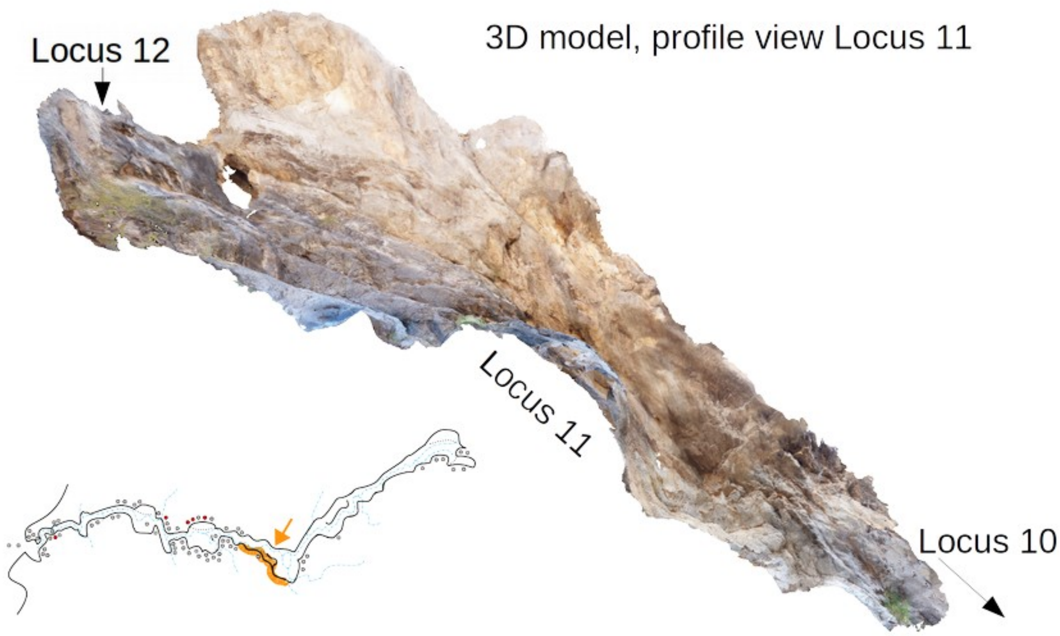

N
3D model, plan view Loci 8 and 9
Locus 8
shelter
Locus 8 cutaway
Locus 9
Locus 10
Locus 7


