Northwest of Tucson in Pima County, Arizona, the Picture Rocks petroglyphs archaeological site (Figures 1 and 2) is situated on a little volcanic hill on private property of the Redemptorist Renewal Center (RRC), a Catholic retreat. Hundreds of rock symbols pecked into the rocks there include dancing anthropomorphic figures (hereafter “anthros”) plus whimsical animal and other glyphic depictions both representational and abstract. I attribute nearly all of these petroglyphs to the Hohokam archaeological culture that was present in south-central Arizona from about 450 to 1450 CE but a few may date to the Archaic period prior to 450. Most or all of the Hohokam glyphs probably were made between 800 and 1100.

The RRC property is in the northeastern foothills of the Tucson Mountains within the Arizona Upland subdivision of the Sonoran Desertscrub biotic province (Turner and Brown 1994), where palo verde, ironwood, and mesquite trees, giant saguaro cactuses, and a variety of other cactus and shrub species are dominant. The hill of bedrock and boulders on which the petroglyphs were created is part of the Safford Dacite lava flow that formed in the Tertiary geologic
period, mostly during the Oligocene epoch ca. 33.9 to 23 million years ago (Lipman 1993). Pima County (2020) online mapping tools indicate the Picture Rocks hill measures approximately 71 m (232 ft) north-south by 60 m (190 ft) east-west, its hilltop elevation is 738 m (2,420 ft) above mean sea level, and the hill stands about 9 m (30 ft) high above the surrounding ground to its east and about 15 m (50 ft) higher than the bed of Picture Rocks Wash, which runs along the western side of the hill (Figure 2).

The Picture Rocks petroglyphs archaeological site is on the private property of the Redemptorist Renewal Center (RRC) located at 7101 W. Picture Rocks Road, Tucson. Persons who wish to visit the petroglyphs are asked to park in one of the RRC’s paved parking lots and walk to the RRC office (see aerial photo site plan below) to request permission to visit. The petroglyphs are to be viewed only from the base of the hill shown in Figure 2. Climbing on the hill is not permitted.

**Petroglyph Panel 1 and the Panel 1 Spiral**

In much of this article I focus on a 4.56 m wide by 1.76 m high (14.96 by 5.77 ft), west-facing bedrock panel at the Picture Rocks site that exhibits a 0.51 m wide by 0.41 m high (20.1 by 16.1 inch) spiral petroglyph with approximately 3.25 coils, plus several other glyphs mostly representing animals but also eight linked anthro petroglyphs. I identify this rock face as Panel 1 and its spiral petroglyph as the Panel 1 spiral. On each summer solstice and each spring and autumn equinox, the morning sunlight forms a “sun dagger” on the Panel 1 spiral. The calendrical association of this petroglyph and attributes of some of the other glyphs at the site suggest Picture Rocks was a place ritually important to and revered by the Hohokam.
A Brief 2006 Reconnaissance

In August 2006, RRC employee Susan Melanson gave me permission to examine the entire Picture Rocks petroglyphs hill, including the hilltop portion normally off-limits to visitors. I conducted an initial reconnaissance of the hill on the morning of August 31, 2006, and later that day emailed Ms. Melanson this summary of my observations:

This morning I spent about 1.5 hours doing a reconnaissance of the entire bedrock hill that comprises the Picture Rocks petroglyphs site, and determined that there are at least 76 petroglyph panels on the top, south, and east sides of the hill, and at least another 70 panels on the west face of the hill, i.e., at least 146 total panels (and probably more). Note that I am using the term “panel” here to mean an individual rock face that contains rock art designs and/or graffiti, and that some of the rock art panels contain more than one design.

Most of the site’s rock art is on the west face of the hill and on the hilltop. Very few petroglyph panels are present on the south side of the hill, and no rock art and no other archaeological features were seen on the north face of the hill except for one nearly hidden rock art panel that faces inward (toward the top of the hill) on the hill’s northwest slope; one north-facing panel depicting what appears to be a bighorn sheep pretty high up on the north face of the hill, close to the main west-facing group of rock art panels; and some north-facing rock art panels at the very top of the hill.

Some of the most prominent rock art panels on the western hill face include two panels with groups of animals and human-like figures that may represent prehistoric hunters, one panel that contains a very well-worn spiral petroglyph above a design depicting a row of hand-holding human-like figures who appear to be dancing in a line; and another panel with another row of hand-holding human-like figures who appear to be dancing, farther south and higher than the row of hand-holding figures that is on the panel with the big spiral design.

There are also at least three bedrock mortars (cup-shaped, intentionally worn or pecked-in depressions) and at least 6 shallower, mortar-like cupules in the bedrock on the hilltop.

During my brief visit today I observed only two prehistoric artifacts higher up on the hill (both were informal stone flake artifacts) but saw prehistoric Hohokam pottery sherds and flaked stone artifacts on the southeast, east, and northwestern slopes of the hill. There are also some historical pieces of amethyst-colored glass and some tin cans that may be more than 50 years old, mostly on the east side of the hill.

The Summer Solstices

The Green Desert: A Silent Retreat. A two-paragraph summary of my August 2006 reconnaissance information above was published in the May-July 2007 issue of the RRC’s newsletter, The Petroglyph, but the summary did not mention the Panel 1 spiral I had described in my email to Ms. Melanson. On June 20, 2007, one of the newsletter’s readers, Margaret McNealy, called me to ask whether I was aware of the Panel 1 spiral, and that it is a calendar marker on which a dagger-shaped ray of sunlight appears on each summer solstice day. I told her I knew about the spiral but not about the solstice sunlight interaction. When I asked Ms. McNealy how she knew about this summer solstice sunlight event, she told me it is described in the book The Green Desert: A Silent Retreat by Rita Winters (2004), and she summarized for me what Winters had written about the phenomenon. (See below for Rita Winters’ exact words.)

The day Margaret McNealy called me, June 20, was the day before the 2007 summer solstice day, so of course I had to visit Picture Rocks the next day to witness this summer solstice sunlight phenomenon myself! Therefore, my son Calvin, a few Old Pueblo Archaeology Center (Old Pueblo) employees, and I visited the petroglyphs site on June 21, 2007, to observe and photograph any summer solstice sunlight interaction that might occur on the Panel 1 spiral (Figure 3). My observation of it that morning convinced me it is indeed a summer solstice marker.
I didn’t obtain Rita Winters’ book *The Green Desert* until after my June 21, 2007 visit, but before telling what I actually observed that day, let me describe her observations about the Picture Rocks petroglyphs here to give her credit for what apparently is the first publication about this site’s solstice-marking petroglyph. Rita Winters wrote on pages 195-197 of her book that she had visited the petroglyphs on Saturday June 21 sometime prior to February 2000, with a woman named Kate from California. The only time June 21 fell on a Saturday in the decade prior to 2000 was in 1997, so I have calculated that her visit was on June 21, 1997. Following are excerpts from *The Green Desert*. The first paragraph below describes a conversation Winters had with Kate sometime before June 21:

Kate asks me whether I can see the big clock-like circle painted [sic] on one of the higher rocks. I can. At its center is the startpoint of a spiral that winds out to the edges of the circle. She says she was here when it illuminated on the summer solstice a few years back. [Kate said:] “On June 21, the first day of summer, starting at about eleven in the morning, you see a spot of bright light appear where the six would be on a clock. As time draws closer to noon, the light follows the hours up the clock until at noon, bright light illuminates the twelve mark and forms a dazzling pyramid of light right below it on the clock’s center line. As time moves past twelve, the triangle grows fainter and then all points of light disappear . . . .” [Winters 2004:53-54]

Farther on in her book, Winters wrote about actually visiting the petroglyphs site on June 21:

At 11:25 I arrive at the Rocks. . . . At precisely 11:30 Kate and the first dot of light at the center point arrive. In excited but respectful silence we watch the dot of light expand into a triangle that grows ever larger between where nine and twelve would be on the clockface were the face enumerated. At exactly noon the dot on twelve lights up so brightly it looks phosphorescent. [Winters 2004:120-121]  

Photographing Picture Rocks Panel 1 on the Summer Solstice. Rita Winters’ description of the summer solstice sunlight interaction with the Panel 1 spiral is pretty accurate except for when it begins. On the June 21, 2007, summer solstice day, my colleagues and I arrived at Picture Rocks around 10:30 a.m. to watch and take timed photographs. As the morning latened and sunlight began illuminating most of the western hill face, the vertical-faced Panel 1 and its petroglyphs (which include others besides the Panel 1 spiral) remained in the shadow of two large, tilted rock slabs just above Panel 1 that protrude slightly westward over it, shielding the panel from the sun (Figure 4). As the sun continued rising over the hill, the prominent crevice between the two slabs directed sunlight downward onto the Panel 1 spiral, as shown in Figures 5 through 9 and as described below and in Table 1.

During the hour after 10:30 a.m. of our June 21, 2007 visit, the morning shadow on the Panel 1 spiral drew upward and inward so that by 11:30 the outer edges of Panel 1 were sunlit and roughly the central half of it was still within the shadow underneath the two tilted rock slabs. The shaded portion of the panel by then gradually became smaller but was still lying directly over the spiral glyph as the sun continued its journey westward over the top of the hill.

Beginning at 11:40 a.m., while the west-facing Panel 1 spiral was still in shadow, a triangular patch of sunlight appeared within the shaded area, along the outermost coil of the spiral (Figure 6, 11:40 a.m.). This triangle of bright light subsequently grew upward and rightward to form the sun dagger (Figure 6, 11:42 a.m. and Figure 7). As the dagger’s lower left corner remained approximately

1 All clock times in this article are Mountain Standard Time (MST), which is the year-round time for southern Arizona.
Table 1: Progression of summer solstice sun dagger on Picture Rocks Panel 1 spiral, June 21, 2007

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-11:40 a.m.</td>
<td>As the morning sun came over the western side of Picture Rocks hill, sunlight illuminated the outsides and bottom of Panel 1, and the shadow of the two large, tilted overhanging slabs above the panel gradually receded (Figures 5 and 6).</td>
</tr>
<tr>
<td>11:40 a.m.</td>
<td>Within the receding shadow a small triangular patch of sunlight appeared along the spiral’s outermost coil about in the 7:30 o’clock position (Figure 6 11:40 a.m. photo).</td>
</tr>
<tr>
<td>11:40-11:48 a.m.</td>
<td>The triangular patch of sunlight expanded upward and to the right, forming the sun dagger (Figure 6 11:42 a.m. photo and Figure 7).</td>
</tr>
<tr>
<td>11:48 a.m.</td>
<td>The sun dagger’s tip was on the top edge of the spiral glyph’s uppermost coil, and the bottom two corners of the dagger had expanded downward and outward so they were slightly below the lowest coil. The shaded portion of Panel 1 had become a semicircular shadow still extending down from beneath the slabs above (Figure 7).</td>
</tr>
<tr>
<td>11:50 a.m.</td>
<td>The bottom of the sun dagger had merged with the rest of the panel’s sunlit area as the shadow of the overhanging slabs receded, and the dagger had expanded upward and to the right. The top of the spiral petroglyph was still in the semicircular, receding shadow. By this time the dagger’s nearly vertical right edge ran along the left innermost coil of the spiral glyph (Figure 7).</td>
</tr>
<tr>
<td>11:52 a.m.</td>
<td>The straight right side of the sun dagger had become wavy as the sun dagger continued moving rightward (Figure 8).</td>
</tr>
<tr>
<td>11:54 a.m.</td>
<td>The central, outermost meander of the sun dagger’s right edge was directly over the innermost coil of the petroglyph spiral (Figure 8).</td>
</tr>
<tr>
<td>11:56 a.m.</td>
<td>The remaining semicircular shadow over the spiral’s upper half had drawn upward and the dagger had become wider, shorter, and truncated at its top (Figure 9).</td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Sunlight illuminated the entire spiral glyph except for the two bottommost points of the withdrawing shadow, which still touched the spiral’s topmost coil (Figure 9).</td>
</tr>
<tr>
<td>12:10 p.m.</td>
<td>The overhanging shadow had faded completely, leaving all of the panel’s petroglyphs in direct sunlight and very difficult to see.</td>
</tr>
</tbody>
</table>
on the spiral’s left outermost coil, the dagger tip rose upward and slightly to the right, appearing to move counter-clockwise along the outermost coil of the Panel 1 spiral.

By 11:48 (Figure 7) the tip of the sun dagger was along the top edge of the spiral glyph’s uppermost coil, and the bottom two corners of the triangular dagger had expanded downward and outward so they were slightly below the spiral’s bottommost coil. By 11:50 (Figure 7), while the top of the spiral was still in the semicircular, receding shadow, the bottom of the sun dagger had merged with the rest of Panel 1’s sunlit area. The portion of the dagger that remained thereafter continued moving to the right and slightly higher, so that its right edge was nearly vertical, cutting across the left innermost coil of the spiral.

By 11:52 a.m. (Figure 8) the straight right side of the light dagger was becoming wavy but that side continued moving rightward until by 11:54 the central, outermost meander of the dagger’s right edge was directly over the innermost coil of the Panel 1 spiral. By 11:56 (Figure 8) the semicircle of shadow that still remained over the upper half of the spiral petroglyph began drawing upward more quickly and, as it withdrew, the sun dagger became wider, shorter, and truncated at its top.

By 12:00 noon (Figure 9) the entire Panel 1 spiral was completely bathed in sunlight except for the two bottom-most points of the withdrawing shadow, which by then was up to the spiral’s topmost coil. Shortly afterward the overhanging shadow withdrew completely, emblazing all of the petroglyphs on Panel 1 in direct sunlight, making them very difficult to see.

In *The Green Desert*, Rita Winters noted she had revisited the petroglyphs the day after the summer solstice but the light phenomenon she had observed on June 21 did not occur on June 22. Photos

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presented hereafter show how sun daggers move across Panel 1 before and after the summer solstice.

The Equinoxes

On March 20, 2008, the day of the spring equinox, I visited the Picture Rocks hill to see whether there was any point, triangle, or dagger-like projection of bright sunlight on the Panel 1 spiral or any of the other petroglyphs. I arrived in Picture Rocks Wash at the base of the hill around 11:30 a.m. – unfortunately, not early enough to see whether there was any significant sunlight interplay with the spiral because by then most of it already was in full sunlight. I observed, however, that the shadow cast by the two big, leaning slabs above the spiral did not project directly down onto Panel 1, but instead extended down and to the left, angling across the north-central part of the panel, as would be expected from the position of the late-morning sun in the mid-southern sky on the first day of spring.

In August 2008 I showed some sequential photographs of the Picture Rocks summer solstice sun dagger to rock art researchers John Fountain and Janine Hernbrode. On September 22, 2008 (the autumn equinox day), Fountain visited and took a video of the Panel 1 spiral, which confirmed that a sun dagger formed on it late that morning. His video documented, apparently for the first time, that a sun dagger narrower than the summer solstice one appears on the spiral petroglyph sometime before noon on the day of the autumn equinox.

On March 21, 2009, the day after that year’s spring equinox, Karen Haas, Terry Mason, Jayma Stembridge, and I took a break from surveying the surrounding area (see Archaeological Surveys, below) and watched as a sun dagger moved across the Panel 1 spiral. That day’s dagger started at 11:11 a.m. as a dot of sunlight outside the spiral’s lower left coil. That first dot of light soon was joined by several others running diagonally up and to the right (southward toward the position of the sun in the sky), after which the dots of sunlight merged and expanded into a dagger that penetrated the center of the spiral. The dagger that day lasted

Figure 7 (right). Continued from Figure 6, summer solstice sequential photos of Picture Rocks Panel 1 spiral petroglyph taken at 2-minute intervals from 11:44 to 11:50 a.m., showing sun dagger expanding upward and rightward as shadow of the upper slabs receded upward (Photos by Calvin Dart, June 21, 2007)
about 15 minutes before opening up and becoming engulfed in the bright sunlight.

From photographs Ms. Stembridge took that day and sent me later, I determined that this near-spring-equinox sun dagger was a human creation, caused by someone who had chipped a notch in the arcing rim of rock that is along the upper right (southern) edge of the Panel 1 spiral, to direct sunlight diagonally down across its center (Figure 10). It is evident the notch in the protruding arc was made after the petroglyphs on Panel 1 were created, because the rock surface in the notch is lighter in color than the surrounding rock surface and the petroglyphs on Panel 1. Therefore, the notch surface has not had as much time to reweather to as dark a color as the rest of the rock surface.

On the 2010 spring equinox day, March 20, I photographed the Picture Rocks sun dagger at 11:00, 11:02, 11:04, then at one-minute intervals from 11:06 until 11:45 a.m. Later examination of these photos and Panel 1 itself showed that on each equinox day, sunlight dots like the ones described above eventually grow together to form a sun dagger running diagonally upward toward the Panel 1 spiral’s center from is lower left side.

In the following description of the March 20, 2010, equinox event, the coils of the spiral are counted from the lower left outside (coil 1) to the innermost (coil 4). The formation and development of the spring equinox sun dagger is described in Table 2 and can be followed starting in Figure 11 (for which photos were taken on the spring equinox days of separate years, 2010 and 2011, since Tom Herrick’s earliest 2011 photo was not taken until 11:06 a.m.); and in the Figures 12 through 14 photographs taken by Mr. Herrick in 2011.

My 2010 spring equinox photos show that the sun dagger began forming at 11:00 a.m. as a tiny dot of sunlight, first visible below and left of the spiral petroglyph. After a few minutes, several more sunlight dots appeared along a line pointing approximately to the center of the Panel 1 spiral, then the dots grew brighter and slightly larger until by 11:11 they had formed a small acute triangle of light that pointed upward and rightward toward the
spiral’s center and touched the outer edge of its outer coil.

