

ESTABLISHING A UNIFORM TERMINOLOGY FOR DESCRIPTION  
OF SOLAR INTERACTIONS WITH ROCK ART PANELS

by Clay Johnson

I must first thank Jesse Warner and Neil Morris, and archaeologist Jim Truesdale, whose patient interest, advice, and criticism have made this research much more than it would have been.

These papers had their beginning in two observations made at last year's symposium. First, the large number of reported rock art interactions with shadow shapes raised the question: might most or all petroglyph sites have interactive functions or design? Second, I noted the scarcity of professional archaeologists at the symposium, and found that many were skeptical of these reported interactions. I began a research program at one site for which such interactions were previously unreported to examine the first question for myself; and determined to present any findings in such a manner that professional archaeologists would accept them.

The first discovery was that there existed no written methodology for the identification or observation of interactive panels, and no standard terminology to describe interactions. There was also no awareness of the type of protective measures implicit in the nature of interactive panels. Without these three things, science will not readily accept researchers' findings, and sites will continue to be destroyed through ignorance.

This paper deals with establishing a terminology for studies of interactive panels. The very fact that a catalog of standard interactive shapes was possible; that panels are classifiable by design function, and that panels at a previously unreported site fit the pattern, supports the position that interactive panels are purposeful, widespread, the result of a fairly mature technology, and offer a legitimate tool for examining archaeological questions.

Terminology should be, as far as possible, self-consistent, easy to understand and employ, and open-ended enough to allow easy addition of new interaction descriptions. It should also facilitate description of the crucial aspect of these interactions: the fact that they are an event of motion and pattern, rather than a static picture.

Thus, the requirements are: a catalog of shapes, a division into light and shadow, a method of describing motion, definitions of the terms "panel" and "element", and terms for the basic solar conditions applicable to a panel.

## BASIC DEFINITIONS

**Element:** A specific glyph or portion of a glyph on a panel.

**Panel:** Arbitrary modern definitions would seem to be less useful than those apparently used by the makers of the panels, and apparent when watching the panels through a cycle. At McKee Spring, Utah, the Fremont seem to have considered a panel as an integral, roughly flat chunk of rock face bounded by strata change, ground level, a major crack, or an abrupt change in angle or surface height of the rock face. This angle change could be more than 90 degrees, or as little as 5 degrees. The change in surface height could be as much as several meters or just a few millimeters. Although difficult to envision on paper, such panel boundaries are often quite plain to observe on-site.

**Gnomon:** A shadow casting object or surface. Gnomons can be natural features, natural features altered or improved culturally, or natural features exposed to the sun at a certain time by cultural removal of surfaces blocking solar access to the gnomon. Gnomons can be very small or very large. At McKee Spring, one gnomon was found within a glyph itself, less than half a centimeter high and half a centimeter from the receiving portion of the panel. One gnomon was on a boulder resting on bedrock about 6.9 meters from its panel. One gnomon was formed by features of a large cleft nearly 19 meters to the west of and 4 meters above its panel. Some gnomons are simply irregularities of the panel or pecking itself.

**Panel Condition:** The basic condition of a panel (for a given time of day and year) can be:

Dark: No Direct sunlight on panel.

Lit: Entire panel receiving direct sunlight.

Part: Direct sunlight on a portion of the panel, but not interacting with glyph elements.

**Interactive:** Three types of interaction are possible.

Non-significant: No alignment of shadow features with glyph elements. Although the alignment may be non-significant, the fact that a given glyph is dark, lit, or interactive at a certain time of year may be important.

Suggestive: Shadow shape suggests an overall shape for glyph or elements of the glyph at some time of the day or year. The alignment delineates one line or side of the glyph, but is not a series of sequential alignments.

Significant: Glyph elements are so placed and constructed that sun and shadow move across a panel in a series or sequence of alignments with glyph features on a particular day or days of the year, but not at other times, presumably to identify that

particular day or days.

Culmination: The time and date at which a suggestive or significant alignment is most exact.

The reason for the above condition categories may not be immediately apparent. At the site researched, there appears to be an overall yearly pattern to many of the interactive panels, with certain panels which work during the summer dark during the winter, and vice-versa. The whole cycle of light and dark throughout the year could be part of any design employing sun and shadow. Thus, this information might be very helpful in assessing overall patterns in the future.