3D model, profile view Loci 8 and 9
Locus 10
Locus 9
Locus 8
Locus 7

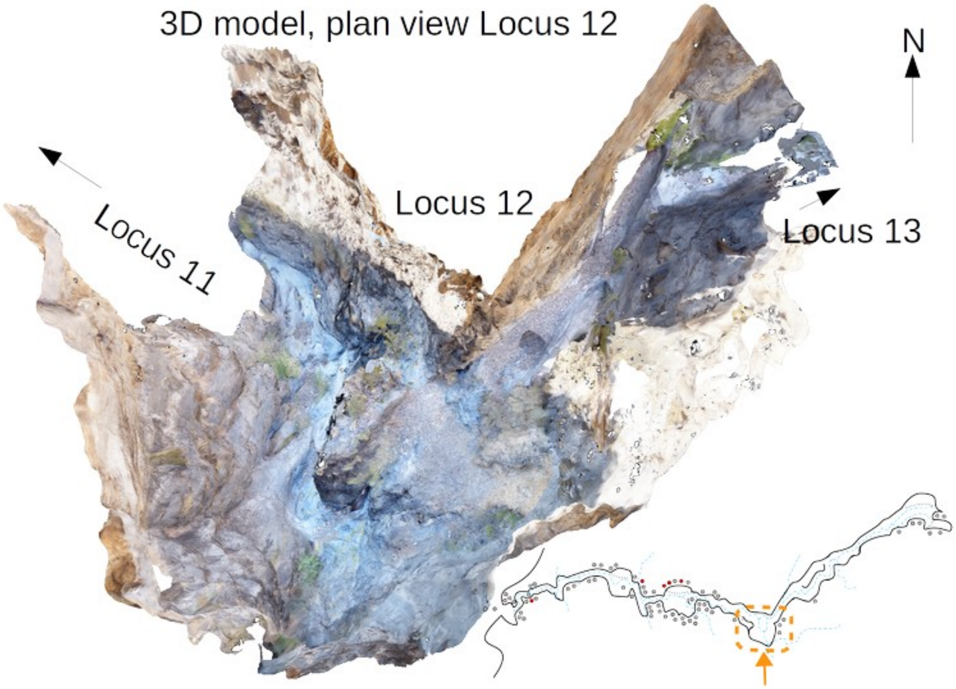

N
3D model, plan view Locus 10
Locus 9
Locus 10
Locus 11


3D model, profile view Locus 10
Locus 10
Locus 11
Locus 9

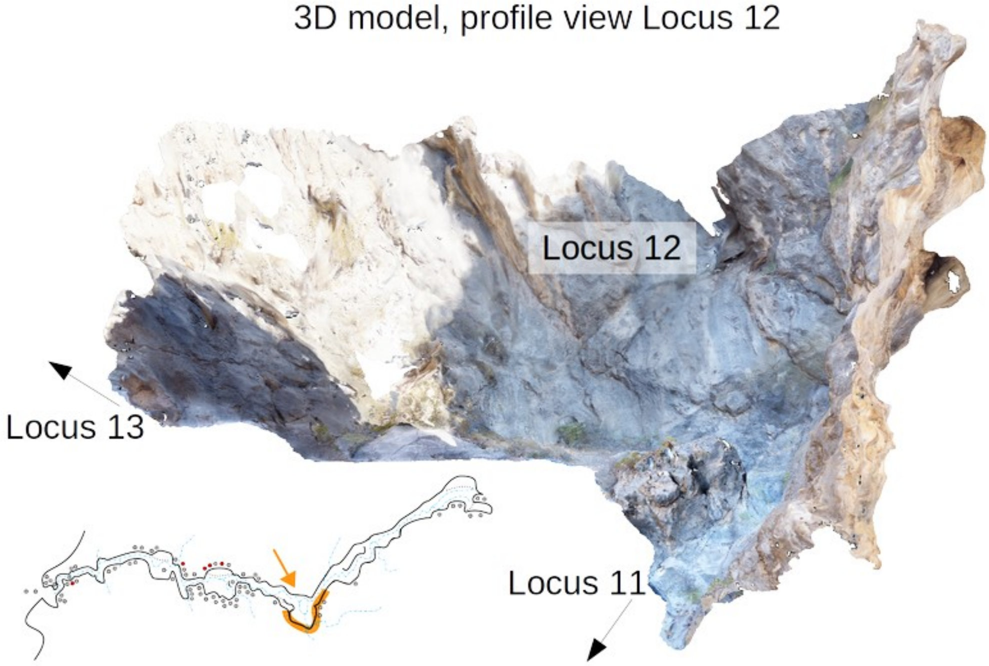

3D model, plan view Locus 11
Locus 10
N
Locus 11
Locus 12

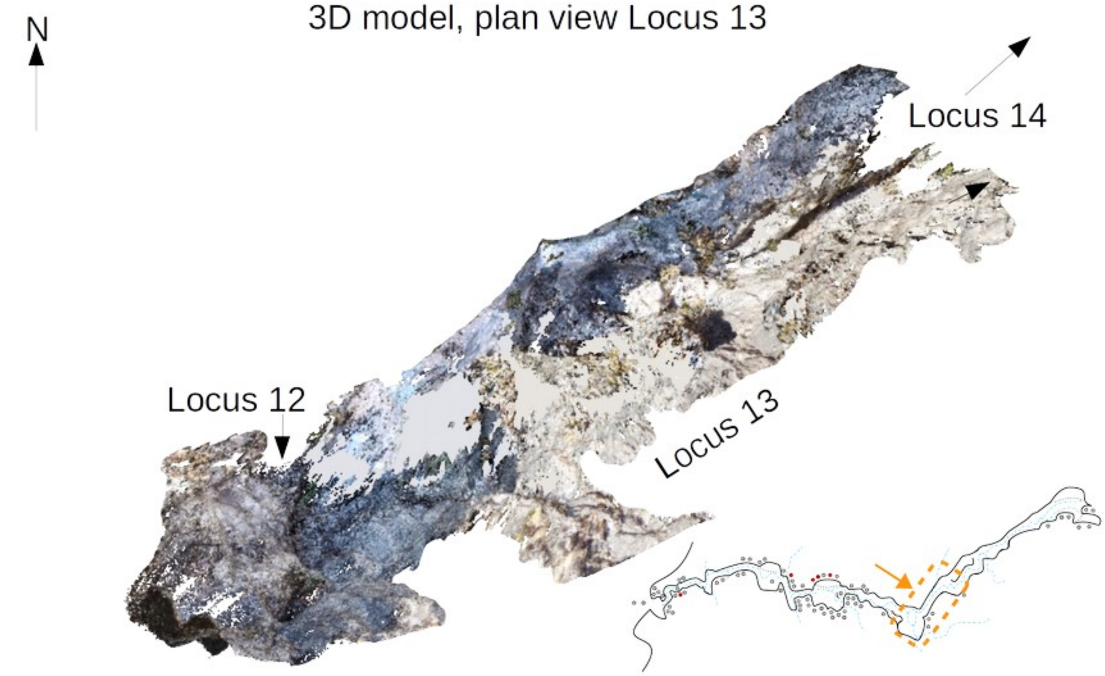

3D model, profile view Locus 11
Locus 12
Locus 11
Locus 10

3D model, plan view Locus 12

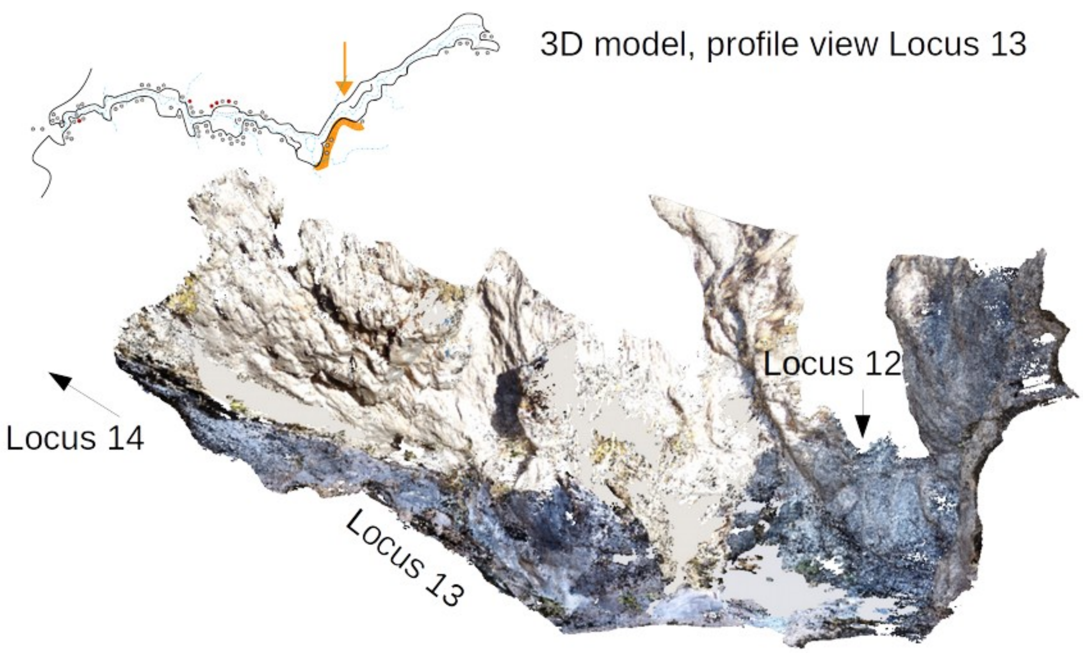


3D model, profile view Locus 12



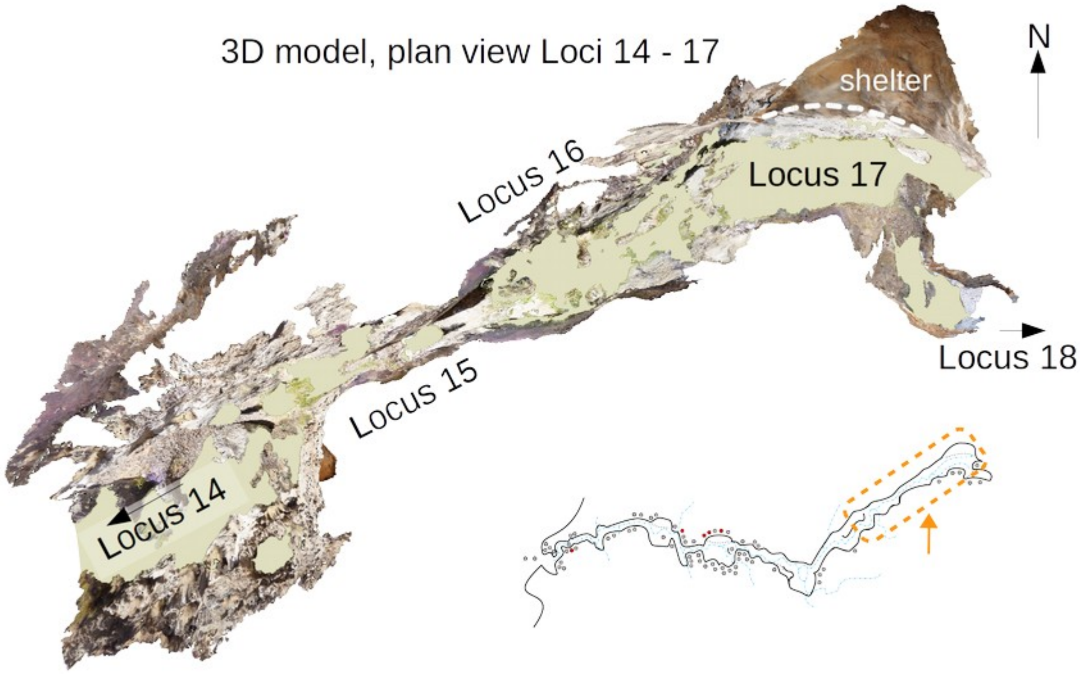


N
3D model, plan view Locus 13
Locus 14
Locus 12
Locus 13

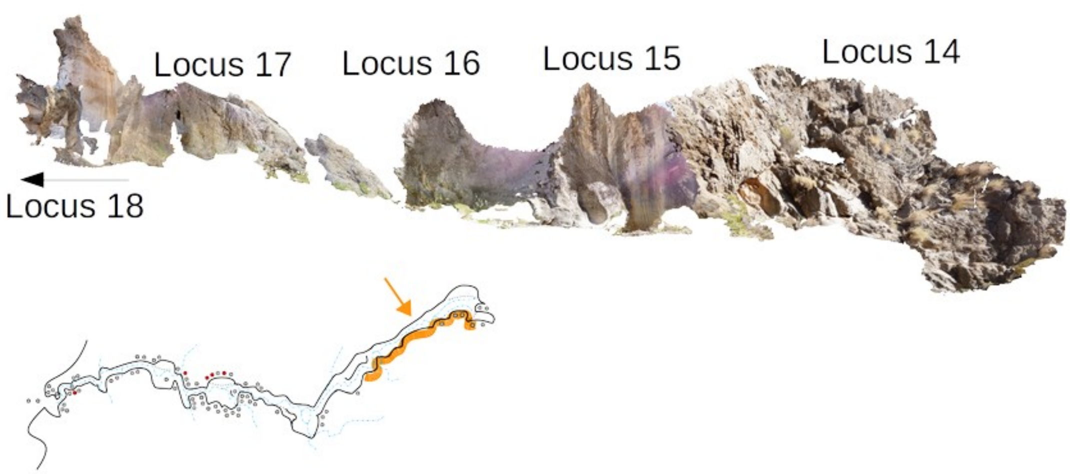


3D model, profile view Locus 13
Locus 12
Locus 14
Locus 13

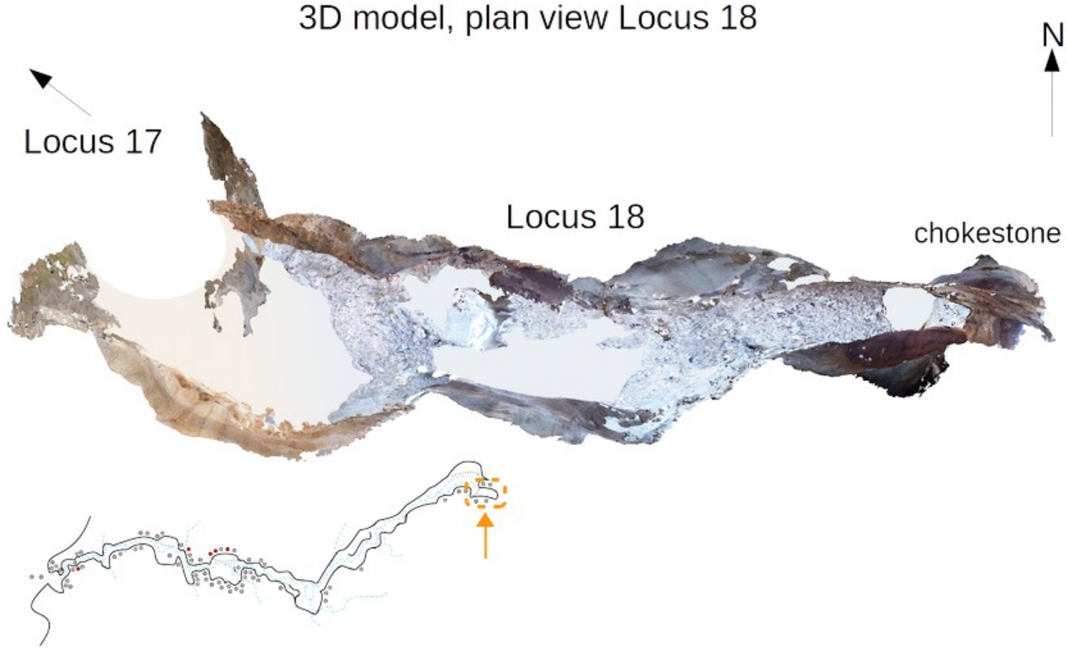
3D model, plan view Loci 14 - 17



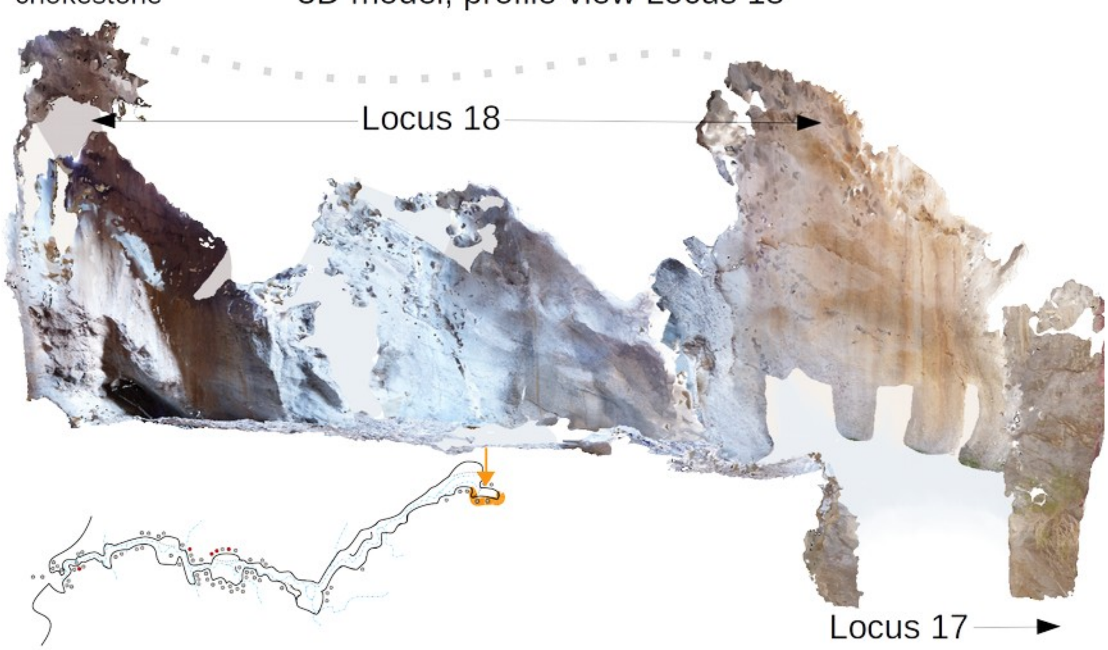
3D model, profile view Loci 14 - 17



3D model, plan view Locus 18



3D model, profile view Locus 18



APPENDIX C: ARCHAEOACOUSTICS

Acoustic Summary for Little Lake Project Area: CA-INY-1634