By 11:15 the three upper right sunlight dots began forming stripes of sunlight approximately perpendicular to the alignment of the light dots (Figure 12, 11:14:00 a.m. and Figure 13, 11:15:53 a.m.), giving the appearance of a light-striped (but not outlined) triangle. By 11:16 the lowest corner of the triangle began splaying outward over the glyph’s outer coil and by 11:18 the sun dagger became almost continuous, extending from just outside the spiral’s outer coil almost into the glyph’s center (Figure 13, 11:18:00 a.m.). The sun dagger then continued growing longer, and wider at its base, and by 11:19 its lower right edge merged with a patch of light that had been forming beyond the spiral’s lower left coil (Figure 13, 11:20:16 a.m.).

By 11:20 the sun dagger had grown continually larger and was beginning to lose its dagger shape as its lower edge became sinuous (Figure 13, 11:20:16 and 11:22:09 a.m.). Thereafter the dagger entirely lost its form as the sun continued rising and casting more and more light onto Panel 1. By 11:25 the entire bottom half of the spiral glyph was illuminated, and by 11:34 the sunlight had engulfed the full spiral (Figure 14). By 11:45 when I took my last 2010 photo, nearly all of Panel 1 was in full sun.

### Table 2: Progression of spring equinox sun dagger on Picture Rocks Panel 1 spiral, March 20, 2010

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 a.m.</td>
<td>A small dot of sunlight appeared below and left of the spiral petroglyph, approximately at the level of the arms of the hand-holding anthropomorph petroglyphs and left of them (Figure 11). This first sunlight dot did not visibly move for several minutes.</td>
</tr>
<tr>
<td>11:06</td>
<td>The first sunlight dot had shifted slightly upward and rightward to a level about even with the necks of the hand-holding anthropomorph glyphs (Figure 11).</td>
</tr>
<tr>
<td>11:08</td>
<td>A second dot of sunlight appeared slightly higher and to the right of dot 1, which was still in its 11:07 position (Figure 12).</td>
</tr>
<tr>
<td>11:09</td>
<td>Sunlight dots 1 and 2 were still present; dot 2, the upper one, had enlarged slightly, and sunlight dot 3 had appeared farther upward and rightward just below and to the left of the spiral petroglyph’s coil 1, along the same diagonal alignment as dots 1 and 2.</td>
</tr>
<tr>
<td>11:10</td>
<td>Sunlight dot 3 became brighter and slightly larger (Figure 12).</td>
</tr>
</tbody>
</table>

(Table 2 continues on next page.)
Figure 11 (left). Spring equinox sequential photos of Picture Rocks Panel 1 spiral petroglyph taken at 2-minute intervals showing how the equinox sun dagger begins to form as a series of sunlight dots from 11:00 to 11:06 a.m. (11:00, 11:02, and 11:04 photos by the author, March 20, 2010; 11:06 photo by Tom Herrick, March 20, 2011)

Table 2 (Continued): Progression of spring equinox sun dagger on March 20, 2010

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:11 a.m.</td>
<td>Sunlight dot 3 had expanded into a small triangle of light in which the most acute angle was pointing upward and rightward, along the alignment of the sunlight dots, and was touching the outer edge of the spiral glyph’s outer coil (coil 1).</td>
</tr>
<tr>
<td>11:12</td>
<td>Sunlight dots 4 and 5 had appeared between the spiral glyph’s coils 1 and 2, along the same alignment as dots 1, 2, and 3 (Figure 12).</td>
</tr>
<tr>
<td>11:13</td>
<td>Sunlight dot 2 had grown slightly, dots 4 and 5 between the spiral’s coils 1 and 2 had become more elongated, and all five light dots were still along the single diagonal alignment.</td>
</tr>
<tr>
<td>11:14</td>
<td>Sunlight dot 5 continued expanding upward and rightward to touch the spiral’s coil 2, and dot 2 was splaying outward from the main alignment onto the upper surface of a slight ridge in the rock panel where dot 2 was shining (Figure 12).</td>
</tr>
<tr>
<td>11:15</td>
<td>Sunlight dots 1 and 2 had nearly joined together and widened, and dots 3-5 were beginning to form a light-striped triangle in which dot 5 formed the stripe at the triangle’s upper right point, dot 4 was a stripe running across the triangle’s center area, dot 3 formed the triangle’s base at the lower left; and a separate amorphous spot of sunlight was starting to illuminate the lower right part of the spiral glyph’s coil 1.</td>
</tr>
<tr>
<td>11:16</td>
<td>Sunlight dots 1 and 2 had joined and widened to the same width as lines extending down and left from the upper point of the light triangle, dots 3 and 4 had joined together to form a trapezoidal stripe of the triangle lying over coil 1 of the spiral glyph, and dot 5 was a larger triangle extending upward and rightward to the outer edge of the spiral glyph’s coil 3. The amorphous sunlight spot on the lower right part of coil 1 was now larger but had not yet reached coil 2 (Figure 13).</td>
</tr>
<tr>
<td>11:17</td>
<td>The former light dots 1 and 2 were no longer distinct as the sunlight started illuminating the rock face in their area. Former dots 3-5 had joined into a single acute triangle pointing upward and rightward with its tip falling within the spiral glyph’s coil 3, and a stringer of light extended out to the right from the lowest angle of this conjoined triangle.</td>
</tr>
</tbody>
</table>

(Table 2 continues on next page.)
Each of the sunlight interactions described here for the equinoxes, and for the summer solstice, lasts no more than about 22 minutes from when the sun daggers begin to form to when the dagger-like sun rays dissipate into full sunlight, assuming, of course, that clouds don’t block the direct sunlight.

I do not have time-sequenced photos of Panel 1 for any autumn equinox. However, I have observed while leading tours to the petroglyphs nearly every spring and autumn equinox day since 2011 that the sequential events noted for the spring equinox sun dagger described in Table 2 begin about 14 to 15 minutes earlier on each autumn equinox.

Table 2 (Continued): Progression of spring equinox sun dagger on March 20, 2010

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:18 a.m.</td>
<td>The newly conjoined sunlight triangle had become wider and longer, extending across the spiral glyph’s coils 1 and 2 and into the center-pecked portion of coil 3; and the light stringer had broadened. The amorphous sunlight spot on the lower right part of coil 1 had enlarged to reach almost to coil 2 (Figure 13).</td>
</tr>
<tr>
<td>11:19</td>
<td>The lower right side of the light triangle began splaying rightward to fill in the previously unlit area between the triangle’s tip and the outer right side of the light stringer, so that the entire sunlit area on the spiral glyph was now like a broader triangle in which the lower right side was concave. The amorphous sunlight spot on the lower right part of the spiral glyph had by now surpassed coil 2 as it widened toward the spiral glyph’s center.</td>
</tr>
<tr>
<td>11:20</td>
<td>As the sun dagger continued to expand, it was beginning to lose its dagger shape as its lower edge became sinuous (Figure 13 11:20:16 and 11:22:09).</td>
</tr>
<tr>
<td>11:21</td>
<td>The dagger had entirely lost its form as the sun continued rising and casting light over Panel 1.</td>
</tr>
<tr>
<td>11:25</td>
<td>The entire bottom half of the big spiral glyph was illuminated.</td>
</tr>
<tr>
<td>11:34</td>
<td>Sunlight had engulfed the full spiral (Figure 14).</td>
</tr>
<tr>
<td>11:45</td>
<td>In the last photo taken, nearly the entire petroglyph panel was in full sunlight.</td>
</tr>
</tbody>
</table>
The Winter Solstices

John Fountain is the first person I know of who documented a winter solstice sunlight interaction with the Panel 1 spiral at the Picture Rocks archaeological site. On December 22, 2008, he emailed me a one-minute video file composed of photos he had taken of the spiral glyph between 10:14 and 11:18 a.m. that winter solstice morning. In his email he commented, “It appears to me, in spite of interference by tree limbs, that there is a significant interaction.” His video shows that the sunlight became focused on the spiral glyph during that 64-minute period.

I took sequential photographs of Panel 1 on the December 21, 2017, winter solstice day. There was cloud cover from when I arrived at 10:00 a.m. to 10:22, so my first photo in which sunlight lit the western hill face was taken at 10:23. I continued photographing each minute from then until 11:15 when the entire panel was illuminated by sunlight. (Clouds also kept the sun from shining on Panel 1 at the 10:35, 10:38, and 10:43 one-minute intervals, and from 11:09 to 11:14 a.m. that day.)

Some of my winter solstice photos are presented in Figures 15 through 18, and Table 3 provides details about my observations that day. Dr. Fountain’s video and my photos show that the winter solstice sunlight interaction with the Panel 1 spiral petroglyph is not as clear-cut as the interactions observed on the equinoxes and the summer solstice. At 10:46 a.m. a spot of sunlight appears on the spiral’s second coil in, at the 8 o’clock position. By 10:56 several spots of sunlight are aligned over the lower portion of the spiral, and one of those spots includes an acute angle on its upper right perimeter that points to the innermost terminus of the spiral (Figure 16, 10:56 a.m.).

At 11:01 a.m. a nearly unbroken band of sunlight illuminated the lower portion of the spiral, and by 11:08 the band had moved upward to illuminate the spiral’s central portion. The 10:56 and 11:08 occurrences just described each lasted just a few seconds so would have been easy to miss.
Cross-Quarter Days

Cross-quarter days occur on the midpoints between solstice and equinox days (i.e., the quarter days), usually during the first weeks of August, November, February, and May of each year. Some authors (for example, Fountain 2005) have suggested cross-quarter days were observed and celebrated by some pre-Spanish Contact (hereafter pre-Contact) Indigenous peoples of the Americas and that some of those who did so might have placed certain rock symbols in positions that would allow sunlight and

Table 3: Progression of winter solstice sunlight interaction with Picture Rocks Panel 1 spiral, December 21, 2017

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-10:22 a.m.</td>
<td>Cloud cover prevented observation of sunlight interaction.</td>
</tr>
<tr>
<td>10:23</td>
<td>No direct sunlight shone on the spiral petroglyph’s panel (Figure 15).</td>
</tr>
<tr>
<td>10:24-10:32</td>
<td>Cloud cover.</td>
</tr>
<tr>
<td>10:33</td>
<td>Sunlight was illuminating the linked anthropomorph petroglyphs below the spiral petroglyph (Figure 15; illumination could have begun as early as 10:24, see above row).</td>
</tr>
<tr>
<td>10:46</td>
<td>A spot of sunlight appeared on the spiral glyph’s second coil in from the 8 o’clock position (Figure 15).</td>
</tr>
<tr>
<td>10:56</td>
<td>Several large spots of sunlight were aligned over the lower portion of the spiral glyph. The spot in the lower left quadrant of the spiral was pointed on its upper right margin, and it pointed approximately to the inner terminus of the glyph coil (Figure 16).</td>
</tr>
<tr>
<td>11:01</td>
<td>A nearly unbroken band of sunlight illuminated the lower portion of the spiral glyph (Figure 17).</td>
</tr>
<tr>
<td>11:08</td>
<td>The band of sunlight had moved upward to illuminate the central portion of the spiral (Figure 18).</td>
</tr>
<tr>
<td>11:09-11:14</td>
<td>Cloud cover.</td>
</tr>
<tr>
<td>11:15</td>
<td>The entire petroglyph panel was illuminated (Figure 18).</td>
</tr>
</tbody>
</table>
shadow to fall on the symbols or specific parts of them on cross-quarter days.

In the December 22, 2008, email John Fountain had sent me about his winter solstice visit to Picture Rocks that year, he noted that Chris Tanz had taken a sequence of photographs of Panel 1 on the cross-quarter day, November 6, 2008, but tree limbs had interfered with the sunlight so much that it was unclear whether there was a significant solar interaction with the spiral glyph.

I took timed, sequential photographs of Panel 1 on four successive cross-quarter days: August 6 and November 7, 2016, and February 3 and May 5, 2017. Below I describe the sunlight interactions with the spiral glyph on each of those dates. Tables 4 through 7 provide details, and Figures 19 through 25 show a sample of the cross-quarter photos.

August 2016 Summer-Solstice-to-Autumn-Equinox Cross-Quarter Day. A sun dagger formed on Panel 1 on the August cross-quarter day. Like the summer solstice sun dagger, the August cross-quarter one was formed by sunlight falling through the crack between the two large slabs immediately above the Panel 1 spiral, and the right edge of the cross-quarter dagger was vertical. The August cross-quarter sun dagger started to form at 11:33 a.m. near the bottom of Panel 1 and left (north) of the spiral glyph. The dagger expanded upward and rightward but did not move onto the spiral until 11:47 a.m., when its right edge touched the spiral’s left-most coil. After that, the dagger moved upward a bit more, its base widened rightward into the lower part of the spiral, then the dagger lost its shape as the shadow of the overhanging slabs withdrew upward and sunlight bathed Panel 1 (Table 4; Figures 19 and 20).

November 2016 Autumn-Equinox-to-Winter-Solstice Cross-Quarter Day. By 10:38 a.m. when I arrived to take photos on the November 7, 2016, cross-quarter day, there already were patches of sunlight on Panel 1. Table 5 lists some details of what I photographed and observed during that visit.

In my photos taken at 1-minute intervals from 10:38 a.m. to 12:22 p.m. during this visit, skipping
only the 10:44 interval, I cannot discern any significant directional sunlight focused on the Panel 1 spiral so no photos from this date are included here. Tree-branch shadows partly shaded the panel’s lower right half but it appears the sunlight started streaking across much of Panel 1, then gradually lit it up entirely (Table 5).

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:32 a.m.</td>
<td>Panel 1 was still totally in morning shade.</td>
</tr>
<tr>
<td>11:33 a.m.</td>
<td>A dot of sunlight appeared about at the level of the left four anthropomorph petroglyphs’ waistlines and directly beneath the tail of the right-facing animal (zoomorphic) petroglyph that is immediately left of the spiral glyph (Figure 19).</td>
</tr>
<tr>
<td>11:34 a.m.</td>
<td>A second sunlight dot appeared slightly above and to the right of the first dot.</td>
</tr>
<tr>
<td>11:35 a.m.</td>
<td>Two more sunlight dots appeared above and right of the first two and on the same, slightly diagonal alignment. The uppermost of the four light dots, which was pointed at its top, was on the animal petroglyph’s hind foot (Figure 19).</td>
</tr>
<tr>
<td>11:37 a.m.</td>
<td>The dagger point was at the animal glyph’s belly (Figure 19).</td>
</tr>
<tr>
<td>11:39 a.m.</td>
<td>The sun dagger point had moved up and rightward about to the animal glyph’s heart area (Figure 20).</td>
</tr>
<tr>
<td>11:44 a.m.</td>
<td>The sun dagger’s tip had continued moving up and right beyond the animal glyph to about the elevation of the spiral glyph’s top, but the dagger still was completely outside and left of the spiral.</td>
</tr>
<tr>
<td>11:47 a.m.</td>
<td>The dagger had risen and moved far enough to the right for its vertical right edge to touch the spiral glyph’s left outermost coil.</td>
</tr>
<tr>
<td>11:51 a.m.</td>
<td>The dagger’s base had widened so that its lower right edge had become diagonal and moved into the left half of the spiral glyph. The dagger point was at the left edge of the left, solid-circle petroglyph above the spiral (Figure 20).</td>
</tr>
<tr>
<td>11:53 a.m.</td>
<td>The sun dagger started losing its shape and thereafter was absorbed into the sunlight.</td>
</tr>
</tbody>
</table>
February 2017 Winter-Solstice-to-Spring-Equinox Cross-Quarter Day. On February 3, 2017, I took photos of Panel 1 at 1-minute intervals from 10:33 to 11:34 a.m. (Table 6). At 11:20 a.m.

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:38 a.m.</td>
<td>Already there were three crescent-shaped patches of sunlight on Panel 1, aligned diagonally upward toward the middle right coil of the spiral petroglyph, with the upper-right light patch touching the glyph’s lower left outer coil.</td>
</tr>
<tr>
<td>10:40</td>
<td>The lower two sunlight patches had grown and merged into a larger amorphous patch, and the upper patch had enlarged into a separate amorphous patch that covered parts of the spiral’s first and second lower left coils.</td>
</tr>
<tr>
<td>10:45</td>
<td>Streaks of sunlight ran diagonally down to the left, partly over the lower part of the spiral petroglyph and below it to the right; and some amorphous sunlight patches were left of the spiral.</td>
</tr>
<tr>
<td>10:47</td>
<td>The sunlight streaks had moved down slightly and several amorphous sunlight patches were on the upper left part of the spiral and left of it.</td>
</tr>
<tr>
<td>10:50</td>
<td>There were several discontinuous sunlight streaks running diagonally down to the left across Panel 1, none of them centered on the spiral.</td>
</tr>
<tr>
<td>10:53</td>
<td>Two large sunlight streaks were oriented diagonally across Panel 1, one above and one below the spiral.</td>
</tr>
<tr>
<td>10:56</td>
<td>Both sunlight streaks had moved up and were still outside the spiral petroglyph.</td>
</tr>
<tr>
<td>11:00</td>
<td>There were several sunlight streaks to the right of the spiral petroglyph, and much of Panel 1 left of that glyph was in sunlight.</td>
</tr>
<tr>
<td>11:04</td>
<td>Several sunlight streaks were across, below, and right of the spiral glyph and most of Panel 1 left of that glyph was in sunlight.</td>
</tr>
<tr>
<td>11:10</td>
<td>The upper left half of the spiral glyph and most of Panel 1 above, left, and below it were in sunlight, and there were faint, narrow sunlight streaks to the right of the spiral. By now it was becoming evident that the streaky sun rays were the result of branches partly shading the panel.</td>
</tr>
<tr>
<td>11:11-11:40</td>
<td>Sunlight gradually lit up all of Panel 1.</td>
</tr>
</tbody>
</table>
the first sunlight that became visible on the panel was a faint, nearly parallel-sided streak (Figure 21) that appeared above the spiral petroglyph. That streak ran diagonally, in line with and about the same width as the maximum width of the notch (Figure 10) that had been chipped into the rock rim above and right of the spiral to create the equinox sun daggers.