#### DESCRIPTION OF ACTION

A sun-shadow line moving across a surface could be thought of as a moving shadow line or a moving sun line. Further, the same line moving in the same direction could be thought of as either (for instance) an advancing sun line, or a retreating shadow line. Arbitrary though it may be, I would suggest we consider motion from left to right (or from top to bottom) as the observer faces the panel, as advancing. Motion from right to left (or bottom to top) as the observer faces the panel would be called retreating. Further, the line will be described in terms of whether sun or shadow is on the left (or top) as the observer faces the panel. Sun on the left (or top): sun line. Shadow on the left (or top): shadow line. A sun-shadow line moving across a panel over time from left to right, with the sunlit part on the left, would thus be termed an advancing sun line. This method has the advantage of giving a great deal of information in a brief description. For instance, the phrase "On February 6 at sunrise, an advancing sun line..." tells one that the action described takes place from left to right, that the sunlit portion of the panel is on the left and the shadowed portion on the right, that thus the panel is going from a darker to a lighter condition during the action.

#### SUN AND SHADOW SHAPE DESCRIPTIONS

Any standard shape catalog will surely need room for additions, but we can list the most common shapes. Each shape can come in either sun or shadow versions. (See Plate A1)

**Arrow:** A wedge shape with included angle of less than 90 degrees. Can be natural, or easily created culturally, sun arrow gnomon is generally a notch. Shadow arrow gnomon is generally a protruding wedge shape. Alignment is normally apex of arrow with glyph element. Eye, mouth, crotch, or hand alignments are common.

**Wedge:** A wedge shape with included angle of 45 to 90 degrees. Similar to arrow in creation and function, or can be the result of two intersecting rock angles.

Angle: A line including a clearly defined angle of 90 to circa 170 degrees. Usually natural. Similar to arrow in function.

Dagger: A wedge shape totally enclosed on all sides. Often the result of an arrow projected on a curved surface of panel. Daggers may function like a knife passing through a point, or dagger tip may align with a glyph element. Sun daggers seem more common than shadow daggers.

Patch: A random shape totally enclosed on all sides. Usually caused by light striking an irregular panel, rather than by light passing through a hole. Often used to highlight a specific, detached glyph element.

Cup: A rounded, semicircular indentation in a line, which precisely conforms to or "cups" a glyph element, usually a spiral, circle, or "shield". The result of a curving projecting gnomon, or a slightly curved shadow line projected on a curved panel surface, and augmented by the technique employed in pecking the glyph element. Common.

Mouth: A cup from which the line recedes on both sides, giving the impression of the silhouette of a fish head with mouth open. Functions like cup; also often "eats" glyphs without precisely cupping any element.

Box: A cup which has three angled sides rather than being a semicircle. Can be natural, sometimes created culturally. Sun box gnomon can be a flat bottomed notch in a rock edge. The box generally surrounds a glyph element on three sides, often without quite touching. Boxes often surround circular elements which appear more likely candidates for a cup. Sun boxes seem the most common.

Nubbin: A deep, narrow, rather test tube shaped protrusion of a line. Shadow nubbin gnomons are natural small pillar-like protrusions, or gnomon can be culturally created by removal of rock, leaving a pillar or peninsula. Sun nubbin gnomons are narrow, flat or round bottom notches.

Line: Line alignments are with a glyph line, or with two or more limiting points on a glyph (such as corners, line ends, intersections of glyph lines, edge of eye or mouth) or with a line segment and one or more limiting points, or with one or more points and a conspicuous natural mark on the panel.

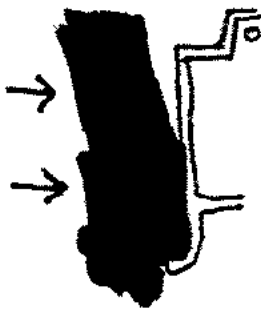
Edge Lighting: Edge lighting is often employed on interactive petroglyph panels which do not have a good natural gnomon for a key date. Glyph lines for edge lit features are often proportionately wide for size of figure or somewhat ragged or crude in appearance.