	Data Mngmt Info		Other Location Info	procedural notes
	Locus #	Locus Name		
Little Lake Landscape project area	0a	Test location		
			setup in notes	
			setup in notes	
			setup in notes	
	0b	North Rim	setup in notes	frequency sweeps; visitors in Honeycombs and north rim
				percussion test sourced from Honeycombs; quadcopter droning
	0c	South Rim		frequency sweeps from South Rim
	1	Honeycombs	Stereo(L,R y/n)	percussion test 1 (begin at M2, end at M1)
			Track 1	
			Track 2	
			Stereo(L,R y/n)	percussion test 2 (just in sheep void)
			Track 1	
			Track 2	
		Honeycombs	B by M1: Ch 1	w/impulse @ B by M1, Ch1 detects resonance near "vortex"
				frequency sweeps, speaker at chokestone descent
				frequency sweeps, sourced in gallery
				frequency sweeps, sourced in amphitheater
	2	Pools	*all 4 channels	frequency sweeps, sourced in "Megan's Hole" (gallery narrows layout)
	3	Narrows	stereo, Ch2	frequency sweeps, from "phallic thing" (gallery narrows layout)
	4	Gallery		frequency sweeps, impulse near M1, wind at M2
				frequency sweeps (begin at M2, then Rec, then B by M1, last vortex)