As the sun moved higher, the sunlight streak broadened at its left (northern) lower end while its margins at its upper right end remained in line with the edges of the chipped notch. I did not stay long enough that day to see what time sunlight fully illuminated Panel 1 but my photos make it evident that the initial streak of sunlight shone through the chipped notch (Figures 21 and 22).

May 2017 Spring Equinox-to-Summer Solstice Cross-Quarter Day. On May 5, 2017, I photographed Panel 1 at 1-minute intervals from 11:29 a.m. to 12:01 p.m. A sun dagger was already present to the left (north) of the spiral glyph by the time I arrived. Table 7 and Figures 23 through 25 show details of the May 2017 cross-quarter sun dagger’s progression.

Much like the August 2016 cross-quarter day sun dagger, the May 2017 cross-quarter dagger

<table>
<thead>
<tr>
<th>Time (MST)</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:33 a.m.</td>
<td>Panel 1 was still fully shaded.</td>
</tr>
<tr>
<td>11:20</td>
<td>First visible sunlight appeared on the panel as a faint, nearly parallel-sided, diagonal streak above the spiral petroglyph (Figure 21); the light streak was in line with and about the same width as the maximum width of the notch that had been chipped in ancient times (Figure 10) to create the equinox sun dagger.</td>
</tr>
<tr>
<td>11:21-11:34</td>
<td>The sunlight streak gradually broadened at its left (northern) lower end while its margins at its upper right end remained in line with the edges of the chipped notch.</td>
</tr>
</tbody>
</table>
started out left of the spiral petroglyph and moved upward and to the right, barely crossing onto the spiral. The May sun dagger differed from the August one, however, in at least two respects. First, the right edge of the May dagger touched the spiral’s outermost left coil at 11:36 a.m. (earlier than the 11:47 time in August). And second, instead of the dagger tip passing along the left edge of the left, solid-circle petroglyph above the spiral as the August 2016 one had, the May 2017 dagger’s tip became blunted as it reached the circle petroglyph’s lower left edge (Figure 24, 11:40 and 11:42 a.m.).

**Significance of Solstice, Equinox, and Cross-Quarter Day Sunlight Interactions**

**Solstices and Equinoxes.** From the observations described above for the summer and winter solstices, the spring and autumn equinoxes, and the four cross-quarter dates per year, it is evident the summer solstice sun dagger on Panel 1 is a natural occurrence caused when the two rock slabs above...
and slightly overhanging the panel focus sunlight down onto the panel in late morning. It seems likely, therefore, that the spiral petroglyph was added to the panel after some ancient person(s) – presumably of the Hohokam culture who lived between 800 and 1100 (see below) – recognized that this dagger-shaped ray of sunlight forms on the panel every summer solstice morning.

It also is apparent the sun dagger that forms on Panel 1 each equinox morning is not a naturally occurring phenomenon, but one intentionally created by some person(s) who chipped the arced rim of rock that sticks out slightly from the panel, above and right of the spiral petroglyph.

How would the Hohokam have known when the solstices and equinoxes occur? One can easily determine when the solstices occur by observing where the sun rises on the eastern horizon every morning of a year – in the northern hemisphere the summer solstice is when the sun rises at its northernmost extreme on the horizon, and on the winter solstice the sun rises at its southernmost extreme (Stanford Solar Center 2020).

However, the equinoxes are not determined simply by calculating half the number of days between the solstices, but by when the sun is directly above the Earth’s equator at noon, which only happens twice each year (National Weather Service 2020). Ancient people in the Southwest probably had no way to determine when that semiannual equatorial event occurs, but it causes at least two observable phenomena on Earth: On each equinox there are nearly equal hours of day and night, and the sun rises due east and sets due west (National Weather Service 2020; Stanford Solar Center 2020). The Hohokam probably could have used one or both of these observations to determine when the equinoxes occur. A person who knew when they occur therefore could have observed the angle of the sun when it starts to illuminate Panel 1 on an equinox. That person then could have marked where to chip the rim of rock that juts out from the panel above and right of its spiral petroglyph, to direct the sun dagger onto the center of the spiral.

So, it seems likely that whoever created the spiral glyph and whoever chipped out the notch (not necessarily the same person) knew when the
summer solstice and when the equinoxes occurred. This attests to the significance of Hohokam astronomical observations and time reckoning. That knowledge may not have resided in just one person; the spiral glyph and the notch in Panel 1 could have been created by different people, possibly years apart.

Solstice-day sun dagger and shadow pointer interactions with Hohokam spiral, concentric-circle, or rayed-circle petroglyphs also have been identified in Tempe on Hayden Butte and in the Phoenix Mountains’ Spiral Man and Shaw Butte Hilltop sites (Bostwick 2010); on Tumamoc Hill in Tucson (Suzanne Fish, personal communication); at Signal Hill in Saguaro National Park-Tucson Mountains Unit (Bradley Schaefer, personal communication); and at the Painted Rock site near Gila Bend (Duran Piotrowski 2020).

**Cross-Quarter Days.** What about the cross-quarter days? As noted above, cross-quarter days fall on the midpoints between solstice and equinox days. Since each solar year is 365.24 days and the lengths of the astronomical seasons vary between 89 and 93 days (National Centers for Environmental Information 2020), one would have to be able to count at least up to 93 to be able to calculate numerically when a cross-quarter day would occur.

Some ethnographic accounts indicate that historically the Akimel O’odham and Tohono O’odham, who likely are descended from the Hohokam, did not keep counts of the number of days per year and apparently rarely or never counted beyond 10 (Russell 1975:155-158; Underhill 1940:39). However, elsewhere in his Akimel O’odham (Pima) ethnography, Russell wrote:

> It is said that when [the Creator] Elder Brother was leaving Pimeria for the last time he told the people to count the tail feathers of the little bird, Gisap, which are twelve in number, and that they should divide the year into that number of parts [Russell 1975:36]

And, in his descriptions of events commemorated in two Pima calendar sticks, Russell wrote that the O’odham who possessed the sticks told him that in the 1850-1851 year there were 134 Yumas killed by O’odham (1975:45), and 15 Apaches were killed in
the 1871-1872 year (1975:54).

If the Hohokam did not count much beyond 10 or keep day counts, they probably could not have calculated the 45 to 47 days from a solstice or equinox day to a cross-quarter day, but Russell’s (1975:45) account of an O’odham informant specifying 134 enemies killed suggests at least some O’odham ancestors (presumably Hohokam) also could count above 100. However, it would have been difficult if not impossible for the Hohokam to determine when cross-quarter days occurred by figuring out the points on the horizon where the sun rose on cross-quarter days, either by identifying the exact horizon midpoints between the solstice and equinox sunrise positions or by using geometry (dividing the angles equally).

Comparison of the solstice, equinox, and cross-quarter sunlight interactions with the Panel 1 spiral suggests the Hohokam who observed the solstice and equinox sun daggers there did not have cross-quarter dates in mind when they created the panel’s petroglyphs. My photos show that no sun dagger forms on Panel 1 on the February or November cross-quarter days, and that the daggers that shine on it on the May and August cross-quarter days do not align with the central portion of the spiral.

In fact, the summer solstice sun dagger that is formed by the crevice between Panel 1’s overhanging slabs (Figures 4 through 9, and Figure 26), and daggers that are directed by the chipped-out notch (Figures 10 through 14, and Figure 27) on the spring and autumn equinoxes, move back and forth across the panel through each year as the angle of the sun in the sky changes daily. These day-to-day repositionings are natural occurrences. The photos of Panel 1 on the May and August cross-quarter dates demonstrate that no significant, focused sunlight shape interacts with the spiral glyph on those dates. I am not aware of any convincing studies showing that ancient southwestern peoples recognized or celebrated cross-quarter days.

As demonstrated in Figures 26 and 27, the summer solstice sun dagger created by the crevice be-
between the two overhanging slabs (Figure 4), and the equinox daggers formed by the chipped notch above and right of the spiral (Figure 10) move back and forth across Panel 1 day after day until the daggers lose their shape as days wear on. The daily sun daggers’ shifts to right and left over the Panel 1 spiral during each year might have made it possible for the Hohokam to use the daggers as calendrical devices for identifying other dates of the year besides the equinox and summer solstice days.

**Sunlight Interactions with Panel 1’s Solid-Circle, Anthropomorph, and Animal Petroglyphs**

Most of the photos in Figures 4 through 23 show two solid-circle petroglyphs that resemble Mickey Mouse ears directly above the Panel 1 spiral. I credit Old Pueblo Archaeology Center volunteer Richard Hofelich with recognizing that the summer solstice sun dagger points into the left solid-circle glyph (Figures 7 and 8) and the autumn equinox dagger points into the right one (Figure 13). After I informed Mr. Hofelich about the solstice and equinox interactions, he visited Picture Rocks to take photos of Panel 1 several days before and after the 2013 summer solstice and several days before and after that year’s autumn equinox, and later informed me about the sun daggers’ relationships with the two solid-circle glyphs on the summer solstice and autumn equinox. I later confirmed that the spring equinox sun dagger also points into the right solid-circle glyph. The winter solstice sunlight interaction with Panel 1 apparently has no orientational relationship to either of the two solid-circle petroglyphs (Figures 15 through 18).

The summer solstice sun dagger rises to the lower edge of the left solid-circle glyph, then becomes blunted and barely penetrates the circle petroglyph before the dagger dissipates (Figures 8 and 9). Neither the autumn nor spring equinox daggers reach all the way up to the right circle glyph (Figures 13 and 14). Just before the sun dagger that is visible on the August cross-quarter day loses its shape, its right edge not only touches the outer left coil of the spiral but also touches the left (north) edge of the left solid-circle petroglyph.
I have not detected any sunlight or shadow phenomena that interact directly with the set of eight hand-holding anthropomorphic petroglyphs that are below the Panel 1 spiral. The summer solstice sun dagger starts out on the outer left coil of the spiral, which happens to be almost directly above the left-most anthropomorphic glyph, but as the dagger progresses upward and to the right it only makes it as far as the second anthropomorphic from the left before the dagger dissolves into full sunlight. By the time the sunlight hits the anthropomorphic glyphs, it lights up nearly the entire bottom of the panel all at once so does not focus on the anthropomorphs (Figures 6 through 8).

On each equinox, as the sun dagger that forms on the Panel 1 spiral opens up nearly into the center of the spiral, the dagger’s lower-right corner aligns with the second anthropomorphic from the left before that dagger is absorbed into the full sun. The equinox daggers do not interact directly with or bracket the other anthropomorphic glyphs (Figures 12 through 14).

As noted above, sun daggers do not form on...
Panel 1 on the November or February cross-quarter days. The vertically oriented dagger that falls on the panel on the August and May cross-quarter days starts out well to the left of the spiral and the anthros, and only moves right far enough to touch the left edge of the spiral and the left-most anthro (Figures 19 and 20).

Neither the summer solstice sun dagger nor the winter solstice band of sunlight coincide with any of the animal petroglyphs on Panel 1. The upper side of the sun dagger on each equinox begins to overlap the legs of the lower right animal petroglyph (possibly a sheep glyph) that is just to the left of the Panel 1 spiral as the dagger begins to merge with the rest of the sunlit part of the panel (Figure 13) but this overlap does not appear to have been intentional. The vertically rising sun dagger seen on the August 2016 cross-quarter day between summer solstice and autumn equinox pierced the lower right animal glyph as the dagger rose (Figures 19 and 20) but, as noted above, the vertical dagger moves back and forth across Panel 1 at least between the spring equinox-summer solstice cross-quarter day in May (Figure 23) and the August cross-quarter day (Figures 19 and 20), so that dynamic dagger’s relationship with any of the animals on Panel 1 may just be fortuitous rather than intentional.

The Light-Colored Portions of Petroglyph Panel 1

Figures 1, 3, and 4 clearly show that portions of Panel 1 are much lighter in color than the rest of the panel and nearly all other boulders and bedrock surfaces on the Picture Rocks hill’s western face, which exhibit darker “desert varnish” surfaces that probably developed over thousands of years (Wright 2014: 117-119). There are two distinct light-colored portions of Panel 1, which I identify here as the smaller light-colored portion and the larger light-colored portion. Some possible reasons why some portions of petroglyph panels may be lighter or darker than others are presented in the accompanying “Differences in Rock Color at Petroglyph Sites” article.

The earliest photos of Panel 1 that I have found were taken on the afternoon of January 11, 1926, by Ethel G. Stiffler, who at that time was a University of Arizona botany instructor. Her photo album that is now in the Arizona Historical Society (AHS) Ethel G. Stiffler collection (MS 1393) has four black-and-white photos of Picture Rocks petroglyphs on page 77 (which is labeled “IN ROAD TO Picture Rocks in the Tucsons” and four more Picture Rocks glyph photos on page 78. [Two other photos on album page 78 are of petroglyph at the Cerro Prieto archaeological site, AZ AA:7:11(ASM), in the Ironwood Forest National Monument west of Red Rock, Arizona, 36.2 km (22.5 miles) northwest of Picture Rocks.] Ms. Stiffler’s album page 77 photo labeled “(NY)” (see Figure 28) and one on page 78 labeled “(OC)” (see Figure 29) show that the smaller and larger light-colored portions of Panel 1 both were light-colored in January 1926. Photo “(OC)” was published in Letters from Tucson, 1925-1927 (Stiffler 2006:63).

The Smaller Light-Colored Portion. The smaller light-colored portion, located above and right of the Panel 1 spiral, is the scar from where the protruding arc of stone on the
panel was partly broken away to direct the equinox sun daggers onto the spiral (Figure 10). This portion’s surface is rough, consistent with breakage of the parent rock in that it shows no evidence of smoothing and very little erosion or reweathering after the break occurred.

**The Larger Light-Colored Portion.** This part of Panel 1 is the central and left section that includes the spiral petroglyph and the glyphs to its left (Figure 4). I have not measured either of the light-colored portions of Panel 1, but this larger section is about four times as wide and about twice as high as the 0.51 m wide by 0.41 m high spiral, so the larger light-colored portion may be about 2 m wide by 0.8 m high. The rock surface of this larger portion is noticeably smoother than the intentionally broken, smaller light-colored portion but I cannot perceive any significant smoothness difference between the panel’s larger light-colored portion and its immediately surrounding, heavily desert-varnished surfaces.

The lighter color of the larger light-colored portion of Panel 1 is due to sluffing off of a former desert-varnished veneer before the spiral petroglyph and the glyphs to its left were created in the lighter portion. Figures 32 through 36 show remnants of the thin, desert-varnished veneer of rock that are only about 1 cm (0.4 inch) thick around the upper and right edges of the larger light-colored portion, and about 3 to 4 cm (1.2 to 1.6 inch) thick at the shoulder level of the left four linked anthro petroglyphs that are below the spiral. These thicknesses suggest there is a natural cleavage plane between the still-desert-varnished veneer and the larger light-colored section, and that the portion of the rock that once covered that section sluffed off along that natural separation. I found no evidence that rock veneer edges remaining above or below the spiral glyph were intentionally chipped, suggesting the veneer flaked off without human involvement.

It seems unlikely that the light color of Panel 1’s larger light-colored portion was damaged in modern times either by people taking rubbings or making casts of the petroglyphs as suggested by Chris and Larry Loendorf (see accompanying article) because the linked anthros on the panel are not light-colored. If anybody had tried to make rubbings or casts on Panel 1, wouldn’t they have attempted to include the anthros in the rubbings or casts?

The still-varnished areas outside the larger light-colored portion of Panel 1 exhibit obvious pecking scars at their edges, whereas only faint pecking scars are visible on the glyph edges with-

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**OLD PUEBLO ARCHAEOLOGY CENTER’S YOUTH EDUCATION PROGRAMS**

Old Pueblo’s OPEN3 Simulated Archaeological Excavation Education Program allows students (and adults) to learn about archaeology by participating in excavations of a full-scale model of a southern Arizona Hohokam Indian archaeological site. Archaeology Outreach Presentations include Ancient People of Arizona; Lifestyle of the Hohokam; and What is an Archaeologist. And in Old Pueblo’s Tours for Youth program, children can go on guided tours to the Picture Rocks petroglyphs, the Los Morteros Hohokam village site, or the Vista del Rio Hohokam village site.

Check out our youth programs at these links:
- https://www.oldpueblo.org/programs/educational-programs/childrens-programs/open3-simulated-excavation-classrooms/
in the larger light-colored portion, in which the glyph outlines nearly blend into the rest of the light-colored portion (Figures 30 and 31).

