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Pueblo Bonito Petroglyph On Fajada Butte: Solar Aspects

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A petroglyph near the top of Fajada Butte in Chaco Canyon, New Mexico, appears to display the major features of the ground plan of Pueblo Bonito and to express the interest of the prehistoric Chacoan culture in the solar cycles (Sofaer and Sinclair 1989) (Figures 1a, b; 2).

In this regard, we consider three aspects of the Pueblo Bonito petroglyph: its similarity to the ground plan of Pueblo Bonito; the petroglyph's own solar orientations; and its association with the motif of other solar petroglyphs near the top of Fajada Butte.

Our interpretation of the petroglyph is consistent with, but does not depend on, cultural evidence of the association of its arrow (and possibly bow-and-arrow) image with the solar cosmology of the descendant Pueblo peoples during the historic period.

BACKGROUND During the period 900-1130 AD, the Chacoan culture built numerous multistoried buildings and extensive roads throughout the 80,000 sq km of the San Juan Basin of northwestern New Mexico (Lekson et al. 1988). Chaco Canyon was the center of the culture. Recent archaeological interpretations suggest that several of the large central buildings, including Pueblo Bonito, were used primarily for ceremony and that Chaco Canyon served as a ceremonial center for outlying Chacoan communities (Judge 1984).

Astronomy played an important role in the Chacoan culture. Earlier research showed that the Chacoans marked the solstices, the equinoxes, solar noon and the standstill positions of the moon in thirteen light markings on petroglyphs on Fajada Butte (Sofaer et al. 1979, 1982; Sofaer and Sinclair 1987). Recent studies show that eleven of the major Chacoan buildings are oriented to the sun and moon (Sofaer et al. 1989); and that each of the major buildings also has an internal geometry that corresponds to the relationships of the solar and lunar cycles (Sofaer 1994). In addition, most of the major buildings are organized in a solar-and-lunar pattern that is ordered about Chaco Canyon (Sofaer 1995). Pueblo Bonito, which is located at the approximate center of Chaco Canyon, plays a central role in this pattern.

Pueblo Bonito was originally four stories high and contained over seven hundred rooms (Lekson 1984). It also contained thirty-six kivas, the round semi-subterranean features of the Chacoan culture, which are thought to have served ceremonial functions. In its longest dimension, Pueblo Bonito is 150 m. It was one of the two largest structures in the Chacoan cultural region. Its semicircular shape is unique among Chacoan buildings.

PHYSICAL FEATURES The primary external design of the building is a semicircle composed of a long front wall, or diameter of the semicircle, which is joined at each end by a long curved back wall, or arc of the semicircle.

The primary internal feature consists of a wall which is perpendicular to the diameter of the semicircle and which approximately bisects it if the line of the interior wall is extended to the long curved back wall as a radius of the semicircle. In addition, Kiva A, a prominent internal feature, is located near the juncture of the primary internal, or radial, wall and the long front, or diameter, wall. Kiva A is 17 m in diameter. It is the largest kiva in Pueblo Bonito.

Fajada Butte, a 135-meter high promontory, is located at the south entrance of Chaco Canyon, seven km to the southeast of Pueblo Bonito. The Pueblo Bonito petroglyph is located at the approximate center of the highest cliff bench of the Butte, about 10 m to the west and slightly above the three-slab Sun Dagger site. Pecked onto a vertical cliff surface, its center is 114 cm from the floor of the cliff bench. The petroglyph is 24 cm by 36 cm.

The petroglyph appears to map the major features of the ground plan of Pueblo Bonito. The design is a semicircle. Its diameter corresponds to the long front wall and its arc corresponds to the long curved back wall of Pueblo Bonito. This semicircular shape is unique among the petroglyphs on Fajada Butte. The uniqueness of the semicircular format of the ground plan and of the petroglyph calls further attention to their relationship.