	5	Amphitheater		frequency sweeps (begin gallery, then middle, then edge)w/raven calls

	ta Mngmt Ir	Resonance and Harmonics				
	Locus #	**Fundamental**	**Odds**	**Evens**	**Chords**	**Infrasound?**
Little Lake Landscape project area						
		no resonance				
		no resonance				
	0a	no resonance				
	0b					
	0c	file(s) not yet analyzed				
		120	no	yes	none	no
		overall dampening effect				
		overall dampening effect				
		114				
		overall dampening effect				
		~2K				
		107	yes	no	fourth	no
	1	file(s) not yet analyzed				
	2	----not audible----			fourth	~12Hz,15Hz
	3	~11K – 12K Hz	no	no	fourth	inconsistent
		incons.>500Hz	no	no	unknown	~17Hz poss
	4					
	5	220 – 260Hz				

	Data Mngmt Info			
	Locus #	Locus Name	Filename or prefix	Notes
Little Lake Landscape project area	0a	Test location	Z01	
			Z02	percussion test
			Z03	percussion test
			Z04	frequency sweeps
			Z05	frequency sweeps
	0b	North Rim	Z06	frequency sweeps; visitors in Honeycombs and north rim
			Z07	percussion test sourced from Honeycombs; quadcopter droning
	0c	South Rim	Z08	frequency sweeps from South Rim