It looks to me like someone tried to recreate the heads of the third and fourth anthro petroglyphs from the left, within the larger light-colored area of the panel, after the lowest portion of the original rock veneer had flaked the heads off of those four glyphs. I agree with Bradley Schaefer and James Stamm (2020) that the original heads of the left four anthro glyphs probably were on the lower part of the panel that broke off after the anthro glyphs were originally created. However, I believe that only a narrow strip of rock that contained the original anthro heads flaked off after the Panel 1 petroglyphs were created. There is a crack in Panel 1 immediately above the level to which the tops of the left four anthros’ heads likely would have extended upward (compare Figures 30 and 31), suggesting that crack line was at the top of the anthro-decorated piece that flaked away. The top of the broken-off piece may have been a little higher, though, judging from color variations on the part of the rock face that includes the spiral’s lowest two coil segments and from the width of the spiral’s lowest coil, which is noticeably wider than the remaining parts of the coil (Figure 31). These differences in rock color and coil width suggest to me that no more than just the lowest one or two coil segments of the spiral may have spalled off and subsequently may have been re-pecked, or ground, to reconnect the remaining parts of the coil and to try to recreate the anthros’ broken-off heads.
There is a natural topographic saddle that divides the Picture Rocks hilltop into a higher northern peak and a slightly lower southern one (Figure 3). If I have correctly interpreted the 2-foot elevational contour-interval lines on the Pima County (2020) Main MapGuide Map, the northern peak is about 2.4 m (8 ft) higher in elevation than the southern one; and I have observed that the southern peak is roughly 2 m (6 ft) above the elevation of the saddle between the peaks. On the southern peak south of the saddle are two small rockshelters – really just natural alcoves – that both open to the west. Rockshelter 1, the more northerly one (Figures 37 and 38) is on the southern peak’s northwestern face, partly within the saddle, and Rockshelter 2 (Figure 39) is on the southern peak’s western face. Each rockshelter has a low ceiling and is only deep and wide enough for one or two people to occupy at a time. The ceilings and sides of the rockshelters have some dark staining that could be either soot or natural desert varnish. Neither rockshelter had any petroglyphs, pictographs, graffiti, or artifacts inside when I examined them multiple times between 2006 and 2020, although there is an anthropograph above Rockshelter 2 (Figure 39).

In my August 2006 reconnaissance (see page 3), I identified at least 146 petroglyph panels on the Picture Rocks hill and noted that at least 70 of them are on its western face. Considering that there are only two panels with ancient (as opposed to historical graffiti) representational petroglyphs on the hill’s
southern side, and maybe five or six on its eastern face, the majority of the panels, including Panel 1, are on the western face. The occurrences of spring equinox, summer solstice, and autumn equinox sun daggers on the Panel 1 spiral suggest it is not mere coincidence that most of the rock images on the Picture Rocks hill are on the same side of the hill as the Panel 1 spiral.

Nearly all of the animal petroglyphs on the western face of the hill face the saddle or the steep natural draw that extends down from it.

### Other Petroglyphs at the Picture Rocks Site

Figures 42 through 51 show examples of some of the other petroglyphs at Picture Rocks including
anthro (Figures 43-46), zoomorph (Figures 46-48), curvilinear and geometric (Figure 49), irregular or undefinable shape (Figure 50), and bow and arrow glyphs (Figures 43 and 51). The two representational petroglyphs mentioned above that are on the hill’s southern face are shown in Figures 43 (third photo from top) and 48 (left photo).

Most of the anthros are stick-figure type but there are a few full-body depictions. Many of the single stick-figure ones have bowed legs, what appear to be male genitalia, and up-raised arms as if supplicating toward the heavens (Figure 43). In the two sets of stick-figure anthros that are linked hand-to-hand, few of the anthros exhibit bowed legs or recognizable genitalia. The eight linked anthros below the Panel 1 spiral (Figures 3 through 25, 29 through 32, and 44 upper photo) face the viewer and at least the four right-most ones in this group appear to be wearing headdresses suggestive of people holding hands and line-dancing in a ritual formation. In the set of two linked anthros (Figure 44 second photo), the anthros face to the left, the left one has a headdress or curving horns and holds a staff, and the right one has no headdress or staff, suggesting a ritual procession led by the one with the headdress and staff.

Most of the full-body anthros are smaller than the stick-figure ones and their outlines are filled in completely with pecking. A notable exception is the glyph shown in Figure 45 (top photo), which is not filled in, is larger than most if not all of the site’s stick-figure anthros, and appears to depict a flute player with a headdress or perhaps two antennas reminiscent of an insect. Two of the filled-in anthro glyphs on one west-facing panel, near the top of the hill, appear to have bison-like horns or wear bison-horn headdress (Figure 45 second photo). The third photo in Figure 45 may depict a full-body anthro with a diamond-shaped body and a headdress, and the filled-in petroglyph left of the diamond-shaped one in that figure’s fourth photo could be a full-body anthro, but the reader is welcome to interpret differently what these petroglyphs might represent.

One of the full-body anthros shown in Figure 42 appears to have both hands reaching out to the head of the largest animal glyph on that panel. At least two of the anthro glyphs – the left (stick-figure) one in Figure 44 second photo and, in Figure 42 the full-body anthro above and to the right of the anthro reaching out to the animal head – appear to be holding staffs.

Nearly all of the Picture Rocks animal petroglyphs (see Figures 46 through 48) are full-body renditions with the outlines entirely filled in by pecking. The only stick-figure animal glyphs I recall seeing at the site are lizard-like ones with prominent tails (for example, Figure 29 lower right; and Figure 45 lower right). Orientations of the animal glyphs on the western side of the Picture Rocks hill are discussed above.

The site’s curvilinear and geometric glyphs are varied. They include the Panel 1 spiral (Figures 3 through 31); two connected curvilinear spirals with rays on their outer coils, next to a small curvilinear spiral (Figure 49 upper left); and rectilinear-spiral or rectangular or boxy-U-shaped ones with extending
lines (Figure 45 in left portion of upper left photo and in the two right photos; Figure 47 in left part of upper right photo; and Figure 49 center right). On top of the hill is a pair of concentric-circle petroglyphs beside a meandering-line glyph suggestive of a face with goggles eyes (Figure 49 upper right).

The curvilinear and geometric elements include other meandering lines (Figure 40) and gridiron-and rake-like petroglyphs (Figure 41) that may be older than the site’s Hohokam glyphs (see discussion below). At least two chevron-shaped glyphs (Figure 49 center photos) resemble stylized mountain peaks.

A filled-in circle glyph inside of two rounded-apex triangle glyphs (Figure 49 lower left) looks rather like the nucleus of an atom with two eccentrically circling electrons. One curvilinear-geometric petroglyph features two upright parallel lines enclosed at the upper end with curving lines branching out on both sides (Figure 49 lower right).

Some irregularly shaped glyphs (examples in Figure 50) cannot easily be described using representational analogs.

Polly Schaafsma (1980:83,88) noted that bow-and-arrow petroglyphs are more common in Hohokam sites of the Tucson area than in Phoenix-area ones, and she illustrated a glyph at Picture Rocks featuring a 3½-coil curvilinear spiral attached to two bow-and-arrow elements, one on each side (Schaafsma 1980:88,Figure 59). There are at least five or six other petroglyphs at Picture Rocks that appear to depict bows, including four with arrows on the bows (Figure 51) and one stick-figure anthro apparently holding a bow (Figure 43 second photo).

Ages of the Petroglyphs

The only petroglyphs I have seen at the site that I believe may have been made prior to 800 CE are the nearly parallel meandering-line glyphs shown in Figure 40 and the gridiron-like and rake-like images in Figure 41. Similar petroglyphs in southern Arizona and Chihuahua were identified by Polly Schaafsma as Great Basin Abstract style, which she attributed to the southwestern Archaic period and estimated a date range of 1000 BCE to 1500 CE in the Great Basin (Schaafsma 1980:36-46 and Figures 19A, 19C, 19D, 20, 21, 22, and 25); and by Ekkehart Malotki, who ascribed them to the Western Archaic Geocentric tradition for which he suggested a time span of 6000 to 1000 BCE (Malotki 2007:22-45 and Figures 29, 31, 32, 33, 37, 38, 41, 48, 54, 59, 61, 62, 65, 67, and 71). Schaafsma’s and Malotki’s suggested dates are somewhat problematic because many twenty-first century southwestern archaeologists identify the time from about 8000 to 2100 BCE as the Archaic period and the subsequent 2100 BCE to 200 CE era as the Early Agricultural period (e.g., Cordell and McBirn 2012:104-105, 129-154).

The meandering-line petroglyphs in Figure 40 are on a sloping rock surface atop the Picture Rocks hill. They are not noticeably more reweathered than most of the other ancient glyphs at this site so it is possible they are Hohokam rather than Archaic or Early Agricultural period glyphs. The gridiron-like and rake-like petroglyphs shown in Figure 41, however, both are much more reweathered than nearly all the other glyphs at Picture Rocks, so are better candidates for Archaic or Early Agricultural ages than the meandering lines.

Animal and anthro images probably comprise the majority of the petroglyphs at the Picture Rocks site. Because such representations only occur on context-dated Hohokam pottery made from about 800 to 1050 (Wright 2014:113) or 1070 CE (Wallace 2014:438-456), most of the site’s glyphs probably also date between 800 and 1070. However, one decorated potsherd we found on the Picture Rocks hill during the survey (in fact, the only painted, stylistically datable pottery sherd found in the entire survey) is of the

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Figure 39. Rockshelter 2 in western face of the Picture Rocks hill’s southern peak (Photo by the author)
Middle Rincon Red-on-brown type, which dates between 1000 and 1100 (Wallace 1995:464-465), so if that sherd was contemporary with some of the petroglyph-making then some of the Hohokam petroglyphs may have been created as late as 1100.

Dates included in the historical graffiti on the Picture Rocks hill range from 1915 to at least 1939 and possibly to as late as 1946 (see Disturbances discussion below).

**Petroglyph-Making Techniques**

Rather than being abraded (ground), carved, incised, chiseled, or scratched into rock surfaces, Hohokam “Gila style” and the earlier Archaic culture petroglyphs in southern Arizona typically are pecked into the rocks using the direct percussion technique of hitting the base rock with hand-held hammerstones (Schaafsma 1980:36,45,83; Wright 2014:101). However, there are rare examples of abraded and scratched Gila style glyphs (Wright 2014:63), including scratched ones on Tumamoc Hill in Tucson (Ferg 1979; Hartmann and Boyle 2013).

With just a few exceptions for which I could not identify the creation technique (including many of the glyphs in the larger light-colored portion of Panel 1), all but one of the petroglyphs at the Picture Rocks site appear to have been pecked into the rocks. This is evidenced by the glyphs’ imprecise, fuzzy-looking edges, shallowness (deep enough just to peck away the desert varnish surface layer), and line widths or diameters that consistently are greater than 2 cm (compare Wright 2014:101).

The exception is a petroglyph atop the hill that includes an abraded groove as well as pecked elements (Figure 43 top photo). The grooved part of this glyph is its central, somewhat sinuous vertical line, in which the obviously abraded part is about 1 cm wide and 1 cm deep. The outer edges of the abraded groove are flaked or cracked off of the parent rock, so the overall width of the petroglyph’s vertical component averages about 2 cm.

**Bedrock Mortars, Cupules, and Grinding Slick**

There are three mortars, six cupules, and one grinding slick worn into the highest-elevation bedrock outcrops atop the Picture Rocks hilltop, near its eastern rim (Figures 52 through 59). Table 8 lists measurements for each of them, referenced to the feature numbers shown in Figure 53.

All of the cupules and two of the mortars are on a nearly triangular, ca. 1.4 by 1.7 m (4.6 by 5.6 ft) outcrop that abuts the southeastern side of the Redemptorist Renewal Center’s large hilltop cross (which is seated in a crevice between outcrops; Figure 52 left photo and Figure 53). The other mortar is 2.5 m (8.2 ft) west-northwest of the other two on a second, approximately rectangular, ca. 1.43 by 2.62 m (4.7 by 8.6 ft) outcrop. The slick is west of the multiple mortars-and-cupules outcrop and south of the single-mortar one on a third, irregularly shaped outcrop, maximum dimensions of which are ca. 1.63 by 2.29 m.
Presumably the mortars were used primarily for processing mesquite, and possibly ironwood and palo verde, bean pods into flour during late spring, summer, or early autumn since all of those legume tree species grow on the hill and nearby, and their beans usually ripen and dry in late spring through early fall. The slick likely would have been used for final processing of coarse mesquite meal into flour, but also would have been suitable for grinding flat seeds like corn kernels. The cupules could have been used for grinding but likely were used for other purposes as well, if not exclusively (Dart and Reed 2020).

Access to the Hilltop

The easiest access to the top of the Picture Rocks hill is up its southeastern side where the slope gradient is about 24 percent at the steepest, as figured using the Pima County (2020) distance-measuring tool and All 2-foot Topography - NAVD88 contour-interval lines. On the hill’s other exposures, the slopes generally are at least twice that steep, with the southwestern side’s overall slope being steepest at about 167 percent. Most of the bedrock and boulder surfaces on those other hillsides have relatively dark, desert-varnished surfaces. I have observed no evidence that any boulders were turned over (which presumably would have exposed their unvarnished sides that were once embedded in the ground) or cleared from any of those other sides to create trails or steps.

On the southeastern slope, however, is a nearly boulderless swath about 4 to 8 m (13 to 26 ft) wide that extends northwestward part-way up the hill, then turns westward at a 0.60 to 0.9 m (2 to 3 ft) high outcrop of fragmented, desert-varnished bedrock (located about midway between the hill base and the summit) into the hilltop saddle (Figures 60 through 62). Within this swath, much of the surface is gravelly, there are several places where loose dirt has been mounded up by burrowing animals and, where bedrock is exposed, the rock surfaces do not exhibit desert varnish nearly as dark as the rest of the hill’s bedrock and boulder surfaces. Was this smoother part of the southeastern slope intentionally cleared of most of its boulders to provide easier access to the hilltop, or maybe to create a group activity area? If so, there are no obvious piles, ridges, or alignments of redeposited rocks anywhere nearby, nor any rough

Table 8. Measurements of the bedrock slick, mortars, and cupules atop the Picture Rocks hill (Feature numbers are shown in Figure 53.)

<table>
<thead>
<tr>
<th>Feature no.</th>
<th>Feature type</th>
<th>Area dimensions (cm)</th>
<th>Depth (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slick</td>
<td>39 x 25</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mortar</td>
<td>18 diameter</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Mortar</td>
<td>16 x 15</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Mortar</td>
<td>19 diameter</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Cupule</td>
<td>8 diameter</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Cupule</td>
<td>10 diameter</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Cupule</td>
<td>10 diameter</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Cupule</td>
<td>9 diameter</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Cupule</td>
<td>8 diameter</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Cupule</td>
<td>3 diameter</td>
<td>1</td>
</tr>
</tbody>
</table>
rocks in the RRC buildings suggesting places to which any cleared rocks may have been moved.

Archaeologist Aaron Wright (2014) described “summit trails” (also called “ascent trails” by Darling and Eiselt [2009:204] and “summit paths” by Wallace [2008]) as short trail segments that start at the base of a relatively steep slope and extend straight, or nearly straight, to the summit of a knoll, hill, or ridge . . . . Summit trails are cleared, sometimes rock-lined, footpaths that ascend an elevated landform in an unbent fashion . . . . Petroglyphs and shrine-like contraptions tend to be found at the trails’ apices [citing Wallace 2008:214-219]. More often than not, the hills on which these trails were engineered are conically shaped, and with their light, sandy brown complexion amid a dark backdrop of patinated igneous boulders the trails can be quite noticeable from a long distance away. [Wright 2014:80]

The surface of the boulderless swath on the Picture Rocks hill’s southeastern slope is mostly covered with light brown, coarse gravel but, after viewing it, Aaron Wright informed me it is not typical of summit trails he has recorded, because most of them are less than 2 m (6.6 ft) wide and usually they are lined either with rocks and gravel moved out of the trails or intentionally placed on the trails’ edges. Several plain brown ware pottery sherds and flaked stone debitage artifacts – the highest density of pre-Contact period artifacts found anywhere on the Picture Rocks hill – are along the southwestern margin of the boulderless swath’s lower-elevation half, suggesting this part of the swath was used by the
Hohokam for activities not directly related to petroglyph-making or glyph visitation.

Disturbances and Thefts

Some disturbances to the rock art have been reported and noted. In 2008, archaeologist William Gillespie provided me with a copy of a 1928 Arizona Daily Star article that said George Kitt, chairman of the chamber of commerce historical committee, had obtained U.S. Department of the Interior warning signs “to be placed at Picture Rocks, northwest of the city” because in the previous few years “a large portion of the valued rocks, which contain the writing of the early day residents of this vicinity, have been broken off and in a number of cases carried away.” The 1928 article’s note that Picture Rocks is “northwest of the city” suggests this is the Picture Rocks petroglyphs site discussed in the present article.

In follow-up research Gillespie determined that the property containing the AZ AA:12:62(ASM) Picture Rocks site – see AZ AA:12:62(ASM) box on page 35 – was patented into private ownership by Henry Hubbard in 1934 as part of his 640-acre claim filed under the Stock-Raising Homestead Act of 1916. This filing indicates the site was on federal land prior to Hubbard’s 1934 homestead action, so the U.S. Department of the Interior would have had authority to issue the federal warning signs for the property to Kitt in 1928. Incidentally, Henry “Hank” Hubbard became a Tucson radio and television personality after 1946, and he passed away in 1993 (Arizona Daily Star 1993).

There are no easily portable petroglyph-bearing boulders remaining at the Picture Rocks site today, suggesting that the signs mentioned in the 1928 Arizona Daily Star article were placed at the site after most of the portable glyph boulders already were removed, or that the signs were ineffective at preventing petroglyph removal.

