

A Potential Astronomical Calendar in Grand Canyon National Park
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Research conducted October 7-14, 1992 per NPS Archaeology trip
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Abstract:

Along the ridge above Hilltop Ruin upstream of Unkar Delta, a “potential shrine” marks a sunwatching station that may have been used by the Hisa’tsanom ancestors of the Hopi. From the “potential shrine” one can observe the winter solstice sun rising through an arch in Coconino Sandstone, the summer solstice sun rising just north of Comanche Peak, and the serrated topography of the eastern horizon “the Palisades” providing a geographic reference system for potential observation and documentation of the sun’s annual migration cycle. The canyon geography may have served as a cultural calendar for the ancestral residents of Unkar Delta, thought by archaeologist Dr. Barton Wright to be members of the Bear Clan. The “potential shrine” has been damaged since this research was conducted.

Introduction:

On a NPS Archaeology reconnaissance trip October 7-14, 1992, I assisted Dr. Jan Balsom in the evaluation of three archaeological sites thought to have the potential of a geographic calendar system that may have been used by the ancient Canyon dwellers. Site C:9:1:c atop of Nankoweap terrace was surveyed and potential astronomical alignment sites lay beyond both the minimum and maximum of the sun’s annual motion as well as that of the lunar 18.6 year cycle. A second site on river right near Tanner Rapid was also assessed and the deteriorated walls did not allow for confidence in azimuth measurements. The site is closed to visitation. The Hilltop Ruin site however indicated a strong potential for a solar observation station.

Methodology:

William Calvin (1991) stated that a point 91 meters along the southwest ridge above Hilltop Ruin aligned with an arch in the Coconino Sandstone and marked the winter solstice sunrise. No such point was found; however, 121 M from the southwest corner of Hilltop Ruin was a circle of stone. Both Dr. Jan Balsom and Ms. Helen Fairley, both NPS archaeologist each independently described the site as a “potential shrine”. A surveyors transit was setup over the “shrine” and the baseplate was aligned with true north using spherical trig equations found in Aveni, A., 1980, Skywatchers of Ancient Mexico. Recorded azimuths were reduced to declinations and the immediate region was searched for petroglyphs to determine if there was any indication as to which ancestral clan may have used the site. No petroglyphs were observed. An ethnographic study was conducted at the NAU Cline Library Special Collections to determine the likely significance of the alignments within the Hopi culture.

Results:

Table 1: Solar alignment aspects of “potential shrine” at Hilltop Ruin, GCNP.

Site alignment from shrine to:	Azimuth (measured)	Altitude (Measured)	Declination (calculated)	Solar event declination
Arch in Coconino Ss.	138° 45'	15.42°	-25.42°	-23.5° Winter Solstice
Valley south of Comanche Pk.	90° 05'	10.0°	0°	0° Equinox
Thumb butte north of Comanche Pk	65° 50'	6° 51'	+23.47°	+23.5° Summer Solstice

The arch in the Coconino Ss. is difficult to find and is best observed at sunrise near winter solstice when light pierces through it. Because the arch lies below the rim, the observation of light would not happen until after actual sunrise. More importantly, the horizon ridge contains a gap just northeast of the arch which aligns with the winter solstice and provides the viewer a more accurate mechanism to determine winter solstice. Second, the “potential shrine” has been partially destroyed by individuals removing rocks from what was a more obvious pattern in October, 1992.

Discussion:

It is anticipated that the winter solstice sunrise will appear through the arch; anticipated because the author has not been able to visually confirm. The author requests the help of GCRG's to take pictures, time and date stamp the photos and then send them to him at Coconino Community College in Flagstaff, AZ. Because of the variegated eastern horizon, observations from this “shrine” would have allowed the Hopi to determine the time of year and anticipate significant dates within their calendar.

However the question is not about alignments; it is about cultural significance. Dr. Barton Wright, retired MNA anthropologist, has stated that the Bear Clan probably comes from the Grand Canyon. Alexander Stephens (1921) in Hopi Journals indicates that Bear Clan is responsible for the winter solstice ceremony announcement, Soyala. However, the Water (Patki) and Sand clans are involved in the announcement of Summer Solstice ceremony (Nimanywa) , both of whom came from the south to inhabit the Wupatki National Monument region (A. Stephens, 1921). In historic Hopi, Equinox ceremonies (Mamzrauti) were carried out by the women’s society, Mamzrau, as a time of balance, harmony and goodness in warfare (Voth, H.R. 1912). Therefore the summer solstice and equinox alignments maybe coincidental as direct ethnographic documentation do not support intentional cultural usage of the alignment. And, in nearly all instances, the sun is used as a marker to tell the ancient people which moon to observe and the ceremony begins with the first crescent of a designated new moon. The Hopi calendar is actually lunar-solar, and the job is the sunwatcher is to know the lunar- solar cycle.

Nonetheless, the alignment of winter solstice suggests a significant possibility of intentional construct. The topography of the eastern horizon allows one to accurately observe the changing azimuth of the sun throughout the year, a pattern seen within other contemporaneous Puebloan cultures