			Z09	frequency sweeps
	1	Honeycombs	Z11	percussion test 1 (begin at M2, end at M1)
				possible weak bands >2k Hz @M1 position (near end)
			Z12	percussion test 2 (just in sheep void)
		Honeycombs	Z13	w/impulse @ B by M1, Ch1 detects resonance near “vortex”
			Z14	raven call
			Z16	frequency sweeps, sourced in gallery
			Z17	frequency sweeps, sourced in amphitheater
	2	Pools	Z21	frequency sweeps, sourced in “Megan’s Hole” (gallery narrows layout)
	3	Narrows	Z19	frequency sweeps, from “phallic thing” (gallery narrows layout)
	4	Gallery	Z22	frequency sweeps, impulse near M1, wind at M2
			Z24	frequency sweeps (begin at M2, then Rec, then B by M1, last vortex)
	5	Amphitheater	Z25	frequency sweeps (begin gallery, then middle, then edge)w/raven calls

Acoustic Summary for Death Valley Project Area: CA-INY-3074

	Data Mngmt Info		Other Location Info	Resonance and Harmonics		
	Locus #	Locus Name		Echo & Delay	Reverb	procedural notes
Death Valley Project Area: slot canyon at CA-INY-3074	N/A	DV Control Site	btwn INY-130 & INY-3074	34ms, 93ms	weak	control