Stepped Line: A shadow line with a step or setback in it, one portion of it lining up with part of a glyph line, followed by the next, or stepped, portion lining up with the remainder of the glyph line.

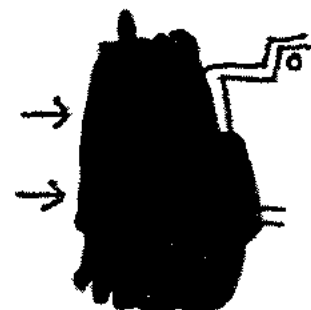
Highlighting: Using the effect of sun on a naturally ripple marked surface to emphasize a figure or element.

Shadow Figures: Natural zoomorphic or anthropomorphic shadow shapes, usually large in relation to glyph size, interacting with the glyph, but the figure itself not coinciding with figures on the panel. The ones at McKee Spring and at least one other site happen at Equinox. Shadow figures identified to date include canine, feline, ursine, and female anthropomorphic shapes.

Stepped Line, phase one



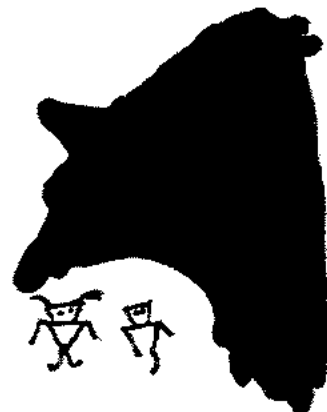
Stepped Line, phase two



Highlighting



Shadow Figure



Sculpting: Technique in which the interior of a solidly pecked element or figure has been differentially pecked as to depth so that sun and shadow create the appearance of interior detail or features for the glyph on a key date.

Normal Appearance



Appearance on Key Date



Shadow Mimic: Glyph is designed to match the shape of a shadow which approaches, but does not touch the glyph on the key date. Not to be confused with interactive alignments which have "decayed" due to precession.

Appearance at Closest Approach of Shadow



## PANEL FUNCTION DEFINITION AND DESCRIPTION

A "tree" of terms is included to aid in panel function definition and description. Following the tree on-site should help identify data gaps for the observer by asking pertinent questions. The term site alignment in this context refers to the constructed alignment of some sort of structure, thus giving a place to "hook" archaeoastronomical site information, if any, to these studies, and to archaeological work in general. The branch labeled astronomic refers to various possibilities for "horizon calendars" and the like, and is again included to construct a broad umbrella under which archaeoastronomic data can be combined with archaeologic data for a site. Those two categories eliminated from the discussion, let us look at the left side of the tree. (See Plate A2)

**Site:** The official site number of record, or an accurate location for an unrecorded site.

**Interactive:** Refers to the fact that glyphs at a site have interactions with sun and shadow.

**Construction:** Is feature a petroglyph, pictograph, combination, or of other construction (applied mud, etc.)

**Suggestive:** Shadow shape seems to suggest an overall shape for the glyph or elements of the glyph at some time of the day or year.

**Non-significant:** No alignment of shadow features with glyph elements. It should be remembered that it is the alignment that is non-significant. The fact that a panel is shadowed or not shadowed at a given time of year may be significant. Some panels are seasonally dark or seasonally lit.

**Significant:** Glyph elements are so placed and constructed that sun and shadow move across a panel in a series or sequence of alignments with glyph features on a particular day or days of the year, but not at other times, presumably to identify that particular day or days.

**Normal or spot:** On a normal panel, the series of sequential alignments takes place over a period of minutes or hours on the same day. The culmination, or day of most precise alignments, is the significant interaction. On a spot panel, the interaction is defined at panel sunrise or sunset, and the series of alignments involves the changes in shadow position on sequential sunrises or sunsets, rather than on sequential time periods on the same day.

**Precise or Seasonal:** To describe the two observed classes of

significant panels, a precise panel is one on which the sun-shadow line passes through a period of significant alignments in a relatively short period (perhaps one or two days), presumably to exactly identify a date and separate it from the days immediately preceding and following it. A seasonal panel presents a somewhat static and non-exact alignment display, or continuing alignment, over an extended period of days, weeks, or months. An analogy is that when one begins seeing Santa Claus pictures everywhere, that doesn't mean it is the day of Christmas; it merely means it is the Christmas season.