In a couple of places near the bottom of the Picture Rocks petroglyph hill, on its western side at about head- to shoulder-level when standing in the wash bottom, some of the hill’s bedrock surfaces are much lighter-colored than the surrounding desert-varnished rock, and in these lighter areas there are indentations or scars in the bedrock. This suggests some chunks of desert-varnished rock were removed at some time in the past. I didn’t find any evidence that such removal, if it occurred, took place after I first noticed them in 2008 but it may indicate that some petroglyph blocks or surfaces were chiseled off of the bedrock face by collectors. If so, this would be consistent with the 1928 Arizona Daily Star article saying government signs were to be posted because people had been removing petroglyphs.

On the western face of the hill where most of the petroglyphs are located there are some places where pieces of rock panels have been spalled off, possibly by human action, and in some of the vertical rock
faces there are several light-colored circular spots that look like bullet-impact pits.

A petroglyph that appears to depict a deer with a long, curly tail (Figure 46 right-center photo) has been altered since it was photographed by Ethel Stiffler in 1926. Today this glyph’s antlers or horns appear to be connected to each other, there appears to be an ear at the back of the animal’s head, and there is a pecked dot under the animal’s tail. In contrast, Stiffler’s photos “(NZ)” and “(OD)” in the AHS collection show the antlers or horns separate, with no ear-like projection from the head and no dot under the tail. At least some of the added elements visible today may be bullet scars.

AZ AA:12:62(ASM)

The Arizona State Museum, University of Arizona (ASM), assigned the designation AZ AA:12:62(ASM) to the Picture Rocks petroglyphs site when it was recorded at ASM. The original ASM record, dated February 15, 1965, is on a 5 by 8-inch note card that included standardized information prompts including Site No./Name; Location; Type of site; General Surroundings; Culture Represented [for example, Archaic, Hohokam, or Historic]; Depth; Pottery; Other Culture [archaeological material]; Drainage [river or stream name]; Legal Description; No. [of] Rooms; Condition; Construction; Water; Arable Land; Area; and on the card’s side 2, Map Reference; Remarks, and Reported by.

The names “Graham (Ayres)” are listed on the card’s “Reported by” line. Ayres was the late James E. Ayres, ASM’s Public Archaeologist in 1965. Sharon Urban, who later held that position, informed me that in older ASM site cards like this, a name not listed in parentheses usually was the person who reported the site to ASM, and a name in parentheses usually was the person who actually filled out the site card. Miss Urban suggested Graham may have been Betty Graham Lee, now deceased.

The ASM site card includes both typed and handwritten information so presumably the typed data were entered by Ayres in 1965 and the handwritten notes were added later. Typed notes list the Site No./Name as “Ariz. AA:12:62,” describe the location and general vegetation, and list Culture Represented as “Unknown”; Type of Site “Petroglyph”; Pottery “no”; and Other Culture as “Bedrock mortars/Cave or rock shelter on the west side of the hill.” Side 2 of the card includes a sketch map of the location relative to the nearest named roads, and these typed Remarks:

Owner of the site is the Catholic church.
The small cave or rock shelter has fire blackened walls and roof. No sherds or other cultural material found.
Petroglyphs include bullseyes, scrolls, male figures with prominent sex organs, five human figure with headress (?) and holding hands. [sic]

Handwritten notes on the card’s side 1 include “(Picture Rocks)” beside the typed “Ariz. AA:12:62” site name; “223 recorded” after the typed “Petroglyph” Type of Site; an “X” over the typed “no” in the Pottery prompt with the added note “A few Gila Plain noted HDW 3/16/82” [Archaeologist Henry D. Wallace’s initials are HDW.]; “No collection”; “ASM Survey No. 1964-1 1965-3”; “Jaynes AA12SE” [an ASM identification of the U.S. Geological Survey’s Jaynes, Ariz., 7.5-minute topographic map]; Universal Transverse Mercator coordinates; Condition “extensive vandalism moderate weathering.” Handwritten notes on side 2 reference the honors thesis of Cheryl Ann White (1965) and note some archaeological surveys besides the ASM 1964-1 and 1965-3 ones that presumably included the site. There is also a rubber-stamped note “SEE ADDIT. SITE INFO. FILE” on side 2.

AZSITE* lists survey no. 1964-1.ASM as the 1964-1965 Saguaro National Monument Survey directed by J. L. Zahniser, which was reported in Zahniser (1970), but that article does not mention the Picture Rocks site probably because it is outside of the National Park Service property. AZSITE identifies survey no. 1965-3.ASM as the 1965 Saguaro National Monument Petroglyph Survey by C. A. White (reported in White [1965]). The other hand-written survey names on the site card evidently were mistakenly entered on it because AZSITE indicates those surveys were located elsewhere in Arizona. The AZSITE survey number for the 2004 Harris Environmental Group survey (see p. 38) is 2004-280.ASM, The Old Pueblo Archaeology Center 2009-2010 survey has not been recorded in AZSITE.

The AZSITE pdf file into which the AZ AA:12:62(ASM) site card was scanned also includes a more recent six-page AZSITE Site Form that identifies AZ AA:12:62(ASM) as AZSITE site no. 73590 and includes additional information about the site that this author reported to ASM in 2007. The only other information in the AZSITE form that is not on the original ASM site card is that the site’s Temporal Component is PREHISTO[ric], its Estimated Time Period is 12000BC-AD1500, its Cultural Affiliation is Native Archaeological Culture, its National Register of Historic Places status is unevaluated, and the additional pages include photocopied segments of the USGS Jaynes topographic map and an aerial photograph on which the site is plotted.

On the original ASM site card for AZ AA:12:62(ASM), the SEE ADDIT. SITE INFO. FILE note refers to additional paper records that are on file at ASM. During the entire time I was preparing this article, ASM was closed because of the COVID-19 pandemic so I was unable to examine any of those additional site records.

* AZSITE is a controlled-access internet Geographic Information System database of recorded cultural resources (archaeological sites and historic properties) and cultural resources surveys within Arizona and a 40-mile buffer around the state, jointly managed by the AZSITE Consortium (which includes ASM, Arizona State University, the Museum of Northern Arizona, and the State Historic Preservation Office).
There are several instances of historical graffiti on the hill including at least one name, initials, some dates and possible dates, and some nonalphabetic numeric petroglyphs (Table 9). Most of the graffiti I have observed are on the western face of the hill and the rest are on the hilltop.

The dates and possible dates include 1915; 1939; either 1932 or 1939 (“1/31-32” or “1/3/32” or “1/31-39” or “1/3/39”); numerals 16 or 18 that probably represent 1916 or 1918; a “30” that may stand for 1930; and characters that appear to be “46,” possible indicating 1946. The incised 1932 or 1939 date with the “J.L.” or “d.L.” characters (Figure 59 center left photo; Table 9) are on the western hill face’s same panel as the upper set of hand-holding anthro glyphs (Figure 44 center photo). The “MML” and dot-in-circle glyphs on the southern hill face (Figure 63 upper right) are on the lower part of a bedrock panel that also features a more ancient (presumably Hohokam) anthro petroglyph higher up, just below the crown of the hill (Figure 43 third photo).

In early 2007 I observed some new rock art on the western face of the hill, among some of the earlier petroglyphs but apparently not overlapping any of them. This new image looked rather like an elongated owl’s face with two big, filled-in (ground) open circles that resembled the eyes. This image addition may have been rendered partly in chalk or another kind of applied white pigment because it was nearly white when I first observed it. However, after a few months most of the oval part of the design around the eye-like circles had faded away.

When I first had a chance to photograph and observe this glyph close up on February 15, 2009, the white pigment had weathered away and the only parts still present were the two eye-like, solid-circle petroglyphs and the irregularly shaped glyph that looked somewhat like a mouth (Figure 64). Those glyph elements all had been abraded into the rock face, apparently with a hand-held stone.

**Archaeological Surveys**

The Redemptorist Renewal Center (RRC) property south of Picture Rocks Road in Pima County,
Arizona, is owned by the Redemptorist Society of Arizona. It encompasses the Picture Rocks petroglyphs site and the RRC building complex, which includes Our Lady of the Desert Catholic Church.

In addition to my several archaeological reconnaissances on the Picture Rocks hill itself since 2006, three cultural resources surveys – land inspections to identify and record archaeological sites and features – have been conducted on the RRC property: one in 1965, another in 2004, and the one I directed in 2009-2010.

The RRC property also is within the boundaries of the massive Northern Tucson Basin, Phase 1 survey conducted by the Arizona State Museum in the early 1980s, but that was a sample survey in which no sites were recorded on the RRC property.

In discussing the 1965, 2004, and 2009-2010 surveys, I do not include survey-area maps, acreages, or specific archaeological site locations other than for the Picture Rocks petroglyphs site out of a concern that revealing where the sites are might result in unauthorized artifact collecting and other vandalism.

1965 Survey. This survey was conducted by Cheryl Ann White for her University of Arizona senior honors thesis in anthropology, which is titled “The Petroglyphs of Saguaro National Monument, Tucson, Arizona” (White 1965). She recorded four petroglyph sites in the Tucson Mountains unit and three in the Rincon Mountains unit of the national monument (now Saguaro National Park) but also included the Picture Rocks site, which is on private property, “because it is being rapidly destroyed by vandals. Logically it can be included with the other sites as it is located within a mile of the boundary of the western section of the monument” (White 1965:9).

White noted that the Picture Rocks site had long been called “Picture Rocks” and also identified it as site C and “Arizona AA:12:62” – see AZ AA:12:62(ASM) box on page 35. She recorded 223 petroglyphs...
there and wrote that they were concentrated on the western and southern sides of the knoll and showed
moderate weathering. She identified three large bedrock mortars, four small mortars, and one rectangular
grinding surface on a horizontal surface of the knoll. She reported that vandalism was extensive, many
figures had been completely obliterated, and approximately 30 percent of the petroglyph designs had been
damaged (White 1965:11). (I disagree with her 30 percent-damaged estimate as indicated herein.) In two
black-and-white photographs of Picture Rocks site petroglyph panels in her report, the petroglyphs are
bright white, suggesting they were chalked for higher contrast as was common in petroglyph recording
prior to about the 1980s.

In her petroglyph frequency and size-range tables on pages 27-30, White classified the 223 glyphs she
recorded into the five basic categories and 42 subcategories reproduced in the present article’s Table 10.
Not all observers would classify them into the same categories and subcategories, and probably not all
would agree with some of her identifications. For example, she acknowledged on page 31 that some of the
glyphs she identified as bisected ovals and half ovals may represent bows and have been designated as
such at other sites in the Southwest. In her page 36 table of petroglyph category percentages (each roun-
ded to the nearest whole percent), White listed the Picture Rocks’ glyphs as 51 percent zoomorphic, 26
percent geometric, 23 percent anthropomorphic, and 0 percent botanical. She also wisely acknowledged,
“It is not possible to know what the artist intended when he executed geometric elements and designs.”

White’s size ranges for each of the subcategories were for all nine petroglyph sites she recorded dur-
ing her project, so the ranges may not apply specifically to the Picture Rocks glyphs. She did not include
any of the historical graffiti petroglyphs in her classifications (see Table 10).

2004 Survey. In March 2004, archaeologists with the Harris Environmental Group consulting firm
surveyed the portion of the RRC property east of
the Picture Rocks petroglyphs site and the existing
buildings and driveways. On the relatively rugged
landscape there they identified two historical ar-
chaeological sites and some isolated occurrences
of archaeological material (IOs).

One site was a scatter of about 300 historical ar-
tifacts dated between 1925 and 1940, plus one pre-
Contact flaked stone artifact. The other site was an
abandoned, early to mid-twentieth century power
line with fewer than 50 scattered historical artifacts
(mostly metal) and one pre-Contact flaked artifact
of chert. Two of the IOs were pre-Contact flaked
stone artifacts (DeJongh, Fahrni, and Urban 2004).

2009-2010 Survey. On seven separate days
from January 17, 2009, to February 6, 2010, ar-
chaeologist Gayle Hartmann and I led an archaeo-
logical survey of the portion of the RRC property
south of Picture Rocks Road that includes the Pic-
ture Rocks hill and areas west and south of the ex-
isting buildings. Sponsored by Old Pueblo Archae-
ology Center and supported by a grant from the
Joseph and Mary Cacioppo Foundation, this effort
was with volunteers named in the Acknowledg-
ments section below. On each survey day, two to
four volunteers led by Gayle Hartmann or myself
walked transects spaced 10 m (33 ft) or less apart
attempting to identify and record all artifacts and
cultural features in the areas inspected.

In addition to the Picture Rocks petroglyphs
site, to which I assigned the field designation PR1,
the survey identified three smaller archaeological
sites designated PR2, PR3, and PR4, and a few IOs.
These sites and the pre-Contact IOs are described
below. Site PR3, located north of site PR1 along
the eastern bank of Picture Rocks Wash, is a series
of stream-control features made of earth and some
boulders too large to move without machinery or
draft animals, so apparently PR3 dates to the twen-
tieth century. I do not discuss the historical or mo-
dern IOs or PR3 further here since they are irrele-
vant to understanding the pre-Contact Picture
Rocks petroglyphs site and its cultural-temporal
context.

Researchers interested in details of Old Pueblo
Archaeology Center’s survey (which also included
the Redemptorist Society’s Desert House of Prayer
property north of Picture Rocks Road) can contact
Old Pueblo Archaeology Center to request access
to the original survey notes and maps.

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Abbreviations: curv. = curvilinear; rect. = rectilinear;
quads. = quadrupeds; zoo. = zoomorphic
PR1, Picture Rocks Petroglyph Site. This archaeological site includes the Picture Rocks petroglyphs hill that is along the eastern bank of Picture Rocks Wash and a relatively flat area extending a few meters south of the hill where a few pre-Contact artifacts were scattered. As measured on Pima County (2020) aerial photographs, the site’s dimensions are 56.4 m east-west by 79.2 m north-south (185 by 260 ft). The wash forms a natural western boundary of the site.

Before a modern gravel-surfaced and rock-lined meditational labyrinth approximately 17 m (55 ft) in diameter was constructed on the flat stream terrace surface south of the hill (Figure 2), the archaeological survey identified a light scatter of pottery and flaked stone artifacts there that extended approximately 7 m (23 ft) southward beyond the hill base about to where the center of the labyrinth is today. There probably

Figure 46. Animal petroglyphs (left center photo by Katherine P. Burdick, others by the author; also see Figures 42, 47, and 48)
were no more than 30 artifacts – about equal numbers of potsherds and flaked stone pieces – in the part of the site south of the hill. All of the pottery south of the hill was polished brown ware typical of Hohokam utility ceramics used between 450 and 1450. The flaked stone artifacts there had no temporally diagnostic attributes but presumably were created by the Hohokam.

The modern labyrinth south of the hill was constructed after the 2009-2010 survey (sometime between Spring 2012 and May 2014 per Pima County [2020] aerial photographs). Other photos (Pima County 2020) show that prior to or during 2000, the relatively flat wash terrace area on the opposite (north) side
of the hill had been graded to create a dirt parking lot, and that a gravel-surfaced and rock-lined labyrinth 14.3 m (47 ft) in diameter had been constructed in that northern graded area between 2000 and May 2005. That northern labyrinth (which still existed at the time of the survey) was removed by May 2014 to create an unpaved parking lot for the RRC. The ca. 1.2 to 1.5 m (4 to 5 ft) wide cleared and rock-lined foot path that still loops around the northern base of the hill (Figure 2) was created at least as early as 2000.

The site might have included additional artifacts or cultural features north, northeast, or east of the Picture Rocks hill originally but, if it did, the artifacts or features would have been removed or covered by post-1965 development of the retreat’s buildings, driveways, and parking areas.

The survey did not locate any archaeological artifacts or features on the eastern stream terrace of Picture Rocks Wash between the northern hill base and the site PR4 horno (described below) that is farther north, and only a few IOs were found across Picture Rocks Wash west of the petroglyphs site.

At least 132 of the site’s petroglyphs are shown in this article’s photos, not counting ones that clearly are historical or modern in age (Table 9). I have made no attempt to inventory all the petroglyphs, but Cheryl Ann White (1965) recorded 223 glyphs there. In my 2006 reconnaissance I identified at least 146 petroglyph panels on the Picture Rocks hill. Counting the panels illustrated in this report that show multiple petroglyphs per panel, there are at least 71 more glyphs than panels, for a minimum petroglyphs total of 219 (Table 11), so there may be more than the 223 non-graffiti glyphs reported by White (1965) and recorded at the Arizona State Museum.

All but a few of the glyphs date to pre-Contact times and I ascribe nearly all of them to the Hohokam culture. Others that may date to the Archaic (pre-Hohokam) period are described under the Ages of the Petroglyphs heading above, and the recognizably post-Contact ones are itemized in Table 9 and in the above discussions of graffiti. Figures 1, 3 through 33, 36, and 39 through 51 show some of the pre-Contact petroglyphs still existing at the site. Other pre-Contact archaeological features on the hill include the three bedrock

| Table 11. Figures in this article that show petroglyph panels with multiple glyphs |
|----------------------------------|---------|----------|-----------|---------------|
| Figure no. | No. of panels | Minimum no. of glyphs on panel(s) | Minus no. of panels | = How many more glyphs than panels |
| 4 | 2 | 14 | -2 | 12 |
| 40 | 2 | 5 | -2 | 3 |
| 41 | 1 | 2 | -1 | 1 |
| 42 | 1 | 22 | -1 | 21 |
| 43 | 4 | 5 | -4 | 1 |
| 44 | 3 | 6 | -3 | 3 |
| 45 | 4 | 8 | -4 | 4 |
| 46 | 6 | 19 | -6 | 13 |
| 47 | 6 | 9 | -6 | 3 |
| 49 | 6 | 12 | -6 | 6 |
| 51 | 4 | 6 | -4 | 2 |
| 57 | 1 | 3 | -1 | 2 |
| Totals | 40 | 111 | -40 | 71 |

Petroglyphs in excess of panel counts | 71 |
mortars, six bedrock cupules, and grinding slick (Figures 52 through 59), and the possibly intentionally cleared, boulderless swath on the southeastern slope (Figures 60 through 62).