		--Zone 1--				
	1	Mouth		13ms	not evident	
	2	First Chute		6ms	weak	
			Pane 54	-7ms, 5ms	not evident	
	3	Landing A	Panel 59	8ms, 27ms	weak	
			North Rim	40ms, 3.4s	not evident	rim and rockshelter test
			North Rim	30ms	not evident	rim and rockshelter test
		rim above L3	North Rim	30ms, 40ms, 3.4s	not evident	rim and rockshelter test
	4	Second Chute				
			Panel 48	24ms (3ms build)	not evident	
			chamber center	unclear	not evident	
	5	Chamber 1	Panel 48	24ms	not evident	
	6	Lower Gallery		9ms	yes	
		--Zone 2--				
	6	Lower Gallery		9ms	yes	
	7	Third Chute				
			Panel 35	8ms, 18ms	weak	
			Panels 35-36	4ms, 8ms, 12ms	yes	
			Panel 32	8ms*, 24ms…	yes	
			Panel 33	8ms, 16ms, 24ms	yes	
			Panel 41	11ms, 19ms	yes	
			Panels 37-39	(5, 10, & 15ms) 32ms, 44ms	yes	
			Panels 26-30	32-40ms (avg 35)	not evident	both percussion & clapping
			Panels 26-30	8ms, 38ms	weak	clapping only
	8	Chamber 2	Panels 26-30	11ms, 37ms	weak	percussion only
	9	Fourth Chute				
				see results below		
			Panel 19	9ms, 23ms(L), 28ms(R)	weak	
			Panel 20	28ms	not evident	