**Solo or Concurrent:** Indicates whether a panel acts alone, or in timed conjunction with another panel or "tick marker". Concurrent panels have alignments which begin and end at the same time as other panels, the alignments to specific features on one panel occurring in a "timed" fashion with to specific features on another panel.

**Date:** The panel identifies a specific date by achieving significant alignment on that day.

**Bracket:** The panel identifies a specific date (usually a solstice) by achieving alignment on dates equidistant on each side of the precise date. This type of functioning is probably almost mandatory for solstice markers, as the declination of the sun (and thus its daily path) are nearly unchanged for several days at each solstice. It seems unlikely this type of technology could design a feature to display only on the precise day of solstice.

**Pre- or Post-:** The panel functions only before or only after a certain date. Of course, due to the nature of the solar year, a panel which functioned after a date between winter solstice and summer solstice would function before the complementary date for the half of the year between summer solstice and winter solstice. In other words, on two days equidistant on each side of either the day of solstice (for instance, 36 days before winter solstice and 36 days after winter solstice) the sun-shadow alignment on a panel will be the same. The term pre- or post- should be used in conjunction with a specific date to avoid confusion: pre-Vernal Equinox, or post-Autumn Equinox.

**Span:** A span panel acts as both a pre and post indicator for a given date. In other words, as a bracket panel for a date other than a solstice. This is accomplished by designing for a period of alignments which precede and follow the spanned date, but without one particular day's alignment being separable as more exact than the others.

**Tick Marker:** A panel or element consisting of several matching or



similar marks, usually connected, usually in a row or line, usually simple lines, dots, or triangles, on which successive marks achieve alignment on successive days or in succession on the same day. Tick markers are found as pre- and post-markers for a date, but may also function concurrently with alignments on another panel. If the tick marker is actually a concurrent panel, it is likely that the panel with which it is aligned will reach culmination on a day when the alignments on the tick marker can pass through their entire sequence, rather than a portion of it.

To accompany the written description of a panel and its interaction, circle graphs would seem most effective to illustrate cyclic events such as changes in panel interactions over a solar year. As shown in Plate A3, the circle is divided to represent a 360 day year, with the extra 5 1/4 days which make up a solar year removed from the summer half of the circle. Thus one degree of the circle equals one day. Winter solstice is at the south, or bottom, end of the circle. Summer solstice at the north, or top, end. The circle is further divided by the equinox dates, and in case of the sample, into crossquarters. This division was dictated by data at the Fremont site under study. It should not be assumed that crossquarter divisions (or equinoctial divisions for that matter) were pan-southwest, or even pan Fremont.

On the graph, black indicates a dark condition for the panel. Lined indicates part lit, white indicates lit. Stippled indicates a non-significant interaction, while crosshatching indicates a significant interaction. Missing data is indicated by wedges missing from the circle. Culmination dates (on which a significant interaction is most exact) are indicated by arrow points facing outward from the perimeter of the circle, the time noted at the point of the arrow. Suggestive interactions are indicated by a line extending from the center of the circle to beyond the perimeter at the date of alignment, time noted at the end of the line.

The Time of Day entry line on the graph sheet may or may not be used for a given panel. Some panels have a cycle which has them dark all day at Summer Solstice and light all day at Winter Solstice. Some panels have an interaction at approximately the same time all year, but the interaction is only significant on certain solar dates. Many panels have a variety of suggestive or significant interactions at different times on different solar dates. Some panels may have their only interactions at sunrise or sunset during the year, regardless of the time sunrise or sunset occur. The Comments section of the graph sheet and the written description of each panel and its interactions can be used to clarify the yearly cycle of the panel. Plate A4 is an example of a written description of the yearly cycle for a very simple panel.