The only pre-Contact artifacts observed on the hill during Old Pueblo’s survey and my other visits there are pottery sherds and a few flaked stone artifacts. All of the sherds are Hohokam plain brown ware that could date any time between about 450 and 1450 except for a single painted one I identified as Middle Rincon Red-on-brown, a type that dates between about 1000 and 1100 (Wallace 1995:464-465). All of the flaked stone pieces are debitage fragments of fine-grained gray basalt or metamorphosed claystone,

Figure 49. Curvilinear and geometric petroglyphs (Photos by the author)
none modified into formal tools and none datable except to say they probably predate 1900. All pre-Con-
tact artifacts observed were in the boulderless swath on the southeastern hill slope and on the flatter ter-
race surface south of the hill beyond that swath except for the red-on-brown sherd, which was found on
the hill’s eastern slope. As noted on page 3, some pieces of amethyst-colored glass and some rusty tin can
fragments also are present.

There are two prominent historical or modern humanmade features on the hill: a large wooden cross
near the eastern edge of the summit, made from utility pole segments; and a tile-mosaic mural of Our La-
dy of Perpetual Help (a Roman Catholic title of the Blessed Virgin Mary), which faces eastward toward
Our Lady of the Desert Catholic Church (Figures 48, 52, 53, 60, and 62). The westernmost wall of the
church is about 30 m (100 ft) east of the hill base, and an asphalt-paved driveway and a concrete sidewalk
run between the hill and the church (see page 2 site plan).

Records of the Pima County Recorder indicate the Redemptorist Society of Arizona purchased the
62.66-acre Picture Rocks property (parcel no. 21412007C) in March 1965, so presumably the cross and
the tile mural were placed on the hill no earlier than then. The earliest record of the mural that RRC Com-
munications & Marketing Manager Peter Tran found in the Society’s archives was a photo in a Redemp-
torist Society newsletter dated January 1969, indicating the original mural already was on the rock face by
early 1969. The original mural was replaced with a new tile-mosaic mural of Our Lady of Perpetual Help
in 2019 (shown in Figure 60).

The only Historic period artifact I recall seeing on the hill besides the amethyst-colored glass and tin

Figure 50. Some irregularly shaped petroglyphs (Photos by the author)
cans noted on page 3 is a centerfire ammunition cartridge case with the headstamp “U.M.C. 44 CFW” found after the survey was done. Apparently the Union Metallic Cartridge Company used this headstamp from 1873 to 1912 (Cook 1989:113). A Remington Arms company historian indicated this cartridge was loaded by the UMC company prior to the 1920s as a substitute for the .44 Winchester Center Fire cartridge and that the CFW stands for Center Fire Western (Friendly Metal Detecting Forum 2019).

Another possibly historical artifact I observed after the survey on the hill’s western slope, north of Panel 1, was a light green glass beverage bottle base, probably from a Dr Pepper soda pop bottle.

**Site PR2.** Site PR2 includes two sparse concentrations of Hohokam artifacts in an approximately 10 m east-west by 24 m north-south (33 by 80 ft) area at the northern base of a steep hill south of the Picture Rocks hill. The approximately 50 to 60 artifacts at PR2 include plain brown ware Hohokam pottery, two flaked stone cores, and several flaked stone debitage artifacts. Bedrock outcrops are present in several places within and adjacent to the artifact scatters, suggesting there is little potential for any buried artifacts to be present at this site.

**Site PR4.** This site is approximately 120 m (about 400 ft) north-northwest of the Picture Rocks hilltop on the eastern terrace of Picture Rocks Wash. It includes a circular, nearly conical pit with rocks, gravel, and soil debris slightly banked up all around its rim and scattered beyond the rim (Figure 65), and some fire- and heat-altered stones. The pit’s diameter at the crest of the banked-up debris was tape-measured at 5.0 m (16.4 ft) and its depth below that crest was tape-measured at 0.66 m (2.2 ft). From the circular crest, the banked-up rocks and sediment extend 1 to 2 m outward so the feature’s total diameter is up to 9 m (29.5 ft).

The only artifacts found in association with the pit are stones inside it that have been blackened by fire
and one that has been vitrified by high heat. The pit’s size, banked-up configuration, and heat- and fire-altered rocks suggest it is a Hohokam horno, that is, a large roasting pit. Hornos that have been excavated at other Hohokam archaeological sites usually are interpreted as earth ovens used to pit-roast many agave hearts at a time for consumption during community feasts (Fish and others 1985; Wallace 2014:460).

2009-2010 Survey Pre-Contact IOs. Pre-Contact artifacts found south of site PR1 and east and southeast of PR2 included two Hohokam plain brown ware potsherds and one flaked stone debitage artifact. Along the eastern side of Picture Rocks Wash we only found one primary flake, between PR1 and the southern RRC property boundary.

Time, Ritual, and Reverence

The Picture Rocks petroglyphs site exhibits evidence of Hohokam timekeeping practices, and certain attributes of the site indicate it was a place of this ancient culture’s rituals and reverence.

**Timekeeping.** The sun daggers that interact with the Panel 1 spiral at certain times of the year demonstrate that the Picture Rocks petroglyphs site had to do with Hohokam timekeeping. The way the daggers interact with the spiral show the Hohokam knew about and marked certain calendar dates, particularly the equinoxes and the summer solstice. It is not clear whether the Panel 1 spiral exhibits a significant sunlight interaction on the winter solstice. It does not appear to do so on any of the cross-quarter dates.

The evidence that one or more Hohokam person(s) intentionally chipped the upper right portion of Panel 1 to direct a sun dagger onto the center of the spiral petroglyph on each equinox day indicates that at least some people in the Southwest several hundred years ago knew enough about astronomy to be able to identify when the equinoxes occur and to mark those events on calendar stones. The Picture Rocks site is not the only one where certain petroglyphs mark the solstices and equinoxes with sunlight and shadow configurations, so it is evident quite a few people in the ancient Southwest knew when those solar events occur. Their knowledge of these celestial phenomena and others, probably including major lunar standstills, is also evident in some settlement orientations and architectural features and alignments (Malville 2008; Dart 2010). Picture Rocks Panel 1 is the only pre-Contact rock art panel I know of that was intentionally altered to direct a sun ray or shadow line onto a petroglyph on particular days of the year. Archaeologist Todd W. Bostwick (2010) proposed that the solstices and equinoxes provided key anchor points in the Hohokam calendar – a calendric framework for scheduling seasonal activities, which would have included maintenance and repair of the hundreds of miles of Hohokam canals in the Phoenix Basin. Hohokam irrigation was not nearly as well developed in the Tucson area because this region’s streams are intermittent or ephemeral, but knowledge of the calendar still would have been important
there, not only for knowing when was the appropriate time of year to sow and care for crops, but for scheduling certain annual rituals and other activities.

Evidence for Rituals. Ritual evidence includes depictions of possible shamanic scenes, deities, mythological figures, and probably human leaders as well as the bedrock cupules and evidence for communal feasting and other group uses of the site.

Possible Shamanic Scenes. Aaron Wright (2014:166-167) cited rock art researchers who have suggested shamanism and altered states of consciousness as explanations for why petroglyphs were created. However, not all shamanistic activities involve mind-altered states. Bostwick and his coauthors Stephanie M. Whittlesey and Douglas R. Mitchell (2010) provided evidence that some Hohokam rock art motifs may represent mythological figures or events, or record “powerful religious personages such as shamans”; and that shaman petroglyph motifs often include large mammals, birds, venomous insects, serpents, spirit beings, composite creatures, and animals with exaggerated, unrealistic, or anatomically incorrect body forms (that is, possibly indicating dream animals). These authors also stated that some petroglyph anthrops appear to be part animal, having horns or sunrays coming out of their heads.

Based on these observations, some petroglyphs at Picture Rocks that might have shamanic implications include the spirals, which could represent serpents. Possible composite creatures include the “curly-tailed deer” glyph (Figure 47 right center); one that looks like an anthro with either a huge tail or an animal’s lower body (Figure 47 lower left); and the anthrops with bison-like horns (Figure 45 second photo).

Might these petroglyphs represent shamans, leaders, warriors, or persons with some other kind of power? And could the petroglyph that appears to represent a human touching the head of a deer (Figure 42) be a depiction of a shaman reaching out to an animal that was believed to cause sickness or otherwise be potentially dangerous (compare Densmore 1929:83,88; Russell 1975:262-265), or could it represent a Hohokam person communicating with the animal? Note that historical O’odham oral traditions tell of a previous era in which O’odham and animals spoke the same language and could communicate with one another (Schmerhorn 2013:199).

Deities, Mythological Figures, Influential People. Some of the anthro petroglyphs at Picture Rocks may depict deities or mythological figures. A prominent example is the flute player glyph shown in Figure 45 (top photo). Dennis Slifer and James Duffield (1994:30) noted that anthrops that appear to be playing flutes are common after 700 CE in petroglyphs of the northern Southwest’s Ancestral Pueblo region.
and those glyphs often are humpbacked and identified as the mythical character Kokopelli (Slifer and Duffield 1994). Janine Hernbrode (personal communication 2021) informed me flute players are rarely seen in Hohokam petroglyphs and, like the Picture Rocks example, other Hohokam flute player petro-

Figure 54. Straight-down view of the bedrock grinding slick (feature 1 in Figure 53); north is at right (Photo by the author)

Figure 55. Straight-down view of bedrock mortar (feature 2 in Figure 53) and graffiti; north is at top of photo (Photo by the author)

Figure 56. Straight-down view of two bedrock mortars and one cupule (features 3, 4, and 5 in Figure 53) north is at top of photo (Photo by the author)

Figure 57. Straight-down view of three bedrock cupules (features 6, 7, and 8 in Figure 53); north is at top of photo (Photo by the author)

Figure 58. Straight-down view of bedrock cupule (feature 9 in Figure 53, below ruler); north is at top (Photo by the author)

Figure 59. Straight-down view of bedrock cupule (feature 10 in Figure 53); north is at top of photo (Photo by the author)
glyphs are less clear than flute player images on Hohokam ceramics. Even on Hohokam ceramics, flute player images are rare. Emil Haury (1976:238-240) illustrated several Hohokam pottery sherds apparently depicting flute players, and wrote that they were restricted to the Colonial period (750-950 CE). He noted that flautists depicted on pottery usually have a headdress indicated by three to seven backward-directed lines, presumably representing feathers, and generally the Hohokam ceramic images show the player “alone, right facing, often with arched body but not with an unmistakable humpback, and holding in both hands a straight object slanting downward from what would be the face on the stylized head.” The Picture Rocks flautist conforms to this description except that it does not have an arched body, its headdress includes only two backward-directed lines (feathers?), and the presumed flute extends nearly horizontally. The flute part of this glyph actually is a natural, linear, lighter colored seam in the rock rather than a pecked image.

Haury suggested it is reasonable to interpret the “straight object” in the Hohokam depictions as a flute because most Indian cultures in the Southwest knew the flute since at least the time of Christ and that historically the flute was the only tone-producing instrument used by the O’odham (Pima) (citing Russell 1908:166-167). Haury also wrote that the headdress and flute, and usually the hunched appearance, “hints at the nonsecular role the flute player had in Hohokam society” and Haury believed the flute player was one of the earliest depictions of a supernatural being in the Southwest (Haury 239-240).

Interestingly, the flute player glyph is one of the few at Picture Rocks that integrates a natural feature of the rock panel – in this case, the light-colored, linear seam in the rock that was used to depict the flute – into the petroglyph image (Figure 45). Might this indicate the artist believed the rock, and perhaps the entire Picture Rocks hill, was sacred?

Another possible deity or mythological personage depicted at Picture Rocks may be the pair of concentric circle petroglyphs beside the meandering-line glyph shown in Figure 49 (upper right photo), which resembles a face with goggle eyes. Some researchers have interpreted goggle-eyed petroglyphs in the southern Southwest as images of Tlaloc, a rain god usually identified in Mesoamerican art by goggle-like eyes that represent clouds heavy with rain (for example, Schafsma 1986:201-203, 235-237).

Two of the petroglyphs at Picture Rocks appear to depict anthropomorphic figures wielding staffs or canes (Figure 42, upper right part of right photo; Figure 44, second photo). These glyphs could represent deities, or shamans, or mere humans who were leaders or who simply used staffs for walking.

At least one historical O’odham deity is said to have used a staff, cane, or wand for magical purposes, as confirmed by anthropologist Donald Bahr and his coauthors’ documentation of O’odham creation stories about Earth Doctor (Jewed Ma:kai) and Siuuhu (I’itoi; Elder Brother), the two primary creator deities.

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2 Many rock art researchers call human-shaped rock art figures “anthropomorphs” instead of “humans” or “persons” because these images could represent nonhuman deities.
in O’odham lore (Bahr and others 1994:11,45,62). These stories include passages saying Earth Doctor possessed a cane, either solid or hollow, that he variously used to stick in the ground and lift himself (like a pole vaulter) straight into the air and across the heavens; to open a subterranean escape passage for a portion of the original people to enter into the underworld (which was described as “a kind of master womb”) to become level with the gods; to point to the heavens meaning he was to drop the heavens and smash the earth; and to shoot through the earth to destroy all the power of the medicine men on the other side (Bahr and others 1994:71-73,79,240-241).

Either or both of the two Picture Rocks petroglyphs that depict anthros holding staffs or canes (Figures 42 and 44), therefore, could represent a deity, but they may instead represent symbols of human authority in certain rituals, important aspects of Hohokam religious belief, or both.

Among many southwestern U.S. and Mexican Indigenous cultures, staffs are given to persons who exercise some kind of religious, civic, or other social authority. For example, Edmund J. Ladd (1979:489) wrote that at Zuni Pueblo in pre-Contact times, a priestly council appointed and charged certain appointees with religious and ceremonial responsibilities for the year and gave each of them a special feather staff called a telnamne as a symbol of office. And at Laguna Pueblo, Florence Hawley Ellis noted that a “Water clansman” still ritually “fed” and cared for the sacred canes of office once belonging to that community’s hunt and town chiefs (Ellis 1979:447). More recently, the National Congress of American Indians (2013) stated “the Pueblos have existed since time in memorial [sic] with traditional canes bestowed upon our leaders by our sacred societies which already symbolizes sovereignty and have always been sovereign entities long before the formation of the United States.”

Closer to Hohokam home, Russell (1975:260) reported that among the Pima (Akimel O’odham), the Si’atcokam (healer) shaman carried his staff in hand when called to treat the sick, and that some wands were made to be held in the hand during ceremonies intended to bring rain, to cure disease, and “for kindred purposes” (Russell 1975:108). Harry J. Winters, Jr., who is not O’odham but has spent over 50 years traveling with and interviewing Akimel O’odham and Tohono O’odham while writing his ‘O’odham Place Names books (Winters 2012, 2020), informed me that with respect to staffs showing authority, the O’odham call them ‘usga, a singular noun composed of ‘uus, which means stick, pole, tree (not of any particular species), post, etc.; and the suffix -ga, which shows ownership. He said this probably is the name O’odham applied to the staffs of office that were given to O’odham men appointed to positions of authority (such as governor, kovnal) by European military men and priests in the late 1600s and the 1700s. This word ‘usga appears in an “archaic” song recorded by Russell (1975:276), the verses of which Dr. Winters translates as “Who with me, who with me stood up? With whomever, with whomever did I sit down? I stood up with this staff of mine. I sat down with this crystal of mine.” (Dr. Winters disagrees with Russell’s translation.)

Even some O’odham staffs used as walking sticks exhibit ritual significance, and some of their users
view them as living beings. Anthropologist Seth Schermerhorn (2013) observed that the staffs that Tohono O’odham walkers, or pilgrims, use during their long walks to Magdalena, Sonora, are believed by their
users to contain both geographical and historical knowledge, evoking memories of past journeys, and these staffs are spoken of and treated as people or at least as extensions of the O’odham walkers.

Tohono O’odham elders told Schermerhorn the traditional walking sticks are not merely canes to lean on, but iagta, meaning “a propitiating gift”; “an article for the harvest ceremony [Wi:giit’a]”; “like a feather or rock, a crystal, the things that a shaman uses”; or “to make an offering, to give something, you use it to pray with . . . [your] staff would become very handy when you go out for days, helps to keep you balance, helps to keep you [sic] walk, but more so, it becomes a sacred item. It becomes . . . a religious artifact of yours. It becomes whatever you want it to become.”

Therefore, iagta symbolizes a gift or sacrifice. Some Tohono O’odham revere their staffs. When not actually walking with them, some of Schermerhorn’s informants said they sprinkle their staffs with water, offer them food, burn incense for them, place them with their personal altars or statues of saints, and take them to different events or just outside from time to time to take in the air and the sun. O’odham say the walking sticks should not be played with, that much like the walkers themselves, staffs can get hurt. They can either help you and heal you or make you sick (Schermerhorn 2013:115-142).