Death Valley Project Area: CA-INY-3074	10	Landing B	Panel 17	30ms	not evident	
	11	Fifth Chute				
	12	Chamber 3	Overlook			
			--Zone 3--			
	12	Chamber 3	Overlook			
	13	Sixth Chute				
	14	First Bypass				
	15	Landing C				
	16	Second Bypass				
	17	Chamber 4				
				10ms	yes	clapping only
				9ms	yes	basalt tablet
				10ms, 22ms, 38ms	yes	indirect percussion
				9ms	yes	soft limestone tablet
				9ms, 13ms, 24ms	yes	direct percussion
				9ms	yes	quartzite tablet
	18	Grotto Gallery		9ms	yes	slow vs. fast tempos

	ta Mngmt Ir	Resonance and Harmonics				
	Locus #	Fundamental	Odds	Evens	Chords	Infrasound?
Death Valley Project Area: slot canyon at CA-INY-3074	N/A	no resonance	no	no	none	not evident
					--Zone 1--	
	1	no resonance	no	no	none	not evident
	2	95, else 226	no	no	Weak 2:3, 3:4	not evident
		no resonance (signal 515-560)	no	no	none	not evident
	3	238-253 (weak)	no	yes	none	not evident
		not tested	N/A	N/A	not tested	not evident
		140, else 190	no	no	3:4 (≥190Hz)	not evident
		not tested	N/A	N/A	none	not evident
	4					
		no resonance	no	no	none	not evident
		no resonance	no	no	none	not evident
	5	no resonance	no	no	none	not evident
	6	166	yes	yes	3:4	possible
					--Zone 2--	
	6	166	yes	yes	3:4	possible
	7					
		above 1k Hz	no	no	none	not evident
		147	no	no	2:3 possible	not evident
		81*	no	yes	3:4	not evident
		82-90*	some	few	2:3	not evident
		81-82* else 125	no	no	inconsistent	not evident
		94, else 117	yes	yes	3:4	19 – 20Hz possible
		109, else 159	no	no	3:4 possible	not evident
		100 (poss)	no	no	3:4	not evident
	8	122, else 187	no	no	inconsistent	not evident
	9					
		94-114, else 162	no	few	unlikely	not evident
		poor resonance	no	no	none	not evident

	Data Mngmt Info			
	Locus #	Locus Name	Filename or prefix	Notes
Death Valley Project Area: slot canyon at CA-INY-3074	N/A	DV Control Site		faint but verifiable echoes
		--Zone 1--		
	1	Mouth	z15-Canyon Mouth.flac	comparable to control
	2	First Chute	lower canyon sc1 landing…	
			z11-Tortoise Sheep-far out…	weak half integer intervals; faint preceding sound @7ms
	3	Landing A	z11-Tortoise Sheep-near…	similar to near range file
			zX-Cnyn Rim Echo	
			zX-Cnyn Rim Percussion	
		rim above L3	zX-Cnyn Rim to Rockshelter	
	4	Second Chute	(not tested)	
			z19-Sheep Corral abstract	echoes stronger in L channel
			Z20-Sheep Corral Chamber	
	5	Chamber 1	Z20-Sheep Corral abstract	
	6	Lower Gallery	z17-Snake Ledge	
		--Zone 2--		
	6	Lower Gallery	z17-Snake Ledge	
	7	Third Chute	(not tested)	
			z12-Shield-Lee...Entrance	strongest bands 1041-2460
			z12-Shield-Lee...Horizon	single iteration 2:3 from fundamental
			z12-Shield-Lee...Percussion	variable echo delay, multiples of 8ms, strongest at 24ms
			z12-Shield-Lee...Sheep	relationships shown in table
			z12-Shield-Lee...Lee	no relationships >2 iterations
			z12-Shield-Lee...Pictograph	minor series of close echoes proceeds stronger distant set; relatively broad resonant bands; integer signal ratios
			z12-Shield-Lee...Watersign	stronger resp above 375-400
			z12-Shield-Lee...Alcove clap	3:4 relationship, but signal noisy below 150Hz
	8	Chamber 2	z12-Shield-Lee...Rut alcove	strong bands ~10K, 12KHz
	9	Fourth Chute	(not tested)	
			z5-Landing Corridor	see results below
			z5-...Abstract	poor resonance
			z5-...Helix	strong bands ~2k, 3.25k; spectrogram comparable to control between 50Hz-2kHz