SOME FREQUENTLY SEEN INTERACTIVE SUN & SHADOW SHAPES

Sun Arrow



Shadow Arrow



Sun Wedge



Shadow Wedge



Sun Angle



Shadow Angle



Sun Dagger



Shadow Dagger



Sun Patch



Shadow Patch



Sun Cup



Shadow Cup



Sun Mouth



Shadow Mouth



Sun Box



Shadow Box



Sun Nubbin



Shadow Nubbin



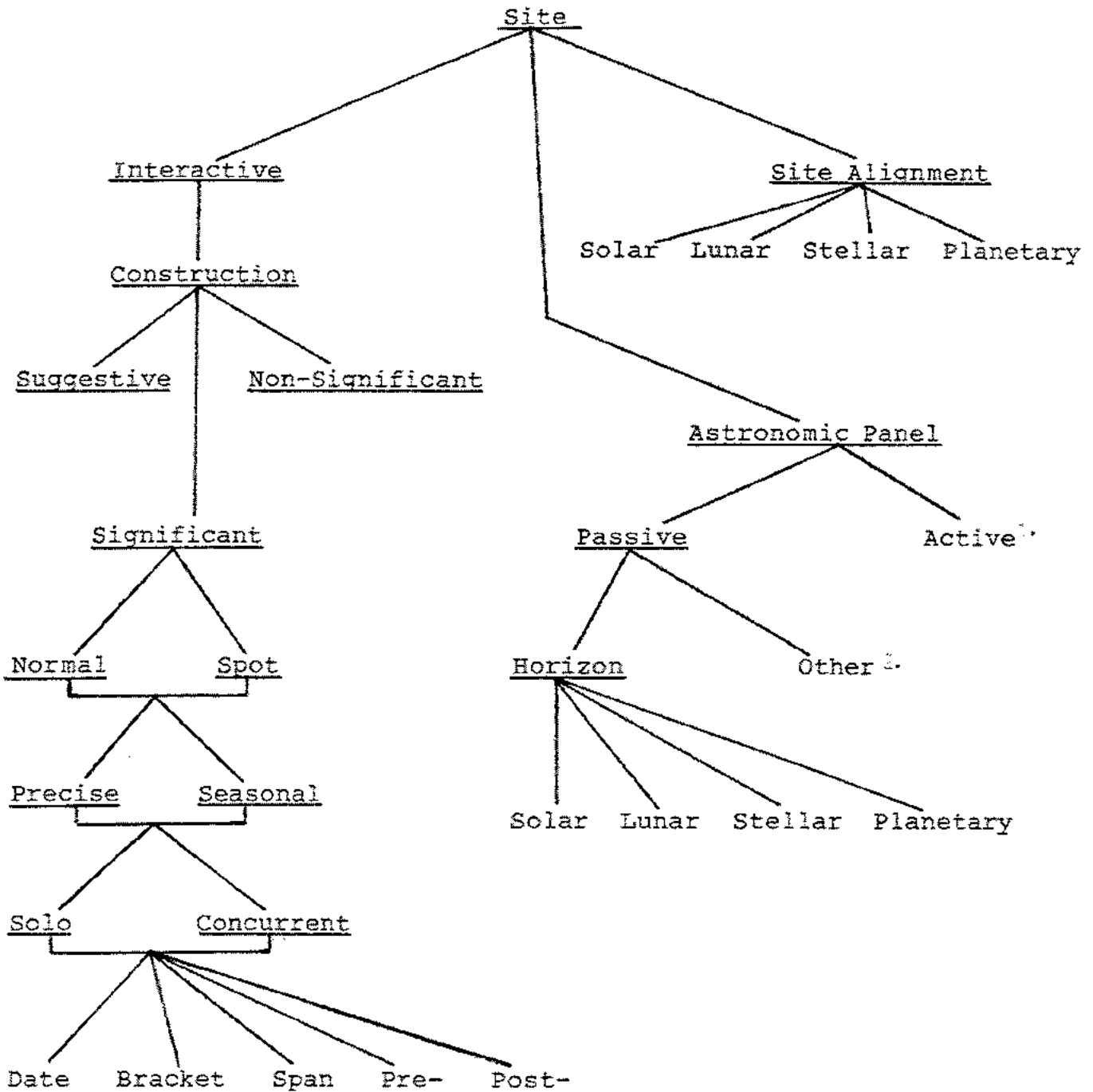
Sun Line



Shadow Line



BASIC FEATURE DESCRIPTION



1. Perhaps some panels are primarily horizon indicators, but show some interactive elements.

2. Perhaps an alignment is not with the horizon, but with some other feature.

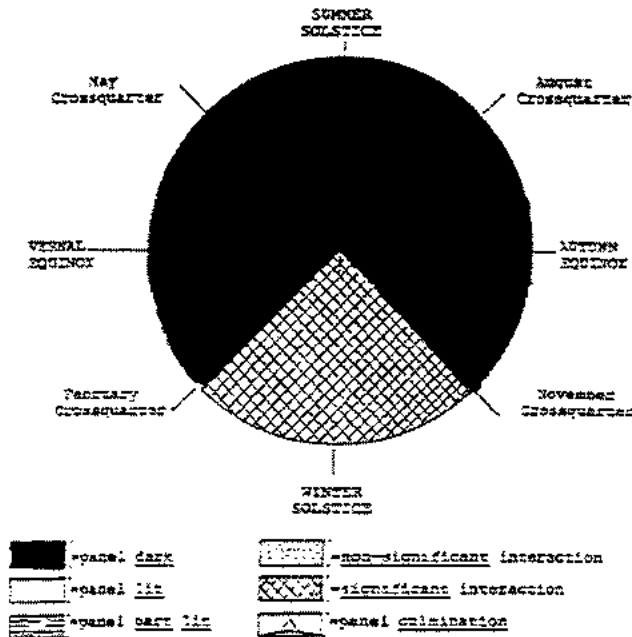
# SAMPLE PANEL DESCRIPTION

## PANEL CONDITION THROUGHOUT SOLAR YEAR

Site:

Panel Name or #: 7B

Time of Day: Sunrise for Site



For periods lacking data, the circle is left incomplete. Successive alignments are noted by a line extending from the circle if date of observation, time noted at end of line. Note complementary patterns on right and left sides of circle.

Comments: Needs additional charts for successive alignments on other Key Dates.

Panel 7B is located at the top center of a related panel, panel 7. It is recorded as a separate panel because its function is different in type than panel 7, and it continues to function for nearly two months during which the rest of panel 7 is in a lit condition. Panel 8, located to the right of panel 7 a few meters, has a function superficially similar to panel 7B.

Panel 7B is a single anthropomorph approximately 18 cm tall, facing panel front, with a feather-like protrusion from the head area on panel left, the hand on panel left enlarged to a roughly circular shape, with three finger-like protrusions depending from it.