The primary internal features of the petroglyph consist of a radial line perpendicular to the diameter of the semicircle, approximately bisecting it, and a drill hole, approximately 1.7 cm deep, near the juncture of the diameter and the radial line perpendicular to it. The radial line appears to correspond to the interior wall and its extension. The drill hole appears to correspond to Kiva A. (We note with interest that the east and west sides of Pueblo Bonito are represented in the petroglyph in reverse of their positions in the ground plan; Kiva A, however, is represented in the petroglyph in its position in the ground plan.)

Two features of the petroglyph are external to the semicircle. First, the head and butt of an arrow are appended to the radial line of the semicircle. In this context, the radial line can be seen as the shaft of the arrow; and the semicircle can possibly be seen as a bow. (We note that, if the image is interpreted as a bow-and-arrow, the order of the bow and arrow are in reverse of the order we find when a bow and arrow are more ready for use.) Second, a spiral surmounts the diameter of the semicircle.

SOLAR ASPECTS OF THE PETROGLYPH We find the following evidence for solar aspects of the Pueblo Bonito petroglyph:

Similarity to Pueblo Bonito The broad similarity of the petroglyph to the ground plan of Pueblo Bonito--the petroglyph's semicircular shape, the radial line dividing it, and the drill hole corresponding to Kiva A--recalls the solar orientation of Pueblo Bonito itself, and of Kiva A.

Earlier work shows that the western segment of Pueblo Bonito's long front wall (or diameter wall) is oriented east-west, the directions of the rising and setting sun at equinox (Sofaer 1995). This work also shows that the primary internal feature--the radial wall which is perpendicular to the western segment of the diameter wall--is oriented north-south and to the azimuth of the meridian passage of the sun at noon. The internal features of Kiva A are also oriented to the cardinal directions. It may be further considered that the vertical axis of Kiva A relates to the nadir and zenith directions.

Thus, as a representation of the key solar elements of Pueblo Bonito's design the petroglyph can be seen to express solar relationships: to the mid-point in the sun's yearly passage and to the mid-point in the sun's daily passage (1). And, in representing Kiva A, it also can be seen as expressing the nadir and the zenith.

The Petroglyph's Orientations The Pueblo Bonito petroglyph is oriented to the cardinal directions and to the zenith and nadir. The petroglyph faces east to the rising sun at equinox and the diameter of its semicircle is oriented north-south to the azimuth of the sun's meridian passage. Its radial line is vertical and thus is oriented to the zenith and the nadir. The drill hole--which appears to be associated with Kiva A--penetrates, in a westward direction, the cliff surface as Kiva A penetrates the floor of the Canyon.

Each of the cardinal orientations of the building is transformed in the petroglyph to another cardinal direction; the east-west diameter wall of Pueblo Bonito is north-south in the petroglyph; the north-south interior wall of Pueblo Bonito is the nadir-zenith in the petroglyph; the nadir-zenith orientation of Kiva A is east-west in the petroglyph.

Each day, over a period of about a half hour during meridian passage of the sun, the visibility of the petroglyph changes gradually from full sunlight to full shadow. This light and shadow transformation does not involve a distinct marking on the petroglyph. And so, we are not certain of its significance to the Chacoans. It seems likely, however, that its effect was noticed by the Chacoans who made numerous light markings that record the sun's meridian passage on petroglyphs on Fajada Butte. It may in fact have been an effect intended by the Chacoans in their placement of the petroglyph on a cliff face with a north-south orientation.

It is of interest that, at summer solstice during the sun's meridian passage, a stick inserted in the drill hole of the petroglyph casts a vertical shadow that falls approximately along the radial line (2). (Such an inserted stick would, itself, point approximately 90 degrees away from the astronomical zenith to the equinoctial sunrise.) Again, we note this with interest, but cannot be certain of its significance to the Chacoans.

Associated Features The spiral which curls above the diameter line of the petroglyph and to which the arrow points may represent an additional solar feature. We note that the association of spirals with solar events is exhibited repeatedly on Fajada Butte. Eleven markings of shadow and light on petroglyphs near the top of Fajada Butte commemorate the solstices, equinoxes and meridian passage of the sun. Eight of these markings occur on spiral petroglyphs.