Death Valley Project Area: CA-INY-3074	10	400? 500? (poor <2k)	no	no	none	not evident
	11					
	12					
					--Zone 3--	
	12					
	13					
	14					
	15					
	16					
	17					
		220 Hz	no	yes	unclear	10-11Hz, 20Hz possible
		20 Hz,else 220	yes	yes	3:4 possible	8-10Hz, 20Hz possible
		74-77 Hz, else 217-220	yes	no	3:4 possible	8-10Hz, 12-13Hz possible
		20, else 35-38, 74, or 218-222	yes	yes	3:4 possible	9-10, 12-13, & 20Hz possible
		219 Hz, else 425-471	no	yes	3:4 possible	not evident
		20 Hz, else 36-41, 75, or 224	yes	no	3:4 possible	7Hz, 10Hz, 20Hz possible
	18	20Hz, else 76, or 220	yes	yes	3:4 possible	10Hz, 20Hz possible

	Data Mngmt Info			
	Locus #	Locus Name	Filename or prefix	Notes
Death Valley Project Area: slot canyon at CA-INY-3074	N/A	DV Control Site		faint but verifiable echoes
		--Zone 1--		
	1	Mouth	z15-Canyon Mouth.flac	comparable to control
	2	First Chute	lower canyon sc1 landing…	
			z11-Tortoise Sheep-far out…	weak half integer intervals; faint preceding sound @7ms
	3	Landing A	z11-Tortoise Sheep-near…	similar to near range file
			zX-Cnyn Rim Echo	
			zX-Cnyn Rim Percussion	
		rim above L3	zX-Cnyn Rim to Rockshelter	
	4	Second Chute	(not tested)	
			z19-Sheep Corral abstract	echoes stronger in L channel
			Z20-Sheep Corral Chamber	
	5	Chamber 1	Z20-Sheep Corral abstract	
	6	Lower Gallery	z17-Snake Ledge	
		--Zone 2--		
	6	Lower Gallery	z17-Snake Ledge	
	7	Third Chute	(not tested)	
			z12-Shield-Lee...Entrance	strongest bands 1041-2460
			z12-Shield-Lee...Horizon	single iteration 2:3 from fundamental
			z12-Shield-Lee...Percussion	variable echo delay, multiples of 8ms, strongest at 24ms
			z12-Shield-Lee...Sheep	relationships shown in table
			z12-Shield-Lee...Lee	no relationships >2 iterations
			z12-Shield-Lee...Pictograph	minor series of close echoes proceeds stronger distant set; relatively broad resonant bands; integer signal ratios
			z12-Shield-Lee...Watersign	stronger resp above 375-400
			z12-Shield-Lee...Alcove clap	3:4 relationship, but signal noisy below 150Hz
	8	Chamber 2	z12-Shield-Lee...Rut alcove	strong bands ~10K, 12KHz
	9	Fourth Chute	(not tested)	
			z5-Landing Corridor	see results below
			z5-...Abstract	poor resonance
			z5-...Helix	strong bands ~2k, 3.25k; spectrogram comparable to control between 50Hz-2kHz

Death Valley Project Area: CA-INY-3074	10	Landing B	Z5-...Hooting crack	strong bands <2k, <3k, ~5k; fund. ~ 180-196 (less likely); subjective “hooting” @ crack
	11	Fifth Chute	(not tested)	
	12	Chamber 3		
		--Zone 3--		
	12	Chamber 3		
	13	Sixth Chute	(not tested)	
	14	First Bypass	(not tested)	
	15	Landing C	(not tested)	
	16	Second Bypass	(not tested)	
	17	Chamber 4	(test interrupted)	
			z4-… Gallery Clapping	
			z4-… Gallery Basalt	sound buildup from
			z4-… Gallery Indirect	
			z4-… Gallery Limestone	
			z4-… Gallery Percussion	wind interference
			z4-… Gallery Quartzite	
	18	Grotto Gallery	z4-… Slow Taps	

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