Harry J. Winters, Jr., offered these other observations about O’odham use of sticks that are relevant to this discussion, and about the two stick-holding Picture Rocks petroglyphs:

- Walking sticks or canes are called chiokuḍ or choikuḍ depending on who taught you the language.
- A bow is a gaat. Since the introduction of firearms in ‘O’odham country, rifles have also been called gaat. When it is necessary to distinguish what you are shooting with, you say ‘uus gaat for the old wooden bow, and vainam gaat (iron bow) for a rifle.
- There were sticks for other purposes as well, for example for marking boundaries, keeping track of time and planting.
- The cane of Jewuḍ Maakai with which he performed magic (see Bahr and others 1997) may have been a length of vaapk, common reed or carrizo, Phragmites australis (Rea 1997:102). This reed was still being used by the sai jukam, witches who called on evil spirits to help them, in the first half of the twentieth century to impress the ‘O’odham with their powers. They would take a hollowed out length of vaapk, show everyone that it was hollow and empty, pack it with dry dirt, do their incantations, and hold it up, and a stream of water would pour out of it.
- When I looked at the Picture Rocks petroglyph with the man with his arm extended out in front of him (Figure 42), the first things I noticed were the way one of his arms is extended out, the cocked position of his other arm, and the animal above him to the left, the first thing that hit me is that the man is hunting and the object he is holding is a bow. His left arm is holding the bow and his left arm has the bowstring drawn back.
- The man on the left in the other petroglyph (Figure 44) seems to be wearing some kind of headdress, the kind of thing that is still called siivoda and siivodak in ’O’odham. Such headdresses have been worn at the Viigida ceremony. Could that possibly be a corn stalk, huuñ va’ug, just to the left of him? Maybe the two figures represent two men dancing at a ceremony such as Viigida.

Because some O’odham have indicated staffs or canes are living things or implements of magical power, it seems probable the ancestral Hohokam held similar beliefs about the staffs wielded by anthros in the Figure 42 and Figure 44 petroglyphs.

The Bedrock Cupules and Mortars. As noted above, there are three bedrock mortars and six cupules atop the Picture Rocks hill. In the previous issue of Old Pueblo Archaeology, Chris Reed and I defined
bedrock and boulder mortars as human-made, circular to ovoid cavities created by pecking, pounding, and grinding with a pestle, typically U-shaped in cross-section and more than 9 cm (3.5 inches) in diameter; and we defined bedrock and boulder cupules as similar-shaped human-made depressions that usually are less than 5 cm (2 inches) deep, less than 8 cm (3.2 inches) in diameter, and that may be found in horizontal, diagonal, vertical, or even undersides of rock faces. We wrote that bedrock and boulder mortars in the southern Southwest usually are interpreted as features used almost exclusively for processing plant products (typically mesquite bean pods or acorns) whereas cupules had both utilitarian and nonutilitarian functions. Some of the latter uses documented and suggested for cupules have included fertility-related rituals, weather control, terrestrial maps, sky maps or astronomy, sound and music, consulting or decision making, trail markers or resting places, rites of passage, artistic endeavors, placement of offerings, calendar/time reckoning, communicating with other (spirit) worlds, water symbolism, death markers, incorporation into rock art, and other symbolism no longer recoverable (Dart and Reed 2020).

Three of the six Picture Rocks cupules are larger than the Dart and Reed (2020) specified 8 cm maximum diameter, but all of them are shallow – just 1 to 3 cm deep – so they likely were used for purposes different from those of the larger and deeper mortars. None of the Picture Rocks hill cupules are incorporated into petroglyphs, and I cannot see any pattern in their placement or execution that would suggest map representations or artistic endeavors. If they were not used for purely functional purposes, however, we are left with over a dozen possible nonutilitarian uses described above for why they were created on top of this hill, in association with petroglyphs. Most of those suggested nonutilitarian uses have ritual, esthetic, or magical associations.

While the mortars at Picture Rocks probably were intended mainly for mesquite or other plant processing, it is possible one or more of them served a nonutilitarian purpose for the Hohokam, just as the bedrock mortar at Ma’vǐt Vâ-âk (‘Puma Lying’) or Tci’apatak (‘Place of the Mortar’) did historically for the Pima (Akimel O’odham). Russell (1975:255) described that feature west of Sacaton, Arizona, as a “shallow mortar” in which partly broken beads, decaying fragments of arrow shafts, and bunches of fresh creosotebush branches had been placed when he visited it in the early 1900s, and he identified it as a Pima shrine.

Communal Feasting and Other Group Uses. The site PR4 horno is fairly close to the Picture Rocks petroglyphs – within 120 meters. Historically, large roasting pits of this kind in the Southwest have been associated with roasting of agave hearts, sometimes up to hundreds at once (Castetter and Underhill 1935:16; Castetter and Opler 1936:35-38; Russell 1975:70). Hornos that have been excavated at Hohokam archaeological sites elsewhere often have been found to contain charcoal and ash, and fire-altered and sometimes vitrified rocks that evidently had been used as heating stones. These hornos usually are interpreted as earth ovens used to pit-roast agave hearts for eating, and possibly to produce alcoholic beverages for drinking, during community feasts (Fish and others 1985; Gasser and Kwiatkowski 1991; Wallace 2014:460). Wallace (2014:460) suggested the communal use of these roasting facilities implies sponsorship by a particular group or communal collaboration, as well as prior planning and communal harvesting, all tied directly or indirectly to rituals.

Edward R. Castetter and Ruth Underhill wrote (1935:14) that historically the Papago (Tohono O’odham) harvested the agave “crown with leaves removed” (that is, the agave hearts) in winter, whereas
Castetter and M. E. Opler (1936:35) observed that the Mescalero Apache harvested agave crowns in late May or early June when the flower stalks begin to appear and the plants are most palatable. Therefore, the Picture Rocks horno probably was fired up sometime after the winter solstice and before the summer one, and possibly around the time of the spring equinox. Its size alone suggests group use, and this may have been for ritual feasting if the horno was contemporaneous with the petroglyphs and if the glyphs had ritual significance.

The Southeastern Slope Boulderless Swath. Henry Wallace (2008:214-219) made a case for the ritual importance of summit trails. Aaron Wright (2014:80) wrote that these intentionally cleared trails to the tops of basically conical hills strewn with petroglyphs are typically unbent, indicating a directness of purpose, and suggested that the conical summits onto which summit trails ascend may be natural, nondomestic analogues for capped mounds in pre-Classic Hohokam villages. The association of petroglyphs, summit trails, and conical hills, Dr. Wright proposed, may be associated with a Hohokam worldview that these sites represented mountains, and that the Hohokam regarded particular geographic rises and mountains as homes of mythic personages just as in Pueblo Indian belief the kachinas dwell in mountains, and as traditional O’odham hold that the creator Elder Brother (Siuuhu, I’itoi) took up residence in the South Mountains and in Baboquivari Peak.

The boulderless swath on the Picture Rocks hill’s southeastern slope does not conform very well to Wallace’s and Wright’s descriptions of summit trails because of its meanders and much greater width. However, this swath of boulderless ground and unvarnished bedrock outcrops appears to extend from the base of the hill up into the saddle between the two summits, and contains the densest concentration of pre-Contact artifacts, which are indicative of human activities on this part of the hill. The width of the boulderless swath and the artifacts’ presence are suggestive of other group activities, possibly ritual-related ones, in addition to use of the site for petroglyph creation and visitation, and whatever the bedrock mortars, cupules, and grinding slick were used for.

I discuss other possible group uses of the Picture Rocks site below under the Private Shrine or Public Place? heading.

Evidence for Reverence. In addition to the ritual implications of the Picture Rocks petroglyphs site, evidence that the site was revered by the Hohokam includes the abundance of glyphs, the animal petroglyph orientations, and the hill’s rockshelters and shape.

The Picture Rocks site has one of the largest and densest concentrations of petroglyphs in the Tucson area, and I estimate that the majority of its glyphs are on the western hill face. As noted above, the Picture Rocks hilltop features a natural topographic saddle and includes two small rockshelters (one of which is situated within the saddle) and virtually all of the animal petroglyphs on the west side of the hill face toward the saddle. Perhaps the reason for these animals’ orientations is because the small rockshelters or the hilltop saddle, or both, were considered important by the petroglyph makers. Polly Schaafsma wrote:

From ancient times, symbolic supernatural passageways have pervaded cosmological concepts in similar ways in Mesoamerican and Pueblo cosmologies. This paradigm fosters a pattern of regularity and a common template of understanding throughout Mesoamerica and the American Southwest regarding the metaphysics of the cosmos and the organization of sacred space . . . . The notion of layered worlds accessed by supernatural passageways – natural earth openings such as caves or as niches symbolically constructed in architectural environments – is a fundamental structuring principle in Mesoamerican and related cosmologies . . . . Although offerings in niches are rarely found archaeologically, offerings from the niche’s natural analog – the landscape cave – are well documented throughout the Mogollon . . . . Hohokam (Ferg and Mead 1993), and Pueblo . . . regions of the Southwest. [Schaafsma 2009:666-667]

Schaafsma (2009:666-667) also noted that the physical properties of Puebloan kivas (subterranean ceremonial chambers) are translatable into spiritual dimensions that replicate the place of human emer-
gence, and descent into the kiva is said to dramatize descent into a lower world validating the layered nature of the cosmos. The Ferg and Mead reference she cited is about Red Cave in Arizona’s Whetstone Mountains southeast of Tucson, which contained numerous unusual artifacts clustered around a natural, water-filled basin. Alan Ferg and Jim Mead (1993) interpreted the artifacts as offerings made by the Hohokam between 1050 and 1100 and, based on analogies with ethnographic shrines, they proposed that Red Cave was either a hunting and/or emergence shrine.

In the Evidence for Rituals section above, the citation from Bahr and others (1994) about Earth Doctor opening a passage to the underworld indicates that caves and perhaps other kinds of openings in the earth also were perceived by historical O’odham as passages into the underworld or “master womb.”

These accounts make it reasonable to suggest that the Hohokam who created and visited the petroglyphs at Picture Rocks regarded the rockshelters, the natural saddle at its summit, and perhaps the deep crevices between some of the bedrock outcrops, as passageways to another world, probably one occupied by spirits. Although the rockshelters and the saddle do not penetrate the earth nearly as deeply as Red Cave, and may never have contained any offerings, might they too have been viewed by the Hohokam with reverence, as places where their ancestors emerged from a layered world beneath the present one, and where spirits still reside?

Private Shrine or Public Place?

In her study of petroglyph sites in the Hedgabeth Hills of northern Phoenix, archaeologist J. Simon Bruder (1983:216-218) proposed an extremely general two-part division for ordering petroglyph sites: “(1) those sites which probably were visited by relatively large numbers of people, who may have been members of distinct social units; and (2) sites which probably were used only by a limited number of people, possibly members of a single social grouping.” She suggested that diversity or similarity of design element groupings in certain Hohokam areas may relate in some fashion to whether the glyphs occur within “public” or “private” areas, respectively.

Dr. Bruder reasoned that petroglyph sites with high frequencies and repetitive instances of just a few element types may have been locations with strong personal or group identifiers, somewhat similar to clan symbols used by the Hopi, and so might only have been used by a limited number of people, perhaps closely related ones. On the other hand, the more public kinds of petroglyph sites may have been within areas open to public visitation or along access routes to resources (for example, sources of stone types suitable for making artifacts) over which no one group had a monopoly.

To assess what kinds and sizes of audiences may have interacted with petroglyph sites, Aaron Wright (2014:150-152) attempted to classify Hohokam petroglyph panels and their individual glyphs in Phoenix’s South Mountains as either highly visible, moderately visible, or hidden. He considered panel orientation (horizontal, vertical, or overhead), aspect (for example, facing a trail), and topographic position (such as perched on a high cliff face or tucked under a slight overhang) to distinguish between public and private settings for the rock art.

Wright (2014:150-152) found that over 80 percent of the South Mountains petroglyphs are on highly visible panels, including ones that seem to have been placed where they could be noticed from afar as well as panels readily visible as one passes near them. He suggested that high visibility denotes either intentionality for visibility or an absolute disregard for privacy. Dr. Wright also determined that fewer than 20 percent of the South Mountains glyphs are on moderately visible panels that can be seen only when one is immediately next to them, usually on horizontal or oddly situated rock surfaces, implying the artisans did not intend for the glyphs to be readily noticed by others but apparently were not concerned about privacy.

In contrast to the highly visible and moderately visible classes of petroglyphs, Wright observed that only about 0.5 percent of the South Mountains glyphs – on just five panels – are in hidden settings. He concluded (2014:150-152), “This high degree of visibility shows a clear concern for audiences to witness rock art ritualism as well as intentionality in petroglyph placement, or the framing of the stages, by petroglyph artisans.” He went on to suggest that the overall visibility of South Mountains rock art relates to the
sizes of the audiences attendant to rock art ritualism. Most panels, he noted, “were intended to be seen and engaged as people moved about the stages on which the glyphs were placed, whereas relatively few were positioned to draw attention from farther afield. This reveals a concern for communicating symbolic information and religious knowledge with others . . . .” (Wright 2014:161).

There is no doubt the Picture Rocks site fits into Bruder’s (1983) and Wright’s (2014) category of “public” sites because its rock symbols are abundant and highly varied, and because the Picture Rocks hill is extremely accessible along Picture Rocks Wash, one of the main drainages providing access into the northeastern Tucson Mountains. Yet a significant number of the Picture Rocks panels – nearly half – are atop the hill, out of sight from persons walking along the wash. They are easily accessible via the hill’s relatively gentle southeastern slope but one cannot enter that boulderless swath directly from the wash since it is on the opposite side of the hill from the wash. Therefore, in contrast to the petroglyphs on the wash (western) side of the hill, the hilltop ones evidently were made by artisans who did not intend for them to be readily noticed, yet were not trying to keep them secret.

Wright (2014:76) also described features at South Mountains petroglyph sites that he interpreted as shrines, which he defined as “places of religious importance and sites of ritual practice [that] include built facilities as well as peculiar, conspicuous, or visually prominent landforms, sources and bodies of water, caves, forests, and so on.” An outcrop of fragmented, desert-varnished bedrock at the upper end of the Picture Rocks hill’s southeastern-slope boulderless swath, where that swath seems to turn westward into the summit saddle, is a visually prominent landform when viewed from the boulderless swath itself, so possibly the outcrop was considered a shrine or altar. Otherwise, I have not observed on the Picture Rocks hill any built features or any of the other kinds of features Wright included in this shrine definition except the small caves on the hill’s west face.

Wright (2014:206) also wrote:

The social organization of religious knowledge during the Preclassic [i.e., Hohokam pre-1150 period] may be characterized aptly as “communal” in the sense that the forms of ritual architecture and the distribution of ritual paraphernalia evidence an inclusive, participatory ritual system . . . . Sensory-rich religious rituals were enacted at an assortment of places – starting with performances in plazas and moving to small capped mounds and ballcourts, symbolic architectural facilities engineered to accommodate audiences. [Wright 2014:206]

The eight linked anthros below the Panel 1 spiral (Figures 3 through 25, 29 through 32, and 44 upper photo) face the viewer passing by in the wash, and at least the four right-most anthros in this group appear to be wearing headdresses suggestive of people holding hands and line-dancing in a ritual formation. In the second set of linked anthros (Figure 44 second photo), the two anthros face left (towards the hilltop saddle and Rockshelter 1), the left one has a headdress or curving horns and holds a staff, and the right one has no headdress or staff, suggesting a ritual procession led by the head-dressed, staff-holding one. In sum, these ten anthros appear to be acting out public rituals for all visitors to see. This is hardly what one would expect to find in a private shrine.

Rock art researcher Janine Hernbrode has informed me that at the King Canyon petroglyphs site, which is just across the Tucson Mountains southwest of the Picture Rocks site, people could have stood on rock ledges in proximity to many of the petroglyphs, to address people below. At the Picture Rocks site there are similar ledges at the bases of nearly all of the west-facing petroglyph panels that likewise could have been stages for public oratory or performances when people gathered there. Considering all the other evidence that the Picture Rocks petroglyphs site was a public rather than private site, and that group activities occurred there, I think it is likely that these “stages” were so used.
Fast Forward

Reverence for the Picture Rocks petroglyphs site did not end when the Hohokam stopped creating petroglyphs there. The glyphs have remained for hundreds of years since, and undoubtedly have been seen by myriad men, women, and children who have been awed by the hundreds of images, even though most visitors probably have not had a clue about the site’s time-keeping features and ritual significance.

While preparing this article, I discussed modern O’odham perspectives about ancient petroglyphs with two O’odham individuals of the San Xavier del W:ak (Bac) community south of Tucson and with two non-Indians who have worked for years among O’odham. These conversations indicate that reverence for ancestral petroglyphs continues among O’odham today.

Tony Burrell, an elder who has traced his ancestry to the historical Sobaipuri O’odham of the Santa Cruz and San Pedro valleys, emailed me that O’odham, particularly elders, occasionally visit petroglyph sites. Austin Nuñez, Chairman of the Tohono O’odham Nation’s San Xavier District since 1987, wrote me saying his personal view is that there are current-day O’odham who revere petroglyph sites as sacred, important cultural places, and who offer prayers or physical offerings there. Prayerful O’odham, who have a spiritual connection to our Mother Earth and all of her bounty from Creator, he wrote, practice this and the practice has been handed down to their children and grandchildren.

Peter Steere, the Tohono O’odham Nation’s Tribal Historic Preservation Officer who is not O’odham, wrote that petroglyph and pictograph sites are visited and regarded as sacred places by the Nation’s spiritual leaders. And Harry J. Winters, Jr., informed me he has visited a number of petroglyph sites with his O’odham friends and has seen some of them leave offerings.

Today there also are other symbols of modern reverence on the Redemptorist Renewal Center property: the Christian cross and the tile-mosaic mural of Our Lady of Perpetual Help on the Picture Rocks hill, and, just across the driveway to the east, the most obviously symbolic modern cultural feature of all: Our Lady of the Desert Catholic Church (Figure 66). Whether future guests who visit the RRC property understand the Hohokam reverence for the site or share recent O’odham or Catholic church beliefs and rituals, the Picture Rocks site likely will remain a place of reverence for many years to come.

Figure 66. Our Lady of the Desert Catholic Church at the Redemptorist Renewal Center: left, Bishop Gerald Kicanas and congregants celebrating renovation of the RRC main dining hall and kitchen facilities after they had burned down in October 2005 (Picture Rocks petroglyph hill is at left beyond the celebrants); right, the church in 2019 after completion of its extension project (Photos courtesy of the Redemptorist Renewal Center, Tucson)

About the Author

Allen Dart, a Registered Professional Archaeologist, has worked professionally in archaeology since 1975 and has been Old Pueblo Archaeology Center’s executive director since 1993.

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Differences in Rock Color at Petroglyph Sites

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There may be any number of reasons why some portions of petroglyph panels may be lighter, darker, or different-colored than other portions of the same rock panel or other panels at the same petroglyphs site, and why rock surface colors vary, or at least seem to, within a single petroglyph site. Some causes of color differences occur naturally, others may be due to unintentional or intentional human actions. Color differences also may be caused by different lighting, optical, or electronic factors.

Possible Natural Causes

Some color variations reflect how long different surfaces of the rock have been exposed to natural weathering and biological actions, but vegetation, extreme temperatures, and chemical interactions can influence rock color.

In arid regions, a prime cause of rock color diversity is the long-term formation of desert varnish, which may darken rock surfaces in shades from black to red to orange. Desert varnish usually is composed of clay minerals, oxides, and hydroxides of manganese and/or iron, and may include silt or sand grains, other particles, and trace elements. Blackish desert varnish typically found on southern Arizona volcanic rocks forms when microorganisms that live on rock surfaces take manganese from out of dust in the air and from moist rock surfaces, oxidize it, and deposit it onto the rock. A complete black coating of manganese-rich desert varnish takes thousands of years to form so it is rarely found on easily eroded surfaces (National Park Service 2018).

The millennia-long desert varnish formation rates account for why most petroglyphs are lighter in color than the rock surfaces that surround them – the varnish has been pecked, scratched, ground, or carved into, exposing the true rock color beneath the varnish. Usually, only those petroglyphs that are thousands of years old have been exposed to the manganese- or iron-secreting microorganisms long enough for the glyph surfaces to again have become as dark as the surrounding rock surfaces.

Differences in surface moisture on various parts of the rock may cause vertical, red (iron) or black (manganese) streaks of desert varnish. As illustrated in Figure 1, rain water occasionally washing downslope on a rocky hill may inhibit microorganism growth on the lower, more-often “rinsed” boulders so that the upper areas appear darker (more manganese-coated) than the lower ones. If there is a wash (intermittent or ephemeral stream) at the base of the hill, as is the case in the view of the Picture Rocks site in Figure 1, the lower rocks may be inundated by the wash’s occasional floods often enough to inhibit desert varnish formation.

The colors of desert varnish coatings on rock also can be altered (usually lightened) by abrasion, such as when wind causes branches of nearby trees or bushes to brush against the varnish, or by natural sandblasting during windstorms.

Actual growth of plants on rocks, or in cracks or crevices in and around them, can affect the color of the stone. Lichens – which are common at

Figure 1. Different degrees of desert varnish formation on upper and lower elevations of a basal, western section of the Picture Rocks hill; runoff from upper levels may have resulted in less varnish formation on the lower areas and, at the base of the hill, occasional floodwaters of Picture Rocks Wash apparently have completely inhibited varnish formation; darker-varnished areas often were preferred for petroglyph placement, probably because those areas provide higher contrast between the glyphs and the surrounding rock color (Photo by the author)
Picture Rocks – and mosses growing on rocks may produce their own colors, often quite vivid (Figure 2; also see lichens in the preceding article’s Figures 1, 40, 42 through 47, 49, 51, 52, 59, 63, and 64).

Not only growth of lichens and moss, but roots of trees and other plants, freeze-thaw interactions, and even chemical actions on rock, such as oxidation or calcium carbonate (caliche) deposition, may affect the rock color. Any of these actions may deteriorate petroglyphs and other features humans have created in the rock such as mortars, cupules, and grinding slicks (Jenny Adams, in Burton and others 2017).

Thermal as well as depositional effects of forest and brush fires, and even of campfires, can cause deterioration of rock surfaces and any petroglyphs or pictographs on the rocks, in addition to altering rock color. Roger Kelly and Daniel McCarthy (2012) noted that in addition to direct charring and smudging from smoke, heat penetration into rock may cause chemical and physical changes that affect the rock color (and colors of organic pigment binders in painted rock art). Thermal effects, they wrote, include discoloration, exfoliation or spalling, and heat absorption.

In a microscopic-level study, Alice M. Tratebas, Niccole Villa Cerveny, and Ronald I. Dorn (2004) determined that wildfires create thermal fractures that enhance rock panel erosion, mostly along weathering rinds that formed long before petroglyphs were created on the affected panels but also on the less-weathered surfaces of the glyphs themselves. To mitigate these fire effects, those authors recommended identifying the areas of petroglyph panels that have been most fire-affected, then clearing trees and shrubs near the panels by hand. They also found, however, that fire ash with high concentrations of potassium strongly adheres to rock varnish on petroglyphs and spalled sandstone, and the potassium may compromise attempts to date the varnish using a cation-ratio technique, which is an impact that probably cannot be mitigated.

Possible Human Causes

Black, vertical desert varnish streaks on cliff faces, especially reddish or brownish ones, often are mistaken for smoke stains. Some of these streaks, however, may have been caused by smoke. Campfires set either willfully or unintentionally next to rock panels that include petroglyphs or pictographs may smudge the rock images. While some human-caused color changes on rocks that contain rock art are intentional vandalism, probably most are either accidental or are byproducts of activities that people conducted on or next to the rock surfaces for purposes other than just altering the rock color. For instance, stone surfaces around some mortars, basins, and grinding slicks abraded into bedrock and boulders are smoothly ground and polished beyond the margins of the grinding depressions, and this polishing may affect rock color – see examples in the preceding article’s Figures 55 and 57, and in Dart and Reed (2020:Figures 8, 20, 30, 32, 33, and 50).

Accidental discoloration of rock art images and their surrounding surfaces also can occur when people step on the images and rock surfaces with soiled feet or footwear, or even when someone touches the surfaces. Oils and other matter on one’s fingers can adhere to rock, causing direct color transfers, and may result in color-altering chemical interactions with the desert varnish or may disrupt development of it by the microorganisms that deposit manganese or iron onto the rocks. And obviously, human chipping or breaking of the rock surfaces, whether accidentally or on purpose (as in the case of the smaller light-colored portion of Picture Rocks Panel 1 as described in the preceding article) can affect rock color.
Recording Techniques that May Result in Color Changes. People who enhance petroglyphs accidentally or intentionally may change colors of some images and of the rock panels on which they occur, by actions such as intentionally removing bits of the desert varnish, chalking or painting the images, making casts of glyphs, overlaying paper or other media over them to make rubbings, and other techniques that once were implemented during documentation of rock art, but that hopefully are used no longer. Before I determined that the larger light-colored portion of Picture Rocks Panel 1 (see preceding article) was a result of natural scaling-off of a desert-varnished surface before the petroglyphs were created in that lighter area, I discussed possible reasons for its lighter color with archaeologists Chris Loendorf, Larry Loendorf, Henry Wallace, and Aaron Wright. Chris Loendorf noted that rubbing of rock art used to be a common recording technique until researchers learned how much wear this method causes to the panels. Chris suggested the lighter color on Panel 1 could have resulted from modern people taking rubbings but also mentioned ethnographic examples of Apache painting pre-Contact petroglyphs and has been told this practice continues.

Larry Loendorf suggested the larger light-colored portion of Picture Rocks Panel 1 might have resulted from someone making casts of the petroglyphs, since that procedure is known to remove the desert varnish, especially when the casting has been done by amateurs or with a product that adheres too tightly to the rock surface. Larry noted that he has seen similar casting damage to petroglyphs in Montana, Wyoming, and elsewhere. He also wrote that it is quite common to see a small bit of pigment or desert varnish removed from petroglyphs and, while he had not seen an actual ethnographic explanation for this proactive procedure, he noted it is generally thought to represent individuals taking the removed bit of varnish for medicine.

Aaron Wright indicated he has come across a number of light-colored petroglyph panels along the lower Gila River in Arizona. He suggested some of them could have been lightened by an old tree that is no longer around, or that sometimes glyphs were made on light-colored surfaces to begin with, and in other cases it seems that people essentially rubbed them out. Aaron remarked that in the South Mountains
south of Phoenix, where he did an extensive study of Hohokam petroglyphs (Wright 2014), there are a couple of panels he thought had been basically “erased” by someone intentionally rubbing out the glyphs but is not sure any more, and also is unsure how to tell with certainty, as the seeming erasures could as easily have been caused by a tree. (See discussion in boxes on pages 62 and 63 about whether petroglyph panels might have been lightened by intentional rubbing.)

In another line of reasoning, Aaron Wright suggested to me that the area of Panel 1’s lighter color may conform morphologically to a natural fissure plane in the rock face and that the lighter area may be confined to a part of the panel where a slab has scaled off. He noted he has seen such a thing many times on the lower Gila, where scaling exposed a less-varnished (i.e., less-patinated) surface that subsequently was used to make glyphs. In cases such as this he is convinced the location was more important than the imagery, since the glyph makers could have chosen a much darker “canvas” on a nearby rock. At Picture Rocks, if the solar interaction with the Panel 1 spiral petroglyph was paramount, the Hohokam may have been obliged to create the spiral glyph where the sun dagger occurs even though it is on a less-varnished surface. He also noted that if the lighter color was due to human rubbing of the surface, he would expect some degree of polish (of which I found no traces on Picture Rocks Panel 1).

In the Schaefer and Stamm (2020) article and in emails to me, Bradley Schaefer suggested the lighter color on Panel 1 resulted from chunks of the black, desert-varnished rock flaking off at some time in the past. He noted that surface layers of rock sheets with high varnish are common on the Picture Rocks hillside and there are marks of broken flakes all around, leading him to surmise that the flaking was entirely natural. He suggested the larger light-colored portion had Hohokam petroglyphs on it before it flaked off because the heads of the left four anthro petroglyphs at the bottom of the panel are broken off, whereas their bodies and the other four anthros are on a part of the panel with heavy desert varnish; and that it was not until after this flaking event that the spiral was pecked into the surface exposed after the original veneer flaked off (Schaefer and Stamm 2020). I disagree with this suggested sequence as noted in pages 25-27 of the preceding article.

Wallace and Holmlund noted that both Hohokam and Archaic glyphs in the Picachos were repecked or ground, and that there were a few apparently more recent petroglyphs that resembled but were noticeably different from the earlier ones. They concluded that “the repecking and attendant new glyphs were produced by a radically changed Hohokam culture or descendants of what was once the Hohokam” and that these phenomena represent the activity of Protohistoric period occupants of the region, who lacked knowledge of the significance or form of the original designs. These authors wrote that ethnographic inquiries to the Pima (Akimel O’odham) Indians living in the area during the Historic period met with a disavowal of any knowledge of glyph making or knowledge of their meaning, although portions of at least two petroglyph sites were used as Piman shrines (Wallace and Holmlund 1986:154-159; citing Russell [1975:254] about the shrines).

When I emailed Henry Wallace some photos of Picture Rocks Panel 1 and asked whether the kind of abrasions he had seen on Hohokam petroglyphs in the Picacho Mountains might account for the Picture Rocks panel’s lighter colored portion, he replied that he had seen abraded/rubbed glyphs/panels at other sites where he was relatively sure the abrasions were done before 1450 or during the 1450-1700 Protohistoric period. He surmised from a close-up photo I had sent him that the lighter portion of Panel 1 looks like a geologically more recent surface and the lighter background would be anticipated if this occurred when the desert varnish was forming. However, he remarked that the exposure of a geologically more recent surface would not account for abrasion of the rock surface or the glyphs, and if the patina (varnish) of the rubbing is within the range of being prehistoric or protohistoric after comparing patina at a microscopic level, one could argue for it being a cultural practice in antiquity and a ritual function would be likely as it does not appear anyone was attempting to erase the designs.

Rock art researcher Janine Hernbrode (2019), who has directed several petroglyph-recording projects in southern Arizona in recent years, noted only one instance among the several thousand glyphs recorded at the Cocoraque Butte archaeological site west of Tucson where it appears petroglyph images were abraded over. She observed, however, that a few rock art elements there are attributable to Tohono O’odham and later visitors. One of the elements she potentially attributed to the 1450-1700 Protohistoric period are what she called “Abraded Natural Features,” which she defined as light abrasions on vertical rock surfaces that emphasize a natural feature or texture of the boulder to make a petroglyph element-like representation:

Very specific natural features are highlighted in this way so they appear to have shape, and thus meaning, beyond the grinding surface . . . . This practice appears to be the ultimate employment of enhancement and incorporation of the natural features of the boulders and an extension of the practice of including natural holes, spalls, surface textures, and aberrations as part of the imagery, a practice some researchers have called “rock feature incorporation.” [Hernbrode 2019:98]
Other Cultural Practices that May Result in Color Changes. There are other Hohokam archaeological sites where petroglyphs apparently were discolored by abrading or polishing after they were created by pecking, most likely by Indigenous peoples. For discussion of this possibility, see the accompanying box discussion about whether petroglyph panels were lightened by intentional abrading or rubbing. If such intentional abrading or polishing occurred, in most cases it probably would have altered the images’ and the rocks’ surface colors.

Lighting, Optical, and Electronic Factors

Natural and Artificial Lighting Situations. Ethel G. Stiffler’s photograph of Picture Rocks Panel 1, which is reproduced as Figure 29 in this issue’s page 25, and her photo of the site’s petroglyphs panel shown in this issue’s Figure 42 (page 43) were published on page 63 of her book Letters from Tucson, 1925-1927 (Stiffler 2006) over this page caption written by the book’s editor, Roger E. Carpenter:

Hohokam petroglyphs north of Picture Rocks Rd., at north end of Tucson Mts., Jan. 1926, now on the private property of a religious retreat. These examples are now more weathered or degraded than in 1926. (E.G.S.)

[Stiffler 2006:63; the parenthetical E.G.S. note indicates the two photos on page 63 were taken by Ethel G. Stiffler.]

Both of the photos on page 63 of Stiffler’s book are of petroglyphs on the western face of the Picture Rocks hill. To reach the conclusion that the glyphs shown in Stiffler’s page 63 photos are now more weathered or degraded than they were in 1926, I believe Mr. Carpenter must have visited the Picture Rocks site for comparison around noon or shortly afterward when the glyphs were in glaring midday sunlight. During that time, most of the petroglyphs and background rock surfaces on the western face of the hill are very light-colored, making the glyphs quite difficult to see.

Ethel Stiffler’s journal account of her January 11, 1926, visit to the Picture Rocks site indicates she and her companions left Tucson around 3 p.m. and stayed till after dark (Stiffler 2006:61,64). On late afternoons in January, the sun already is behind the large hill west of the Picture Rocks hill, engulfing the latter in shadow and making nearly all of the western hillside’s petroglyphs highly visible until twilight.

In the preceding article, Figures 5 through 9 illustrate the extent to which details of some petroglyphs can fade from view as they emerge from shadow into bright midday sunlight. In many southern Arizona petroglyph sites I have visited, most of the glyphs are most easily seen on cloudy days or when they are in shadow, and often are nearly impossible to make out when they are in glaring sunlight. The degree to which the Picture Rocks glyphs may have become more weathered or degraded between 1926 and 2006 (when Stiffler’s book was published), therefore, is questionable.

Cloudy and shadowy situations are not always the best conditions for seeing the details of all petroglyphs in the field, however. For example, the ones shown in this article’s Figure 3 and in the preceding article’s Figure 40 are seen more clearly on bright sunlit days than when they are in shadow, and even most of the glyphs on the Picture Rocks hill’s western face are highly visible in mid- to late-afternoon sunlight as shown in Figure 1 of the preceding article (page 1).

Enhanced or artificial lighting can make a difference in perceived colors of rock images and backgrounds. Natural lighting can be manipulated or enhanced by using devices such as reflective vehicle-windshield shades to focus sunlight onto certain parts of a rock panel to better illuminate those sections. And photographs taken with a flash device in shaded, twilight, or full-darkness situations can make dramatic differences in perceived
colors (Figure 4).

Petroglyph and pictograph panels also may vary greatly in color in different printed photographs of the same panel, or when viewing them in computer or television monitors. The times of day when the photographs are taken are big factors in rock color differences, but other differences may be more apparent than real due to variations in the cameras’ and viewing devices’ color accuracy and photographic resolution. Such differences can be seen in the preceding article’s Figures 1 vs. 3, 26 vs. 27, 42, and several of its other figures.

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Figure 4. Day and night color differences of a vandalized petroglyph boulder in Arizona’s Salt River Canyon: left, photographed in daylight under a shade, June 18, 2007; right, photographed at night with a flash, August 18, 2007 (Photos by the author, using the same camera for each)
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