We note that in the petroglyph the arrow points to the spiral, which seems to have solar associations, and to the zenith (3).

Cultural Similarities in the Historic Period The arrow, and the bow-and-arrow, are associated with the sun in the cosmology of the historic Pueblo peoples, who are descendants of the Chacoan people. In certain Pueblo traditions the arrow is seen as a vertical axis and as relating the nadir and the zenith... or the world below and above. In a version of the Zuni creation story, the Sun-Father gives his sons bows and arrows and directs them to lift, with an arrow, the Sky-Father to the zenith (Cushing 1896). In other versions, the sun directs his sons to use their bows and arrows to open the way to the world below for the Pueblo people to emerge to the earth's surface and to the sun's light (Bunzel 1932). At the solstices, the Pueblo people give offerings of miniature bows and arrows to the sun (Ellis and Hammack 1968, Parsons 1939). The sun is depicted by Pueblo groups as carrying a bow and arrow (Stevenson 1894).

Summary A number of features of the Pueblo Bonito petroglyph, taken together, powerfully suggest its solar character (4).

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NOTES 1) See John Stein, in *Anasazi Architecture and American Design*, University of New Mexico Press 1996, for another view on the importance of solar noon in the design and location of Pueblo Bonito.

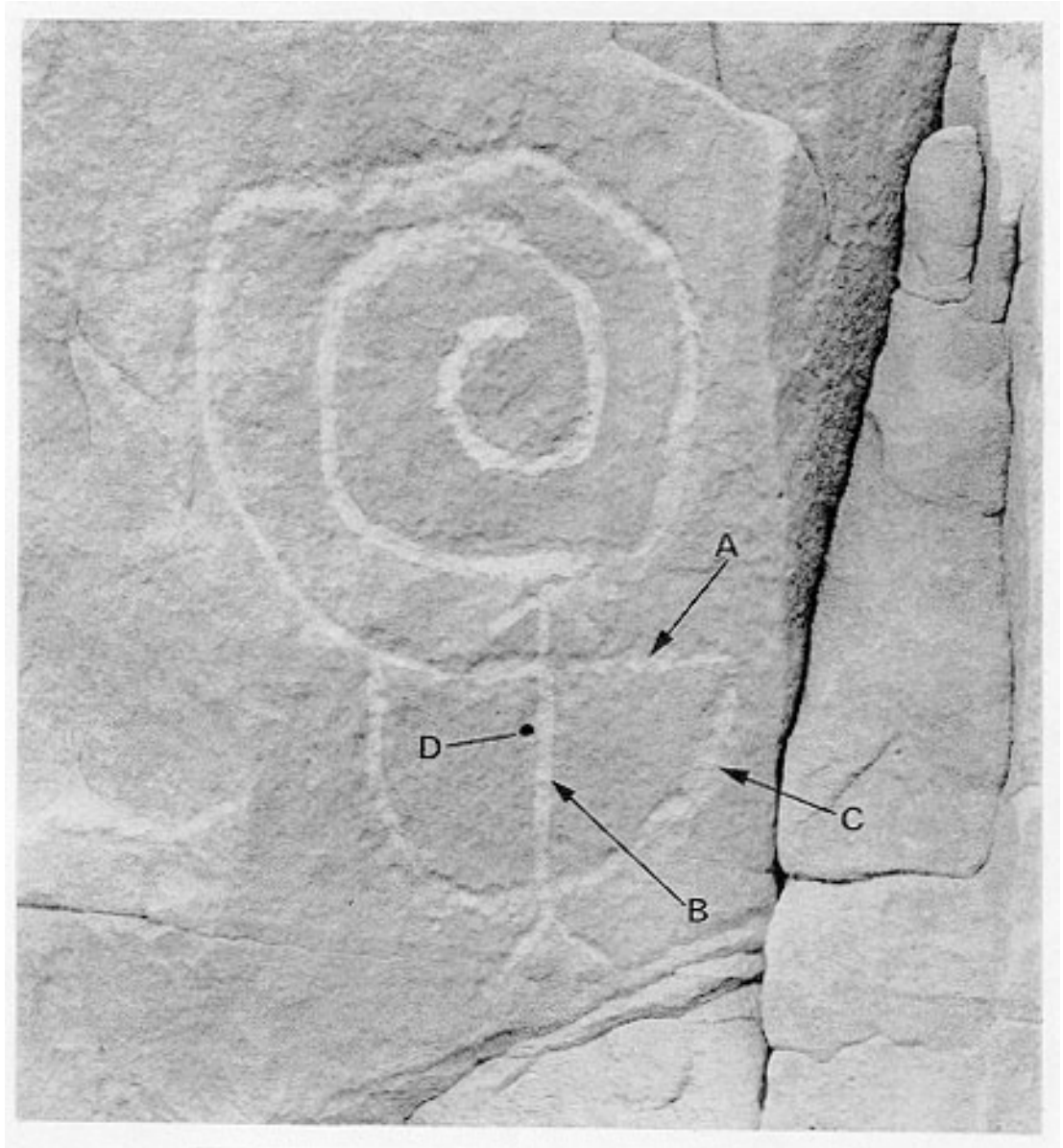
2) We note that Dabney Ford (National Park Service) has also observed this phenomenon.

3) In our consideration of the solar aspects of the petroglyph, it is of particular interest that the interior wall of Pueblo Bonito, which is oriented to the azimuth of the meridian passage of the sun, is represented in the petroglyph as an arrow pointing to the zenith. This possible association of the zenith pointing arrow with the meridian passage of the sun, also suggests a link between the nearby Sun Dagger (which occurs 35 minutes before solar noon at summer solstice) and the seven markings of solar noon on Fajada, with Pueblo Bonito. Ultimately this petroglyph may deepen our understanding of the design of Pueblo Bonito.

4) We make special note of the rotations and reflections in the petroglyph. Our future study of this petroglyph will focus on these interesting characteristics.

FIGURES

Figure 1a



Petroglyph near the top of Fajada Butte. It is 24 cm by 36 cm and located about 10 m west of the three slab Sun Dagger site (see Sofaer et al. 1979). A, B, C & D indicate features of Pueblo Bonito, shown in the ground plan below.

Figure 1b

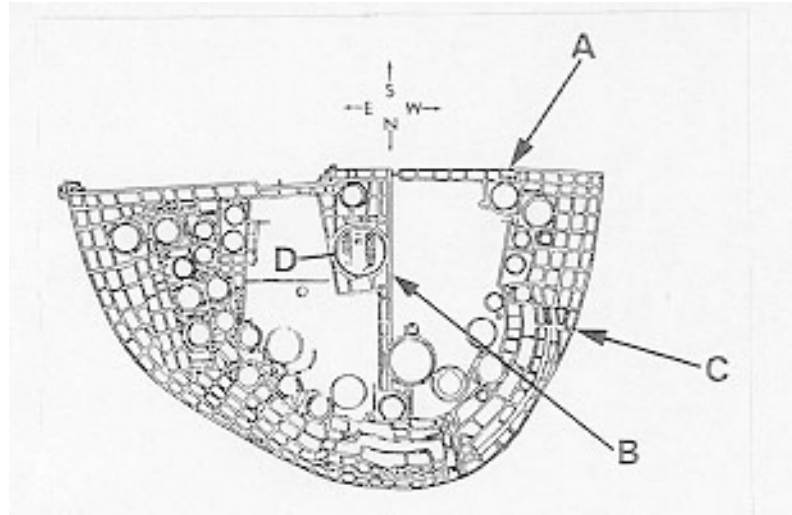


Figure 1b) Ground plan of Pueblo Bonito. A: East-west oriented wall. B: North-south oriented wall. C: semicircular outline of the building. D: Kiva A. [(c) The Solstice Project, 1995.]

Note: The petroglyph is artificially emphasized because of its inherent low contrast.

Figure 2



Aerial view of Pueblo Bonito from the north.
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