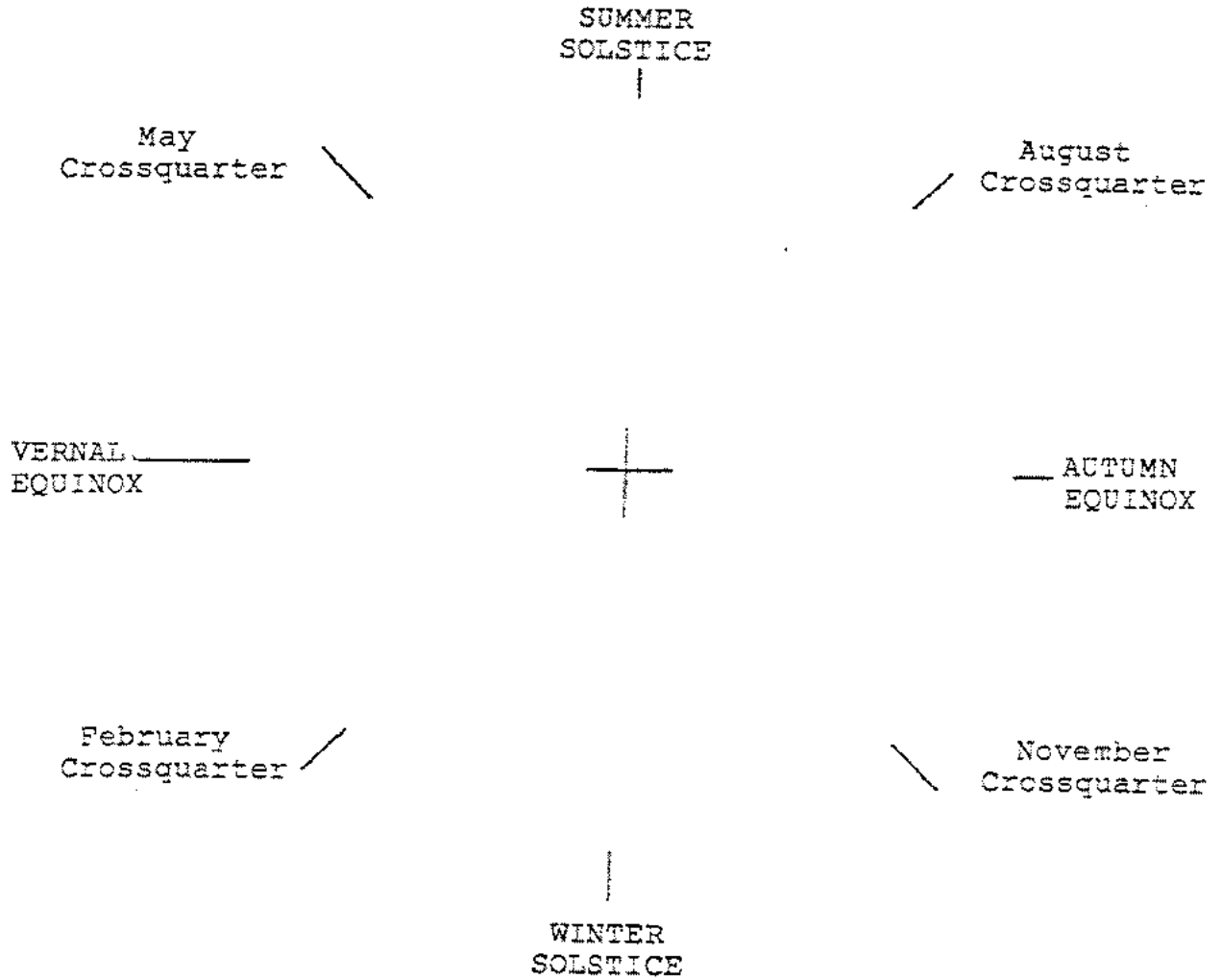
7B is a interactive, significant, seasonal, solo petroglyph panel, which functions at sunrise, for the winter quarter of the year. On the November crossquarter date, when panel 7 reaches culmination, a sun patch can be seen to panel left of 7B. Three days after November crossquarter the sun patch lights the extreme left edge of the enlarged hand area at sunrise. On each successive sunrise a bit more of the hand area (and body) is lit. At crossquarter plus 14 days, approximately one third of the hand is lit. At crossquarter plus twenty-five days, approximately two thirds is lit and a shadow nubbin extending panel left to the center of the hand has become visible. During the remaining 19 days to winter solstice, the hand area (and the body) becomes nearly totally lit, while the shadow nubbin becomes more slender without quite leaving the center of the hand. After winter solstice, process is reversed, until two days before the February crossquarter date the glyph is again dark at sunrise. Gnomon for the overall interaction is the surface of panel 7 itself, but the gnomon for the shadow nubbin is cultural in origin, a tiny raised pedestal approximately 5 mm in diameter left unpecked at the extreme right edge of the enlarged hand. control of the nubbin to hold center of the hand was apparently achieved by pecking the hand rather deeply. The use of the shadow nubbin parallels the use of a natural shadow nubbin for the main interaction on panel 7.






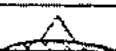
PANEL CONDITION THROUGHOUT SOLAR YEAR

Site:

Panel Name or #:

Time of Day:



- |   |                        |   |                                      |
|---|------------------------|---|--------------------------------------|
|  | =panel <u>dark</u>     |  | = <u>non-significant interaction</u> |
|  | =panel <u>lit</u>      |  | = <u>significant interaction</u>     |
|  | =panel <u>part lit</u> |  | =panel <u>culmination</u>            |

For periods lacking data, the circle is left incomplete.  
Suggestive alignments are noted by a line extending from the  
circle at date of observation, time noted at end of line.  
Note complementary pattern on right and left sides of circle.

Comments: